A. GENETIC RESOURCES AND SEED DIVISION

A I. GENE BANK DEPARTMENT

PROGRAMME AREA: COLLECTION, CONSERVATION, HARACTERIZATION, EVALUATION AND DOCUMENTATION OF JUTE AND ALLIED FIBRE GERMPLASM

PROJECT 1: COLLECTION, CONSERVATION AND DOCUMENTATION OF JUTE AND ALLIED FIBRE GERMPLASM

Objectives: To collect jute and allied fibre germplasm for conservation in the BJRI Gene Bank.

1.1 Title of the Programme: Collection of jute and allied fibre germplasm for conservation in BJRI Gene Bank (GB-1/2025)

Background and objectives: Germplasm collection are very important for increasing the present stock of gene bank. It can be done by two main ways, i.e. exploration and procurement from other agencies, individuals, companies, etc. (Frankel, 1970). Germplasm are living genetic resources such as seed or tissues that are maintained for the purpose of animal and plant breeding, preservation and other research uses (Day-Rubenstein *et.al*, 2003). Beginning from the dawn of the century, land races have been collected slowly and gradually from all parts of the country, where jute has been growing as a commercial crop. Since the varieties grown are mainly released cultivars of BJRI or its predecessors, rarely other types in pure forms are forthcoming in recent years. New isolates are either former eroded cultivar of natural hybrids between land races and eroded cultivars, which offer little to donate commercially as has been experienced with other crops. Newer and varied types were collected, hitherto unknown, from local homesteads, where these plants are mainly used for culinary purposes as dooryard herbs which are presumable primitive cultivars. The collections include all the four bast fibre species of commercial importance.

At present there are 6106 germplasm conserved in BJRI Gene Bank in which 2446 accessions of *Corchorus capsularis* L., 1534 accessions of *C. olitorius* L., 696 accessions of *Hibiscus cannabinus* L., 489 accessions of *H. sabdariffa* L., 279 of wild *Corchorus* species, 284 of wild *Hibiscus*, 259 of allied genera and 119 of Inter Specific Hybrids covering an array of population including land races, obsolete cultivars, improved cultivars, exotic collections, genetic stock and induced mutants in the Gene Bank, BJRI. To fulfill the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic resources, BJRI Gene Bank would be increased total 6700 germplasm as on December 2030. For this reason, germplasm collection programme would be taken every year for collecting jute and allied fibre germplasm from different parts of Bangladesh from different sources. The collection should be meticulously organized after consideration of the past activities and thorough planning for all the minutest details. Selection of a region for exploration shall depend mainly on expectation of desired genetic variability, chance of erosion, priorities for conservation and findings of past exploration exercise. To fulfill the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic resources, BJRI fixed up the target to collect a total of 6700 genetic resources of jute and allied fibre crops by 2030. For this reason, germplasm collection programme would be taken every year for collecting jute and allied fibre germplasm from different parts of Bangladesh from different sources. The collection should be meticulously organized after consideration of the past activities and thorough planning for all the minutest details. Selection of a region for exploration shall depend mainly on expectation of desired

genetic variability, chance of erosion, priorities for conservation and findings of past exploration exercise.
Expected output: Collecting of jute and allied fibre germplasm may be increased the total germplasm collection of BJRI Gene Bank. These genetic resources may be used for varietal development programme.

Duration: January to December, 2025.

Name of the investigators: A.S.M. Yahiya, M.W. Islam, Kazi Shafiqul Islam and M.N. Uddin.
Location: Pabna, kustia, Natore, Meherpur, CHT districts of Bangladesh.

Detail Procedure: The team should be kept small for efficiency. Two to three persons make an ideal team; it should consist of at least one jute, kenaf or mesta worker who knows varietal types, soil types, diseases and insects and the general environment in the area. The team should also have some knowledge of the region to be visited. Whenever possible, the team should include a specialist on the region, such as, an extension officer who works in that area. The method of collection to be followed for genetic resources materials of jute and allied fibre germplasm.

Treatment: 20 new germplasm of jute and allied fibre will be collected in this year.

Procedure: Generally 50, 200, 250, 250 fruits of *Corchorus olitorius*, *C. capsularis*. *Hibiscus cannabinus* and *H. sabdariffa*, respectively provide 5000 seeds. For a field or a population of 1000 plants; 50, 200, 250, 250 plants for *C. olitorius*, *C. capsularis*. *H. cannabinus*, and *H. sabdariffa*, respectively to be selected at random and one fruit/plant to be collected for seeds. Larger number of plants to be sampled for fruits with fewer seeds to make up the required number of 5000 seeds per sample.

Records to be kept: The following records will be kept:

A. 1. Date of collection 2. Name of collectors 3. Genus name 4. Species name 5. Latitude 6. Longitude 7. Altitude 8. Location: village, Upazila, Zila
B. Status: Land race/Cultivated/ Wild/Obsolete cultivar/other (specify)
C. Source: Natural/ farmland/market/ other (specify)
D. Site: Cultivable land/forest/backyard garden/waste land
E. Sampling method: Single plant/ bulk/random/nonrandom
F. Types of sample: Seeds/ fruits
G. Plant use: Fibre/vegetable/medicinal/other (specify)
H. Associated flora
I. Special plant characters
J. Additional notes

Estimated cost: Tk. 2,00,000/-

PROJECT 2: MORPHO-AGRONOMIC CHARACTERIZATION AND DOCUMENTATION OF JUTE AND ALLIED FIBRE GERMPLASM

Objectives: To characterize jute and allied fibre germplasm for their morpho-agronomic attributes.

2.1 Title of the experiment: Characterization of deshi jute (*Corchorus capsularis* L.) germplasm (GB-2/2025)

Background and objectives: Characterization is a routine work for gene bank department. It

is very important because germplasm are the treasure of genes that may be required for various purposes in future. It consists of recording those characters which are highly heritable, can be easily seen by the eye and are expressed in all environments. Characterization should provide a standardized record of readily assessable plant characters which, together with passport data, go a long way to identify an accession (Frankel, 1986). The internationally/nationally accepted descriptors and descriptor states should be used to record observation such as those developed by Biodiversity International, UPOV, USDA, or NBPGR minimal descriptors for characterization and evaluation of field crops (Mahajan *et. al.*, 2000). Characterization descriptors include plant height, base diameter, fibre weight, stick weight, leaf shape, seed shape, flower color and fruit color and other characters which are generally more of taxonomic type (Yahiya *et al*., 2009). The characterization should be carried out during the initial stage of acquisition of germplasm and may be completed in a suitable environment preferably at a site nearest to the site of collection of the germplasm or under similar agro-climatic condition. The Gene Bank of Bangladesh Jute Research Institute (BJRI) has been conserved 6096 germplasm of jute and allied fibre of both indigenous and exotic origin. Out of this 2446 germplasm are *Corchorus capsularis*. Already 861 germplasm are characterized as per *Corchorus* descriptor. The rest of germplasm need to characterize and find out superior germplasm for varietal development programme. Fifty accessions of deshi jute (*Corchorus capsularis*) germplasm collected from different sources will be selected for characterization for this year for morpho-agronomic traits to identify the promising types.

Expected output: Characterization, identification and documentation of *Corchorus capsularis* germplasm for utilization in genetic improvement programme.

Date of initiation and duration: March to October, 2025.

Name of the investigators: A. S. M. Yahiya, M.W. Islam, Kazi Shafiqul Islam and M. N. Uddin

Location: Jute Agriculture Experimental Station (JAES), Manikganj and Jute Research Regional Station, Chandina.

Experimental details: The experiment will be conducted by following augmented design compared with four check varieties. The seeds will be sown on last week of March, 2025. Each accession will be sown in single row with 3 m length; spacing will be 30 cm between rows, 5-6 cm between plants and 1m between blocks.

Treatment: Hundred (100) accessions of *Corchorus capsularis* along with check varieties BJRI deshi pat 7, deshi pat 8 (BJC-2197), BJRI deshi pat 9 (BJC-5003) and BJRI deshi pat 10.
Area under experiment: 220 m^2
Procedure: Usual cultural and inter-cultural operations will be followed for growing the accessions.
Records to be kept: The germplasm will be studied according to *Corchorus* descriptor.
Estimated cost: Tk. 50,000/- per station.

2.2 Title of the experiment: Characterization of tossa jute (*Corchorus olitorius* L.) germplasm (GB-3/2025)

Background and objectives: Characterization is the description of plant germplasm. It determines the expression of highly heritable characters ranging from morphological or agronomical features that can be easily seen by the eye and are expressed in all environments. Characterization and conservation of the wild and native species is also very important because

these are the treasure of genes which may be required for various purposes in future but are not yet characterized. Characterization should provide a standardized record of readily assessable plant characters which, together with passport data, go a long way to identify an accession (Frankel, 1986). Measurements of different morphological characteristics of these collected landraces at different stages of growth were recorded following the guidelines of test for Distinctiveness, Uniformity and Stability of rice (*Oryza sativa* L.). Characterization descriptors include plant height, base diameter, fibre weight, stick weight, leaf shape, seed shape, flower color and fruit color and other characters which are generally more of taxonomic type. The characterization should be carried out during the initial stage of acquisition of germplasm and may be completed in a suitable environment preferably at a site nearest to the site of collection of the germplasm or under similar agro-climatic condition (Islam, 1996). The Gene Bank of Bangladesh Jute Research Institute (BJRI) has been conserved 6070 germplasm of jute and allied fibre of both indigenous and exotic origin. Out of this 1534 germplasm are *Corchorus olitorius*. Already 1396 germplasm are characterized as per *Corchorus* descriptor. The rest of germplasm need to characterize and find out superior germplasm for varietal development programme. Forty accessions of tossa jute (*Corchorus olitorius*) germplasm received from different sources will be selected for characterization for morpho-agronomic traits to identify the promising types.

Expected output: Characterization, identification and documentation of *Corchorus capsularis* germplasm for utilization in genetic improvement programme.
Date of initiation and duration: April to October, 2025.
Name of investigators: M.W. Islam, A. S. M. Yahiya, Kazi Shafiqul Islam and M. N. Uddin
Location: JAES, Manikganj and Jute Research Regional Station, Rangpur.

Experimental details: The experiment will be conducted by following augmented design with four check varieties. The seeds will be sown on first week of April, 2025. Each accession will be sown in a block in single row with 3m length; spacing will be 30 cm between rows, 5-6 cm between plants, 60 cm between unit plots and 1 m between blocks. The selected accessions will be characterized according to *Corchorus* Descriptor.

Treatment: Eighty (80) accessions of *Corchorus olitorius* along with check varieties 0-9897, BJRI Tossa Pat 6 (O-3820), BJRI Tossa Pat 8 (Robi-1) and BJRI Tossa Pat 9.
Area under experiment: 170 m^2
Procedure: Usual cultural and inter-cultural operations will be followed for growing the germplasm.
Records to be kept: The germplasm will be studied according to *Corchorus* descriptor.
Estimated cost: Tk. 30,000/- per station.

2.3 Title of the experiment: Characterization of Mesta (*Hibiscus sabdariffa* L.) germplasm (GB-4/2025)

Background and objectives: Mesta an annual crop has been grown in a number of tropical countries as a source of bast fibre for cordage and textile production. The traditional use of mesta focuses on its fibre production, such as making ropes, sacks, canvases and carpets. However, new applications of mesta have recently being developed such as pulping and paper making, board making, absorbents and polling media, filtration, textiles especially as raw materials for geo-textile and livestock feed. With the present importance for diversified use and future potentials in view, attention should be given on the improvement of this crop through breeding research. The use of plant genetic resources in breeding research is largely dependent on the available information of their genetic variability (Mostofa, 2012). Characterization of germplasm is essential to provide information on the traits of accessions assuring the maximum utilization of the germplasm

collection to the final users (Islam, 2008). There are 489 germplasm of mesta of both indigenous and exotic sources are conserved in the gene bank of BJRI. Out of these 363 germplasm are already characterized in different years. The rest of germplasm need to characterize and find out superior germplasm for varietal development programme in this study one hundred and fifty accessions will be selected for characterization to find out the superior genotypes according to *Hibiscus* descriptor.

Expected output: Preliminary selection of mesta (*Hibiscus sabdariffa*) germplasm with better morpho-agronomic performances compared with the check varieties.
Date of initiation and duration: April to October 2025.

Name of the investigators: A. S. M. Yahiya, M.W. Islam, Kazi Shafiqul Islam and M. N. Uddin
Location: JAES, Manikganj and Jute Seed Production and Research Centre, Dinajpur.

Experimental details: The experiment will be conducted by following augmented design with two check varieties. The seeds will be sown on first week of April, 2025. Each accession will be sown in a block in single row with 3m length; spacing will be 30 cm between rows, 5-6 cm between plants, 60 cm between unit plots and 1 m between blocks. The selected accessions will be characterized according to *Hibiscus* Descriptor.

Treatment: One hundred fifty (120) accessions of *Hibiscus sabdariffa* along with two check varieties HS-24 and BJRI Mesta 3.
Area under experiment: 230 m^2
Procedure: Usual cultural and inter-cultural operations will be followed for growing the accessions.
Records to be kept: The accessions will be studied as per *Hibiscus* descriptor.
Estimated cost: Tk. 1,00,000/- per station.

PROJECT 3: EVALUATION OF JUTE, KENAF AND MESTA GERMPLASM FOR MORPHO-AGRONOMIC TRAITS, DISEASE AND PEST STATUS OF SELECTED GERMPLASM

Objective: To evaluate morpho-agronomic attributes, disease and pest status of jute and allied fibre germplasm

3.1 Title of the experiment: Evaluation for morpho-agronomic attributes, biotic and abiotic traits of selected tossa jute germplasm (GB-5/2025)

Background and objectives: Evaluation involves the methodical collection of data on agronomic (e.g. plant height, yield data) and quality traits through appropriately designed experimental trials. Evaluation of genetic diversity is important to know the source of gene for a particular trait within the available germplasm (Tomooka, 1991). Evaluation data frequently includes disease and insect-pest resistance, quality evaluations and environmental traits (e.g. drought, cold, saline tolerance and others). Evaluation should be undertaken in germplasm which are already characterized and where enough quantity of planting materials is available. Single row (3-5) plot or small plots of more than one row, depending upon the quantity of seeds available and the nature plant species, are generally grown for germplasm evaluation (Islam *et al*., 2011). The Gene Bank of Bangladesh Jute Research Institute (BJRI) has been conserved 1529 germplasm are *Corchorus olitorius* of both indigenous and exotic origin. Out of these already 1357 *Corchorus olitorius* germplasm have characterized as per *Corchorus* descriptor and 142 germplasm are evaluated from characterized germplasm. In this study selected forty accessions of tossa jute (*Corchorus olitorius*) germplasm will be evaluated for 2nd year for morpho-agronomical traits, biotic and abiotic stress according to

Corchorus descriptor for utilization in tossa jute breeding programme.

Expected output: Identification of superior Olitorius (*Corchorus olitorius*) germplasm for varietal improvement programme.
Date of initiation and duration: April to October, 2025.
Name of the investigators: A. S. M. Yahiya, M.W. Islam, Kazi Shafiqul Islam, M. N. Uddin and respective scientists of pest management & agronomy division.
Location: JRSS, Monirampur and JRRS, Rangpur.

Experimental details: The experiment will be conducted by following Randomized Complete Block Design with three replications. The seeds will be sown on 1st week of April, 2025. Each accession will be sown in a block in single row with 3m length; spacing will be 30 cm between rows, 5-6 cm between plants, 60 cm between unit plots and 1 m between blocks. The selected accessions will be characterized according to *Corchorus* Descriptor.

Treatment: Forty (40) selected accessions of *Corchorus olitorius* along with two check varieties O-9897 and BJRI Tossa Pat 9.
Area under experiment: 210 m^2.
Procedure: Usual cultural and inter-cultural operations will be followed for growing the accessions.
Records to be kept: The accessions will be evaluated as per *Corchorus* descriptor.
Estimated cost: Tk. 50,000/- per station.

3.2 Title of the experiment: Evaluation for morpho-agronomic attributes, biotic and abiotic traits of selected kenaf germplasm (GB-6/2025)

Background and objectives: Evaluation involves the methodical collection of data on agronomic (e.g. plant height, yield data) and quality traits through appropriately designed experimental trials. Evaluation data frequently includes insect pest resistance, plant pathology, quality evaluations and environmental traits (e.g. drought, cold, saline tolerance and others). Evaluation should be undertaken in germplasm which are already characterized and enough quantity of planting materials is available. Single row (3-5) plot or small plots of more than one row, depending upon the quantity of seeds available and the nature plant species, are generally grown for germplasm evaluation (Islam *et al*., 2011). Evaluation of genetic diversity is important to know the source of gene for a particular trait within the available germplasm (Tomooka, 1991). A total of 694 kenaf germplasm are conserved in BJRI gene bank where already 576 germplasm were characterized in different years. Out of 595 characterized germplasm, already 207 germplasm were evaluated. In this study selected forty accessions of *Hibiscus cannabinus* germplasm will be evaluated for 2nd year for morpho-agronomical traits, biotic and abiotic stress according to *Hibiscus* descriptor for utilization in kenaf breeding programme.

Expected output: Identification of superior kenaf (*Hibiscus cannabinus*) germplasm for varietal improvement programme.

Date of initiation and duration: March to October, 2025.
Name of the investigators: M.W. Islam, A. S. M. Yahiya, Kazi Shafiqul Islam, M. N. Uddin and respective scientists of pest management & agronomy division.

Location: JRRS, Kishoreganj and JRSS, Monirampur.

Experimental details: The experiment will be conducted by conducted by following Randomized

Complete Block Design with three replications. The seeds will be sown on last week of March, 2025. Each accession will be sown in single row with 3 m length; spacing will be 30 cm between rows, 5-6 cm between plants and 1m between blocks.
Treatment: Forty (40) selected accessions of *Hibiscus cannabinus* along with two check varieties HC-95 and BJRI Kenaf 3 (Bot Kenaf).
Area under experiment: 180m^2.
Procedure: Usual cultural and inter-cultural operations will be followed for growing the accessions.
Records to be kept: The accessions will be evaluated as per *Hibiscus* descriptor.
Estimated cost: Tk. 50,000/- per station.

PROJECT 4: REGENERATION AND VIABILITY ASSESSMENT OF JUTE AND ALLIED FIBRE GERMPLASM FOR CONSERVATION AND MAINTENANCE

Objectives:

i) To regenerate of jute and allied fibre germplasm for conservation.

ii) To monitor viability of jute and allied fibre germplasm at storage condition.

4.1 Title of the programme: Regeneration of jute and allied fibre germplasm for conservation (GB-7/2025)

Background and objectives: The germplasm of jute and allied fibre stored in the BJRI gene bank, possess rich diversity for genetic improvement. It needs to conserve the germplasm in proper way for the use of future research work. Conservation includes management of known genetic resources in both ex-situ and in-situ condition which are equally important to safeguard the genetic erosion, genetic vulnerability and finally genetic wipeout. Gene bank of BJRI has been started conservation of only orthodox seeds of jute, kenaf, mesta and allied fibre since 1982 with installation of ex-situ conservation facilities for medium term (in $+4^0$C) and long term (in -20^0C) storage. But over the period of time, seed viability and germination percentage are deteriorated gradually. Same result also found in rice seed. Due to poor and inappropriate storage infrastructure incurred at farmers' field, there are reduced rice seed quality due to low purity, low germination rate and high moisture content (Huda, 1992; Mia and Nahar, 2000).

At present there are 6070 accessions comprising 15 species of *Corchorus*, 22 species of *Hibiscus* and 15 species of allied genera conserved in the gene bank of BJRI. The stored seeds are being used for characterization, evaluation and varietal improvement programme. In order to replenish the stock, continuous process of seed multiplication and conservation are carried on. With this objective, a programme is undertaken to multiply 300 accessions of *Corchorus*, 200 accessions of *Hibiscus* and 50 accessions of allied fibre germplasm during 2025.

Expected output: It is expected to get more quality seeds with higher percentage of germination for storage.
Date of initiation and duration: July to December, 2025.
Name of the investigators: M.W. Islam, A. S. M. Yahiya, Kazi Shafiqul Islam and M. N. Uddin
Location: Central Station, Dhaka and JAES, Manikganj.
Treatments: 300 accessions of *Corchorus* species, 200 accessions of *Hibiscus* species and 50 accessions of allied fibre germplasm.
Layout and design: As per regeneration requirements and availability of land.
Records to be kept:

1. Dates of sowing, germination, first flowering, maturity of fruits and harvest, pigmentation, flower color, fruit size and shape, seed weight, etc.

Estimated cost: Tk. 1,00,000/- per station.

4.2 Title of the programme: Monitoring the viability of jute and allied fibre germplasm conserved in short and long term condition and their maintenance (GB-8/2025)

Background and objectives: Conservation includes management of known genetic resources in both ex-situ and in-situ condition which are equally important to safeguard the genetic erosion, genetic vulnerability and finally genetic wipeout. Gene bank of BJRI has been started conservation of only orthodox seeds of jute, kenaf, mesta and allied fibre since 1982 with installation of ex-situ conservation facilities for medium term (in $+4^0$C) and long term (in -20^0C) storage. The germplasm of jute and allied fibre stored in the BJRI gene bank, possess rich diversity for genetic improvement. It needs to conserve the germplasm in proper way for the use of future research work. It is important to preserve the genetic integrity of seeds during storage to retain high seed quality (Prodhan & Badola, 2012). Factors that affect the quality of seed during storage include drying temperature, moisture content, storage temperature, oxygen supply, pest and diseases, packaging materials and duration of storage (Muangkaeo *et al*., 2005; Chattha *et al* ., 2012; Jyoti & Malik, 2013). The IPGRI Advisory Committee recommends that seed stored under preferred standards in base collection should be monitored at least every ten years and for active collections monitoring is recommended for every five years. With a view to assess the germination percent of seeds the experiment is undertaken for the seeds stored at $+4^o$C and -20^oC. The accessions will be regenerated if the seed viability falls below 80% to get fresh seeds for storage in the gene bank.

Expected output: Assessment of germination percent ensuring the quality seed stored in BJRI Gene Bank at $+4^0$C and -20^0C.

Date of initiation and duration: January to December, 2025.

Name of the investigators: A. S. M. Yahiya, M.W. Islam, Kazi Shafiqul Islam and M. N. Uddin

Location: Gene Bank, BJRI, Dhaka.

Treatments: 50 accessions of *Corchorus* and 30 accessions of *Hibiscus* species.

Experimental details: 100 seeds of each accession will be studied for germination. The seeds will be allowed to germinate in 4 replications with 25 seeds in each Petridis. The viability test will be recorded for three days from the date of germination test. Germination percent will be recorded as per recommended ISTA rules.

Estimated cost: Tk. 50,000/-

REFERENCES

Chattha, S.H.; Jamali, L.A.; Ibupoto, K.A. &Mangio, H.R., 2012. Effect of different packing materials and storage conditions on the viability of wheat seed (TD-1 Variety). *Science, Technology and Development, 31 (1)*. 10-18.

Day-Rubenstein, K and Heisey Paul. 2003. Plant Genetic Resources: New Rules for International exchange.

Frankel, O.H. 1986. Genetic Resources: The Founding Years. II. The movement's constituent assembly. Diversity 9:30-32.

Frankel, O.H. and Bennett, E. 1970. Genetic Resources in Plants their Exploration and Conservation, Oxford, Black Well.

Huda, M.N., 1992. Effects of quality of certified seed and farmers' seed on the productivity of rice and wheat. Ph.D. Thesis. Department of Agronomy, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Islam, M.R. 1996. Genetic Divergence in *Corchorus olitorius* L. MS Thesis submitted to Institute of Postgraduate Studies in Agriculture (IPSA), Salna, Gazipur.

Islam, M.T. 2008. Morpho-agronomic diversity of hyacinth bean (*Lablab purpureus* L.) accessions from Bangladesh. Plant Genetic Resources Newsletter, 156:72-77 (Itali).

Islam, M.T., R.U. Chowdhury, R. Afroz, S. Rahman and M.M. Haque. 2011. Morpho-

agronomic diversity of hyacinth bean (*Lablab purpureus* L.) accessions from Bangladesh. Plant Genetic Resources Newsletter, 156:72-77 (Itali).

Jyoti& Malik, C.P. 2013. Seed deterioration. A review. International Journal of life sources Biotechnology and Pharma Research 2 (3). 374-385.

Mahajan, R.K., Sapra, R.L., Srivastava U, Singh M and Sharma GD (2000). Minimal descriptors for characterization and evaluation of agri-horticultural crops (part I). National Bureau of Plant Genetic Resources, New Delhi, pp 230.

Mostofa, M.G.2012. Genetic divergence, combining ability, heterosis and gene action for yield characters in kenaf (*Hibiscus cannabinus* L.). PhD thesis submitted to Department of Genetics & Plant Breeding, Bangladesh Agricultural University, Mymensingh.

Muangkaeo, R.; Srichuwong, S. &Vearasilp, S 2005. Influence of packaging materials storage time on seed viability and chemical component of rice seed. Conference on International Research for Development. Held from 11-13 October, 2005. Stuttgart-Hohenheim, Germany.

Prodhan, B.K.7 Badola, H.K. 2012. Effect of storage condition and storage periods on seed germination in eleven populations of Swertiachiravita. A critically endangered medicinal herb in Himalaya.

Sobhan, M.A. 1993. Heritability of fibre, fruit and seed yields in *Hibiscus sabdariffa*. PhD Thesis submitted to University of Dhaka.

Tomooka, N. 1991. Genetic diversity and landrace differentiation of mungbean, *Vigna radiate* L. wilczek and evaluation of its wild relatives (The subgenus *Ceratoupics*) as breeding materials. Tech. Bull. Trop. Res. Centre, Japan. No.28. Ministry of Agric, Forestry and Fisheries, Japan. P.1.

Yahiya, A.S.M., M.S.R. Bhuiyan, M.M.Islam, M. Al-Mamun and M.M. Rahman. 2009. Genetic Divergence in *Corchorus capsularis* L. J. Sher-e-Bangla Agric. Univ., 3(2): 57-63.

A II. CYTOGENETICS DEPARTMENT

PROGRAMME AREA :	**VARIETAL IMPROVEMENT THROUGH BIOTECHNOLOGICAL APPROACHES**
TITLE OF THE PROJECT :01	**VARIETAL IMPROVEMENT THROUGH SOMATIC VARIATION**
TITLE OF THE PROJECT :02	**VARIETAL IMPROVEMENT THROUGH MOLECULAR TECHNIQUE**

Objectives:

1. Development of plant regeneration protocol from different genotypes of jute, kenaf and mesta through *in vitro* explants culture for increasing plant regeneration potentiality.
2. Introduction of foreign genes in jute, kenaf and mesta through genetic transformation for crop improvement.
3. DNA finger printing of jute, kenaf and mesta germplasm.
4. Molecular marker identification for selected traits from jute, kenaf and mesta germplasm against abiotic and biotic stresses.

TITLE OF THE PROJECT :01	**VARIETAL IMPROVEMENT THROUGH SOMATIC VARIATION**

1.1 Title of the experiment: Optimization of *In Vitro* Plant Regeneration Protocol from Cotyledonary Petioles of Mesta (*Hibiscus sabdariffa* L.) (Cyto. 1/2025)

Background and Objectives:

Mesta (*Hibiscus sabdariffa* L.), commonly known as roselle, is an economically important plant cultivated for its fibre, leaves, seeds, and calyces. It plays a crucial role in the production of natural fibres, food, and beverages (Dhir & Shekhawat, 2009). Developing an efficient *in vitro* regeneration protocol is essential for improvement of genetic transformation and breeding efforts (Anis & Shahzad, 2015). Cotyledonary petioles are considered an ideal explant source because of their high regenerative potential, makes them valuable in tissue culture studies (Rout & Das, 1997; Biswas & Mandal, 2007). Optimization of regeneration protocols for *H. sabdariffa* could lead to the development of improved varieties that are resistant to pests, diseases, and environmental stresses (Murthy & Saxena, 1998).

Plant regeneration via tissue culture has been widely applied in plant breeding and genetic engineering to produce genetically modified or improved plants (George *et al*., 2008). For *H. sabdariffa*, establish an efficient *in vitro* regeneration system is crucial for future genetic manipulation aimed to enhance fibre quality, yield, and resistance to biotic and abiotic stresses (Dhir & Shekhawat, 2009). Factors such as plant growth regulators (PGRs), explant type, and culture conditions play a significant role to optimize regeneration (Murashige & Skoog, 1962; Fratini & Ruiz, 2002; Bhojwani & Razdan, 1996). Additionally, successful acclimatization of plantlets from tissue culture to greenhouse or field conditions is critical for their survival and growth (Preece & Sutter, 1991).

The primary objective of this study is to establish a reliable and efficient *in vitro* regeneration protocol using cotyledonary petioles of *H. sabdariffa* (Mesta). By focusing on this specific explant source, the study aims to maximize regenerative potential for use in future breeding and genetic transformation efforts. A key goal is to determine the optimal concentrations of plant growth regulators (PGRs), particularly auxins and cytokinins, which are critical for induction of efficient shoot and root regeneration. Various combinations of these PGRs will be tested to identify the best conditions for shoot and root formation. Additionally, the study will

evaluate the effect of different culture media compositions on regeneration efficiency, as the choice of media can significantly influence the success of *in vitro* tissue culture. Finally, the experiment seeks to develop a robust protocol for acclimatization of regenerated plantlets and successfully transfer them to soil, ensure that plants can survive and thrive under natural growth conditions.

Date of initiation and duration: May, 2025 to December 2027.
Name of the investigators: Md. Abdur Razzak Taohidi**,** Arju Miah, and Dr. Md. Nasir Uddin.
Location: Laboratory of Cytogenetics Department, Genetic Resources and Seed Division, BJRI, Dhaka.
Experimental details:
Materials:
Plant material: Cotyledonary petioles of *H. sabdariffa* L. varieties.
Culture medium: Murashige and Skoog (MS) basal medium.
Plant growth regulators (PGRs):
Auxins: Indole-3-acetic acid (IAA), Naphthaleneacetic acid (NAA), Indole-buteric acid (IBA)
Cytokinins: 6-Benzylaminopurine (BAP), Kinetin (KIN)
Sterilizing agents: Ethanol, sodium hypochlorite, distilled water.
Inoculation tools: Forceps, scalpel, petri dishes, culture tubes, cotton.
Growth chamber: For maintaining temperature, humidity, and light conditions.

Methods:
Explant Preparation: Seeds of *H. sabdariffa* will be surface sterilized using ethanol and sodium hypochlorite. Then they will be germinated on semi-solid MS basal nutrient medium. 7-10 days after germination, cotyledonary petioles from healthy seedlings will be excised and used as explants.

Media Preparation: MS medium supplemented with different concentrations and combinations of auxins (IAA, NAA) and cytokinins (BAP, KIN) will be prepared. Then pH will be adjusted to 5.8 before autoclaving.

Inoculation and Culture: Explants will be inoculated onto the media under aseptic conditions in a laminar airflow chamber. Cultures will be maintained at 25°C with a 16-hour photoperiod.
Shoot Induction: The effect of different concentrations of BAP and KIN on shoot induction will be studied. Data on the number of shoots and shoot length will be recorded.
Root Induction: Regenerated shoots will be transferred to media containing auxins (IAA and IBA) for root induction. After root initiation, data on the number of roots and root length will be recorded.

Acclimatization: Rooted plantlets will be transferred to soil and acclimatized in a controlled environment. Survival rate of plantlets will be observed after acclimatization.
Expected Output: Development of a reproducible *in vitro* regeneration protocol for *H. sabdariffa*. And the concentrations and combinations of plant growth regulators for efficient shoot and root regeneration will be optimized. Establishment of a method for successful acclimatization and transfer of plantlets to soil through this study.

Data to Be Recorded:
Percentage of explants producing shoots.
Average number of shoots per explant.
Average length of shoots.

Percentage of shoots producing roots.
Average number of roots per shoot.
Average root length.
Survival rate during acclimatization.
Time taken for shoot and root induction.
Estimated cost: 1,50,000/-
References:

Anis, M., & Shahzad, A. (2015). *Plant tissue culture: Propagation, conservation and crop improvement*. Springer.

Bhojwani, S. S., & Razdan, M. K. (1996). *Plant tissue culture: Theory and practice* (2nd ed.). Elsevier.

Biswas, P. K., & Mandal, A. B. (2007). In vitro regeneration of *Hibiscus sabdariffa* through somatic embryogenesis. *Plant Tissue Culture and Biotechnology, 17*(1), 63-70.

Dhir, S., & Shekhawat, N. S. (2009). In vitro culture of *Hibiscus* species. *Plant Biotechnology Reports, 3*(3), 161-171.

Fratini, R., & Ruiz, M. L. (2002). In vitro culture of lentil (*Lens culinaris*). *Plant Cell Reports, 21*(7), 511-518. h

George, E. F., Hall, M. A., & De Klerk, G. J. (2008). *Plant propagation by tissue culture* (3rd ed.). Springer.

Murashige, T., & Skoog, F. (1962). A revised medium for rapid growth and bioassays with tobacco tissue cultures. *Physiologia Plantarum, 15*(3), 473-497.

Murthy, B. N. S., & Saxena, P. K. (1998). Somatic embryogenesis in *Hibiscus rosa-sinensis*. *Plant Cell Reports, 17*(10), 751-753.

Preece, J. E., & Sutter, E. G. (1991). Acclimatization of micropropagated plants. *In Vitro Cellular & Developmental Biology - Plant, 27*(2), 94-99.

Rout, G. R., & Das, P. (1997). Somatic embryogenesis in *Hibiscus sabdariffa*. *Plant Growth Regulation, 22*(2), 105-108.

1.2 Title of the experiment: Mutagenic effects of Ethyl Methane Sulphonate (EMS) on morpho-physiological traits of jute and kenaf (Cyto. 2/ 2025)

Background and Objectives

Ethyl Methane Sulphonate (EMS) is a powerful chemical mutagen that has been extensively used in plant breeding to create genetic variability. EMS induces mutations by adding ethyl groups to nucleotides in DNA, causing base pair substitutions, predominantly G/C to A/T transitions (Kumar & Singh, 2019). These mutations can lead to alterations in genes, which may manifest in changes to plant morphology, physiology, or overall fitness. In jute (*Corchorus spp.*) and kenaf (*Hibiscus cannabinus*), both economically important fibre crops, genetic improvement is often restricted by the limited natural variability (Das *et al*., 2020). Mutation breeding using EMS provides a useful strategy to overcome this limitation by generating novel genetic variations, potentially leading to improved traits such as fibre yield, quality, disease resistance, and stress tolerance (Roychowdhury *et al*., 2011).

In addition to chemical mutagens like EMS, physical mutagens such as radiation

n (especially gamma rays) have been widely used in mutation breeding (Maluszynski *et al*., 2000). Gamma radiation is often employed to determine the lethal dose (LD_{50})—the dose at which 50% of the treated plants die (Kharkwal, 2012). Establishment of the LD_{50} is essential for mutation breeding programs as it helps identify the most effective dose of radiation that induces beneficial mutations without causing excessive plant mortality (Patade *et al*., 2011). The use of radiation has been shown to effectively enhance genetic diversity and improve plant characteristics in several crops, including jute and kenaf (Dey & Islam, 2016; Ahloowalia *et*

al., 2004).
The objective of this study is to evaluate the mutagenic effects of Ethyl Methane Sulphonate (EMS) on key morpho-physiological traits of jute and kenaf. By the study, the impact of EMS on plant growth, yield, and fibre characteristics, the study aims to identify beneficial mutations that could enhance these economically important traits. In particular, the research will focus on determine the optimal dose of EMS that induces favorable genetic variations without compromising plant viability. Additionally, the study will compare the effectiveness of EMS-induced mutations with gamma radiation-induced mutations to determine which mutagenic treatment is more effective for induction of desirable traits such as improved fibre quality, disease resistance, and stress tolerance. To further refine mutation breeding strategies, the lethal dose (LD_{50}) of EMS and gamma radiation will be established for different jute and kenaf varieties. This information will serve as a critical reference for guiding future mutation breeding efforts aimed at develop superior crop varieties.

Expected output: A high mutagenesis rate on deshi jute would be obtained using EMS as chemical mutagen.
Date of initiation and duration: March 2024 to December 2026.
Name of the investigators: Arju Miah**,** Md. Abdur Razzak Taohidi and Dr. Md. Nasir Uddin.
L**ocation:** Laboratory of Cytogenetics Department, Genetic Resources and Seed Division, BJRI, Dhaka.

Experimental details:
Plant material: The seeds of Deshi jute, Tossa jute and Kenaf varieties such as BJRI deshi pat-, BJRI deshi pat9, BJRI deshi pat10, O-9897, BJRI Tossa pat8, BJRI Tossa pat9, JRO-524, HC-95, BJRI Kenaf4 and BJRI Kenaf5 will be collected from Capsularis Department, Breeding Division, BJRI.
EMS Lethal Dose (LD_{50}):0.2%
Chemicals: EMS, MS media, Agar/gelrite™, growth regulators etc.
Methods:

Callus induction: It is a process used to obtain calli (undifferentiated cells) from mature seeds. In this research, the seedcoat will be removed before surface sterilization and then surface disinfected by soaking them in 70% ethanol for 1 minute and then in a 5% NaOCl for 5 minutes. After five rinses with sterilized water, the seeds will be sown in solid MS media (2.2 g/L MS powder+0.5 mg/L IAA+3.0 mg/L BAP+2.5 g/L gelrite) for callus induction. pH will be adjusted to 5.8 before autoclaving. Sterilin 90 mm petri dishes will be filled with 25 mL media after autoclaving. Fourteen sterilized seeds will be sown in each petri dish and plates will be sealed and incubated for three weeks in complete darkness at 28°C. Contaminated seeds will be discarded and healthy callus masses growing close to the embryo will be selected avoiding smaller root producing calli.

Chemical mutagenesis : It describes a process of mutagenesis using ethyl methane sulfonate (EMS) on mature seed-derived calli. The process begins by transferring callus masses into three 375 mL NUNC EasyFlasks™ with filter caps for continuous venting. The flasks will be filled with 96 mL of nutrient reach liquid MS media to grow plant cells in the laboratory. This media is supplemented with 125 mg L^{-1} L-ascorbic acid and 125 mg L^{-1} citric acid to prevent callus oxidation in further callus mutagen treatments. The callus masses will be transferred until the final volume reaches 110 mL in each flask.

Next, two of the flasks will be immediately mutagenised by adding EMS (0.2% v/v) following

the safety instructions provided by the manufacturer's Material Safety Data Sheet (MSDS). The flasks will be placed on an orbital shaker (150 rpm) and covered with aluminium foil to avoid light for two hours. After incubation, every callus batch will be rinsed ten times using 200 mL liquid MS media and removing it after 3 to 4 minutes.
After rinsing, the calli will be incubated on modified liquid MS media supplemented with 2 mg L^{-1} 2–4 D and shaken (120 rpm) for two additional days (28°C, darkness).

Plantlet regeneration: The process begins with partially drying calli (a mass of undifferentiated cells) in a laminar flow cabinet on sterile cellulose paper for about 30 minutes before sowing them in solid MS fortified with 4.5 g L^{-1} Gelrite™ (Duchefa) in 90 mm diameter dish and cultured for four weeks in darkness at 28°C.Then the calli will be transferred to regeneration media (2.2 g/L MS powder+0.5 mg/L NNA+3.0 mg/L BAP+4.5 mg/L Gelrite) petri dishes (90 mm diameter) and cultured under a 12 hours photoperiod at 28°C until plantlets will be fully formed 30 days later. The pH will be adjusted (5.8) by using 0.5 M HCl solution and then autoclaved.

The regenerated plantlets will be numbered and its callus mass origin will be recorded as soon as they will be sub-cultured into culture tubes (17 cm high/2 cm width) filled with 10 mL of root media (2.2 g/L MS powder+0.25 mg/L IBA+4.5 g/L Gelrite). Plants will be cultured for three more weeks to enhance rooting and leaf development under a 12 hours photoperiod at 28°C. The calli will be transferred every three/four weeks to fresh MSM media until the end of the experiment at 22 weeks.

Mutant population seed stock: Rooted plantlets will be ex vitro acclimatized as follows. Media will be carefully removed from roots using tap water and plants will be transplanted into pots, each pot filled with peat moss - vermiculite (2:1 v/v) substrate that will be supplemented with fertilizer mix. Then 1 g of $CaCO_3$ per peat litre will be added to adjust the substrate to pH 6. Seeds will be collected in individually labelled envelopes and stored as if they will be an M_3 mutant population generated by seed mutagenesis

Data to be recorded:

1. No of callus, induced callus, regenerated shoot, days required for callus induction and shoot regeneration, rate of plant establishment
2. Plant height (m) , base diameter(cm), ,bark thickness (mml), number of nodes, number of leaf and leaf angle, number of branches/plant, green weight with and without leaves(g). dry fiber and stick weight (g)
3. Chlorophyll content of leaf (SPAD-502) and total chlorophyll, leaf relative water content (RWC), proline content, content of malonaldehyde (MDA)
4. No of pods/plant, number of seeds/pod, thousand seed weight.

Estimated cost: 150,000/-

References

Ahloowalia, B. S., Maluszynski, M., & Nichterlein, K. (2004). Global impact of mutation-derived varieties. *Euphytica*, 135(2), 187-204.

Das, A., Mandal, N., & Sarkar, S. (2020). Jute improvement through induced mutagenesis. *Indian Journal of Agricultural Sciences*, 90(4), 703-707.

Dey, M. M., & Islam, S. (2016). Mutation breeding in jute (*Corchorus spp.*). *Bangladesh Journal of Botany*, 45(4), 843-850.

Kharkwal, M. C. (2012). A brief history of plant mutagenesis. *Indian Journal of Genetics and*

Plant Breeding, 72(2), 135-145.
Kumar, G., & Singh, V. (2019). EMS and its mutagenic effect on plants: A review. *Plant Mutation Reports*, 11(1), 1-5.
Maluszynski, M., Ahloowalia, B. S., & Sigurbjornsson, B. (2000). Application of in vivo and in vitro mutation techniques for crop improvement. *Euphytica*, 118(2), 179-196.
Patade, V. Y., Bhargava, S., & Suprasanna, P. (2011). Radiation induced in vitro mutagenesis for sugarcane improvement. *Sugar Tech*, 13(2), 128-135.
Roychowdhury, R., Tah, J., & Ghosh, S. K. (2011). Chemical mutagenesis of *Corchorus olitorius* L.: The JRO-524 variety. *Journal of Crop Science and Biotechnology*, 14(2), 111-117.
Singh, R. J., & Singh, B. P. (2015). Mutation breeding in fiber crops. *Journal of Genetics and Plant Breeding*, 76(1), 9-18.
Tripathi, R. D., Dwivedi, S., & Kumar, A. (2014). Mutagenesis for crop improvement. In R. S. Ahloowalia, M. Maluszynski, & K. Nichterlein (Eds.), *Plant Mutation Breeding and Biotechnology* (pp. 215-239). CABI.

TITLE OF THE PROJECT :02	**VARIETAL IMPROVEMENT THROUGH MOLECULAR TECHNIQUE**

2.1 Title of the experiment: Molecular characterization of Deshi Jute germplasm through DNA finger printing (Cyto-1/2025)

Background and Objectives:

Identification of jute and allied fibre germplasm is difficult based only on its morpho-physiological characters such as plant pigmentation pattern, leaf shape, stipule shape, seed coat colour and so on (Begum and Kumar, 2011). The phenotypic identification based on morphological parameters is subjected to environmental variation. Cultivars that are closely related or have low genetic variability cannot be readily distinguished by morphological traits (Degani *et al*., 1998). DNA fingerprinting for cultivar or varietal identification has become an important tool for genetic identification in plant breeding and germplasm management. When planning DNA fingerprinting, one of the most important decision is the marker system and technique to be used. Various systems and their related techniques are currently available based on polymerase chain reaction (PCR). PCR based techniques or molecular markers such as Randomly Amplified Polymorphic DNA (RAPDs), Simple Sequence Repeats (SSRs) or, microsatellites and Amplified Fragment Length Polymorphisms (AFLPs), have an apparent advantage as cultivar descriptors in that they are unaffected by environmental or physiological factors. SSRs have become a powerful and popular tool for determining unique genetic identity or fingerprint, and establishing genetic relatedness as well as diversity among various crop cultivars. Jute genetic diversity has been reported using molecular markers by different scientists like Huq *et al*. (2009), Nag *et al*. (2018) etc. Therefore, the present piece of work is undertaken to develop genetic fingerprints and to estimate genetic relatedness of deshi jute germplasm using SSR markers.

Expected output: Primer polymorphism and genetic diversity of deshi jute germplasm would be known..

Date of initiation and duration: March 2025 to February 2026.

Name of the investigators: Arju Miah, Md. Abdur Razzak Taohidi and Dr. Md. Nasir Uddin.

Location: Laboratory of Cytogenetics Department, Genetic Resources and Seed Division, BJRI, Dhaka.

Experimental details:

Plant material: Sixty (60) Deshi jute germplasm will be used in this study.
DNA Extraction: DNA will be extracted from the seedlings (21 days old) following the modified mini preparation CTAB method (Doyle and Doyle, 1987).
Designing of SSR Primers: Twenty five (25) microsatellite primers will be used for PCR amplification.

PCR amplification: PCR amplification will be carried out in a 10µl reaction mixtures containing 20ng of jute genomic DNA, 5µM of each primer pair, 10X PCR buffer, 50mM $MgCl_2$, 2mM dNTPs, and 0.2-unit Tag DNA polymerase. The thermal cycler will be programmed as follows: Preheating for 5 min at 95^0C; 35 cycles, each for 45 sec at 95^0C (denaturation), 50 sec at the annealing temperature of a particular primer pair, and 45 sec at 72^0C for 5 min.

Separation and staining of PCR products: Before loading in gels, the PCR products will be denaturated by adding equal volume of tracking dye (95% formamide, 10mM EDTA, 0.23% bromophenol blue and 0.23% xylene cyanol) and heating at 94^0C for 5 min. and run in a 8% denaturing polyacrylamide gel, using sequencing gel apparatus. The gels will be run in 10X TBE buffer adjusted to pH 8.3 at 150 volt for 2.5-3.0 hours. Staining will be done using ethidium bromide and gel pictured with bands will be taken by using gel documentation system. Fragment size will be calculated by comparing with fragments of 1 Kb+ ladder marker DNA (Invitrogen Life Technologies).

Data to be recorded:

1. The amplified products will be scored. During scoring, only intense clearly resolved amplification products that were reproducible in multiple runs will be considered for analysis. The DNA fragments that will be amplified by a given primer pair will be scored as '1' for presence or 'O' for absence of a particular locus for all the genotypes.
2. Polymorphisms among the germplasm .
3. A dendrogram will be made on the basis of scored data.

Estimated cost: 1,50,000/-

References

Begum T. and Kumar D. 2011. Usefulness of morphological characteristics for DUS testing of jute (*Corchorus olitorius* L. and *C. capsularis* L.). Span J Agric Res. 9:473-483.

Degani C, Rowland LJ, Levi A, Hortynski JA, Galletta GJ .1998. DNA fingerprinting of strawberry (Fragaria X ananassa) cultivars using randomly amplified polymorphic DNA (RAPD) markers. Euphytica 102:247-253

Doyle JJ. and Doyle JL. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. Phytochem Bulletin. 19:11-15.

Huq S, Islam, Sajib AA, Ashraf N, Haque S, Khan H. 2009. Genetic diversity and relationship: in jute (Corchorus sp.) revealed by SSR markers. Bangladesh J Bot. 38:153-161.

Nag S, Mitra J, Satya P, Kar CS, Karmakar PG. 2018. Genetic diversity assessment in jute (Corchorus species) utilizing inter simple sequence repeat and simple sequence repeat markers. Indian J Biotechnol. 17:316-326.

2.2 Title of the Experiment: Molecular identification and characterization of salt tolerant genes in selected mutant lines of kenaf (*Hibiscus cannabinus* L.) (Cyto. 2/2025)

Background and Objectives:

Kenaf (*Hibiscus cannabinus* L.) is a vital fibre crop that holds significant economic and environmental importance due to its diverse applications in textiles, bioplastics, and biofuels (Basak *et al*., 2020). However, soil salinity poses a major threat to its cultivation, limiting its productivity and quality (Ashraf & Harris, 2013). Globally, approximately 20% of irrigated agricultural lands are affected by salinity, necessitating the development of salt-tolerant crops (Munns & Tester, 2008).

Mutagenesis and molecular breeding have been used as effective tools to create genetic diversity and identify desirable traits, including salinity tolerance, in crops like kenaf (Chakraborty *et al*., 2019). Salt-tolerant plants exhibit complex mechanisms, such as osmotic adjustment, ion compartmentalization, and antioxidant responses, governed by key genes (Zhu, 2002). Recent advances in genomics and transcriptomics have enabled the molecular identification of genes responsible for salinity tolerance in crops (Negrão *et al*., 2017).

Several genes, such as those encoding Na^+/H^+ antiporters, transcription factors, and reactive oxygen species (ROS)-scavenging enzymes, have been associated with salinity tolerance in plants (Shi *et al*., 2003). Mutant lines of kenaf, developed through gamma irradiation and chemical mutagens, may harbor novel variations in salt tolerance-related genes (Ahmed *et al*., 2021). These genetic resources need to be characterized at the molecular level to identify and utilize salt-tolerant traits in breeding programs (Bari *et al*., 2022).

The study of candidate genes through molecular markers, such as SSRs and SNPs, coupled with bioinformatics approaches, has proven effective in elucidating the genetic basis of abiotic stress tolerance (Yadav *et al*., 2019). Such efforts can significantly contribute to the sustainable cultivation of kenaf in saline soils, promoting agricultural resilience and economic development (Roy *et al*., 2018).

Objective

To identify and characterize salt-tolerant genes in selected mutant lines of kenaf (*H. cannabinus* L.) at the molecular level.

Date of initiation and duration: March, 2025 to December 2026.

Name of the investigators: Arju Miah, Md. Abdur Razzak Taohidi**,** Md. Kamrujjaman and Dr. Md. Nasir Uddin.

Location: Laboratory of Cytogenetics Department, Genetic Resources and Seed Division, BJRI, Dhaka.

Experimental details:

Materials:

Plant material: Mutaten line CA001K, CA002K,CA003K and HC-02(Control).

Sterilizing agents: Ethanol, sodium hypochlorite, distilled water.

Methodology:

Amplification of Saline Tolerant Genes

The molecular experiment will be conducted at the Cytogenetics Laboratory, BJRI, Dhaka. Three mutant relatively tolerant lines and one kenaf variety will be selected through mutagenesis (radiation and chemical mutagen both) based on morphological and physio-chemical parameters, to identify saline tolerance using gene-specific primers for saline tolerant genes.

Determination of Critical Stress Conditions
Twenty-day-old kenaf plants will be treated with 350 mM NaCl at 0h, 3h, 6h, and 9h intervals. RNA will be extracted from leaves, stems and roots using the Promega Total RNA Isolation Kit (Promega Corp., USA).

Isolation of Total RNA
RNA will be extracted following the protocol by Kobs (1998) and New England Biolabs guidelines:

1. Plant tissues will be frozen in liquid nitrogen and ground.
2. 30 mg of tissue will be mixed with 175 µL RNA lysis buffer.
3. Steps involving RNA dilution, ethanol addition, washing, DNase treatment, and elution will be followed as per kit instructions.
4. Purified RNA will be stored at –70°C.
5.

First-Strand cDNA Synthesis
First-strand cDNA will be synthesized using the Promega cDNA Synthesis Kit (Promega Corp., USA). RNA and primers will be heated at 65°C, chilled, and mixed with reverse transcription reagents. The reaction will be incubated at 42°C for one hour, and cDNA will be stored for further analysis.

Development of Gene-Specific Primers
Primers for saline-tolerant selected genes will be designed using DNA sequences from the GenBank database. CLUSTAL WX will be used for sequence alignment, and the primers will be designed manually from the sequences of targeted genes.
Table 1: Sequences of Gene-Specific Primers for Selected Genes from Different gene family

Primer Name	Sequence (5'-3')	GC (%)	Length (bp)
GateWRKY2_F	GCG CCC ATG GAG AAT TAT CAA ATG	46.15	26
GateWRKY2_R	CCG AAG GGA GTG TAA ATC TG	45.45	22
GateWRKY14_F	ATG GAA AAA ACG ATG GGT TGG GAG C	40.74	27
GateWRKY14_R	GCG CCC TGT AAA AAA TTA GTG AAC TC	40.74	27
GateWRKY16_F	ATG ACA TGG AGG GGG TTG AAG	52.17	23
GateWRKY16_R	TGT ATG GGC AGA TTG TGT AGA G	41.67	24
GateWRKY33_F	ATG GAA CCA GCT TGG GTG GA	54.55	22
GateWRKY33_R	CAC AGC TCA TCC TGA AAT GG	50.00	22
GateWRKY44_F	CAT GAT CAG CAA AGT TAT GGT GG	45.83	24
GateWRKY44_R	GCT GGT TCA TGT TTA AGG AAC GTG G	51.85	27

PCR Amplification
The PCR cocktail will be prepared using Q_5 High-Fidelity DNA Polymerase.
Table 2: Components of PCR Cocktail

Component	Quantity (25 µL reaction)
5X Q_5 Reaction Buffer	5 µL
10 mM dNTPs	0.5 µL

Forward Primer (10 µM)	1.25 µL
Reverse Primer (10 µM)	1.25 µL
Template DNA	50–100 ng
Q_5 High-Fidelity DNA Polymerase	0.25 µL
Nuclease-Free Water	Up to 25 µL

The thermal cycler will run with the following profile:

Table 3: Thermal Profile for PCR

Step	Temperature	Time	Cycles
Initial Denaturation	98°C	30 seconds	1
Denaturation	98°C	30 seconds	35
Annealing	60.7–61.8°C	30 seconds	
Extension	72°C	45 seconds	
Final Extension	72°C	2 minutes	1

Purification of PCR Products

PCR products will be purified using the Promega Purification Kit. Equal volumes of membrane binding solution will be mixed with PCR products, and steps for washing and elution will follow the manufacturer's instructions. After purification, the PCR product will ready for sequencing.

Data Analysis

Nucleotide sequences will be aligned using BioEdit Sequence Alignment Editor (Hall, 1999). Consensus sequences will be calculated, and phylogenetic trees will be constructed using MEGA 10 (Tamura *et al*., 2007).

Output

1. Salt-tolerant mutant lines of kenaf will be identified using molecular and physiological screening.
2. Genes associated with salinity tolerance will be characterized through molecular markers and bioinformatics tools.
3. Novel genetic resources for salinity tolerance in kenaf will be developed for future breeding programs.

Expected cost: 4,00,000/-

References

Ahmed, R., Sarker, A., & Kabir, M. (2021). Development of mutant lines in kenaf through induced mutagenesis. *Journal of Crop Improvement*, 35(4), 123–134.

Ashraf, M., & Harris, P. J. C. (2013). Potential biochemical indicators of salinity tolerance in plants. *Plant Science*, 166(1), 3–16.

Bari, M. A., Islam, M. M., & Akter, F. (2022). Advances in kenaf breeding for abiotic stress tolerance. *Plant Breeding Reviews*, 45, 67–99.

Basak, S. C., Chowdhury, A., & Saha, B. (2020). Prospects of kenaf as a multipurpose crop in Bangladesh. *Fiber Crops Science*, 12, 34–45.

Chakraborty, S., Roy, P., & Sinha, P. (2019). Genetic improvement of kenaf through molecular breeding. *Plant Breeding*, 138(3), 345–354.

Hall, T. A. (1999). BioEdit: A user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series, 41*(1), 95–98.

Kobs, G. (1998). Isolation of total RNA from plants using Promega's RNA extraction system. Promega Notes Magazine, 68, 27–29.

Munns, R., & Tester, M. (2008). Mechanisms of salinity tolerance. *Annual Review of Plant Biology*, 59, 651–681.

Negrão, S., Schmöckel, S. M., & Tester, M. (2017). Evaluating salinity tolerance in crops. *New Phytologist*, 216(4), 984–996.
New England Biolabs. (n.d.). RNA extraction and purification protocol. Ipswich, MA: New England Biolabs.
Promega Corporation. (n.d.). *Promega Total RNA Isolation Kit protocol*. Madison, WI: Promega Corporation.
Roy, S., Biswas, A., & Ghosh, S. (2018). Strategies for sustainable kenaf production in marginal lands. *Environmental Sustainability*, 1, 23–31.
Shi, H., Zhu, J.-K., & Zhu, J. (2003). Regulation of Na^+/H^+ antiporters in plants. *Plant Physiology*, 131(3), 537–544.
Tamura, K., Stecher, G., Peterson, D., Filipski, A., & Kumar, S. (2007). MEGA7: Molecular evolutionary genetics analysis software for larger datasets. *Molecular Biology and Evolution, 33*(7), 1870–1874.
Yadav, R., Singh, A., & Sharma, S. (2019). Molecular approaches for stress tolerance in fiber crops. *Crop Science Journal*, 56(4), 765–778.

2.3 Title of the Experiment: Expression profiling of selected salt tolerant genes in mutant lines of kenaf (*Hibiscus cannabinus* L.) using qRT PCR (Cyto. 3/2025)

Background and Objectives

Kenaf (*Hibiscus cannabinus L.*) is a versatile fibre crop widely grown for its industrial and agricultural applications. However, its growth and productivity are significantly affected by salinity stress, a major abiotic factor limiting crop yield globally (Flowers *et al*., 2015). Salinity stress induces physiological, biochemical, and molecular changes in plants, reducing water uptake and nutrient availability (Munns and Tester, 2008). Development of salt-tolerant varieties through genetic and biotechnological approaches has been emphasized to mitigate these challenges (Ashraf and Foolad, 2013). Mutagenesis and molecular breeding have been effectively used to enhance salt tolerance in crops by inducing genetic variability (Jain, 2010). In recent years, advances in quantitative real-time PCR (qRT-PCR) have enabled precise expression analysis of salt-responsive genes, providing insights into the molecular mechanisms underlying stress tolerance (Livak and Schmittgen, 2001). Genes such as *NHX1*, *HKT1*, and *SOS1* have been identified as key players in salt stress responses in many plant species (Zhu, 2003). The expression profiling of such genes in mutant lines can reveal their role in conferring salt tolerance, paving the way for developing resilient crop varieties (Tester and Davenport, 2003).

Kenaf mutant lines developed through physical or chemical mutagenesis techniques provide a valuable resource for studying gene expression under salinity stress (Roychoudhury and Basu, 2014). The identification and expression analysis of salt-responsive genes in these mutants will help elucidate their functional roles in stress adaptation. This approach aligns with the global demand for sustainable crop improvement strategies to combat salinity-induced yield losses (Rengasamy, 2010).

Objective

To profile the expression of selected salt-tolerant genes in mutant lines of kenaf (*H. cannabinus L.*) under salinity stress using qRT-PCR.

Date of initiation and duration: March, 2025 to December 2026.

Name of the investigators: Arju Miah, Md. Abdur Razzak Taohidi**,** Md. Kamrujjaman and Dr. Md. Nasir Uddin.

Location: Laboratory of Cytogenetics Department, Genetic Resources and Seed Division, BJRI, Dhaka.

Experimental details:

Materials:

Plant material: Mutaten line CA001K, CA002K,CA003K and HC-02(Control).

Methodology

Determination of Critical Stress Condition

Twenty-day-old kenaf seedlings will be treated with 350 mM NaCl for 0, 3, 6, and 12 hours. Total RNA will be extracted from the leaves, stems and roots using the Promega Total RNA Isolation Kit.

RNA Isolation from Kenaf Leaves, stems and roots

1. Plant tissue will be frozen in liquid nitrogen and ground with a mortar and pestle.
2. Thirty milligrams of ground tissue will be mixed with RNA lysis and dilution buffers.
3. Following centrifugation, 95% ethanol will be added, and the mixture will be processed through a spin column.
4. DNase treatment will be performed to remove DNA contamination.
5. The purified RNA will be eluted in nuclease-free water and stored at -70°C.

First-Strand cDNA Synthesis

1. Total RNA (up to 5 µg) will be combined with primers (Oligo dT or Random Primer) and nuclease-free water.
2. The mixture will be heated to 70°C for 5 minutes and cooled on ice.
3. A reverse transcription mix will be prepared with reaction buffer, $MgCl_2$, nucleotide mix, RNasin®, reverse transcriptase, and nuclease-free water.
4. RNA-primer and reverse transcription mixtures will be combined and incubated at 42°C for one hour to synthesize cDNA.
5.

Primer Development

Gene-specific primers targeting selected saline-tolerant genes will be designed using sequences from GeneBank (Chen *et al*., 2022).

Table 1 lists the sequences.

Table 1: Primer Sequences for Salinity Tolerance Analysis

Primer	Sequences
HcWRKY2_F	GTTTAACGTGTGGTGCATCG
HcWRKY2_R	AGACAGGGCAAGATTCCAGA
HcWRKY7_F	CCTGGGTAGCCCTATCATCA
HcWRKY7_R	TCAACTGCACAAGGCAAATC
HcWRKY14_F	TATTTCCGCCAGCAATATCC
HcWRKY14_R	ATTGGAATGGTTTCGTGCTC
HcWRKY16_F	GCTGAAATTCAAGCCTTTGC
HcWRKY16_R	TTCCTGGAAAGTCCCAGTTG
HcWRKY25_F	GATCGACCTCGCTCTTTGTC
HcWRKY25_R	TCGATTTCATCAGCATCGAG
HcWRKY31_F	GAAGAGGAAAGCCGAGTGTG
HcWRKY31_R	CCTTAGGCTTTTTGCACGAG
HcWRKY33_F	GATCGTGAGAAGGGGAATGA
HcWRKY33_R	AGTACGGCCAGAAAGTGGTG
HcWRKY44_F	TCTCAGTGTCGTCGGAAGTG
HcWRKY44_R	GGCAGAAGGCTGTGAAGAAC
ABI1_F	AGAGTGTGCCTTTGTATGGTTTTA

ABI1_R	CATCCTCTCTCTACAATAGTTCGCT
ACTIN2_F	TCAGATGCCCAGAAGTGTGTT
ACTIN2_R	CCGTACAGATCCTTCCTGATAT
DREB2A_F	AAGGGTCGAAGAAGGGTTGT
DREB2A_R	CGAGCCAAAGGACCATACAT
SOS1_F	GTGAAGCAATCAAGCGGAAA
SOS1_R	TGCGAAGAAGGCGTAGAACA
HKT1_F	GATTTGTCCCCACGAATGAGA
HKT1_R	CAAAACCAAGAAGCAAGGGAAC
18S_F	CTACGTCCCTGCCCTTTGTA
18S_R	GGTTCACCTACGGAAACCTTG
TUB-Alpha F	AATGCTTGCTGGGAGCTTTA
TUB-Alpha R	GTGGAATAACTGGCGGTACG
NHX1_F	AGGAGATGGCTGTTTCTTGGC
NHX1_R	CGACCTTGATGGAAGACACC
NHX2_F	ACTCCAGCCTGGTCGTAATC
NHX2_R	TTGCTGGGACTGTTTGAGTG
CIPK1_F	CAGGAGGAGGAAGAACTGGC
CIPK1_R	GGGAATGCAGGGAAGGTTAC
CIPK2_F	CCTGAAGGTTTGCAGGTTGA
CIPK2_R	AGCTTCTGCTTGTCCGTCTC
RAN_F	GCCATGCCGATAAGAACATT
RAN_R	GTGAAGGCAGTCTCCCACAT

PCR Amplification

PCR reactions will be set up in 25 µL volumes with 2 µL cDNA, 0.5 µM primers, and 12.5 µL GoTaq Green Master Mix.

Cycling parameters will include:

Initial denaturation at 95°C for 5 minutes.

35 cycles of denaturation at 95°C for 30 seconds, annealing at 60°C for 30 seconds, and extension at 72°C for 30 seconds.

Final extension at 72°C for 7 minutes.

Data Analysis

PCR products will be analyzed using gel documentation software.

The relative expression levels of targeted genes will be normalized against Actin2 as the reference gene.

The 2-ΔΔCt method (Livak *et al*., 2001) will be used to calculate the fold change in gene expression.

Output

1. The differential expression patterns of salt-tolerant genes in mutant kenaf lines will be determined.
2. Salt-tolerant mutant lines with upregulated stress-responsive genes will be identified.
3. Molecular insights into the role of specific genes in salinity tolerance will be provided, contributing to future breeding programs.

Expected Cost: 4,00,000/-

References

Ashraf, M., & Foolad, M. R. (2013). Crop improvement for salt tolerance in the era of molecular markers and marker-assisted selection. *Plant Cell, Tissue and Organ Culture*, *104*(3), 233-239.

Chen, J., Li, X., Hu, R., Zhang, L., Wang, X., Zhang, C., & Wang, X. (2022). WRKY transcription factors: evolution, regulation, and functional diversity in stress tolerance in plants. *Frontiers in Plant Science*, *13*, 851560.

Flowers, T. J., Galal, H. K., & Bromham, L. (2015). Evolution of halophytes: multiple origins of salt tolerance in land plants. *Functional Plant Biology*, *42*(6), 485-492.

Jain, S. M. (2010). Mutagenesis in crop improvement under the climate change. *Romanian Biotechnological Letters*, *15*(2), 88-106.

Livak, K. J., & Schmittgen, T. D. (2001). Analysis of relative gene expression data using real-time quantitative PCR and the 2^-ΔΔCt method. *Methods*, *25*(4), 402-408.

Munns, R., & Tester, M. (2008). Mechanisms of salinity tolerance. *Annual Review of Plant Biology*, *59*(1), 651-681.

Rengasamy, P. (2010). Soil processes affecting crop production in salt-affected soils. *Functional Plant Biology*, *37*(7), 613-620.

Roychoudhury, A., & Basu, S. (2014). Salt tolerance mechanisms in salt-tolerant grasses (STGs) and their prospects in cereal crop improvement. *Plant Cell Reports*, *33*(8), 1215-1234.

Tester, M., & Davenport, R. (2003). Na+ tolerance and Na+ transport in higher plants. *Annals of Botany*, *91*(5), 503-527.

Zhu, J. K. (2003). Regulation of ion homeostasis under salt stress. *Current Opinion in Plant Biology*, *6*(5), 441-445.

A III. BREEDER SEED DEPARTMENT

PROGRAMME AREA : PRODUCTION OF NUCLEUS AND BREEDER SEED AS WELL AS IMPROVEMENT OF SEED QUALITY

1. TITLE OF THE PROJECT : NUCLEUS SEED PRODUCTION OF JUTE, KENAF AND MESTA

Objectives: To maintain nucleus seed stock of released varieties of jute, kenaf and Mesta.

Title of the Program: Production of nucleus seed stock of jute, kenaf and Mesta (BS-1/2025)

Background and objective:
Over time, even well-adapted and improved cultivars gradually lose their varietal distinctiveness and homogeneity due to improper management, inbreeding depression, and mutational changes. Selection is a well-established and effective method for maintaining a variety's genetic integrity and uniqueness. The purity of released jute and kenaf varieties is preserved through individual plant selection. Each year, seeds from these selected plants are collected separately and sown in individual rows. By bulking seeds from the pure rows, a nucleus seed stock is produced. This nucleus seed is then used for breeder seed production in the following cropping season. That's why, a routine program has been undertaken to produce nucleus seed for breeder seed production in the next year.

Expected output: Genetic uniformity of the variety will be maintained.

Date of initiation and duration: March, 2025-February, 2026.

Name of the investigators: T. Kumar, Md. M. Ali, M.N. Uddin and officer in charge of the respective stations.
Location: Dhaka, Manikganj, Monirampur and Nasipur.

Program details:

Materials:
Dashi jute (*C. capsularis*) variety: CVL-1, BJRI Deshi Pat 5 (BJC-7370), BJRI Deshi Pat 8 (BJC-2197), BJRI Deshi Pat 9 (BJC-5003), BJRI Deshi Pat 10 (BJC-12221), BJRI Deshi Pat shak 1(BJC-390) and BJRI Deshi Pat shak 2(Mara lal)
Tossa jute (*C. olitorius*) variety : O-9897, BJRI Tossa Pat8 (Robi-1) and BJRI Tossa Pat 9 (Sobuj Sona)
Kenaf (*H. cannabinus*) variety: HC-95 and BJRI Kenaf4
Mesta (*H. sabdarifa*) variety: BJRI Mesta 2

Procedure: The selected varieties will be grown in small separate plots (1-2 decimal) keeping proper isolation distance. In first year, about 15-50 typical individual plants will be selected from small bulk plot on the basis of phenotypic uniformity and seeds of each plant will be collected properly and stored in separate paper bags with proper labeling. In second year, seeds of selected individual plants will be sown in individual rows to assess the genetical purity meticulously several times during the growing season. The progeny rows that deviate in one or other characteristics will be discarded and entire progeny rows will be rejected. The plant

progenies that are uniform and true to type will be selected and bulk together as nucleus seed. This nucleus seed will used for breeder seed production in the next year.

Records to be kept:

1. Morphological characters
2. Off-type plant should be removed
3. Incidence of disease and pest infestation will be observed
4. Seeds of each variety will be collected at proper time
5. Recommendation of research personnel will be maintained
6. Seed weight (kg)
7. Seed health test

Estimated Cost: 1,00,000/- (approx.)

Table 1: Area (acre), plants to be select and number of rows for nucleus seed in 2025-26

Station Variety	Year	Dhaka	Manikganj	Monira mpur	Nasipur	Selection (plants)	Sowing time	Cutting Transplanting
Deshi jute								
CVL-1	1st	0.01acre	0.02acre	-	-	45 +45	3rd h week of March (MP)	3rd week of June
	2nd	-	30 rows	-	30 rows	-	1st week of June	-
BJRI Deshi Pat 5	1st	-	0.01 acre	-	-	30	2nd week of March (MP)	3rd week of June
	2nd	-	30 rows	-	30 rows	-	Last of May	-
BJRI Deshi Pat 8	1st	-	0.01 acre	-	-	30	3rd week of March (MP)	3rd week of June
	2nd	-	20 rows	-	15 rows	-	1st week of June	-
BJRI Deshi Pat 9	1st	-	0.01 acre	-	-	30	3rd week of March (MP)	3rd week of June
	2nd	-	20 rows	-	30 rows	-	1st week of June	-
BJRI Deshi Pat 10	1st	-	0.01 acre	-	-	40	3rd week of March (MP)	3rd week of June
	2nd	-	20 rows	-	20 rows	-	1st week of June	-
BJRI Deshi Pat Shak 1	1st	0.01 acre	0.01 acre	-	-	20 + 20	1st week of June	-
	2nd	-	40 rows	-	-	-	1st week of June	-
BJRI Deshi Pat Shak 2	1st	0.01 acre	0.01 acre	-	-	20 + 20	1st week of June	-
	2nd	-	20 rows	-	-	-	1st week of June	-
Tossa jute								
O-9897	1st	-	0.02 acre	-	-	40	2nd week of March (MP)	3rd week of June
	2nd	-	40 rows	40 rows	-	-	2nd week of March (MP)	3rd week of June
BJRI Tossa Pat 8	1st	-	0.02 acre	-	-	40	2nd week of March (MP)	3rd week of June
	2nd	-	40 rows	40 rows	-	-	2nd week of March (MP)	3rd week of June
BJRI Tossa Pat 9	1st	0.01acre	0.02 acre	-	-	30+50	2ndweek of March (MP)	3rd week of June
	2nd	-	40 rows	40 rows	-	-	2ndweek of March (MP)	3rd week of June
Kenaf and Mesta								
HC-95	1st	0.01 acre	0.03 acre	-	-	30 + 80	3rd week of July	-
	2nd	-	80 rows	-	40 rows	-	1st fortnight of August	-
BJRI Kenaf 4	1st	0.01 acre	0.01 acre	-	-	20 + 20	3rd week of July	-
	2nd	-	20 rows	-	20 rows	-	1st fortnight of August	-
BJRI Mesta 2	1st	-	0.02 acre	-	-	50	3rd week of July	-
	2nd	10 rows	30 rows	-	30 rows	-	1st fortnight of August	-

Note: In case of deshi jute, tossa jute and kenaf the area shown is for plant selection. Cuttings of mother plant (MP) will be taken from 110-120 days of plant age and transplanted.

2. TITLE OF THE PROJECT : PRODUCTION OF BREEDER SEED OF DESHI JUTE (*C. capsularis*), TOSSA JUTE (*C. olitorius*), KENAF (*H. cannabinus*) AND Mesta (*H. sabdariffa*) VARIETIES

Objective: To produce breeder seed of different varieties of jute and kenaf.

2.1. Title of Program: Production of breeder seed of deshi jute, tossa jute, kenaf and Mesta (BS-2/2025)

Background and Objective: Breeder seeds of the Bangladesh Jute Research Institute released varieties of jute (*C. capsularis* and *C. olitorius)*, kenaf (*H. cannabinus*) and mesta (*H. sabdariffa*) will be produced at Manikganj, Rangpur, Kishoreganj, Chandina, Monirampur, Faridpur and Nasipur stations of BJRI. To maintain genetic purity and quality appropriate isolation distance of different varieties of the same species is 50.0 m and of other species is 5 m (Saha *et al*., 2016) and standard cultivation procedure will be followed. Recommendations of Seed Certification Agency (SCA) will also be followed to maintain field and seed standard for seed production. Breeder seed production will be undertaken to supply breeder seed (Islam, 2009) of jute, kenaf & mesta in different seed producing organizations for the production of foundation as well as certified seed.

Location: Manikganj, Rangpur, Kishoreganj, Chandina, Faridpur, Monirampur and Nasipur.

Date of initiation and duration: March, 2024-February,2025.

Name of Investigators: T. Kumar, Md. M. Ali, M.N. Uddin and officer in charge of the respective stations.

Experimental details:

Materials:

Deshi jute (*C. capsularis*) varieties: CVL-1, BJRI Deshi Pat 5 (BJC-7370), BJRI Deshi Pat 8 (BJC-2197), BJRI Deshi Pat 9 (BJC-5003), BJRI Deshi Pat10 and BJRI Deshi Pat Shak 1

Tossa jute (*C. olitorius*) varieties : O-9897, BJRI Tossa Pat 8 (Robi-1) and BJRI Tossa Pat 9 (Sobuj Sona)

Kenaf (*H. cannabinus*) variety: HC-95 and BJRI Kenaf 4

Mesta (*H. sabdarifa*) variety: BJRI Mesta 2 (VM-1)

Procedure: Six varieties of deshi jute, 3 varieties of tossa jute, 2 varieties of kenaf and 1 variety of Mesta will be grown in separate plots at different research stations of BJRI keeping proper isolation distances. The varieties of *C. capsularis*, *C. olitorius,H. cannabinus* and *H. sabdariffa* will be sown as mentioned in the following schedule (Table 2). Rouging of the off-type plants will be done in time. All tossa jute varieties will be sown in 1st week of March (as mother plant), deshi jute varieties mid to last week of May, kenaf and mesta last week of July. However, it may vary depending weather condition and land type of respective stations. Cuttings of mother plant will be transplanted in last week of June to produce seeds of tossa jute varieties. On the contrary, direct seeding method will be followed for the production of seeds of deshi jute, kenaf, mesta varieties and in some cases of tossa jute variety.

Table 2. Demand of breeder seed (kg) by BADC and different private seed company (2025-26)

Variety	BADC	Private seed company
CVL-1	90.00	-
BJRI Deshi Pat-5	5.00	-
BJRI deshi pat shak 1	9.00	-
Sub total	**114.00**	**-**
BJRI Tossa Pat-9	80.00	-
Sub total	**80.00**	**-**
BJRI Kenaf-4	28.00	-
Sub total	**28.00**	**-**
Total	**222.00**	**-**

Table 3: Area (acre) and production (kg) target of breeder seed for the year, 2025-26

Station	Manikgonj		Rangpur		Kishoregonj		Chandina		Manirampur		Nashipur		Faridpur		Total Area	Prodⁿ Target	Time of sowing/Cuting transplanting
variety	Area	Prodⁿ	Area	Prodⁿ	Area	Prodⁿ	Area	Prodⁿ	Area	Prodⁿ	Area	Prodⁿ	Area	Prodⁿ			
Deshi Jute																	
CVL-1	0	0	0	0	0.6	60	0	0	0.6	60	0.6	60	0	0	1.8	180	2nd week of June (DS)
BJRI Deshi pat 5	0	0	0.15	15	0	0	0	0	0.15	15	0	0	0	0	0.3	30	Last week of May (DS)
BJRI Deshi pat 8	0	0	0	0	0	0	0.2	20	0	0	0.2	20	0	0	0.4	40	2nd week of June (DS)
BJRI Deshi pat 9	0	0	0.1	10	0	0	0	0	0	0	0.1	10	0	0	0.2	20	2nd week of June (DS)
BJRI Deshi pat 10	0.15	15	0	0	0.15	15	0	0	0	0	0	0	0	0	0.3	30	2nd week of June (DS)
BJRI Deshi pat shak 1	0	0	0	0	0	0	0.15	15	0.15	15	0	0	0	0	0.3	30	2nd week of June (DS)
Sub Total	0.15	15	0.25	25	0.75	75	0.35	35	0.9	90	0.9	90	0	0	3.3	330	
Tossa Jute																	
O-9897	0.15	15	0	0	0	0	0	0	0.15	15	0	0	0	0	0.30	30	Last weel of July (DS)
	0.10	10	-	-	-	-	-	-	0.10	10	-	-	-	-	0.20	20	15 th march MP / Last week of June (TC)
BJRI Tossa pat 8 (Robi-1)	0	0	0.0	0	0.1	10	0.1	10	0	0	0	0	0	0	0.20	20	Last weel of July (DS)
	0	0	0.0	0	0.15	15	0.15	15	0	0	0	0	0	0	0.30	30	15 th march MP / Last week of June (TC)
BJRI Tossa pat 9(Sobuj Sona)	0.5	50	0.25	25	0	0	0	0	0.5	50	0.25	25	0.25	25	1.75	175	Last weel of July (DS)
	0.5	50	0.25	25	0	0	0	0	0.5	50	0.25	25	0.25	25	1.75	175	15 th march MP / Last week of June
Sub Total	1.25	125	0.50	50	0.25	25	0.25	25	1.25	125	0.5	50	0.5	50	4.5	450	
Kenaf																	
HC-95	0.8	80	1.75	175	1.75	175	0	0	1	100	1.7	170	0	0	7	700	Last week of July (DS)
BJRI kenaf 4	0	0	0	0	0	0	0.30	30	0.30	30	0	0	0	0	0.6	60	Last week of July (DS)
Sub Total	0.8	80	1.75	175	1.75	175	0.30	30	1.30	130	1.7	170	0	0	7.6	760	
Mesta																	
BJRI Mesta 2	0.1	10	0	0	0	0	0.15	15	0	0	0	0	0	0	0.25	25	Last week of July (DS)
Sub Total	0.1	10	0	0	0	0	0.15	15	0	0	0	0	0	0	0.25	25	
Total	2.3	230	2.5	250	2.75	275	1.05	105	3.45	345	3.1	310	0.5	50	15.65	1565	

Note: In case of tossa jute, the area shown is for cuttings. Mother plants will be sown just 75% of the mentioned areas.
Estimated Cost: 6,00,000/- (approx.)

3. TITLE OF THE PROJECT : ENHANCEMENT OF SEED YIELD AND QUALITY OF BREEDER SEED

Objectives: To gain quality seed of jute and allied fibre crops

3.1 Title of the Expt: Supervision of foundation seed produced at different farms (BS-3/2025)

Background and Objectives:
Every year many GO, NGO and private seed producing farms used breeder seed from BJRI and provide relevant information on foundation seed production (e.g., D/S, D/T, Locations, variety etc.). BJRI is the main authorized body for supplying breeder seed of jute and allied fiber crops to BADC and other private seed companies for producing foundation seed as per need. The quality of breeder seed plays a vital role in the production of foundation seed as well as certified seed. Quality seed of an improved variety itself provides about 15- 20% more yield along with normal agricultural practices (Islam *et Al*.,2002a). That's why, this experiment will be carried out to visit breeder and foundation seed plots of different seed producing agencies at different growth stage to ensure the quality of produced seed.

Locations: Chitla (Meherpur), Nasipur (Dinajpur), Karimganj & Kotiadi (Kishoreganj).

Date of initiation and duration: March to December, 2025.

Name of investigators: T. Kumar, M. Ali, M.N. Uddin and officer in charge of the respected Stations.

Procedure:
Scientists of Breeder seed department of BJRI will make field visits in appropriate times to ensure the standard recommended procedure and to observe performances of foundation seed production. Foundation seed production farms of BADC (Chitla, Meherpur and Nasipur, Dinajpur), Safoan Beej Vandar Pvt. Ltd. (Kishoreganj), Gachihata aquaculture farms Ltd. (Kishoreganj), M/S Maa enterprise (Kishoreganj) will be visited to observe the varietal purity and performances of foundation seed throughout the seed production and processing times. During the visit the following activity will be done and information will be collected:

i) Date of sowing/ transplanting
ii) Intercultural operation
iii) Insect- pest infestation
iv) Varietal purity (%)
v) Isolation distances
vi) Barrier crops
vii) Weeding
viii) Rouging
ix) Seed harvesting and processing and
x) Seed Storage

Estimated cost: Tk. 50000.00 per location

3.2 Title of the Expt: Effect of Chemical priming on the Germination of BJRI Mesta 2(*Hibbicus subdariffa*) under salinity (BS-4/2025).

Background: Plant growth and production are significantly hampered by various environmental constrains such as heavy metal toxicity, UV radiation, excess light, freezing, cold, heat, flooding, drought and salinity. Global food security is being threatened by the detrimental effects of abiotic stress on plant growth and productivity, which are further exacerbated by anthropogenic contributions such as urbanization and industrialization (Nagajyoti et al.2010) and climate (David and Christopher 2007; Reddy 2015; Savvides et al 2016). A number of approaches have been used worldwide to increase crop productivity under multiple abiotic stresses. However, some strategies such as conventional breeding are time consuming,while other such as genetic engineering are not accepted across different countries of the world (Savvides et al.206). This makes plants to enter the primed state where the provocation of defensive processes is faster than unprimed plants (Sani et al. 2013). Chemical priming offers efficient ways for crop stress management so as to counteract the adverse effects of stresses on plant growth and development (Sani et al. 2013).

Objectives:

1. To know the effect of osmosis or specific ions for the germination of mesta
2. To what extent can seed recover from exposure to high concentration of sodium chloride, and
3. To identify the suitable pre- treatment that improves germination and overcomes the effects of NaCl by investigating the role of three chemicals during the germination of mesta under increasing the NaCl salinity in order to get more information on the mechanisms by which salinity may inhibit germination of this species in the lab condition

Locations: Breeder Seed Department Lab

Date of initiation and duration: March, 2025-February, 2026.

Name of investigators: A.R. Taohidi and M.N. Uddin

Experimental details:

Treatment: Chemical C1=Potasium Nitrate, Chemical C2= Gibberellic acid and Chemical C3= Boric Acid

Variety: Mesta-2

Layout and Design: CRD with three replications

Procedure:

Among three varieties of BJRI Mesta, one of them will be collected from Kenaf and Mesta Department and two varieties from Breeder seed department. Seeds will be sterilized with 70% ethanol for 5 minutes and wash five times with distilled water. Then these seeds will be treated with three chemicals (C1, C2, C3) separately and put it 24 hours in a dish. After 24 h these treated seeds wash thoroughly with distilled water 3 times and air dried genteelly. Initial seed weight will be collected.

Seed will be placed in tightly sealed 9 cm Petri dish with Whatman paper -1 moistened in 2ml distilled water or a test saline solution. Three replications of 20 seeds will be used for each treatment. For evaluation of salinity tolerance at seedling stage, seeds will be sown in petri dish on filter paper soaked with NaCl solution (0, 50,100, 150 and 200mM). Germination will carry

out in the room temperature at Breeder seed department lab. These petri dish will be checked daily to count the germination of seeds. Seeds developing radicals of >1 mm length will be considered germinated. After Seven days ungerminated salt treated seeds will be collected from petri dish and wash 3 times with distilled water. Then these ungerminated seed again placed in petri dish to determine their ability to recover from salt parameter.

Records to be kept:

1.Rate of Germination
2.Germination %
3.Germination Recovery
4. Germination index
5.Seed Vigour index
6.Shoot length
7.Root Length
8.Seedling length

Estimated cost: 1,00,000/-

REFERENCES

Anonymous, 2006. Manual for seed quality control. Seed wing, Ministry of Agriculture, Govt. of the People's Republic of Bangladesh. Seed Industry Development/DANIDA, Karim Printers & Packages. September 2006.pp209.

Atia, A.; Debez, A.; Barhoumi, Z.; Smaoui, A.; Abdelly, C. ABA, GA 3, and nitrate may control seed germination of *Crithmummaritimum* (Apiaceae) under saline conditions. *ComptesRendus Biol.* **2009**, *332*, 704–710.

AVRDC, Genetic Resources and Seed Unit (GRSU). 2008. Characterization records sheets, AVRDC- The World Vegetable Center, Shanhua, Taiwan

Bajehbaj AA. The effects of NaCl priming on salt tolerance in sunflower germination and seedling grown under salinity conditions. African Journal of Biotechnology 2010;9(12).

Biswa, D and TM Singo, 2019. Effect of Roselle extracts on the selected quality characteristics of ice cream. International Journal of Food Properties, 22: 42-53.

Bouzidi, A.; Krouma, A.; Chaieb, M. Chemical seed priming alleviates salinity stress and improves *Sulla carnosa*germination in the saline depression of Tunisia. *Plant Direct* **2021**, *5*, e357.zturk, S.W., 48. [CrossRef][PubMed]

D'Heureux-Calix, F and N Badrie, 2004. Consumer acceptance and physicochemical quality of processed red sorrel/Roselle (*Hibiscus sabdariffa* L.) sauces from enzymatically extracted calyces. Food Service Technology, 4(4): 141-148.

Ekka, U., N. Singh, N. Bharti, P. K. Sahoo, and M. K. Singh. 2019. Design of seed metering system for jute seeds. Agricultural Engineering International: CIGR Journal, 21(3): 88–93.

Ghassemi-Golezani K, Esmaeilpour B. The effect of salt priming on the performance of differentially matured cucumber (*Cucumis sativus*) seeds. NotulaeBotanicaeHortiAgrobotanici Cluj-Napoca 2008;36(2):67-70.

Gulzar, S.; Khan, M.A. Effects of salinity and temperature on the germination of Urochondrastulosa (trin.) C.E. Hubbard. Seed Sci. Technol. **2001**, 29, 21–29.

Gupta, R. K., and S. K. Das. 1997. Physical properties of sunflower seeds. Journal of Agricultural Engineering Research, 66(1): 1–8.

Hongua, C.; Leynan, T.; Junmei, S.; Xiaou, H.; Xianguo, C. Exogenous salicylic acid reveals an osmotic regulatory role in priming the seed germination of Leymus chinensis under salt-alkali stress. Environ. Exp. Bot. **2021**, 18, 104498.

Hussain S, Zheng M, Khan F, Khaliq A, Fahad S, Peng S, Huang J, Cui K, Nie L. Benefits of rice seed priming are offset permanently by prolonged storage and the storage conditions. Scientific Reports 2015;5(1):1-2.

Islam, M.M.2009. Jute seed technology. September 2009.pp14-15.

Kazemi K, Eskandari H. Does priming improve seed performance under salt and drought stress. Journal of Basic and Applied Scientific Research 2012;2(4):3503-3507.

Mahadevan, N. & Shivali, & Kamboj, P. 2009. Hibiscus sabdariffa Linn. –An overview. Natural Product Radiance. 8. 77-83.

Meot-Duros, L.; Magné, C. Effect of salinity and chemical factors on seed germination in the halophyte *Crithmummaritimum*L. *Plant Soil.* **2008**, *313*, 83–87.

Nagar RP, Dadlani M, Sharma SP. Effect of hydropriming on field emergence and crop growth of maize genotypes. Seed Research 1998;26:1-5.

Ngomuo, M., Stoilova T. Feyissa T, Ndakidemi PA. 2017. Characterization of Morphological Diversity of Jute Mallow (Corchorus spp.) International Journal of Agronomy Volume, ID 6460498, 12 pages https://doi.org/10.1155/2017/6460498.

Saha, C.K., Mostofa, M.G., Hussain, M.M., Akter, N. and Khatun, R. 2016. Manual on maintenance breeding and breeder seed production of jute. Bangladesh Jute Research Institute.25.

Sari, N. 2021. Seed Characterization and Relationships between Seed and Cotyledon Properties in Lagenaria spp. Accessions. Journal of Hort. science 56(2):185–192. 2021. https://doi.org/10.21273/HORTSCI15569-20.

Shim, S.I.; Moon, J.-C.; Jang, C.S.; Raymer, P.; Kim, W. Effect of potassium nitrate priming on seed germination of seashore paspalum. HortScience**2008**, 43, 2259–2262.

Tavili A, Zare S, Moosavi SA, Enayati A. Effects of seed priming on germination characteristics of Bromus species under salt and drought conditions. American-Eurasian Journal of Agricultural and Environmental Sciences 2011;10(2):163-168.

3.3 Title of the Expt: Effect of Different Maturity Levels and Post-Harvest Ripening on the Shelf-life of Kenaf Seed (BS 5/2025)

Background of the Research

Kenaf (*Hibiscus cannabinus* L.) is a fast-growing, annual fiber crop belonging to the Malvaceae family [1]. In Bangladesh, kenaf has gained increasing attention due to its economic and environmental benefits. The crop is cultivated on approximately 0.04 million hectares of land, yielding around 0.08 to 0.09 million tons of fiber annually [2]. In recent years, kenaf has gained considerable attention in Bangladesh for its economic value, adaptability to different agro-climatic zones, and potential in crop diversification and environmental sustainability. It is used in textiles, paper, biodegradable plastics, and even in composite materials in the automobile industry [2]. Very few amounts of kenaf seed are produced in Bangladesh, but there is no statistics about kenaf seed production [3]. inadequate supply of quality seed is the major barrier to the expansion of kenaf. The quality of kenaf seeds depends on many pre and postharvest factors, such as time of cultivation and method, time of seed maturity and harvest, threshing, processing, and drying operation and storage condition [4]. One major challenge in ensuring an adequate supply of quality seed is the rapid loss of seed viability during storage, which reduces germination rates and crop establishment. Improper harvesting at suboptimal maturity and poor post-harvest ripening practices contribute to this problem, as farmers often rely on visual signs rather than scientific indicators of maturity. Understanding optimal harvest timing and the role of post-harvest ripening could significantly improve seed quality, storage, yields, and farmer profitability.

Objectives

1. To evaluate the effect of different physiological maturity levels on kenaf seed viability and vigor.
2. To determine the role of post-harvest ripening duration on seed quality and shelf life.
3. To identify the optimum maturity stage and post-harvest treatment that ensures maximum seed longevity under storage conditions.

Expected Outcomes

- Identification of the best harvesting time for kenaf seeds based on physiological maturity.
- Establishment of the optimum post-harvest ripening duration to improve seed storage quality.
- Development of recommendations for farmers and seed producers to enhance seed viability and reduce post-harvest losses.
- Improvement in seed germination and field performance, contributing to sustainable kenaf production in Bangladesh.

Location: JAES, Manikganj, JRRS Kishoreganj and JRSS Manirampur.
Date of initiation and duration: August, 2025-February, 2026.
Name of investigators: T. Kumar, M. Ali and M.N. Uddin
Design: Randomized Complete Block Design (RCBD) with factorial arrangement
Replications: 3
Factors:

- **Maturity Levels**: (i) 30 days after flowering (DAF), (ii) 40 DAF, (iii) 50 DAF, (iv) 60 DAF
- **Post-Harvest Ripening Duration**: (i) No ripening, (ii) 3 days, (iii) 7 days, (iv) 10 days

Materials and Methods

Materials

- Kenaf variety HC-95
- Drying chambers
- Seed storage containers
- Germination testing kits (ISTA standard)
- Lab facilities for seed moisture, vigor, and viability testing

Procedures

1. **Harvesting:** Plants will be Harvested at four different maturity stages (30, 40, 50, and 60 Days after average flowering).
2. **Post-Harvest Ripening:** Collected plants will undergo different ripening durations.
3. **Seed Processing:** Seeds will be extracted, dried to standard moisture levels, and stored under ambient conditions.
4. **Storage Duration:** Seeds will be stored for up to 6 months with periodic testing every 2 months.

5. **Data Collection:**
    - Germination percentage
    - Seed moisture content
    - Seedling vigor index
    - Accelerated aging test
    - Electrical conductivity test
6. **Data Analysis:** ANOVA will be performed to determine statistical significance using statistical software "R".

Budget need: 1,00000 tk

References:

1. Jubayer Ahmed, Firoz Mahmud, Sharmin Sultana , "Genetic Diversity Studies in Kenaf (*Hibiscus cannabinus* L.) through Multivariate Analysis," Advances in Zoology and Botany, Vol. 12, No. 4, pp. 191 - 198, 2024. DOI: 10.13189/azb.2024.120401.
2. Mahbubul Islam. (2019) Kenaf (Hibiscus cannabinus L., Malvaceae) Research and Development Advances in Bangladesh: A Review. J.Nutrition and Food Processing, 2(1); DOI: 10.31579/2637-8914/010
3. Khan, M. A., Tareq, M. Z. & Debnath, M. R. (2014). Effects of sowing time and variety on kenaf(Hibiscus cannabinus L.) seed production. Bangladesh J. Seed Sci. & Tech. 18 (1&2), 15-18.
4. Mollah, A. F., Khan, M. A., Tareq, M. Z., Hoque, A. B. M. Z. and Debnath, M. R. (2016).Effect of drying period of harvested plant and method of threshing on yield and quality of kenaf seed. Journal of Bioscience and Agriculture Research, 11(02), 963-967.

A. IV. MOLECULAR BIOLOGY DEPARTMENT

PROGRAMME AREA: IMPROVEMENT OF JUTE AND ALLIED FIBRE CROPS THROUGH BIOTECHNOLOGICAL APPROACHES

1. TITLE OF THE PROJECT: DEVELOPMENT OF JUTE AND ALLIED FIBRE CROPS AGAINST ABIOTIC STRESS

1.1 Title of the experiment: *In Silico* protein-protein interaction and regulatory network analysis of identified drought tolerant genes from both jute species (MolBio-01/2025)

Background and objectives: Drought is a major abiotic stress that significantly impacts jute production, causing significant yield loss. It is crucial to understand drought stress tolerance mechanisms in crops to address the problems caused by this stress. Plant response to drought stress involves physiological, biochemical, and molecular changes, with genes encoding effector proteins and regulatory proteins regulating the expression of downstream target genes. Plant metabolism pathways participate in response to abiotic stress, and a delicate balance between these pathways is necessary for growth and development. However, abiotic stress can break this balance, leading to the generation of reactive oxygen species (ROS) that can damage tissues and cells (Yang *et al*., 2017; Zhang *et al*., 2021). Advancements in biotechnology have made the most direct and effective way to explore stress resistance mechanisms in plants. Jute, the second most important global biodegradable natural fiber crop, is a prime example of drought tolerance. However, no molecular studies have studied the genetics of jute under drought conditions, and a comprehensive study on drought tolerance is yet to be conducted. It is imperative to delve deeper into these molecular and functional mechanisms of tolerance in jute. So, the following objectives will be achieved from this experiment:

- To analyze and visualize protein-protein interactions *in silico*
- To develop and analyze regulatory networks for drought-tolerant genes in both *Corchorus* species.
-

Expected output: Protein-protein interaction and different regulatory networks of drought-tolerant genes in will be known in both *Corchorus* species

Duration of the study: May 2025 – February 2026.

Names of the Investigators: Md. Abdullah-Al-Mamun, Tania Afroz, Md. Al Mamun and Md. Nasir Uddin

Location: Molecular Biology Laboratory, BJRI

Experimental Details:

a. Materials: High-configured computers and bioinformatic software/ tools

b. Methodology:

i. Preparation of the identified drought-tolerant genes database
ii. Selection of target protein through literature mining and preparation
iii. Prediction of protein-protein interaction using STRING, HADDOCK, PIE etc.
iv. Analysis and visualization of interaction patterns using DiscoveryStudio, PyMol etc.
v. Determination of the promoter region-binding motif using PLANTCARE database.
vi. Analysis of regulatory components and development of the regulatory network using different online tools such as Bio Tapestry, CellOracle etc.

Records to be preserved:

1. Records of regulatory network will be preserved.
2. All data related to the analysis will be recorded.

Estimated Cost: 50000 BDT

References:

Yang, Z., Dai, Z., Lu, R. et al. Transcriptome Analysis of Two Species of Jute in Response to Polyethylene Glycol (PEG)- induced Drought Stress. *Sci Rep* 7, 16565 (2017). https://doi.org/10.1038/s41598-017-16812-5

Zhang, Gaoyang et al. "Comparative transcriptome sequencing analysis and functional identification of a NAM-2-like gene in jute (*Corchorus capsularis* L.)." *Plant physiology and biochemistry*: PPB vol. 161 (2021): 25-35. doi: 10.1016/j.plaphy.2021.01.043

1.2 Title of the experiment: Genome-wide Identification, Classification and Expression Analysis of the HSFs (Heat Shock Transcription Factor) Family Gene in both *Corchorus* species (MolBio-02/2025)

.

Background and Objectives:

Plant growth and development depend significantly on a timely and efficient response to biotic and abiotic stresses. Transcription factors are essential in regulating the expression of stress-responsive genes, which play vital roles in plant responses to stresses (Song *et al*., 2016). Heat shock proteins (HSPs) are molecular chaperones that execute crucial functions in response to heat stress. These proteins respond by folding, accumulating, and degrading other protective proteins when cells are exposed to heat stress (Feder *et al*., 2019). The expression of these HSP-coding genes is regulated by a group of DNA-binding transcription factors known as heat shock transcription factors (HSFs). Furthermore, HSFs can regulate reactive oxygen species (ROS)-scavenging enzymes, such as ascorbate peroxidase (APX) and catalase (CAT) (Ohama *et al*., 2017). Therefore, HSFs play crucial roles in elucidating the molecular mechanisms underlying plant responses and adaptations to stresses. Besides, HSFs also participate in plant growth and development. Further studies on HSFs are necessary to develop strategies for crop improvement, addressing the challenges posed by global environmental changes (Wei *et al*., 2016). A typical HSF protein possesses a DNA-binding domain (DBD) near the N-terminus, an adjacent oligomerization domain (OD) consisting of heptad repeats of hydrophobic amino acid residues (HR-A/B) and specific motifs such as nuclear localization signal (NLS), nuclear export signal (NES), activator motif (AHA motif) and repressor domain. DBD is the most conserved ingredient of HSFs, comprising three helical bundles (α1, α2, and α3) and four antiparallel β sheets (β1, β2, β3, β4) (Damberger *et al*., 1999). Additionally, the HR-A/B regions have the characteristic of a predicted coiled-coil structure, which is vital for forming active trimers (Hartl *et al*., 2002). Under various stress conditions, HSF proteins can assemble into active trimers to activate the expression of target genes, such as HSP30, 70 and 90, by binding to cis-elements of these gene promoters. To date, the function of many members of HSFs family has been analyzed in several plants, including maize, rice, chinese cabbage, wheat, carrot, soybean, arabidopsis, cotton, legumes, poplar and barrel clover. Experiments have confirmed that HSFs not only take part in resistance to heat but also are involved in response to abiotic or biotic stresses. However, a comprehensive study of HSFs genes at the whole genome level in jute has not been conducted so far. Jute is a significant cash crop, cultivated commercially in Bangladesh. The climatic regimes in Bangladesh are changing as well as the world. However, this species is threatened by climate change. It is a diploid annual crop ($2n = 14$) distributed in the tropics, subtropics, and warm temperate regions of the world (mainly in Asia and Africa) (Ghosh *et al*., 2015). Successful assembly of jute chromosome-level genome provides basis for the comprehensive identification and characterization of the jute HSFs family, which is crucial for exploring the molecular mechanism of jute resistance to stresses. Here, we performed a comprehensive analysis of HSFs in jute, including physicochemical properties, phylogenetic relationships, motif distribution, intron-exon pattern,

gene duplication events, and expression profiles.

Objectives

i. To identify HSFs genes in both *Corchorus* species.

ii. To classify and characterize HSFs transcription factors.

Duration of the study: July 2025 to June 2026.

Name of the Investigators: Tania Afroz, M Abdullah-Al-Mamun, M Al-Mamun and MN Uddin

Location: Molecular Biology Laboratory, BJRI

Experimental Details:

a. Materials: High-configured computers and bioinformatics software/tools

b. Methodology

i. Preparation of HSFs database through literature mining with the existing HSFs genes database.

ii. Homology searching and putative identification of the HSFs genes in tossa jute species using BLAST searching tools.

iii. Domain analysis of identified genes using SMART, ScanProsite, and InterproScan.

iv. Motif analysis of identified genes using Multiple Expectation Maximizations for Motif Elicitation (MEME Suite)

v. Determination of physicochemical properties and subcellular localization of identified genes using Expasy, WoLF PSORT, and the Plant-mPLoc server.

vi. Phylogeny analysis, classification and naming of identified genes using MEGA (Molecular Evolutionary Genetics Analysis) Software.

vii. Chromosomal localization, collinearity and syntenic analysis of identified HSFs genes using TBtools.

viii. Determination of the intron-exon structure of identified genes using Gene Structure Display Server (GSDS) software.

ix. Gene ontological analysis of the identified genes using BLAST2GO software.

x. Determination of the promoter region-binding motif using the PLANTCARE database.

xi. Transcriptome data analysis of identified genes among different tissues using publicly available raw RNA-Seq data.

xii. Validation of identified gene through qRT-PCR.

Records to be preserved:

1. Records of identified genes will be preserved.
2. All data related to the genomic analysis of identified genes will be recorded.

Estimated Cost: 100,000 BDT

References

Damberger FF, Pelton JG, Harrison CJ, Nelson HC, Wemmer DE. Solution structure of the DNA-binding domain of the heat shock transcription factor determined by multidimensional heteronuclear magnetic resonance spectroscopy. *Protein Sci.* 1994. 3(10):1806.

Feder ME, Hofmann GE. Heat-shock proteins, molecular chaperones, and the stress response: evolutionary and ecological physiology. *Annu. Rev. Physiol*. 1999. 61:243–282.

Ghosh S, Meena K, Sinha MK, Karmakar PG. Genetic diversity in *Corchorus olitorius* genotypes using jute SSRs. Proceedings of the National Academy of Sciences India. 2015. 1-10.

Hartl FU, Hayer-Hartl M. Molecular chaperones in the cytosol: from nascent chain to folded

protein. *Science*. 2002. 295 (5561):1852–8.
Ohama N, Sato H, Shinozaki K, Yamaguchi-Shinozaki K. Transcriptional regulatory network of plant heat stress response. *Trends Plant Sci*. 2017. 22 (1): 53-65.
Song L, Huang SC, Wise A, Castanon R, Nery JR, Chen H, Watanabe M, Thomas J, Bar-Joseph Z, Ecker JR. A transcription factor hierarchy defense an environmental stress response network. *Sci*. 2016. 354(3).6312.
Wei Y, Hu W, Xia F, Zeng H, Li X, Yan Y, He C, Shi H. Heat shock transcription factors in banana: genome-wide characterization and expression profile analysis during development and stress response. *Sci Rep*. 2016. 6:36864.

2. TITLE OF THE PROJECT: VARIETAL DEVELOPMENT OF JUTE, KENAF AND MESTA THROUGH MOLECULAR BIOLOGICAL TECHNIQUES

2.1 Title of the experiment: Molecular characterization of kenaf mutants through DNA fingerprinting (MolBio-03/2025)

Background and Objectives:

Kenaf is a member of the *Hibiscus* genus in the Malvaceae family and is native to east-central Africa, where it has been grown for several thousand years for food and fiber (LeMahieu *et al*., 2003). Kenaf is characterized as a fast-growing, high-yield plant with strong stress resistance and adaptability. Research on the genetic diversity and genetic basis of kenaf is limited. Additional research is necessary to analyze the genetic diversity and phylogenetic relationships of kenaf germplasm resources, which is an important component of germplasm resources research. The results can provide scientific references for the utilization of kenaf germplasm resources in genetic breeding and molecular marker-assisted selection. To date, random amplified polymorphic DNA (RAPD), amplified fragment length polymorphism (AFLP), and inter-simple sequence repeat (ISSR) markers have been utilized in kenaf research (Cheng *et al*., 2002). Currently, ISSR and SRAP markers are effective for DNA fingerprinting, genetic diversity analyses, and germplasm evaluation (Liu *et al*., 2008). SSRs have become a powerful and popular tool for determining unique genetic identity or fingerprints and establishing genetic relatedness as well as diversity among various crop cultivars. Jute genetic diversity has been reported using molecular markers by different scientists like Huq *et al*. (2009), Nag *et al*. (2018) etc. Therefore, the present piece of work is undertaken to develop genetic fingerprints and to estimate the genetic relatedness of kenaf mutants using ISSR markers.

Expected output: Primer polymorphism and genetic diversity of kenaf mutants would be known.

Date of initiation and duration: April 2025 to December 2025.

Name of the investigators: M Al-Mamun**,** Tania Afroz, M Abdullah-Al-Mamun and MN Uddin

Location: Molecular Biology Laboratory, BJRI

Experimental details:

Plant material: Seeds of 36 crossing materials of kenaf mutants and their parents.

DNA Extraction: DNA will be extracted from the seedlings (21 days old) following the modified mini-preparation CTAB method (Doyle and Doyle, 1987).

Designing of ISSR Primers: Twenty-five (25) microsatellite primers will be used for PCR amplification.

PCR amplification: PCR amplification will be carried out in a 10µl reaction mixture containing 20ng of jute genomic DNA, 5µM of each primer pair, 10X PCR buffer, 50mM $MgCl_2$, 2mM dNTPs, and 0.2-unit Tag DNA polymerase. The thermal cycler will be programmed as follows: Preheating for 5 min at 95^0C; 35 cycles, each for 45 sec at 95^0C (denaturation), 50 sec at the annealing temperature of a particular primer pair, and 45 sec at 72^0C for 5 min.

Separation and staining of PCR products: Before loading in gels, the PCR products will be denatured by adding an equal volume of tracking dye (95% formamide, 10mM EDTA, 0.23% bromophenol blue and 0.23% xylene cyanol) and heating at 94^0C for 5 min. and run in a 8% denaturing polyacrylamide gel, using a sequencing gel apparatus. The gels will be run in 10X TBE buffer adjusted to pH 8.3 at 150 volts for 2.5-3.0 hours. Staining will be done using ethidium bromide and gel pictures with bands will be taken by using a gel documentation system. Fragment size will be calculated by comparing with fragments of 1 Kb+ ladder marker DNA (Invitrogen Life Technologies).

Data to be recorded:

4. The amplified products will be scored. During scoring, only intense, resolved amplification products that were reproducible in multiple runs will be considered for analysis. The DNA fragments that will be amplified by a given primer pair will be scored as '1' for presence or 'O' for absence of a particular locus for all the genotypes.
5. Polymorphisms among the germplasm.
6. A dendrogram will be made based on scored data.

Estimated cost: 1,00,000/-

References

Cheng Z. et al. Identification and genetic relationships of kenaf germplasm revealed by AFLP analysis. *Genet. Resour. Crop Evol.* 2004.

Doyle JJ. and Doyle JL. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochem Bulletin*. 1987. 19:11-15.

Huq S, Islam, Sajib AA, Ashraf N, Haque S, Khan H. 2009. Genetic diversity and relationship: in jute (*Corchorus* sp.) revealed by SSR markers. *Bangladesh J Bot*. 2009. 38:153-161.

Liu L. W. et al. DNA fingerprinting and genetic diversity analysis of late-bolting radish cultivars with RAPD, ISSR and SRAP markers. *Sci. Hortic*. 2008.

Nag S, Mitra J, Satya P, Kar CS, Karmakar PG. 2018. Genetic diversity assessments in jute (*Corchorus* species) utilizing inter simple sequence repeat and simple sequence repeat markers. *Indian J Biotechnol.* 17:316-326.

B. BREEDING DIVISION
BI. CAPSULARIS DEPARTMENT

PROGRAMME AREA: VARIETAL DEVELOPMENT OF WHITE JUTE

1. TITLE OF THE PROJECT: DEVELOPMENT OF BREEDING MATERIALS WITH WIDER GENETIC BACKGROUND

Objectives: Development of genetic resources of white jute enriched with (a) Abiotic stress tolerance (salinity, drought, short day, low-temperature tolerance and less photosensitivity, particularly more flexibility of sowing and harvesting time); (b) biotic stress tolerance (disease and pests) and; (c) superior quality of fibre producing characteristics for diversified end uses.

1.1A: Title of the experiment: Hybridization among the selected lines of white jute (CBr-01/2025)

Background and objectives: Hybridization helps to create variability by accumulating desirable genes for qualitative and quantitative traits from diverse parents. So, it is possible to combine desirable characteristics through hybridization and to select superior progeny for the varietal improvement program (Buerkle *et al*., 2013; Zhou *et al*., 2012). The development of short-duration, quick-growing, stress-resistant and high-yielding jute variety has been given the highest research priority under global climate change. The genetic variability of white jute (*C. capsularis* L.) is very narrow compared to tossa jute (*C. olitorius* L.) (Basu *et al*., 2004). In the past, a small number of germplasm of diverse geographic origin were isolated, having desirable characteristics such as quick growing, high-yielding, tolerance to biotic and abiotic stress, less photosensitivity, etc. Moreover, leafy vegetables are scarce in the market during early summer in Bangladesh. Jute can be an additional source of vegetables in this season. To fulfill the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic materials, the breeding division has taken this study to create new variants of white jute through hybridization or conventional breeding method. Therefore, the hybridization program will be undertaken with the following objectives:

1) To create genetic variability for a short-duration, stress tolerant and high-yielding jute varieties.
2) Development of vegetable-type jute lines that contain high minerals and vitamins.

Expected output: Aaccumulation of desirable traits in a genotype with variability for beneficial qualities.
Date of initiation and duration: August 2025 to January 2026.
Name of investigators: S. Nasrin, M. K. Islam and M. G. Mostofa
Location: Central research field, BJRI, Dhaka.

Experimental details

Materials: A hybridization program will be undertaken at the experimental field, Dhaka, during August 2025 to January 2026 to develop lines having desirable traits. Twelve white jute genotypes will be used.

Table 1: Stress-tolerant, high yielding parental lines and varieties of white jute genotypes with their characters

Sl. no.	Genotypes	Characters
1	C-870	Short day low-temperature tolerant
2	Acc. 2134	Fungal (*Macrophomina phaseolina, Botryodiplodia theobromae, Sclerotium rolfsii*) and moderately root-knot nematode resistant
3	Acc.-2262	Petiole light radish, vigorous growth
4	Acc. 2265	Petiole brownish red, stem green, vigorous growth
5	Acc. 4594	Stem and petiole light reddish, wider leaf, Vigorous,
6	Acc. 4618	Full green, broad leaf, Vigorous growth
7	CVL-1	Tolerant to mosaic virus
8	BJRI Deshi pat 7	Snow white fibre
9	BJRI Deshi pat 9	High-yielding, lanceolate leaf, Nematode tolerant
10	BJRI Deshi pat 10	Salt tolerant
11	BJRI Deshi pat shak 1	No bitter taste, vigorous leaf growth.
12	Cheramera	Stem slightly red, leaf and petiole slightly red, Leaf serrate type, dwarf, bushy and sweet in taste.

Methods: Seeds will be sown two times at 15 days intervals in earthen pots during August 2025 to synchronize flowering. Cross will be made as much as possible. Emasculation and pollination will be done with appropriate techniques and time. Hybrid and selfed fruits will be collected separately.
Estimated cost: Tk. 40,000/-

1.1B: Title of the experiment: Inter-specific hybridization among different species of jute by using plant growth hormones (CBr-02/2025)

Background and objectives: Genetic variability of white jute (*C. capsularis* L.) is very narrow compared to tossa jute (*C. olitorius* L.). Nevertheless, white jute has comparatively wide adaptability to soil and climatic condition such as salinity, drought, low-temperature etc. but it is slightly susceptible to diseases and pests. It provides white commercial fiber, no need for bleaching but the fiber is slightly weak. While *C. fascicularis* is a low yielder but highly resistant to stem rots. The combination of these species is essential for getting high yield, good quality and disease-resistant variety. In the past, the necessity for the inter-specific hybridization of cultivated jute was realized by many researchers (Patel and Datta, 1960; Islam and Rashid, 1960 and so on). Though inter-specific hybridization in jute is very difficult due to hybrid sterility and other genetical, cytoplasmic and physiological factors, some breeders are claimed to get inter-specific hybrid by using different hormones (IAA, GA_3, NAA and Kinetin), which promote embryo development, seed and fruit setting. Therefore, the present study was undertaken to determine the effect of hormones in inter-specific hybridization and the performance of hybrids along with their parents of the two cultivated species of jute. To fulfill the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic materials, the breeding division has taken this study to create new variants of jute through hybridization or conventional breeding method.

Expected Output: Desirable hybrid will be obtained by transferring one or a few genes from one species to another.
Date of initiation & duration: August to December 2025.
Name of investigators: **S. Nasrin, M. K. Islam and M. G. Mostofa**

Materials: i) White jute (BJRI Deshi pat 7, BJRI Deshi pat 10 and CVL-1), tossa (O-9897) and wild (*C. fascicularis* & C. *insicifolius*) genotypes

ii) Hormones namely IAA and a mixed hormone (GA_3 + NAA+ Kinetin)

Methods: Seeds will be sown two times at 15 days intervals in the earthen pot during August 2025 to synchronize flowering. Emasculation and pollination will be done with appropriate techniques and time. Hormones will be applied at the pedicel of each pollinated flower bud using a piece of cotton wool, wrapped around the pedicel. It will be applied twice a day and continued for three days after pollination. At the maturity stage crossed and selfed fruits will be collected separately for further research.

Records to be kept:

1. Total number of flowers pollinated.
2. Total number of successful crosses
3. Number of fruits harvested
4. Total number of seeds/ fruit and mature seeds/fruit.

Estimated cost: Tk. 50,000/-.

1.2A: Title of the experiment: Confirmation of F_1s in white jute (CBr-03/2025)

Background and Objective: Confirmation of F_1 is a very important task for a variety of development procedures. It is necessary to confirm whether the hybrid is true or parental type (Roy et al., 2006; Islam et al., 2002). Crossing between two genetically different plants produces a hybrid (Al-Mamun et al., 2022a). In 2023, 55 crosses were made among the genotypes to get a desirable hybrid. Among them, 21 crosses were produced successful pods, and seeds were collected. This year all F1 plants will be grown for confirmation of true hybrids. To fulfill the targets (2.3 and 2.5) of Sustainable Development Goals (SDG) for increasing the genetic materials and doubling agricultural productivity, respectively, the breeding division has taken this study to confirm the hybrids (F_1) of white jute for new high-yielding variety development.

Expected output: Identification of true F_1 plants

Date of initiation and duration: Mid-March to October 2025.

Name of investigators: M. K. Islam, S. Nasrin and M. G. Mostofa

Location: Central research field, BJRI, Dhaka.

Experimental details:

Materials: Seeds of F1s made in 2024 along with their parents.

Methods: Seeds obtained from hybridization in 2024 will be grown in a one-meter row at the experimental field of Dhaka. The respective parents will also be grown alongside these hybrids to compare their traits. The plants of F1s, having the phenotypic traits of both male and female parents into them, would be confirmed as true hybrids, and the plant(s) showing the traits of either male or female parents would be discarded. The ripened fruits of true hybrids will be carefully collected and preserved with proper tag labels.

Records to be kept:

1. Date of sowing and germination.
2. Date of first and average flowering.
3. Plant height, base diameter and other morphological traits of F1s with their parents.

Estimated cost: Tk. 30,000/-

1.2B Title of the experiment: Evaluation of segregating materials and selection of superior plants/lines of white jute (CBr-04/2025)

Background and objectives: After the confirmation of true hybrids, evaluating hybrid plants and selecting superior plants based on their desirable traits, is very important in crop improvement (Abbott et al., 2013). It is simple and easy, but the difficulty in crop improvement lies in the handling of segregating generation. The breeder should have well-defined, clear-cut objectives based on the present and expected future needs for developing a new variety (Caligari and Foster, 2015). Hybrid lines are heterozygous, and they need to be selfed by growing generation up to F6 to select a desirable homozygous one as a stable line (Mandal et al., 2013; Rudolf-Pilih, 2019). For this, the selection and evaluation of expected lines are the essential tasks of a breeding program. In the year 2024, F1 seeds were grown at Dhaka stations. Selection will be done based on plant height, leaf shape, stem and stipule color, flowering behavior etc. This year, the experiment will be undertaken for the selection of genotypes among the segregates obtained from last year. For the fulfillment of Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, respectively, the breeding division has taken this study to select the superior genotypes from the segregated population of white jute for developing a high-yielding new variety.
Expected output: To evaluate segregating lines of white jute
Date of initiation and duration: Mid-March to October 2025.
Name of investigators: M. K. Islam, S. Nasrin and M. G. Mostofa
Locations: Central research field, BJRI, Dhaka.
Experimental details
Materials: Seeds of 134 plants (60 F2, 42 F3, 28 F4 lines and 4 F5)
Methods: Each segregating line will be sown in the experimental field of Dhaka, having a single row of 3m in length. Desirable jute plants will be selected based on morphological traits. To multiply the seed materials, the top cutting of the plants chosen will be done in earthen pots, and self-seeds will be collected to get purebred lines (Ngomuo et al., 2017). Seeds will be collected separately at the right time.
Records to be kept:
1. Date of sowing and germination.
2. Date of first flowering and harvesting.
3. Observation of diseases and pest infestation.
4. Morphological characters and other characters of importance as directed by the research personnel.
5. Collected seeds of each plant.
Estimated cost: Tk. 25,000/-

1.2C Title of the experiment: Selection of white jute mutants at M_4 generation (CBr-05/2025)

Background and Objective: Genetic variability is the most significant requirement for the effective development of crops with variant selections. In this respect, genetic variability can occur through the hybridization process, recombination, mutation, and selection. Generated mutation is a reliable option for the diversity of jute and allied fiber which revives and redevelops the variability. Irradiation has been utilized effectively to cause suitable mutations for plant breeding improvement. Gamma rays have proved to be more economical and effective compared to other ionizing radiations because of their easy availability and power of penetration (Al-Mamun *et al*., 2022b). More frequently than chemical mutagens (ethyl methane

sulfonate [EMS]), physical mutagens (X-rays, UV radiation, neutrons-alpha-beta particles, fast and thermal neutrons, especially gamma rays) are employed to artificially cause mutations in plants (Ramazan and Mustafa). Several positive mutations have been created in agricultural crops by using gamma irradiations. Gamma ray treatment on seeds of the *C. capsularis* variety D-154 produced a wide range of variability (Saha *et al*., 1991). Crops with improved characteristics have successfully been developed by mutagenic inductions. Therefore, the program has been undertaken to create variation and select genotypes of mutant generations with stress tolerance, quick maturity, short duration, good fiber quality and high yield for future development of new varieties that will fulfill the Sustainable Development Goals (2.3 and 2.5) and 4IR (Hotspot specific strategies 1, 2, 3).

Expected output: High-yielding and desirable mutants (M_5) will be identified for new variety development
Date of initiation and duration: March to December, 2025.
Name of investigators: M. K. Islam, S. Nasrin and M. G. Mostofa
Locations: Central research field, BJRI, Dhaka.
Experimental details
Materials: Selected 4 M_4 and others M4 mutants obtained from different doses γ-rays on CVL-1, along with CVL-1 as control.

Methods: Each mutant line will be sown in field along with control having 3 rows of 1 meter length. Desirable plants will be selected based on morphological traits. Top cutting of the selected plants will be done and self-seeds (M_4) will be collected. Selected lines will be harvested and yield contributing morphological data like plant height, base diameter, and bark thickness along with fiber yield (after top cutting) will be recorded carefully.

Records to be kept
1. Date of sowing and germination
2. Date of first flowering and harvesting
3. Observation of diseases and pest infestation
4. Morphological characters and other characters of importance as directed by the research personnel
5. Collected seeds of each plant

Estimated cost: 25,000/-

1.3 Title of the experiment: Rapid generation advance (RGA) in deshi jute (CBr-05/2025)

Background and Objective: Developing a new variety of jute poses significant challenges. To overcome these challenges, we require an efficient breeding system that can create new varieties more quickly. The traditional method of developing varieties through the pedigree approach is time-consuming, taking approximately 12 to 13 years from the initial work in the breeder's lab to making them available to farmers. Rapid Generation Advance (RGA) is a method to make selection system faster from the advanced generations of segregating populations under controlled environment. A technique of single seed descent method would allow 3 generations instead of single generation per year of the existing system; which is the main driving force to reduce the breeding cycle in variety development system of rice, wheat, pulses etc. (Collard *et al.,* 2017; Watson *et al.,* 2018). In alignment with the Sustainable Development Goal (Target 2.1), BJRI (Bangladesh Jute Research Institute) has made the decision to revamp its breeding program by adopting new breeding technologies and

improved research management methods. This strategic shift aims to enhance the efficiency of selecting jute plants with desirable agricultural characteristics, resistance to pests and adverse environmental conditions, and meeting consumer preferences.

Expected output: To speed up the breeding cycle for faster variety development and to reducing breeding costs (resources, labor, and space) and making the variety development process faster as well as homozygous lines of white jute will be obtained.

Date of initiation and duration: April 2025 to March 2026.
N**ame of the investigators**: S. Nasrin, M. K. Islam and M. G. Mostofa
Locations: Central research field, BJRI, Dhaka.
Experimental details
Materials: Seeds of F_2 generations of deshi jute.
Methods: Each generation will be sown in field and earthen pot (Nursery block and green house). Seeds will be collected from desirable individual plant(s) and dried: and sown again in same year 2 times as follows:
1st set (F_2): September 2024 - March 2025 (Nursery block)
2nd set (F_3): March 2025 - September 2025 (Field)

Records to be kept
1. Date of sowing and germination
2. Date of first flowering and harvesting
3. Morphological and other characters of importance as directed by the research personnel
5. Collected seeds information of each generation for further studies.
Estimated cost: 30,000/-

1.4 Title of the experiment: Screening of selected white jute germplasm for salinity tolerance (CBr-06/2025)

Background and objectives: To identify genetic variability, screening and evaluating white jute germplasm for higher yield and other desirable traits is the routing work of capsularis department. The yield performance of the existing white jute variety is good but not up to the mark. Moreover, our cultivable land is decreasing day by day due to the increasing population. Soil salinity is a serious threat to crop production, biodiversity, food and nutritional security. Identification of jute varieties tolerant to the salinity can extend the jute cultivation to the salt-affected soils in coastal areas in which cultivation is generally not practiced. So, we have to increase the productivity of white jute in problematic soil. In 2024, a total of 104 selected genotypes were screened out. On the basis of previous study, this year 35 superior genotypes will be further screened for stress tolerance (salinity, drought) to fulfill the Sustainable Development Goals (2.3 and 2.5) and 4IR (Hotspot specific strategies 1 & 2).

Expected output: Drought and salt-tolerant as well as high yielding white jute germplasms will be identified.
Date of initiation and duration: March to October 2025.
Name of investigators: **S. Nasrin, M. K. Islam and M. G. Mostofa**
Location: Patuakhali and Khulna
Experimental details
Materials: 15 selected genotypes including three control varieties (CVL-1, BJRI Deshi pat 10 and CC-45).
Methods: The experiment will be conducted at the experimental field of Patuakhali and

Khulna. Each material will be sown in 3 lines of 3 m length in the last week of March 2025. Plants will be harvested at the maturity stage (120 DAS) and relevant data will be collected. Soil salinity will be measured at cropping season. Seeds will be collected from mother plants and/or top cuttings.

Design and layout: Augmented design.
Records to be kept:
1. Date of seed sowing, germination, average flowering and harvest
2. Soil salinity and premature flowering data will be recorded.
3. Morphological data would be recorded.
4. Plant height, base diameter, green weight, fiber weight and stick weight of 10 plants data will be recorded (120 DAS).
5. Data on diseases and insect pests would be recorded carefully.
Estimated cost: Tk. 35,000/-

1.5 Title of the experiment: SSR-Marker assisted genetic diversity analysis in white jute (CBr-08/2025)

Objective(s): To evaluate genetic diversity in white jute
Duration: Mid-March to October 2025.
Investigators: S. Nasrin, M. Al-Mamun, M. K. Islam and M. G. Mostofa
Location: Central research field, BJRI, Dhaka.
Materials: CVL-1, CVE-3, CC-45, BJRI deshi pat5, 7, 8, 9, C-2262 and C-870.

Methods

DNA EXTRACTION

- Leaf tissues were harvested from single plantlets.
- Then, dried in liquid nitrogen.
- High-quality genomic DNA was extracted from dried leaf tissue based on a modified CTAB approach.
- Finally, a concentration of 70 ng/µl was used for analysis of markers.

AGAROSE GEL ELECTROPHORESIS

- Electrophoresis was done using a 3% MetaPhor™ agarose gel.
- The 5 µl PCR product was mixed with loading dye and load on the gel.
- The gel was run at 60 V for 80 minutes adjusted with 400A.

And visualized under UV light and analyzed using Bio Imaging System

2. TITLE OF THE PROJECT: EVALUATION OF WHITE JUTE PROMISING LINES AT PROGENY LEVEL

2.1 Title of the experiment: Preliminary yield trial of high yielding white jute strains (CBr-07/2025)

Background and objectives: Six promising germplasm were selected previously. To evaluate yield and yield contributing characters of the strains. The promising germplasm derived through screening of white jute germplasm of BJRI gene bank. However, this year these lines with two control variety will be further tested for assessment of their yield and other attributes under different agro-ecological conditions.

Expected output: White jute lines with distinct character, higher yield and quality fibre will be identified.
Date of initiation and duration: Late March to December, 2025.
Name of investigators: M. K. Islam, S. Nasrin, M. G. Mostofa and stations in charge
Location: Manikganj and Jashore.
Experimental details
Materials: Six white jute lines namely C-10, C-682, C-4453, C-4523, C-4528 and C-4617 with two control varieties BJRI Deshi pat 9 and BJRI Deshi pat 10.
Sowing time: Last week of March, 2025.
Methods: Design and layout**:** RCBD with 3 replications.
Unit plot size: 2m × 1 m = 2 m^2.

Records to be kept:

1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plants (if any) would be recorded and removed.
3. Plant population at final thinning and harvesting time.
4. 120 DAS plant height, base diameter, green weight with and without leaves, dry fibre and dry stick weight of 10 randomly selected plants from each plot.
5. Green weight (with and without leaves), dry fibre weight and stick weight per plot.

Estimated cost: Tk. 25,000/- per station.

3. TITLE OF THE PROJECT: FIELD EVALUATION OF ADVANCED STRAINS OF WHITE JUTE IN DIFFERENT AGRO-ECOLOGICAL ZONES

Objectives: To evaluate the yield and adaptability of different advanced lines at farmers' fields as well as on stations in different regions.

3.1 Title of the experiment: Zonal yield trial and nutrient analysis of white jute genotypes for vegetable purpose (CBr-8/2025)

Background and objectives: Jute (*Corchorus* sp.) is consumed as a leafy vegetable in many parts of the world (Daniel *et al.,* 2014). Leaves of two cultivated jute species, *C. olitorius* L. and *C. capsularis* L. are used as vegetables (Furumuto *et al*., 2002) mainly as a by-product of thinning jute fields at the seedling stage (Choudhary *et al*., 2013). The plant parts are palatable and have high nutritional value, containing lipids, protein, crude fiber, carbohydrates, vitamins (A, C, E) and the minerals calcium, sodium, potassium, phosphorus and iron (Choudhary *et al.,* 2013; Dansi *et al*., 2008; Grubben and Denton, 2004; Odhav *et al.*, 2007; Steyn *et al*., 2001). In early summer (mid-March to mid-May) in Bangladesh, leafy vegetables are normally scarce in the market. Jute can be an additional source of vegetables in this season. To determine the nutritional components of jute leaf, Merha pink will be grown with BJRI Deshi pat shak 3 in field condition to achieve the SDG (2.1 and 2.2) for safe, nutritious and sufficient food all year round and also remove malnutrition from girls, women and older persons.
Therefore, this study will be conducted

(a) To determine the chemical composition of vegetable-type white jute genotypes;
(b) To determine leaf yield and various-associated traits
(c) To develop variety as vegetable-type jute.

Expected output: Higher vitamin and mineral content germplasm will be identified.
Date of initiation and duration: Mid-March to December, 2025.
Name of investigators: S. Nasrin, M. K. Islam, M. G. Mostofa and stations in charge.
Location: Manikganj, Faridpur, Rangpur, Monirampur, Dinajpur and Patuakhali.

Experimental details:

Materials:

1. Cheramera
2. Merha pink
3. Red pat shak
4. Red pat shak (P)
5. BJRI Deshi Pat shak 3 (Control)

Design and layout: RCBD with three replications.
Unit plot size: 4m × 2 m = 8 m^2, line to line distance: 30cm.

Methods:
The germplasm of Cheramera, Merha pink and Red pat shak were collected in Bangladesh's Rangpur district. Red pat shak (P) were collected in Patuakhali district. Leaf samples will be collected from 30-day-old plants. Calcium (Ca), potassium (K), sodium (Na), phosphorus (P) and iron (Fe) will be estimated according to Moisture, protein, ash, vitamin C and β-carotene will be estimated.

Records to be kept:

1. Date of seed sowing, germination and harvest
2. Leaf pigmentation
3. Leaf shape
4. Harvesting will be done at 30 days after sowing
5. Plant height, number of leaves/plants, total green weight and weight of edible part (leaves & twig).
6. Data on diseases and insect pests' infestation
7. Nutritional status & taste of leaf

Estimated cost: Tk. 30,000/-

3.2 Title of the experiment: On farm yield trial of white jute advanced lines for short day and low temperature tolerance (CBr-9/2025)

Background and objectives: To identify short day and low-temperature lines coupled with disease resistance, 50 indigenous and exotic germplasm were taken from Gene Bank, of BJRI. Yield trial and selection programs were done from 2015 to 2024. Two accessions attained desirable higher yield without premature flowering in preliminary and advanced yield trials. Therefore, the yield trial will be conducted at different agro-ecological zone in 2025 to evaluate their performance in achieving the Sustainable Development Goals (2.3 and 2.5) to increase the genetic materials and double the agricultural productivity.

Expected output: Short day and low-temperature tolerant lines with the higher yield will be identified.
Name of investigators: S. Nasrin, M. K. Islam, M. G. Mostofa and station in charge.
Location: Manikganj, Faridpur, Monirampur, Dinajpur, Rangpur and Kishorganj
Materials: Advanced line C- 870 and CC-45 (control variety)
Methods:
Unit plot size: 2.5 decimals
Line to line distance: 30cm
Date of initiation and duration: February to July, 2025.

Date of Sowing: Last week of February

Procedure:

A plot of 5 decimals will be divided into two equal parts; each part of 2.5 decimals will be used for growing C-870 and CC-45 (control). Seeds will be sown on the last week of February. An equal quantity of seeds of tested line and control variety will be sown and an equal plant population will be maintained. Intercultural operations will be done in time simultaneously as per recommendations. The experiment will be harvested at 120 days after sowing.

Records to be kept:

1. Date of sowing, germination and harvesting time.
2. Premature flowering plants (if any) would be recorded weekly.
3. Plant population at final thinning and harvesting time (120 DAS).
4. Disease infestation (if any).
5. Weather data.
6. Any other important observation (if any).

Plant height, base diameter of 2 **Date of Sowing:** Last week of February

7. 0 randomly selected plants from each line will be recorded at 120 DAS.
8. Green weight (with and without leaves), dry fibre weight and stick weight per plot at 120 DAS.

Estimated cost: Tk. 25,000/- per station.

3.2B Title of the experiment: On-farm yield trial of high-yielding breeding lines of white jute (CBr-10/2025)

Background and objectives: Advanced breeding line (C-2262) was evaluated from 2015 to 2024, preliminary, advanced and Zonal yield achieved a desired higher yield. Therefore, the trial will be conducted at different agro-ecological zone in 2025 to evaluate its performance in achieving the Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity.

Expected output: High fibre-yielding white jute varieties will be developed.
Date of initiation and duration: Mid-March to August, 2025.
Name of investigators: M. K. Islam, S. Nasrin, M. G. Mostofa and stations in charge
Location: Manikganj, Faridpur, Monirampur, Dinajpur, Rangpur and Kishorganj

Experimental details
Materials: C-2262 and CVL-1 (control).

Methods:
Unit plot size: 2.5 decimals
Line to line distance: 30cm
Date of Sowing: Last week of March, 2025.

Procedure:

A plot of 5 decimals will be divided into two equal parts; each part of 2.5 decimals will be used for growing C-2262 and CVL-1 (control). Seeds will be sown on the last week of March. An equal quantity of seeds of tested line and control variety will be sown and an equal plant population will be maintained. Intercultural operations will be done in time simultaneously as per recommendations. The experiment will be harvested at 120 days after sowing.

Records to be kept:

1. Date of sowing, germination and harvesting time.

2. Plant population at final thinning and harvesting time (120 DAS).
3. Disease infestation (if any).
4. Weather data.
5. Any other important observation (if any).
6. Plant height, base diameter of 20 randomly selected plants from each entry will be recorded at 120 DAS.
7. Green weight (with and without leaves), dry fibre weight and stick weight per plot at 120 DAS.

Estimated cost: Tk. 25,000/- for each station.

4. TITLE OF THE PROJECT: SEED MAINTENANCE OF DESHI JUTE

Objectives: To maintain the nucleus seed stock of released and pre-released varieties/lines of deshi jute from which breeder seeds of respective varieties will be produced.

4.1 Title of the experiment: Maintenance of nucleus seed stock of white jute (CBr-11/2025)

Background and objectives: The well adapted old varieties and different strains may often be deteriorated for their genetical distinctness and uniformity at the time of seed production. cultivation. Varietal purity for genetic characteristics and potentialities will be maintained properly based on individual plant selection to achieve the SDG target 2.3 by 2030, double the agricultural productivity by production and distribution of good quality seed. It is also routine work of the breeding division.
Objective: To maintain nucleus seed stock of released varieties and advanced lines of white jute

Expected output: Genetic composition of the varieties will be maintained.
Date of initiation and duration: July-December, 2025.
Name of investigators: **M. K. Islam, S. Nasrin and M. G. Mostofa**
Location: Manikganj and Monirampur
Experimental details
Materials:
Advanced lines: C-870, C-2262, C-2281, C-5002, C-5036, C-5105, C-5149, C-10, C-682, C-4453, C-4523, C-4528 and C-4617, Mehra pink, Red pat shak and Cheramehra
Varieties: CVL-1, CC-45, BJRI Deshi pat 5, BJRI Deshi pat 8, BJRI Deshi pat 10, BJRI Deshi pat shak 1, BJRI Deshi pat shak 2 and BJRI Deshi pat shak 3.

Methods:
A. Plot size: 2 decimals for each variety or line
B. Procedure: Each variety will be grown in separate blocks keeping isolation distance properly.

Records to be kept:
1. Morphological and seed-related characteristics should be taken.
2. The off-type plant should be removed.
3. Observation of disease and pest infestation.
4. Seeds of each variety will be collected at the proper time.

Estimated cost: Tk. 40,000/- for each station.
References:
Abbott R., D. Albach, S. Ansell, *et al*. 2013. Hybridization and Speciation. Journal of

Evolutionary Biology, 26 (2), 229-46. doi: 10.1111/j.1420-9101.2012.02599.x

Al-Mamun, M., Rafii, M. Y., Berahim, Z., Ahmad, Z., Khan, M. M. H., and Oladosu, Y. (2022a). Estimating Genetic Analysis Using Half Diallel Cross Underlying Kenaf (*Hibiscus cannabinus* L.) Fibre Yield in Tropical Climates. *BioMed Research International*, 2022.

Al-Mamun, M., Rafii, M., Oladosu, Y., Ahmad, Z., and Khan, M. H. (2022b). Genetic Consequences of Induced Mutagenesis in development of new plant varieties: A Review. *Malaysian Journal of Genetics (MJG)*, 2(12):11-28.

Anonymous (2011). Laboratory Solution Preparation. Flinn Scientific, Inc. https:// www.snc.edu/ chemicalhygiene/docs/labsafety/SolutionPrep.pdf

Beyaz R, Yildiz M. The Use of Gamma Irradiation in Plant Mutation Breeding. Plant Engineering [Internet]. 2017 Nov 17; Available from: http://dx.doi.org/10.5772/intechopen.69974

Buerkle CA, Wolf DE, Rieseberg LH. (2013). The origin and extinction of species through hybridization. *In* Population Viability in Plants. Springer, Berlin, pp 117–141.

Caligari P.D.S., Brian P. Forster. 2015. Plant Breeding and Crop Improvement. Wiley Online Library. doi.org/10.1002/9780470015902.a0002025.pub3

Choudhary, S.B., H.K. Sharma, P.G. Karmakar, A.A. Kumar, A.R. Saha, P. Hazra, and B. S. Mahapatra (2013). Nutritional profile of cultivated and wild jute (*Corchorus*) species. Aust. J. Crop Sci 7(13):1973–1982.

Collard B. C. Y., Joseph C. Beredo, et al. (2017). Revisiting rice breeding methods evaluating the use of rapid generation advance (RGA) for routine rice breeding, Plant Production Science, 20:4, 337-352, DOI: 10.1080/ 1343943X.2017.1391705.

Daniel, K. (2014). Comparison of nutritive values of the leaves and stems of long-fruited jute (*Corchorus olitorius*) and local garden egg (*Solanum macrocarpon*). Sci. J. Agric. Res. Manag sjarm-129. 1–3. doi: 10.7237/sjarm/129.

Dansi, A., A. Adjatin, H. Adoukonou-Sagbadja, V. Faladé, H. Yedomonhan, D. Odou, and B. Dossou (2008). Traditional leafy vegetables and their use in the Benin Republic. Genet. Resour. Crop Evol. 55:1239–1256. doi: 10.1007/s10722-008-9324-z.

Furumuto, T., R. Wang, K. Okazaki, F.A. Hasan, and I.M. Ali (2002). Antitumor promoters in leaves of jute *Corchorus capsularis* and *Corchorus olitorius*). Food Sci. Technol. Res. 8 265 (3): 239–243. doi: 10.3136/fstr.8.239.

Gomez K. A. and A. A. Gomez (1976). Statistical Procedures for Agricultural Research. International Rice Research Institute. John Wiley & Sons, Inc.

Grubben, G.J.H., and O.A. Denton (2004). Plant resources of tropical Africa 2. Vegetables. PROTA Foundation, Wageningen, The Netherlands.

Islam, A., Rashid, A. First Successful Hybrid between the Two Jute-yielding Species, *Corchorus olitorius* L. (Tossa) × *C. capsularis* L. (White). *Nature* 185, 258–259 (1960). doi.org/10.1038/185258b.

Islam, Md & Begum, Selina & Alam, A & Ahmed, Izaz & Alamgir, Ali. (2009). Study the impact of climatic changes on jute production in Bangladesh. Bangladesh J. Prog. Sci. & Tech. 7.153-156.

Islam, R., Islam, M. M.,Akter, N., Ghosh, R. K. *et al*., 2002. Genetic variability and performance of tossa jute (*Corchorus olitorius*). Pakistan Journal of Biological Science, 5(7): 744-745.

Khatun, R., Hossain, M. A., and Pervin, N. 2014. Field evaluation of advanced strains of jute in different agro-ecological zones.Annual Research Report.2013-2014.pp.1-2.

Mandal, A., A.K. Datta, S. Datta, *et al*. 2013.Assessment of stability and viability of a jute hybrid (*Corchorus capsularis* L. × *C. trilocularis* L.) and its trueness based on RAPD markers. *Nucleus* 56, 163–170. doi.org/10.1007/s13237-013-0093-5

Nawaz T., Mansoor Hameed, Muhammad Ashraf, F Al-Qurainy, Muhammad Sajid, Aqeel Ahmad, Adnan Younis and Muslim Hayat (2011). Ecological significance of diversity in leaf tissue architecture of some species/ cultivars of the genus *Rosa* L. *Pakistan Journal of Botany*, 43(2): 873-883, 2011.

Ngomuo M., T. Stoilova, T. Feyissa and P.A. Ndakidemi, 2017.Characterization of Morphological Diversity of Jute Mallow (*Corchorus* spp.).Hindawi: International Journal of Agronomy, Volume 2017, Article ID 6460498, 12 pages. doi.org/10.1155/2017/6460498

Odhav, B., S. Beekrum, U.S. Akula, and H. Baijnath (2007). Preliminary assessment of nutritional value of traditional leafy vegetables in KwaZulu-Natal, South Africa. J. Food Compos. Anal. 20(5): 430–435. doi: 016/j.jfca.2006.04.015.

Parvin D., Parveen Rashid and J. L. Karmoker (2018). Anatomical Responses of Jute (*Corchorus capsularis* L. cv. D-154) to Water logging. Dhaka University Journal of Biological Science, 27(2): 213-219.

Patel, G.I., Datta, R.M. Interspecific hybridization between *Corchorus olitorius* Linn. and *C. capsularis* Linn. and the cytogenetical basis of incompatibility between them. *Euphytica* 9, 89–110 (1960). https://doi.org/10.1007/BF00023259.

Roy, A., Bandyopadhyay, A., Mahapatra, A. K., Ghosh, S. K., Koundal, K. P. *et al*., 2006. Evaluation of genetic diversity in jute (*Corchorus* species) using STMS, ISSR and RAPD markers. Plant Breeding 125: 292-297.

Rudolf-Pilih K, M. Petkovšek, J. Jakše, N. Štajner, J. Murovec and B. Bohanec. 2019. Proposal of a New Hybrid Breeding Method Based on Genotyping, Inter-Pollination, Phenotyping and Paternity Testing of Selected Elite F_1 Hybrids. Front. Plant Sci. 10:1111. doi: 10.3389/fpls.2019.01111.

Saha, C.S., & Shaikh, M.A.Q. (1991). Varietal improvement in jute through induction and use of mutants. International Atomic Energy Agency (IAEA): IAEA

Sengupta G. and P. Palit (2004). Characterization of a Lignified Secondary Phloem Fibre Deficient Mutant of Jute (*Corchorus capsularis* L.). Annals of Botany. 2004 Feb; 93(2): 211–220. Doi: 10.1093/aob/mch029.

Sfiligoj M. Smole, S. Hribernik, K. Stana Kleinschek and T. Kreže (2013). Plant Fibres for Textile and Technical Applications. Advances in Agrophysical Research, July 31st 2013. DOI: 10.5772/52372

Steyn, N.P., J. Olivier, P. Winter, S. Burger, and S. Nesamvuni (2001). A survey of wild, green, 310 leafy vegetables & their potential in combating micronutrient deficiencies in rural populations. S. Afr. J. Sci 97(7–8): 276–278.

Ververis C., K. Georghiou, N. Christodoulakis, P. Santas, R. Santas (2004). Fiber dimensions, lignin and cellulose content of various plant material and their suitability for paper production. Industrial Crops and Products 19 (2004): 245–254. Doi: 10.1016/j.indcrop.2003.10.006.

Watson A., S. Ghosh, M. J. Williams, *et al.* (2018). Speed breeding is a powerful tool to accelerate crop research and breeding. Nature Plants, 4(1). DOI: 10.1038/s41477-017-0083-8.

Zhou G, Chen Y, Yao W, Zhang C, Xie W, Hua J, Xing Y, Xiao J, Zhang Q. (2012) Genetic composition of yield heterosis in an elite rice hybrid. ProcNatlAcadSci USA 109: 15847–15852.

BII. OLITORIUS DEPARTMENT
PROGRAMME AREA: VARIETAL IMPROVEMENT OF TOSSA JUTE
1. TITLE OF THE PROJECT: DEVELOPMENT AND BROADENING OF GENETIC MATERIALS OF TOSSA JUTE

Objectives: Development and screening of genotypes having (a) less thermo and photo-sensitivity, (b) tolerance to abiotic stresses (e.g., salinity, waterlogged condition etc.), (c) tolerance to diseases and pests and (f) superior quality of fibre producing characteristics for diversified end uses.

1.1 Title of the experiment: Hybridization among the selected genotypes of tossa jute (OBr-01/2025)

Background and objectives: Creation of variability in plant species is the prerequisite for selection of line(s) or genotype(s) from the crossing materials by the breeders. Hybridization is a traditional way of variability creation in plant species which helps to create recombinant(s) by accumulating desirable genes for both qualitative and quantitative characters from diverse parents (Kar *et al*., 2009; Rauf *et al*., 2010). Through hybridization, it is possible to combine the desirable characters and isolate superior progeny from the segregates for varietal improvement (Abbott *et al*., 2013). In the year 2024**,** plants were grown in earthen pots in the crossing block of BJRI, Dhaka. Seeds of the crosses are under processing stage. This year, single crosses will be grown in the field of BJRI, Dhaka for confirmation and further crosses (double and multiple crosses) will be made among the F_1s, besides these, limited backcrosses will be done with the selected parents in order to get desirable plants. To fulfil the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic materials, breeding division has taken this study to create new variants of tossa jute through hybridization or conventional breeding method.

Expected output: Genetic variability will be created in tossa jute.
Date of initiation and duration: August 2025 to January 2026.
Name of the investigators: M. J. Alam, N. Tasnime, K. Fatema, S.S.U. Ahmed, M.M. Mukul, and M.G. Mostofa
Location: Central research field, BJRI, Dhaka.
Experimental details

Materials: Popular varieties, advanced lines, accessions and different generations.

Table 1: Parents and their characteristics for hybridization

01	O-9897	High yielding variety, lanceolate leaf
02	BJRI Tossa Pat-5	High yielding variety, lanceolate leaf
03	BJRI Tossa Pat-8	High yielding variety, Quick growing
04	JRO-524 G	High yielding variety, Narrow lanceolate leaf
05	O-043-7-9 G	Narrow lanceolate leaf with good yield
06	O-043-7-9 R	Narrow lanceolate leaf with good yield
07	O-0512-6-2 G	High yielding line, Narrow lanceolate leaf
08	O-0512-6-2 R	High yielding line, Narrow lanceolate leaf
09	O-0419-3-1 G	High yielding line, lanceolate leaf
10	O-0419-3-1 R	High yielding line, lanceolate leaf
11	O-049-1-3 R	High yielding line, lanceolate leaf
12	O-0411-10-4 R	High yielding line, lanceolate leaf
13	O-0412-9-4 R	High yielding line, lanceolate leaf
14	Acc. 1306	Waterlog tolerant, lanceolate leaf

15	Acc. 1318	Waterlog tolerant, lanceolate leaf
16	Acc. 4582R	Good yielding accession with narrow leaf
17	Acc. 4582G	Good yielding accession with narrow leaf
18	C_3H-T_5 G	Low lignin content
19	C_4H-T_7 G	Low lignin content
20	C_5H-T_4 G	Low lignin content
21	Acc. 6099	High yielding
22	Acc. 6100	High yielding

Methods: All possible crosses will be made in all desired combinations. Two to three sets of plants will be grown in earthen pots at 15 days interval for the synchronization of flowering in parents. Emphasis would be given for making crosses directly or indirectly with the good parents like BJRI Tossa pat 5, BJRI Tossa pat 8 and JRO-524. Emasculation and pollination will be done in proper ways and in time. F_1 pods of crosses, and selfed fruits of parents would be collected separately for further study (Sawarkar *et al.,* 2015; Zhang *et al.,* 2019).
Estimated cost: 50,000/-

1.2 Title of the experiment: Confirmation of F_1s in tossa jute (OBr-02/2025)
Background and objectives: It is essential to confirm the F_1s obtained from hybridization program of the last year (2024) for varietal development procedure. Breeders need to search variability for developing new varieties (Caligari and Foster, 2015). Since, hybridization is one of the major tools for creation of variability. After getting hybrid pods, it is necessary to confirm whether it is hybrid or parental type before selection of generation from F_2 population. For this, the experiment is undertaken to ensure the true hybrids among the F_1s. In 2025, single cross hybrids (F_1) of 2024 will be grown in one row by standing parents in both sides for evaluation of the true hybrids (Sahagún-Castellanos, 2011). To fulfil the targets (2.5 and 2.3) of Sustainable Development Goals (SDG) for increasing the genetic materials and doubling the agricultural productivity, respectively, breeding division has taken this study to confirm the hybrids (F_1) of tossa jute for new high-yielding variety development.

Expected output: F_1s obtained from hybridization program will be confirmed.
Date of initiation and duration: Mid-March to December, 2025
Name of the investigators: K. Fatema, N. Tasnime, M.M. Mukul, S.S.U. Ahmed, M. J. Alam and M.G. Mostofa
Location: Central research field, BJRI, Dhaka.
Experimental details
Materials: F_1 seeds made in 2024 and respective parents.

Methods: Seeds obtained from hybridization in 2024 will be grown in one-meter row at experimental field, Dhaka. The respective parents will also be grown alongside of these hybrids for the comparison of their traits. The F_1s having the mixed phenotypic traits of both male and female parents among them will be confirmed as true hybrids; and the plant(s) showing the traits of either male or female parents will be discarded. The ripen fruits of true hybrids will be collected and preserved with proper tag labels carefully. The seeds will be grown on the next season and the selection will be done in F_2 plants having desirable traits.

Records to be kept
1. Date of sowing, seed germination and flowering
2. Plant height, base diameter and other morphological traits of F_1s with their parents.

Estimated cost: 50,000/-

1.3 Title of the experiment: Evaluation of segregating materials and selection of superior lines of tossa jute (OBr-03/2025)

Background and objectives: After the confirmation of true hybrids, the evaluation of hybrid plants followed by selection of superior plants based on their desirable traits is very important in the method of crop improvement (Abbott *et al.,* 2013). It is fairly simple and easy but the difficulty in crop improvement lies in the handling of segregating generations. Breeder should have well-defined, clear-cut objectives based on the present and expected future needs for developing a new variety (Caligari and Foster, 2015). Hybrid lines are heterozygous and it needs to be selfed by growing generation up to F_6 for selecting a desirable homozygous one as a stable line (Mandal *et al*., 2013; Rudolf-Pilih, 2019). For this, selection and evaluation of expected lines are important task of a breeding program. In the year 2025, plants of F_2-F_6 generations will be grown in BJRI, Dhaka and desirable plants will be selected on the basis of plant height, leaf shape, stem, stipule colour and flowering behavior etc. For the fulfillment of Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, respectively, breeding division has taken this study to select the superior genotypes from the segregated population of tossa jute for developing high-yielding new variety.

Expected output: Desirable segregants from different generations will be selected.
Date of initiation and duration: March to December, 2025.
Name of the investigators: N. Tasnime, K. Fatema, M.M. Mukul, S.S.U. Ahmed, M. J. Alam and M.G. Mostofa
Locations: Central research field, BJRI, Dhaka.
Experimental details
Material: Plants of F_2-F_6 generations.

Methods: Each segregating line will be sown in single row of 3m length in research field. Desirable jute plants will be selected on the basis of morphological traits. To multiply the seed materials, top cutting of the selected plants will be done in earthen pots and self-seeds will be collected for pure bred lines (Ngomuo *et al.*, 2017).

Records to be kept

1. Date of sowing and germination
2. Date of first flowering and harvesting
3. Observation on diseases and pest infestation
4. Morphological characters and other characters of importance as directed by the research personnel
5. Collection of seeds from each plant

Estimated cost: 60,000/-

1.4 Title of the experiment: Anatomical study of tossa jute for quality fibres (OBr-04/2025)

Background and objectives: Jute fibre is anatomically the secondary phloem cells which are accumulated during growth of plant and arranged in regular fashion of fibre wedges. So, bark thickness, number and area of phloem wedge of the stem directly contribute to fibre yield (Sengupta and Palit, 2004). The quality of fibre is dependent on some chemical and physical parameters. Among them length breadth ratio of fibre cells is of immense importance. The higher length breadth ratio imparts better spinnability. Jute fibre is not a single fibre, it is composed of many ultimate fibres and so known as commercial multicellular fibre (Sfiligoj *et*

al., 2013). The quality of fibre depends upon the length and length-breadth ratio of these ultimate fibres. The more length-breadth ratio, the superior the quality of fibre. The higher length-breadth ratio imparts better spinnability and thus involves better quality of fibre (Ververis *et al.,* 2004). In 2025, promising lines of tossa jute will be grown to evaluate their anatomical features for identification of high yielding lines to fulfill the Sustainable Development Goals (2.3) for enhancing jute productivity.

Expected output: Tossa jute genotypes will be selected having desired yield attributing anatomical features.
Date of initiation and duration: Mid-March to December, 2025.
Name of the investigators: K. Fatema, N. Tasnime, M.M. Mukul, S.S.U. Ahmed, M. J. Alam & M.G. Mostofa
Location: Breeding laboratory, BJRI, Dhaka and JEAS, Manikganj
Experimental details
Materials:

1. Genotypes selected from the observational trial of tossa jute
2. BJRI Tossa pat 9, JRO-524 (Control)

Methods: Standard cultivation procedure and RCB design will be followed.

Plant anatomy at matured stage (110 days old plants)

1. 5-10 plants having similar height and base diameter will be considered as a sample. Plants will be selected from the middle of row. For studying anatomical characters, 3 inches long piece of stem will be cut from the middle parts of each of the selected plant at the age of 110 days. These materials will be preserved in Formalin- Aceto- Alcohol (FAA) solution (10 ml of Formalin, 5ml of 85% glacial acetic acid and 85 ml of 70% alcohol) (Anonymous, 2011).
2. The preserved sample will be taken out and washed. About 20-25µm thick transverse sections (TS) will be cut with the help of a microtome machine for preparing slide. The slides will be studied under compound microscope (4x10 magnifications) and data will be recorded for bark thickness, number and area of phloem wedges, number of fibre bundle layers and number of fibre bundles per section. Plant weight, base diameter and dry fibre weight of the materials will also be recorded.
3. Maceration of fibre cell: The fibre will be extracted following the method described by Mahesh (2015) with little modification.
   The anatomical data will be recorded from 5-10 randomly selected plants of each genotype from each replication at the time of harvest (110 days of crop age).

Records to be kept

1. Date of germination, flowering and harvest
2. Bark diameter, bark thickness, number of trapezoid/sections will be calculated for three plants of each accession under microscope.
3. Area of trapezoid/section (µm): Area of trapezoid will be measured by the following formula: (Area of trapezoid = ½ (Upper length + Lower length) × perpendicular length of trapezoid × conversion factor [Conversion factor = 43.9 in 3.5 × 10 magnification].

   [Note: For the lens 4/ 0.1, 65 unit of webcam scale or 23 unit of oculometer scale = 1 mm, and for the lens 10/0.25, 158 unit of webcam scale or 68 unit of oculometer scale = 1 mm.]
4. Number of bundle layers/trapezoid, number of bundles/trapezoids will be recorded under microscope from randomly selected trapezoid
5. Length, breadth and length-breadth ratio will be measured for 10 randomly selected trapezoid by using oculometer under microscope.

Estimated cost: 60,000/-

1.5 Title of the experiment: Induction of male sterility in tossa jute using maleic hydrazide (OBr-05/2025)

Background and objectives: Jute (*Corchorus* spp.), also known as 'golden fiber', is an important ligno-cellulosic natural fiber-yielding industrial crop of tropics and subtropics with diversified economic and industrial uses. It belongs to the family *Tiliaceae*. Tossa jute was cultivated to provide bark for fiber production (Jute) and mucilaginous leaves utilized in food. Bangladesh ranks first position in terms of jute production and export from 2017 to present. *C. olitorius* also has medicinal and health promoting properties (Islam, 2013). Tossa jute is very sensitive to biotic and abiotic stresses than white jute, Kenaf and Mesta (Mukul *et al.,* 2021). So, development of high yielding tossa jute variety through conventional breeding methods is very difficult and time consuming. Hybrid variety has been developed in about 30 crop species. The farmers want the higher yield from low cost of production. Male sterile line is the prerequisite for developing hybrid jute variety. There is no hybrid variety has been developed in the world till now. No CMS line of jute was found in the world. It is very difficult but essential to search or develop male sterile line in jute. Male sterility can be induced in jute using different methods like mutation, environmentally, thermal applications, etc. Use of CHAs or chemical hybridizing agents like Maleic hydrazide, Ethrel, Ethidium, etc. showed good efficacy to develop hybrid vegetables ((Sharma et al., 2017; Meena and Visarada, 2021)). This study was undertaken to identify the effective CHA and its optimum dose for male sterility (MS) in jute at during reproductive stage. The developed MS line of jute will be used to develop hybrid variety of tossa jute in Bangladesh which will fulfil the SDG 2.3.

Expected output: The effective chemical hybridizing agent and optimum dose will be identified to induce male sterility for hybrid variety development in tossa jute.
Date of initiation and duration: August to December 2025.
Name of the investigators: MM Mukul, K Fatema, N Tasnime, SSU Ahmed, MJ Alam, MG Mostofa
Location: Laboratory and Field, BJRI, Dhaka.
Materials and Methods
Plant materials: O-0412-9-4 (♂), Acc. 6099 (♀), BJRI Tossa pat 9 (♀)
Chemical: Maleic hydrazide

Methods:

- Seeds will be sown early for flowering
- Female & doner parent will be grown in the same plot
- MH (0.0, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0mM) will be sprayed on female plants before and/or after flower initiation keeping the male plants covered.
- Treated female flowers will be studied for male sterility
- Male plants will be uncovered & allowed for outcross, and hybrids (F_1) will be observed

Records to be kept

1.Time of sowing.
2. Nature of plants.
3. Flowering time.
4. Number of flowers sprayed.
5. Size, shape and type of pollen, stigma, style.
6. Number or percentage of sterile and non-sterile pollen in the treated flower.
7. Suitable pollen doner or male parent for restoring of fertility in the female parent.
8.Number of hybrid fruits

Estimated cost: 100,000/-

Meena, K. and K.B.R.S. Visarada, 2021. Induction of Male Sterility: A Boon for Plant Breeding. Int.J.Curr.Microbiol.App.Sci (2021) 10(02): 1084-1101. https://doi.org/10.20546/ijcmas.2021.1002.128

Sharma, H, Arroju, A.K., Choudhary, S.B., et al., 2017. Towards Development of Hybrid Tossa Jute (*Corchorus olitorius* L.) using Chemical Hybridizing Agent: Insight into Agro-Morphological and Reproductive Response. Vegetos- An International Journal of Plant Research. Volume : 30, Issue : 3.

1.6 Title of the experiment: Creation of variability in *C. incisifolius* using gamma radiation for vegetable purposes (OBr-06/2025)

Background and Objective: *Corchorus incisifolius*, a member of the Malvaceae family, is commonly known as cut-leaf jute or a type of jute plant. Traditionally, *C. incisifolius* has been cultivated for its fiber, which is highly valued in the textile industry. However, its leaves are also edible and contain high levels of essential nutrients, such as vitamins (e.g., Vitamin A, C) and minerals (e.g., iron, calcium), making it an ideal candidate for use as a leafy vegetable (Mujib *et al.*, 2012). Despite its potential as a vegetable crop, the lack of genetic diversity within *C. incisifolius* limits its exploitation for vegetable purposes, such as improving leaf size, nutritional content, and resistance to pests and diseases. Gamma radiation is a widely used mutagenic tool that induces genetic mutations in plants by altering DNA. By exposing seeds to controlled doses of gamma radiation, new genetic variations can be generated that may improve agronomic traits (Mohan *et al.,* 2009). This technique has been employed in other vegetable crops to induce beneficial mutations in growth, yield and quality characteristics (Zeb *et al*., 2016). The use of gamma radiation in *C. incisifolius* could lead to the development of superior mutants with enhanced vegetable attributes such as larger leaves, improved growth rate, better pest resistance and higher nutritional value. These improvements could ultimately enhance the plant's utility as a vegetable crop, benefiting both smallholder farmers and consumers by providing a sustainable, nutritious food source.

Objective:

The primary objectives of this study are as follows:

1. To induce genetic variability in *Corchorus incisifolius* through gamma radiation.
2. To identify and select mutant lines with improved traits seeds as vegetable production, resistance to pests and higher nutritional content.

Date of initiation and duration: March to December, 2025.

Name of the investigators: S.S.U. Ahmed, N. Tasnime, K. Fatema, M.M. Mukul, M. J. Alam and M.G. Mostofa

Location: Atomic energy commission, Savar and Central Research Field, BJRI, Dhaka.

Materials and Methods

Plant Material:

The seeds of *Corchorus incisifolius* will be used in the experiment.

Mutagenic Treatment (Gamma Radiation):

Gamma radiation will be chosen as the mutagen for this study. Seeds will be exposed to varius level of gamma radiation to evaluate the effects of different radiation levels on plant traits. The radiation level to be selected 100 Gy, 200 Gy, 400 Gy, 600Gy, 800 Gy, 1000 Gy and 1200 Gy. A control group of untreated seeds will be included as check for comparison. The gamma irradiation will be carried out at a certified radiation facility using a Cobalt-60 (Co-60) gamma source.

Morphological and Agronomic Evaluation:
The following morphological and agronomic traits to be measured and recorded:

- **Plant height**: At 25, 35 and 45 days after sowing.
- **Leaf size and number**: The size of fully expanded leaves will be measured using a leaf area meter, and the total number of leaves per plant will be counted at harvest.
- **Leaf color and texture**: Observations will be made on leaf appearance, including color intensity (chlorophyll content) and texture (smoothness or roughness).
- **Growth rate**: Growth parameters such as plant height, leaf number, and biomass will be recorded in a regular intervel.

Nutritional Content Analysis:
The nutritional quality of the leaves was assessed by analyzing their vitamin and mineral content:

- **Vitamin content**: Vitamin C and Vitamin A levels will be determined using High-Performance Liquid Chromatography (HPLC), based on methods outlined by Cakmak et al. (2010).
- **Mineral content**: The concentrations of essential minerals such as calcium, iron, and potassium will be measured using Atomic Absorption Spectroscopy (AAS) as described by Sharma *et al*. (2013).
- **Fiber content**: The crude fiber content will be determined using the gravimetric method (Van Soest, 1967).

Statistical Analysis:
Data collected from the various evaluations will be analyzed using analysis of variance (ANOVA) to determine the effects of gamma radiation on different traits. Mean comparisons will be performed using Tukey's HSD (Honestly Significant Difference) test at a 5% significance level. The experimental design will be a completely randomized design (CRD) with five replication per treatment group.

Selection of Mutants:
Mutants showing desirable traits, such as larger leaf size, higher yield, improved disease resistance, and better nutritional quality, will be selected for further propagation. These mutants will be grown in subsequent generations to confirm the stability of the favorable traits. Selected mutant lines will undergo additional breeding and field trials to assess their performance under real agricultural conditions.
Estimated cost: 80,000/-

1.7 Title of the experiment: Regulation of vascular cell division in tossa jute (OBr-07/2025)

Background and objectives: Jute (*Corchorus olitorius*), known as the "golden fiber," is a key cash crop in Bangladesh, contributing significantly to the country's economy and supporting millions of farmers. It belongs to the Tiliaceae family and is of high industrial importance. Bangladesh is the second-largest producer of jute globally. According to the Bangladesh Bureau of Statistics (BBS), the total jute production in FY 2023 was estimated at 1.9 million tons (Mt), marking a 0.3% increase from FY 2022 (Whitlock et al., 2003; Hoque et al., 2010). The vascular system is crucial for mechanical support and resource transport in plants, with the xylem responsible for water and nutrient transport and the phloem for photosynthetic products and signaling. This study focuses on the regulation of cell divisions that form vascular tissues in jute (O-9897). The goal is to examine the effects of plant growth regulators (PGRs), specifically on fiber and stick growth, to enhance jute productivity in alignment with SDG 2.3.

Expected output: To determine the impact of a specific dose of selected hormones on bast fiber production.
Date of initiation and duration: March to December, 2025.
Name of the investigators: S.S.U. Ahmed, N. Tasnime, K. Fatema, M.M. Mukul, M. J. Alam and M.G. Mostofa
Location: Central Research Field, BJRI, Dhaka.

Materials and Methods: A randomized complete block design (RCBD) with three replications will be used. The unit plot size is 1.8 m × 2.8 m. Jute seeds (O-9897) will be sown in mid-March 2025 with a 30 cm distance between lines. Treatments include a control (no spray) and 100 ppm GA3 applied as foliar spray at 45, 60, 75, and 90 DAS.
Estimated cost: 50,000/-

1.8 Title of the experiment: Improvement of tossa jute through somaclonal variation (OBr-08/2025)
Background and objectives: High quality and higher yield of jute may be achieved by conventional as well as biotechnological approaches. Induction of somaclonal variation through callus culture may also provide some quality plants. Use of mutation on tossa jute callus may bring heterogeneity, which may be a way of producing high quality and high yield of jute. Application of this techniques and inducing variation in plant materials has added a new dimension. However, potential exploitation of these methods for improvement of jute (*Corchorus olitorius* L. and *Corchorus capsularis* L.) which is a very important fiber yielding commercial crop remains almost untapped so far. The standardization of the method of *in vitro* regeneration of jute plants may ultimately lead to successful inter specific hybridization which has been a long-cherished goal of the jute breeders (Ghosh and Chatterjee, 2009). To create variation through tissue culture as well as callus mutation, the experiment was taken for the fulfilment of SDG (2.5.1).

Expected output: To bring changes at chromosomal level for varietal improvement of jute.
Date of initiation and duration: January, 2025- December,2025
Name of the investigators: S.S.U. Ahmed, N. Tasnime, K. Fatema, M. M. Mukul, M. J. Alam, B. Ahmed and M. G. Mostofa
Location: Lab of Breeding Division and experimental field of BJRI Head Quarter, Dhaka.
Materials: Explant (Shoot tip from young seedlings) of tossa jute.
Methods:

Step 1: *In vitro* regeneration.
Tissue culture protocol development for production of callus in tossa jute. Different explants like shoot tip will be used for the clonal propagation of this crop.

Step 2: *In vitro* mutation.
Different explants and callus will be cultured on MS medium supplemented with various concentrations of auxin (0.5, 1, 2 and 3mg/l) and cytokinin (0.5, 1, 2 and 3mg/l) to create variations for regeneration and multiplication of plants. Physical (gamma rays) and chemical (EMS, Colchicine) mutagens in different doses will be used, if needed.

Step 3: Acclimatization, establishment of plantlets in the field.
The regenerated plantlets will be transferred to earthen pots containing sterile soil and decomposed cow dung for establishment of the plantlets. Plantlets will be transferred to field

after several days of hardening. Finally, field trial for new variants will be performed onwards the recommendation of a promising cultivar.

Step 4: Follow up study of *In vitro* regenerated mutant plants.
Macroplants derived from *in vitro* regeneration will be compared with mother (control) plant. The data will be recorded on different parameters and analyzed statistically for interpretation of results.

Step 5: Comparative yield study of all variants
Comparative study of all variants on different parameters will be done. Necessary data will be taken and statistically analyzed.
Estimated cost: 120,000/-

1.9 Title of the experiment: Effect of Polyethylene Glycol (PEG) induced drought stress on tossa jute (OBr-9/2025)
Background and objectives: Due to climate change, abiotic stresses such as salinity and drought affected area are gradually increasing in the environment which is responsible for restricted plant growth and productivity (Zandalinas *et al.,* 2021; Litskas *et al.,* 2020). As different levels of drought affect various jute genotypes differently, it is necessary to isolate highly drought tolerant genotypes for research and cultivation purposes. Tossa jute seedlings make different strategies to tolerate the water deficit situation by increasing the osmo-regulators contents, developing roots and reducing leaves size (Yakoub *et al*., 2016). Root length and distribution is also one of key characteristics for screening drought tolerance in many crops. Screening and identification of drought tolerant jute genotypes that maintain productivity under drought conditions is an effective approach for varietal improvement. Therefore, the objective of this study is to evaluate the influence of drought stress on germination and early vegetative growth stage to a better understanding of the mechanisms and capability of drought tolerance of those genotypes.

Expected output: To identify drought tolerant tossa jute genotypes will be identified.
Date of initiation and Duration: March to December, 2025.
Name of investigators: N. Tasnime, K. Fatema, M.M. Mukul, S.S.U. Ahmed, M. J. Alam, M. Hasan and M.G. Mostofa
Location: Breeding lab and Central research field, BJRI, Dhaka.
Experimental details:

Materials: Twelve tossa jute genotypes (O-0411-10-4, O-0512-6-2 G, O-049-1-3R, O-0419-3-1, O-0412-9-4, Raja, Rani, O-9897, BJRI Tossa pat 4, BJRI Tossa pat 5, BJRI Tossa pat 8 and BJRI Tossa pat 9).
Method:
Seed germination
The experiment will be conducted under laboratory conditions following completely randomized design (CRD). Three replicates of 25 sterilized (with 5% sodium hypochlorite) seeds will be germinated in Petri dishes. The 10 ml treatment solution or distilled water will be poured on the filter paper and afterwards the solution or distilled water will be given according to the needs. Seeds will be incubated at 20 ± 2°C and 12-hour light dark period for 10 days. Seed germination percentage was observed every 24 hours for 10 days and then seed germination percentage will be computed. Drought stress along with control induced by applying 0, 10% and 20% of polyethylene glycol-6000 (PEG) which is equivalent to three osmotic potential levels including −0.001 and −1.09 MPa.

Seedling growth experiment

The experiment will be laid out according to randomized complete block design with split plot arrangements. Genotypes will be considered as main factor, whereas osmotic potentials will be regarded as sub-factor. Seedling growth experiment will be carried out in plastic pots (97 × 165 × 90 mm) filled with a mixture of the sand and peat (1:1). The pots will be placed into growth cabinet with 3 replications and 10 seeds will be planted in each replication. Seeds will be sown 3 cm in depth and pots will be irrigated with PEG-6000 solutions as to generate osmatic potentials of 0 and -1.09 MPa. Pots will be incubated under 25°C and 70–80% relative humidity for 30 days (Mahpara S. *et al,* 2022).

Records to be kept:

At eight days after germination

- Germination percentage (GP) and Germination Index
- lengths of root and shoot, root-shoot ratio
- fresh and dry weight of seedlings

At 30 days after sowing

- no. of live leaves, chlorophyll content of leaves
- lengths of shoot
- length and diameter of primary root
- no. of secondary roots
- length and diameter of secondary roots
- fresh and dry weight of root and shoots

Data of different parameters will be recorded from five seedlings of each unit petri dish and analyzed statistically by statistical software Minitab 18.

Estimated cost: 50,000/-

1.10 Title of the experiment: Screening of tossa jute genotypes against waterlog stress (OBr-10/2025)

Background and objectives: A plenty of water is required for the normal growth of jute plants, especially for the later stage of its vegetative growth (Wahab, 1978). In the seedling stage the jute plant cannot stand waterlogged condition. Young seedlings even cannot withstand water above field capacity (Kundu *et al.,* 1959). The rate of growth of jute plant up to the age of six weeks is always impaired by excess water (Wahab, 1978). The requirement of water at different stages of growth of jute plants has not yet been established. According to Prodhan *et al.* (2001), among the two cultivated species of jute, *Corchorus capsularis* L. can tolerate more water than *Corchorus olitorius* L. Most of the cultivars of *C. olitorius* cannot tolerate standing water for long time. In Bangladesh, the effect of water in tossa jute cultivars at different stages of growth has not yet been investigated thoroughly. The cultivar R-26 of *C. olitorius* can withstand waterlogging condition for several weeks without seriously affecting its growth or even without much deterioration of the quality of its fibre (Anonymous, 1985). This red stemmed cultivar was developed from local varieties of Rajshahi District (Patel and Ghose, 1940). It produces one of the excellent bast fibres but the yield is low. Little is known about its growth feature under different moisture conditions. Therefore, the present work has been undertaken to screen out the salt tolerant tossa jute genotypes which will be used as breeding material for further development of waterlog tolerant new variety. To fulfil the Bangladesh Delta Plan (BDP 2100) hotspot specific strategy 3 (Haor and Flash Flood Areas), the study has been taken to screen the waterlog tolerant tossa genotypes for stress tolerant variety development.

Expected output: To isolate desirable waterlog tolerant genotypes.

Date of initiation and duration: March to December 2025.

Name of the investigators: M. J. Alam, N. Tasnime, K. Fatema, S.S.U. Ahmed, M.M. Mukul, and M.G. Mostofa
Locations: Breeding lab and Central research field, BJRI, Dhaka.
Experimental details

Materials: 40 genotypes including varieties, advanced lines and accession

Methods: The experiment will be conducted in the earthen pots of height 35 cm, top diameter 33 cm and base diameter 27 cm. The pots will be perforated at its bottom for quick drainage of excess water and for proper aeration. Each pot will be filled in up to the top with light loam soil thoroughly mixed with cowdung at the ratio of 5:1. Fertilizers at the rate of 2 gm urea, 1 gm TSP and 2 gm MP will be added with top soil of each pot. The total quantity of TSP and MP and 50% of urea will be applied as basal dose and the rest 50% of urea as top dressing. In each pot 30 seeds will be sown. Agronomic practices will be done regularly to raise seedlings. Before commencement of the treatments, all the pots will be kept under uniform condition of soil moisture of 20-25%. At 60 days old, the pots with seedlings will be transferred in the pool containing water. The water height will be kept 2 ft from the base of jute plants. The seedlings will be waterlogged for 30 days. The seedlings will be observed regularly and cultural operations will be done following standard procedure of jute cultivation. Plant protection measures will be taken as and when necessary. After drainage out of water from the pool, the plants will be observed for 30-45 days to record the desirable traits.

Records to be kept

1. Date of sowing, application of treatments
2. Plant height, base diameter
3. Survivability rate
4. Root length, shoot length etc.

Estimated cost: 100,000/-

1.11 Title of the experiment: Screening of tossa jute genotypes against salinity stress (OBr-11/2025)

Background and objectives: Soil salinity is a major abiotic stress and challenge for agricultural crop production which adversely affects crop production in arid and semi-arid lands in worldwide and Bangladesh is no exception under this impediment (Mukul *et al.,* 2021). Salt stress is a serious threat to jute cultivation in saline areas (southern parts) of Bangladesh (Mukul *et al.,* 2021). According to SRDI (2010), about 1.51 million hectares of arable lands are affected by varying degrees of salinity which adversely impairs the crop ecosystem in Bangladesh. Salinity is one of the major problems in the coastal region of Bangladesh which contributes to 20% of the total land area. About 53% of the coastal region is affected by different degrees of salinity (Habiba *et al.,* 2014). Evaluation of jute genotypes for salt tolerance is highly important because salt-affected areas are constantly increasing worldwide, especially in Bangladesh where salt-tolerant jute variety is unavailable (Ghosh *et al.,* 2013, Mukul *et al*., 2021). But there is no sufficient information on salt tolerance of tossa jute crop in Bangladesh. Therefore, the present study was conducted to screen out the salinity tolerant tossa jute genotype.
Expected output: Salt-tolerant jute genotypes will be identified.
Date of initiation and duration: June, 2025-January, 2026
Name of the investigators: M.M. Mukul, N. Tasnime, K. Fatema, S.S.U. Ahmed, M. J. Alam, and M.G. Mostofa
Location: Laboratory, BJRI, Dhaka.

Materials and Methods

- 100 Accessions will be sourced from the Genebank.
- Seeds will be sterilized and allowed to germinate on bloating paper supplied with 10-12 dS/m NaCl salt under *in-vitro* condition in the Growth Chamber.
- Salt-tolerant genotypes will be identified based on G^n (%), seedling growth status, salt tolerance index, relative salt harm rate, etc.
- The identified salt tolerant genotypes will be grown in pot soil and plants (15 days) will be kept in trays supplemented with 10-12 dS/m salt solution along with control.
- The survived genotypes will be evaluated based on growth status and will be allowed to grow for top cutting & seed collection.
- Seeds will be collected for further studies in saline fields in next season.

Estimated cost: 80,000/-

1.12 Title of the experiment: Evaluation selected of short day and low temperature tolerant tossa jute genotypes (OBr-12/2025)

Background and objectives: Flowering time is one of the most important agronomic characteristics that ultimately determine yield potential and eco-geographical adaptation in crops. *Ghd8* and *Ghd7*, two major flowering genes, have similar functions and large pleiotropic effects in controlling the plant height and yield (Wang *et al.,* 2019). In this study, we are screening short day and low temperature tolerant lines coupled with stress (biotic and abiotic) resistance from different genotypes of tossa jute. For the fulfilment of SDG (2.3), to identify the optimum sowing and harvesting times for increasing productivity as well as to fit in the suitable cropping pattern.

Expected output: Short day and low temperature tolerant lines with better yield potential will be identified.

Date of initiation and duration: March to December, 2025

Name of the investigators: MM Mukul, K Fatema, N Tasnime, SSU Ahmed, MJ Alam, MG Mostofa

Location: Field of BJRI Head office.

Experimental details

Materials: Selected 10 tossa jute genotypes with 3 control varieties (BJRI Tossa pat 5, BJRI Tossa pat 6, BJRI Tossa pat 9)

Methods: Standard cultivation procedure and augmented design will be followed.

Sowing time: 1st & 15th February and 1st & 15th March, 2025

Records to be kept

1. Date of sowing, germination and harvesting time
2. Plant population after final thinning and at harvesting time
3. Date of first and average flowering
4. Disease infestation if any
5. Weather data from seed sowing to harvest
6. Other important observation if any
7. Plant height, base diameter, green weight (with and without leaves), fiber weight (at 100 and 120 days after sowing) and stick weight of 10 randomly selected plants from each line will be recorded.

Estimated cost: 80,000/-

1.13 Title of the experiment: Screening of short duration and high yielding tossa jute genotype to fit in three cropping patterns (OBr-13/2025)

Background and objective: Cultivation of short duration jute in Bangladesh is urgent needed to fit in three copping patterns. Jute - T. Aman - Boro cropping system is a climate resilient eco-friendly technology that would help to increase system productivity and could help towards maintaining economic and food security in the country. Short duration jute can also create opportunity to facilitate legume pulses and green manuring crops before boro rice cultivation which can contribute significantly to achieve the twin objectives of increasing productivity and improving the sustainability of the cropping system (Quayum and Amin 2012). Choosing optimum date of planting and short duration for high yielding cultivars occupies an important part of high production package (Mahmud *et al.,* 2017). Therefore, specific objectives were outlined to raise the yield and quality of jute on reduced coverage by evolving early sowing, short cycled varieties which will be adjusted to three-crop patterns and also to fulfill SDG target 2.3 for increasing productivity in short period of time.

Expected output: Desirable short duration and high yielding jute genotype will be identified to fit in three copping patterns.

Date of initiation and duration: 10 March to 30 June, 2025.

Name of investigators: R.K. Ghosh, S.S.U. Ahmed, K. Fatema, N. Tasnime, M.M. Mukul, M. J. Alam and M.G. Mostofa

Location: Research field of Faridpur station.

Materials and methods: 15 genotypes of tossa jute

1. Controls -2 varieties of tossa Jute [one high yielding variety (BJRI Tossa pat 8), one short duration variety (BJRI Tossa pat 6)]
2. Eight advanced lines and
3. Ten accessions

Design: RCBD with 3 replications.

Data to be recorded:

1. Date of sowing, germination and harvest (90, 100 and 110 DAS)
2. Date of first and average flowering after sowing
3. PH at 90, 100 and 110 DAS (average of 10 plants)
4. BD at 90, 100 and 110 DAS (average of 10 plants)
5. Green weight with leaves at 90, 100 and 110 DAS
6. Green weight without leaves at 90, 100 and 110 DAS
7. Dry fiber yield at 90, 100 and 110 DAS
8. Dry stick yield at 90, 100 and 110 DAS
9. Retting period
10. Retting homogeneity (top and base)

Estimated cost: 80,000/-

2 TITLE OF THE PROJECT: EVALUATION OF PROMISING LINES OF TOSSA JUTE AT PROGENY LEVEL

Objectives: To evaluate the selected genotypes and progenies of tossa jute for yield and other agronomic traits.

2.1 Title of the experiment: Observation yield trial of selected materials of tossa jute for higher fiber yield (OBr-14/2024)

Background and objectives: Transgressive segregation can be fixed whether it is observed in the F_2 or at the F_6 stage, regardless of the genetic architecture of the traits (Snape and Riggs, 1975). As different regions have different natural conditions and cropping systems, breeding targets will very accordingly. The criteria of determination of breeding target for tossa jute have been disease resistant, high yielding, early sowing but not early flowering, salt tolerant. Their F_1s and following generations were raised in the subsequent years at BJRI. Selection of desirable plant type was practiced from F_2 and back cross generation. Finally, F_6 promising lines having different morphological characters were selected and upgraded for Observation yield trial for assessment of their yield and other attributes. On the basis of results, selected lines will be upgraded as PYT (Preliminary Yield Trial) and as ZYT (Zonal Yield Trial) for confirmation of their yield, adaptability and suitability at regional stations. For the fulfillment of Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, respectively, breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of tossa jute for developing new variety.

Expected output: To observe yield of different materials.

Date of initiation and duration: March to December, 2025

Name of the investigators: K. Fatema, S.S.U. Ahmed, N. Tasnime, M.M. Mukul, M. J Alam and M.G. Mostofa

Location: JAES, Manikganj.

Experimental details

Materials: Forty-five genotypes including generations and advanced lines of tossa jute and three controls.

Methods: Standard cultivation procedure and augmented design will be followed.

Records to be kept

1. Date of sowing, germination and harvesting time
2. Plant population after final thinning and at harvesting time
3. Date of first and average flowering
4. Disease infestation if any
5. Weather data
6. Other important observation if any
7. Plant population number at seven days' intervals
8. Plant height, base diameter, green weight (with and without leaves), fiber weight (at 100 and 120 days after sowing) and stick weight of 10 randomly selected plants from each line will be recorded.

Estimated cost: 50,000/-

2.2 Title of the experiment: Observational Trial of selected mutants of tossa jute (OBr-15/2025)

Background and Objective: Jute is an herbaceous annual fiber crop bearing chromosome number 2n=2x=14 is an important fiber yielding crop of Bangladesh belongs to the family Tiliaceae (Basu, 1967; Mukul *et al*., 2021). The main challenges of developing *C. olitorius* varieties are narrow genetics base, possibilities of out-crossing (8–12%) (Kar *et al*., 2009). Fiber yield of jute relies on some crucial parameters plant height, leaf architecture, rooting pattern and base diameter (Islam, 2012). The tall plant, non-branching, less shattering and lodging tolerant is the desired morpho-physiological characteristics for higher fiber yield (Maity *et al.,* 2012). Another hindrance of jute cultivation is farmers are relying on the exotic jute variety and less supply of quality seed against its requirement for sowing, which influence negatively the expansion of jute cultivation in Bangladesh (Akter et *al,* 2020).). JRO-524 is a popular dark jute variety which is developed from African Jute (cv. Sudan Green) and the main morphological feature of this variety is free of short duration and non-shattering pod. The main challenges of the variety JRO-524 is low yield and seed unavailability to the famer due to exotic variety (Benor, 2011). In Bangladesh context, it is essential to develop jute variety having higher seed production ability without compromising fibre and quality traits. Mutation breeding is the best way to create variability in jute crop because it's narrow genetic base. There was an extensive application of physical mutagens such as gamma-ray to obtain genetic variations within a short period of time and (Thakare *et al.* 1973). Low lignin and high fiber and stick yield was found in several studies through mutation breeding (Acquaah G, 2012).

Expected output: To evaluate some selected mutant lines for higher yield.
Date of initiation and duration: Mid-March to December 2025.
Name of the investigators: MM Mukul, SN Islam, K Fatema, SSU Ahmed, MJ Alam, N Tasnime, MG Mostofa
Locations: BJRI, Dhaka.
Experimental details:
Material: 12 Gamma ray mutants (M_7, M_4) & 3 EMS mutants (M_3) of tossa jute & 2 controls
Sowing time: Mid-March to December, 2025
Layout and Design: Augmented design

Records to be kept:

1. Date of sowing and germination.
2. Percent of premature flowering for each plot
3. Plant height and base diameter of 10 randomly selected plant per plot at 110 DAS
4. Plant population at harvest.
5. Green weight with leaves & without leaves, fiber weight, stick weight from each plot.
6. Observation plot will be maintained for seed production by top cutting.

Estimated cost: 50,000/-

2.3 Title of the experiment: Preliminary yield trial of promising lines of tossa jute for higher fiber yield (OBr-16/2025)

Background and objectives: The preliminary yield trial is an initial step of varietal development in jute crops which is generally practiced under the proper observation by the breeders in the fields of research stations located in different agro-ecological zones (Khatun *et al.,* 2009). The developed breeding lines are needed to be experimented against the latest released varieties of same species as control(s) in respect of specific desirable traits like fiber

yield and other attributing characters in jute crops (Kar *et al.,* 2009). Two breeding lines including another two entries (Raja and Rani) from India will be experimented along with one control varieties namely BJRI Tossa pat 8 (Robi-1) in RCB design with three replications (Gomez and Gomez, 1983) for evaluation of their yield performance and other attributes at different agro-ecological environments. Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity. Breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of tossa jute for developing new variety.

Expected output: To evaluate yield and yield contributing characters of the selected lines.
Date of initiation and duration: Mid-March to December, 2025
Name of investigators: S.S.U. Ahmed, M.M. Mukul, K. Fatema, N. Tasnime, M.J. Alam, M.G. Mostofa and officers in stations
Locations: Rangpur, Faridpur and Manikganj.
Experimental details

Materials:
T_1 = C3H-T5 (Green stem with low lignin content)
T_2 = C_5H-T_4 (Green stem with narrow leaf)
T_3 = R5 (Red stem with ovate lanceolate leaf)
T_4 = JRO-524R (Red stem with ovate narrow lanceolate leaf)
T_5 = O-043-7-9R (Red stem with ovate narrow lanceolate leaf) and
T_6 = BJRI Tossa pat 9 (Control)

Methods:
RCBD design with 3 replications will be followed. Plants will be harvested at 100 and 110 days after sowing. Unit plot size: 3m × 3 m =9 m^2, Spacing: line to line 30 cm and plant to plant 5-7 cm.

Records to be kept
1. Date of sowing, germination, flowering, weeding, thinning and harvest
2. Percent of premature flowering for each plot
3. Plant height and base diameter of 20 randomly selected plants per plot at harvest
4. Plant population at harvest
5. Green weight with and without leaves, dry fiber and stick weight per plot
6. Records on diseases and pest attack

Observation plot of the regional station would be maintained for seed production by top cutting
Estimated cost: 50,000/-

3. TITLE OF THE PROJECT: FIELD EVALUATION OF ADVANCED LINES OF TOSSA JUTE IN DIFFERENT AEZ

Objectives: To evaluate the yield and adaptability of different advanced lines at different regional station as well as farmer's field.

3.1 Title of the experiment: Advanced yield trial of three breeding lines of tossa jute (OBr-17/2025)

Background and objectives: The advanced yield trial is the second step after the PYT for fiber yield as well as new variety development system in jute crops which is practiced under the proper observation by the breeders in the fields of research stations located in different agro-ecological zones (Khatun *et al.,* 2009). After the yield trial in preliminary stage, the breeding

lines selected for desirable traits should be experimented against the latest released varieties of same species as control(s) in respect of specific desirable traits like fiber yield and other attributing characters in jute crops (Kar *et al.,*2009). To develop early sowing with higher fiber yielding tossa jute, three breeding lines namely O-0412-9-4 (Red stem with ovate lanceolate leaf), O-O49-1-3 (Red stem with ovate lanceolate leaf), O-O411-10-4 (Red stem with ovate lanceolate leaf), were tested previously and found good in respect of fiber yield and quality. These lines were selected for their good morphological attributes and higher yield. In this year, these four lines will be grown along with one control varieties namely BJRI Tossa pat 8 (Robi-1) in RCB design with three replications (Gomez and Gomez, 1983) for further evaluation of their yield performance and other attributes at different agro-ecological environments. To fulfil the SDG target (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity. Breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of tossa jute for developing new variety.

Expected output: To find out the lines for higher fiber yield in different regions
Date of initiation and duration: Mid-March to December, 2025
Name of the investigators: M. J. Alam, M.M. Mukul, S.S.U. Ahmed, K. Fatema, N. Tasnime, M.G. Mostofa and officers in stations
Location: Rangpur, Faridpur, Monirampur and Manikganj.
Experimental details

Materials
T_1 = Acc. 6099 (Green stem with ovate lanceolate leaf)
T_2 = Acc. 6100 (Green stem with ovate lanceolate leaf)
T_3 = Acc. 4582 (Green stem with narrow leaf)
T_4 = JRO-524R (Red stem with lanceolate leaf) and
T_5 = BJRI Tossa pat 9 (Control)

Methods
RCB design with 3 replications will be followed. Plants will be harvested at 100 and 110 days after sowing. Unit plot size: 3m × 3 m =9 m^2, Spicing: line to line 30 cm and plant to plant 5-7 cm.

Records to be kept

1. Date of sowing, germination, flowering, weeding, thinning and harvest
2. Percent of premature flowering for each plot
3. Plant height and base diameter of 20 randomly selected plants per plot at harvest
4. Plant population at harvest
5. Green weight with and without leaves, dry fiber and stick weight per plot
6. Records on diseases and pest attack

Observation plot of the regional station will be maintained for seed production by top cutting.
Estimated cost: 80,000/-

3.2 Title of the experiment: On-farm yield trial of tossa jute lines in jute growing areas of
Background and objectives: Jute is an important natural fiber crop having significant contribution in the national economy of Bangladesh. Most of the cultivable land, climatic conditions and environment are suitable for jute cultivation. Only two species of jute namely white jute (*Corchorus capsularis*) and tossa jute (*C. olitorius*) are cultivated for fiber purposes where tossa jute produces fibers with good qualities having higher market value than white jute. Beside the BJRI developed tossa jute varieties an exotic variety named JRO-524 has

introduced in Bangladesh through import system and illegally by the unscrupulous businessman. The variety becomes popular and cultivated by the farmers in Bangladesh. As per the instruction of the Government authorities, this exotic variety is need to be introduced through proper system in Bangladesh. Adaptive trial is a stage of yield trial of a foreign or unknown or imported plant variety to an unknown environment considering all the agricultural practices. Hence, the exotic tossa jute variety JRO-524 was taken to perform the adaptive trial to investigate its performance in respect of fiber yield, biotic-abiotic stress tolerance, fiber quality, etc. Two controls were taken in this trial.

Expected output: To evaluate the performance of some breeding lines of tossa jute
Date of initiation and duration: March to December, 2025
Name of the investigators: MM Mukul, MJ Alam, SSU Ahmed, K Fatema, N Tasnime, MG Mostofa, RS in-charge
Locations: Manikganj, Faridpur, Monirampur, Rangpur, Chandina and Kishoreganj.
Experimental details

Materials
T_1 = O-0512-6-2 (Green stem with ovate lanceolate leaf)
T_2 = Acc. 6099 (Green stem with ovate lanceolate leaf)
T_3 = Tossa pat 9 (Green stem with narrow lanceolate leaf)
Duration: March to December, 2025

Methods
1. Each genotype will be grown in 2 decimal size plots
2. Equal PP will be maintained in each plot for proper growth
3. Plants will be observed carefully in terms of PP, flowering, PH, BD, FW, FT, FY, SY
4. Top cutting will be done to collect seed materials for further studies.

Records to be kept
1. Date of sowing, germination, flowering, weeding, thinning and harvest
2. Number of plants/plots at final thinning and at harvest
3. Plant height and base diameter of 20 randomly selected plants/plot at harvest
4. Green weight with and without leaves, dry fiber and stick weight/plot
5. All the plants to be harvested at 120 days after sowing
6. Records on diseases and pest infestation
7. Fibre sample of the materials may be needed for quality test at TRB wing of BJRI.

Estimated cost: 70,000/-

4. TITLE OF THE PROJECT: VARIETAL MAINTENANCE OF TOSSA JUTE
Objective: To maintain nucleus seed stock of released and pre-released varieties/lines of tossa jute

4.1Title of the experiment: Maintenance of nucleus seed stock of tossa jute (OBr- 19/2025)
Background and objectives: The old varieties, although well adapted may often be deteriorated for their varietal distinctness and uniformity with the age of cultivation due to lack of proper maintenance. Their purity for genotypic characteristics and potentialities will be maintained properly based on individual plant selection (Musibau *et al.,* 2018). SDG target 2.3 by 2030, production and distribution of good quality of seed for double the agricultural productivity, breeding division maintain pure seed production for every year.

Expected output: To maintain genetic purity of different genotypes of tossa jute.
Date of initiation and duration: March-December, 2025
Name of the investigators: K. Fatema, N. Tasnime, M.M. Mukul, S.S.U. Ahmed, M. J. Alam, M.G. Mostofa & officers in stations.
Location: JAES, Manikganj and Rangpur.

Experimental details
Materials:

1. O-4
2. O-9897
3. BJRI Tossa pat 3 (OM-1)
4. BJRI Tossa pat 4 (O-72)
5. BJRI Tossa pat 5 (O-795)
6. BJRI Tossa pat 6 (O-3820)
7. BJRI Tossa pat 7 (MG-1)
8. BJRI Tossa pat 8 (Robi-1) and
9. JRO-524

Methods:
Plot size:1.0 and 2.5 decimal area for selacted varieties
Each variety will be grown in separate block. Stem cutting will be done at 110 days plant and placed in different blocks with keeping isolation distance properly from variety to variety.

Records to be kept

1. Individual plant should be selected on the basis of varietal traits
2. Off-type plants should be removed.
3. Observation on diseases and pest infestation
4. Seeds of each selected plant of each variety will be collected carefully.
5. Other characters of importance as directed by the research personnel

Estimated cost: 60,000/- for each location

4.2 Title of the experiment: Maintenance of parents of tossa jute (OBr-20/2025)
Background and objectives: To maintain different strains already in use and to be used as parents in different experiments for breeding improved tossa jute varieties. SDG target 2.3 by 2030, production and distribution of good quality of seed for double the agricultural productivity, breeding division maintain pure seed production for every year.

Expected output: To maintain different strains already in use and to be used as parents for breeding improvement of tossa jute.
Date of initiation and duration: March to December, 2025
N**ame of the investigators**: N. Tasnime, K. Fatema, M.M. Mukul, S.S.U. Ahmed, M. J. Alam, M.G. Mostofa & officers in stations.
Locations: JAES, Manikganj and Monirampur
Experimental details
Materials:

1. Acc. 4582
2. O-043-7-9 (Green)
3. O-043-7-9 (Red)
4. O-0412-9-4 (Red)
5. O-0512-6-2 (Red)
6. O-0512-6-2 (Green)
7. O-0411-10-4 (Red)
8. O-049-1-3 (Red)
9. O-0419-3-1 (Red)
10. O-0419-3-1 (Green)
11. Acc. 1306 and
12. Acc. 1318

Methods: Each accession will be sown in two decimal area of land at Manikganj station. Stem cutting will be prepared at 110 days plants and placed in block with keeping isolation distance

properly from strain to strain. Seeds will be collected on individual plant basis and late jute seed production will be practiced, if necessary. Other two sets of genotypes will be grown in Rangpur and Monirampur station having three lines of three-meter length at Dhaka station for safety of seed production.

Records to be kept

1. Date of sowing and germination.
2. Date of first flowering and harvesting.
3. Observation on disease and pest infestation.
4. Morphological characters study and other characters of importance as directed by the research personnel.
5. Seeds of each accession will be collected separately at right time.

Estimated cost: 60,000/- for each location

References

Abbott R., D. Albach, S. Ansell, *et al.* 2013. Hybridization and Speciation. Journal of Evolutionary Biology, 26 (2), 229-46.

Acquaah, G. (2012). Principles of plant genetics and breeding (2nd ed.). Wiley-Blackwell.

Akter, S., Rahman, M. M., & Hossain, M. A. (2020). Constraints of quality seed supply and its impact on jute cultivation in Bangladesh. Journal of Agricultural Extension and Rural Development, 12(5), 75–82. https://doi.org/10.5897/JAERD2020.1125

Basu, R. N. (1967). Jute in India. Indian Council of Agricultural Research, New Delhi.

Benor, D. (2011). Challenges and prospects of exotic jute varieties in South Asia. International Journal of Fiber Crop Research, 9(2), 103–109.

Caligari P.D.S., Brian P. Forster. 2015. Plant Breeding and Crop Improvement. Wiley Online Library.

Ghosh P.K. and A. Chatterjee. 2009. Regeneration of plants from hypocotyl derived callus tissue of jute (*Corchorus olitorius* L. var. JRO-632). Journal of Crop and Weed, 5(2): 78-79.

Gomez, K.A., Gomez, A.A., 1983. Statistical Procedure for Agriculture Research, 2nd Ed. John Willey and Sons, Inc. New York 357-427.

Hoque, M., Rahman, M. M., & Sultana, R. (2010). Jute production and its contribution to the Bangladesh economy. Bangladesh Journal of Agricultural Economics, 33(2), 45–56.

Islam MM, 2013. Biochemistry, Medicinal and Food values of Jute (*Corchorus capsularis* L. and *C. olitorius* L.) leaf: A Review. International Journal of Enhanced Research in Science Technology & Engineering. Vol. 2 (11), pp: 35-44.

Islam, M. S. (2012). Morphophysiological traits influencing fiber yield in jute (Corchorus spp.). Bangladesh Journal of Agricultural Research, 37(3), 405–414. https://doi.org/10.3329/bjar.v37i3.12123

Kar, C., Kundu, A., Sarkar, D., Sinha, M.K., Mahapatra, B.S., 2009. Genetic diversity in Jute (*Corchorus* spp.) and its utilization: A review. Indian Journal of Agricultural Sciences 79(8), 575-586. http://epubs.icar.org.in/ejournal/index.php/IJAgS/article/view/2454/590

Khatun R., M. M. Islam, M. A.Hussain, N. Parvin and K. Sultana. 2009. Performance study of newly developed jute variety BJRI Deshi-7 (BJC-2142). Int. J. Sustain. Agril. Tech., 5(4): 12-18.

Mahmud S., M. M. Hassan, M. M. Rahman and M. Jannat. 2017. Response of short duration aman rice varieties to date oftransplanting. J. Bangladesh Agril. Univ. 15(1): 1–6, 2.

Maity, S., Ghosh, R. K., & Pal, S. 2012. Morpho-physiological traits associated with fibre yield in jute (Corchorus olitorius L.). Indian Journal of Agricultural Sciences, 82(10), 875–

878.
Mandal, A., A.K. Datta, S. Datta, *et al.* 2013. Assessment of stability and viability of a jute hybrid (*Corchorus capsularis* L. × *C. trilocularis* L.) and its trueness based on RAPD markers. *Nucleus* 56**,** 163–170.
Mohan, S. V., Reddy, M. M., & Babu, M. (2009). Induction of mutations in plants using gamma radiation. *Plant Mutation Breeding*, 22(3), 345-354.
Mujib, A., Zameer, A., & Siddiqui, M. A. (2012). Nutritional and health benefits of jute leaves. *International Journal of Food Sciences and Nutrition*, 63(2), 1-9.
Mukul MM, Ahmed SSU, Akter N, Mostofa MG, Rahman MS, Talukder FU. 2021. Responses of seed germination, seedling growth under salinity stresses and variability for phenotypic traits in Tossa Jute (*Corchorus olitorius* L.). Plant Sci. Today; b8(1):166–180.
Musibau A. Azeez, Amos O. Adubi and Felicia A. Durodola. 2018. Landraces and Crop Genetic Improvement. DOI: 10.5772/intechopen.75944.
Ngomuo M., T. Stoilova, T. Feyissa and P.A. Ndakidemi, 2017. Characterization of Morphological Diversity of Jute Mallow (*Corchorus* spp.). Hindawi: International Journal of Agronomy, Volume 2017, 12 pages.
Quayum M. A. and Ali M. A. 2012. Adoption and diffusion of power tillers in Bangladesh. Bangladesh J. Agril. Res. 37(2): 307-325
Rauf S, A. Jaime, T. da Silva, A. A. Khan, A. Naveed, 2010. Consequences of Plant Breeding on Genetic Diversity. International Journal of Plant Breeding 4 (1), 1-21.
Rudolf-Pilih K, M. Petkovšek, J. Jakše, N. Štajner , J. Murovec and B. Bohanec . 2019. Proposal of a New Hybrid Breeding Method Based on Genotyping, Inter-Pollination, Phenotyping and Paternity Testing of Selected Elite F_1 Hybrids. Front. Plant Sci. 10:1111.
Sahagún-Castellanos J. 2011. Inbreeding and yield of synthetic varieties derived from single and double cross hybrids. *Maydica*, 56(3).
Sawarkar A., Y. Sonika, S.G. Patil and S. Mukherjee. 2015. Evaluation of quantitative traits of tossa jute (*Corchorus olitorius* L.) based on principal component analysis. *Electronic Journal of Plant Breeding*, 6(1): 307-311.
Sengupta G. and P. Palit (2004). Characterization of a Lignified Secondary Phloem Fibre-deficient Mutant of Jute (*Corchorus capsularis L.*). Annals of Botany. 2004 Feb; 93(2): 211–220.
Sfiligoj M. Smole, S. Hribernik, K. StanaKleinschek and T. Kreže (2013). Plant Fibres for Textile and Technical Applications. *Advances in Agrophysical Research*, July 31st 2013.
Sharma, S. R., Sharma, R. K., & Singh, G. (2013). Determination of mineral content in vegetables using Atomic Absorption Spectroscopy. *Journal of Agricultural and Food Chemistry*, 61(25), 6219-6225.
Snape, J., Riggs, T. 1975. Genetical consequences of single seed descent in the breeding of self-pollinating crops. Heredity 35, 211–219.
Thakare, A. Y., Patel, D. U., & Ghosh, M. (1973). Induced mutation in jute: Genetic variability through gamma radiation. Indian Journal of Genetics and Plant Breeding, 33(3), 421–428.
Ververis C., K. Georghiou, N. Christodoulakis, P. Santas, R. Santas (2004). Fiber dimensions, lignin and cellulose content of various plant material and their suitability for paper production. Industrial Crops and Products 19. 245–254.
Wahab, M.A., 1978. Influence of waterlogging on the yield of capsularis jute. Proceedings of the 3rd Annual Bangladesh Science Conference, January 8-12, Bangladesh, pp: 14-15.
Wang, Y., Guo, H., Lin, H., & Wang, F. (2019). The pleiotropic effects of Ghd7 and

Ghd8 genes on flowering time, plant height, and yield in rice. Plant Physiology and Biochemistry, 139, 229–236. https://doi.org/10.1016/j.plaphy.2019.03.031

Wang, P., R. Gong, Y. Yang, 2019. *Ghd8* controls rice photoperiod sensitivity by forming a complex that interacts with *Ghd7*. BMC Plant Biol 19, 462.

Whitlock, R., Khan, S., & Ahmed, T. (2003). Jute and jute-based industries in Bangladesh: A historical and economic perspective. Dhaka: University Press Limited.

Yakoub, A. R. B., Benabderrahim, M. A., and Ferchichi, A. (2016). Physiological and agro-morphological of Tossa jute to drought stress. *Journal of Plant Physiology and Pathology*. 4:3

Zandalinas, S.I.; Fritschi, F.B.; Mittler, R. 2021: Global warming, climate change and environmental pollution: Recipefora multifactorial stress combination disaster. *Trends in plant science*, ***26*****(6),** 588–599.

Zeb, A., Rehman, H., & Aftab, F. (2016). Mutagenesis and its applications in agriculture. *Environmental and Experimental Biology*, 14(2), 163-173.

Zhang L., A.K. Ibrahim, S. Niyitanga, L. Zhang, J. Qi. 2019. Jute (Corchorus spp.) Breeding. In: Al-Khayri J., Jain S., Johnson D. (eds.) Advances in Plant Breeding Strategies: Industrial and Food Crops. Springer, Cham. ttps://doi.org/10.1007/978-3-030-23265-8-4.

B III. KENAF AND MESTA DEPARTMENT

PROGRAMME AREA: VARIETAL IMPROVEMENT OF KENAF AND MESTA

1. TITLE OF THE PROJECT: DEVELOPMENT AND BROADENING OF GENETIC MATERIALS OF KENAF AND MESTA

Objectives: Development and searching of genotypes suitable for (a) less thermo and photo-sensitivity, especially allowing more flexibility of sowing and harvesting time with optimum biomass formation, (b) tolerance to problem soil (e.g. salinity, waterlogged condition etc.) (c) tolerance to diseases and pests; and having (d) small seed size with long duration of seed viability (e) smoothness and indehiscence type of fruits and (f) superior quality of fiber producing characteristics for diversified end uses.

1.1 (A) Title of the experiment: Hybridization in Kenaf and Mesta (KM-1A/2025)

Background and objectives: Plant breeding is mechanism of changing the characters of plants for getting desired characteristics. It is being used to upgrade the quality of products for the benefit of human being (Hartung and Schiemann, 2014). Classical plant breeding means crossing or hybridization of pure lines, followed by artificial selection to get plants with desirable traits of higher yield, nutrition and resistance to diseases (Bauman and Crane, 1992). Hybridization helps to create recombinant types by accumulating desirable genes for both qualitative and quantitative characters from diverse parents. Through hybridization, it is therefore, possible to combine the desirable characters and to select superior progeny for varietal improvement program. In January 2025, a total of 20 genotypes of Kenaf and Mesta from diverse geographic origin were sort out having desirable characters such as quick growing, less photo and thermo-sensitive, tolerant to biotic and abiotic stresses etc. The program has been designed with these selected genotypes for creating variability and to transfer desirable traits from donor parents to the recipient parent. To fulfil the target (2.5.1) of Sustainable Development Goals (SDG) for increasing the genetic materials, Kenaf and Mesta department has taken this study to create new variants of Kenaf and Mesta through hybridization or conventional breeding method.

Expected output: Desirable progenies will be isolated.
Date of initiation and duration: August, 2025 to January, 2026.
Name of the investigators: A. Hasan, S.K. Biswas, M.H. Rashid and M.G. Mostofa
Location: Crossing block at Central Station of BJRI, Dhaka.
Experimental details
Materials: Twenty selected genotypes including eight high yielding varieties (HC-95, BJRI Kenaf 3, BJRI Kenaf 4, BJRI Kenaf 5; and BJRI Mesta 2, BJRI Mesta 3, BJRI Mesta 4 and BJRI Mesta 5).

Methods: Seeds of all materials will be grown in pots and sowing will be done two times after 15 days interval for synchronization of flowering. Crosses will be made in possible combinations. Emasculation and pollination will be done in proper ways and time. Crosses and selfed fruits will be collected separately for further study.

Table 1a: Twenty genotypes of Kenaf along with their salient features

Sl. No.	Genotype	Salient features
1.	KP_{13} (HC-95)	Plant full green, palmate, flower completely cream colour
2.	KP_{14} (BJRI Kenaf 3)	Green, cordate, flower cream red centre, quick growing and high biomass producing capacity

3.	KP_5 (BJRI Kenaf 4)	Reddish, palmate, flower cream red centre
4.	KP_{24} (BJRI Kenaf 5)	Reddish stem, cordate leaf, flower cream with red center
5.	KP_{21} (KBL-51)	Purple, cordate, flower cream with red centre
6.	KP_{34}	Greenish, palmate, pink flower
7.	KP_{37} (KM-16-1-8-1-1)	Stem reddish patches, smooth, palmate, flower cream with red center
8.	KP_{38} (KM-17-9-1)	Green, palmate, purple flower
9..	KP_{40} (KM-16-43-1-1-3-4)	Greenish, cordate, purple flower
10.	KP_{42} (KM-17-15-3-4-4)	Full green, palmate, deep purple flower

Table 1b: Twenty genotypes of Mesta along with their salient features

Sl. No.	Genotype	Salient features
1.	BJRI Mesta 2 (VM-1)	Red, semi-cordate, fruit red with fleshy calyx
2.	MP_{14} (BJRI Mesta 3)	Green, palmate, flower completely yellow
3.	BJRI Mesta 4 (VM-2)	Greenish, semi-cordate, fruit greenish with fleshy calyx.
4.	BJRI Mesta 5	Stem green, palmate, petiole both end purple colour, fruit green and smooth.
5.	Acc.1740	Full green, bushy type, semi-cordate, fruit green, small with fleshy calyx
6.	MP_{30}	HS-24 type, fruit green, smooth.
7.	MP_{31}	Reddish, palmate, fruit red, smooth.
8.	VM-A	Purple stem, palmate leaf, flower purple colour.
9.	VM-B	Purple stem, palmate leaf, light purple flower, fruit red colour.
10.	VM-C	Greenish, semi-cordate leaf, flower orange colour.

Estimated cost: Tk. 30,000/- including inputs and cultural practices.

1.1 (B) Title of the experiment: Confirmation of F_1s (KM-1B/2025)

Background and objectives: F_1 confirmation is 1st step activity after hybridization and very important for variety release procedure. It is necessary to confirm whether the hybrid is true or parental type. A total of 193 and 46 crosses were made among selected lines and check varieties of Kenaf and Mesta, respectively. The seeds were obtained from 144 and 27 successful crosses of Kenaf and Mesta, respectively. This year (2025), the seeds of these crosses along with their parents will be grown side by side in earthen pots for confirmation of F_1 as true hybrids. Similar works were also done by Hazmy *et al.* (2018) in rice where they confirmed the F_1 hybrids derived from different crosses; and identified pure hybrid of F_1. In addition, selfed seeds from parental populations will be collected separately for further study. Therefore, the objectives of this experiment are: (a) confirmation of hybrids comparing with parents; and (b) production of parental population seeds. To fulfill the targets (2.5 and 2.3) of Sustainable Development Goals

(SDG) for increasing the genetic materials and doubling the agricultural productivity, Kenaf and Mesta department has taken this study for new high-yielding variety development.

Expected output: On the basis of phenotypic expression, F_1s will be confirmed as true hybrids. In addition, selfed seeds will be obtained.
Date of initiation and duration: August to December, 2025.
Name of the investigators: S.K. Biswas, A. Hasan, M.H. Rashid and M.G. Mostofa.
Location: Central Research Field, BJRI, Dhaka.

Experimental details:
Material: Seeds of all cross combinations made in 2024 (Kenaf=144 and Mesta=27).
Methods: Seeds will be grown in earthen pots along with their parents in crossing block of Breeding Division, BJRI Dhaka. Recommended management practices like weeding, watering, insecticides spraying and top dressing of urea fertilizer will be followed to raise the crop (Islam and Ali, 2017). At vegetative stage as well as maturity, each cross will be confirmed comparing with respective parents; and fruits of hybrids will be harvested, threshed, cleaned and the seeds will be preserved for the next generation.

Records to be kept:
1. Date of sowing and germination.
2. Date of first flowering and average flowering.
3. Plant height, base diameter and pigmentation.
4. Any morphological variation of the hybrids with the parents.

Estimated cost: Tk. 20,000/- including inputs and cultural practices.

1.1 (C) Title of the experiment: Set A: Evaluation of segregating lines of Kenaf and Mesta (KM-1C/2025)

Background and objectives: Hybridization is the most important method of improving the genetic properties of cultivated crops (Anonymous, 2001). It is fairly simple and easy but the difficulty is in the handling of segregating generations. Breeder should have well-defined, clear-cut objectives based on the present and expected future needs in developing a new variety. Hybrid lines are heterozygous and it needs to undergo selfing by growing generation up to $F_6$for selecting a desirable homozygous one as a variety (Allard, 1999). For this, evaluation and selection of expected lines are important tasks of a breeding program. In 2024, a total of 162 {F_2 (25), F_3 (36), F_4 (47), F_5 (26) and F_6 (28)} segregating lines of Kenaf and 15{F_2 (12) and F_3 (3)} segregating lines of Mesta were grown from which total 83 {F_2 (22), F_3 (20), F_4 (15), F_5 (18) and F_6 (8)} desirable plants of Kenaf and total 22{F_3 (19), and F_6 (3)} desirable plants of Mesta were selected on the basis of plant height, stem color, leaf shape, smoothness, flower and fruit color. Seeds were collected separately to evaluate them in 2025. For the fulfillment of Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, respectively, Breeding Division has taken this study to select the superior genotypes from the segregated population of Kenaf and Mesta for developing high-yielding new variety.
Expected output: Desirable plants from segregating lines of different generations will be selected and seeds will be collected and maintained for future program.
Date of initiation and duration: April to December, 2025.
Name of the investigators: M.H. Rashid, S.K. Biswas, A. Hasan and M.G. Mostofa
Location: Central Station of BJRI, Dhaka.
Experimental details:

Material: The selfed seeds of selected 94 (Kenaf=75 and Mesta=19) desirable plants from different generations (F_2, F_3, F_4 and F_5) of Kenaf and Mesta. Besides, selfed seed of 30 selected Kenaf and 16 selected Mesta hybrids (F_1 plants) seeds will also be used as sowing materials.

Methods: Each segregating line will be sown in the field of central station, Dhaka having single row of 2m length. Desirable plants will be selected on the basis of morphological traits and seeds will be harvested.

Records to be kept:

1. Date of sowing, germination, first flowering, weeding, thinning and harvesting.
2. Observation on diseases and pest infestation.
3. Morphological characters like stem color, leaf shape, flowering behavior, fruit colour etc. and other characters of importance as directed by the research personnel.
4. Seeds of each plant will be collected separately at right time.

Estimated cost: Tk. 30,000/- including inputs and cultural practices.

Set B: Evaluation of segregating lines of Kenaf (KM-1C/2025)

Background and objectives:

To develop a new high-yielding variety of Kenaf for commercial cultivation, 36 cross materials (F_1s) were successfully produced in 2019 from nine morphologically distinct Kenaf genotypes using a half-diallel mating design. F_1s were confirmed in 2020. Selection of desirable plant types was practiced in 2020-2021 under PhD work (Al-Mamun et al., 2023). Among the nine genotypes, one was a commercial variety (BJRI Kenaf 4), and eight were mutant lines (ML5, ML9, ML36-10, ML36-24, ML36-25, ML36-27, MLRing4P2 and ML36-21(2)) developed from the V-36 variety through acute and chronic gamma irradiation. Selected desirable plant types of 36 Kenaf crossing materials were upgraded at the F_4 generation in 2024, and selfed seeds of desirable plants were collected for further study.

Expected output: Breeding lines with distinct characters, higher yield and quality fibre.

Date of initiation and duration: April to August 2025

Names of investigators: M. Al-Mamun, M.H. Rashid, S.K. Biswas, A. Hasan and M.G. Mostofa

Location: Dhaka

Experimental details:

Materials: Seeds of 36 selected plants and their parents.

Methods: Each segregating line will be sown in Dhaka's research field, having a row of 2m in length. Desirable plants should be selected based on morphological traits and seeds will be harvested.

Record of being kept:

1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plants (in any) would be recorded and removed.
3. Observation of diseases and pest infestation.
4. Plant population after final thinning and at harvest (110 DAS and 130 DAS).
5. Plant height, base diameter of 10 randomly selected plants per plot.
6. Green weight with and without leaves, fibre weight, and stick weight per plot.

7. Seeds of each plant will be collected separately at the right time.

Estimated cost: TK. 25,000.00

1.2 Title of experiment: Screening of Kenaf germplasm for higher fibre yield (KM-2/2025)

Background and objectives: Genetic variability in existing genotypes is very important for development of variety with higher yield and other desirable agronomic traits. Variable genotype itself is also used as a pure line derived variety and it can be used as a parent for different varietal improvement program (Bertan *et al.,* 2007). 36 Kenaf germplasm collected from GRSD, BJRI will be used in this experiment. These germplasms have wider gene pool with different types of biotic and abiotic stress tolerance. Screening of these germplasm is very important for searching variability and to isolate desirable genotypes, which can be used successfully for developing a new variety or also used in crossing program for development of new variety of Kenaf. These Kenaf genotypes and four existing varieties will be investigated at Dhaka for yield performance and other desirable traits. To fulfill the Sustainable Development Goals (2.5 and 2.3) and 4IR, the program has been undertaken to select promising genotypes for future development of new varieties.

Expected output: Superior genotypes with desired characters will be identified.
Date of initiation and duration: March to December, 2025.
Name of investigators: S.K. Biswas, A. Hasan, M.H. Rashid and M.G. Mostofa.
Location: Dhaka.
Experimental details:
Materials: 36 Kenaf genotypes and four control varieties e.g., HC-95, BJRI Kenaf 3, BJRI Kenaf 4 and BJRI Kenaf 5.

Methods: The experiment will be conducted following augmented design. Each genotype will be sown in the field of 2.0 m long row. Spacing will be 30 cm between rows, 6-7 cm between plants and 1.0 m between blocks.

Records to be kept:

1. Date of sowing, germination, weeding, thinning and harvest.
2. Date of first flowering of each genotype.
3. Observation on diseases and pest attack.
4. Special phenotypic traits (if any).
5. Plant height, base diameter, green weight, fiber weight and stick weight of 5 randomly selected plants from selected genotypes at 120 DAS.

Estimated cost: Tk. 25,000/- per location including inputs and cultural practices.

1.3 Title of the experiment: Rapid Generation Advance (RGA) protocol development in Kenaf (KM-3/2025)

Background and Objective: The challenges are many in developing a new Kenaf variety. To overcome few of them, we need an efficient breeding pipe line to have readymade supply of variety. The present variety development procedure (pedigree method) is quite lengthy. It takes 14 to 15 years from breeder's lab to farmer's hand. Rapid Generation Advance (RGA), a method to make selection method faster from the advance generations of segregating populations under controlled environment will be followed. A technique of single seed descent in this method would allow 3 (generally one generation a year in the existing system)

generations a year is the main driving force to reduce the breeding cycle in a variety development system (Collard *et al.,* 2017). That is why, BJRI has decided to reorganize its breeding program through adopting new breeding technology and research management methods improving the selection efficiency for the varieties targeting for desirable agronomic traits, biotic and abiotic stress tolerance, fibre quality etc.

Expected output: 2-3generations per year will be obtained.
Date of initiation and duration: January to December, 2025.
N**ame of the investigators**: M.H. Rashid, A. Hasan, S.K. Biswas and M.G. Mostofa
Locations: Central Research Field, BJRI, Dhaka.
Experimental details :
Materials:Seeds of selected plants (F_2-F_5) of Kenaf.

Methods: Each generation will be sown in field or earthen pot. Seeds will be collected on individual plant and dry all seed and sowing again in this year 2-3 times in natural environment condition and glass house in winter.

Records to be kept:

1. Date of sowing and germination.
2. Date of first flowering and harvesting.
3. Morphological characters study and other characters of importance as directed by the research personnel.
4. Seeds of each genotype will be collected separately at right time.

Estimated cost: Tk. 20,000/-

1.4 Title of the experiment: Biochemical analysis of Kenaf and Mesta seed oil (KM-4/2025)

Background and objectives: Kenaf (*Hibiscus cannabinus*) and Mesta (*Hibiscus sabdariffa*) seeds contain 22–24% oil and are considered to have high nutritional value and health promoting properties due to the presence of relatively high amount of monounsaturated and polyunsaturated fatty acids (MUFAs and PUFAs). Both Kenaf and Mesta seeds contain pharmacological agent and a variety of bioactive phytochemicals like polyphenols and phenolic acids, phytosterols, amino acids, fatty acids, phospholipids etc. that possess great nutritional, phyto-pharmaceutical and therapeutic values (Dhar *et. al*., 2015). In our country, there is a shortage of edible and non-edible industrial oils, which is meeting up by importing these oils from abroad. Refined oils from Kenaf and Mesta seeds are edible and can play an important role in filling the shortage of vegetable oils in the country by using it for cooking purposes. Besides, Kenaf and Mesta seed oil has also been proved suitable for making paints, varnishes and soaps because it is rich in oleic and linoleic acids and has a higher saponification index (Akhter *et. al*., 2015). Oil extracted from Kenaf seed may be used as Engine oil and pharmaceuticals which is related to 4IR. Little is known about the multipurpose use of Kenaf and Mesta seed oil. Therefore, an experiment is taken at Central Station, Dhaka, BJRI to estimate the biochemical properties e.g., fatty acid, glyceride, lipid and polyphenol content of Kenaf and Mesta seed oil and explore their potential uses as ingredients of functional food and natural pharmaceuticals.
Expected output: Fatty acid, glyceride, lipid and polyphenol content of Kenaf and Mesta seed oil will be estimated.
Date of initiation and duration: July, 2025 to January, 2026.
Name of investigators: M.H. Rashid, S. K. Biswas, A. Hasan, M.A.F. Mollah, M.M. Ali,

M.G. Mostofa

Locations:

A) **Field experiment**: Central Research station, BJRI, Dhaka.
B) **Lab experiment**: Biochemistry laboratory, Sher-e-Bangla Agricultural University and BCSIR, Dhaka.

Experimental details:

Materials:

Kenaf: HC-95, BJRI Kenaf 3, BJRI Kenaf 4 and BJRI Kenaf 5
Mesta: BJRI Mesta 2, BJRI Mesta 3, BJRI Mesta 4 and BJRI Mesta 5

Estimated cost: Tk. 80,000/-

1.5 Title of the Experiment: Anatomical study of Kenaf promising lines (KM-5/2025)

Background and objectives: The secondary phloem tissue which determines the yield capacity of jute arises from cambial activity (Palit *et al*., 1999). It is also true for Kenaf and allied fibre crops. The secondary phloem cells which are accumulated during growth of plant and arranged in regular fashion of fibre wedges. So, bark thickness, number and area of phloem wedge of the stem directly contribute to fibre yield. Whilst the quality of fibre is dependent on some chemical and physical parameters. Among them length breadth ratio of fibre cells is of immense importance. From plant anatomical point of view the length-breadth ratio (L: B) of ultimate fibre cells has a definite bearing on fibre quality. Higher the ratio finer is the fibre (Sen, 2009). Kenaf fibre is not a single fibre, it is composed of many ultimate fibres and so known as commercial multi-cellular fibre. The quality of fibre depends upon the length and length-breadth ratio of these ultimate fibres. The more length breadth ratio, the superior quality of fibre. This year, promising lines of Kenaf with checks will be grown to evaluate the anatomical feature for identification of high yielding lines to fulfill the Sustainable Development Goals (2.3) for enhancing jute productivity.

Expected output: Higher fibre content lines will be identified.
Name of investigators: A. Hasan, S.K. Biswas. M.H. Rashid and M.G. Mostofa.
Location: JAES, Manikganj and Central Station of BJRI, Dhaka.
Date of initiation and duration: April - December, 2025.
Experimental details:

Materials: KBL-51 = Stem purplish, cordate leaf.
KBL-73 = Stem green, cordate leaf.
KBL-17-1-9 = Stem purple, palmate leaf.
KBL-17-9-1 = Stem green, palmate leaf, purple flower.
HC-95 (control) = Plant full green, palmate, flower completely cream.

Layout: RCBD with 3 replications. Standard agronomic practices will be followed.

Methods:

1. 3-5 plants having similar height and base diameter will be considered as a sample. For studying anatomical characters 3 inches long piece of stem will be cut from the middle parts of each of the selected plant at the age of 120 days. These materials will be preserved in Formalin-Aceto-Alcohol (FAA) solution (10 ml of Formalin, 5 ml of 85% glacial acetic acid and 85 ml of 70% alcohol).
2. The preserved sample will be taken out and washed. About 20-25µ thick transverse

sections (TS) will be done with the help of a microtome machine for preparing slide. The slides will be studied under compound microscope (4x10 magnifications) and data to be recorded for bark thickness, number and area of phloem wedges, number of fibre bundle layers and number of fibre bundles per section. Plant height, base diameter and dry fibre weight of the materials will also be recorded.

3. Maceration of fibre cell: The fibre will be extracted following the method described by Miah (1964) with little modification.
4. The anatomical data will be recorded from 3-5 randomly selected plants of each line/variety from each replication at the time of harvest (110 days and 120 days).

Records to be kept:

1. Date of germination, flowering and harvest.
2. Bark diameter, bark thickness, number of trapezoids/section will be calculated for three plants of each line/variety under microscope.
3. Area of trapezoid/section (µm): Area of trapezoid was measured by the following formula;
   (Area of trapezoid = ½ (Upper length + Lower length) x perpendicular length of trapezoid x conversion factor [Conversion factor = 43.9 in 3.5 X 10 magnification]
4. Number of layers/trapezoid, number of bundles/trapezoid will be calculated under microscope from randomly selected trapezoid.
5. Length, breadth and their ratio to be measured for 10 randomly selected fibre cells by using coulometer under microscope.

Estimated cost: Tk. 30,000/- including all inputs.

2. TITLE OF THE PROJECT: EVALUATION OF BREEDING LINES OF KENAF AND MESTA AT PROGENY LEVEL

Objectives: To evaluate the selected genetic resources and crossing materials of Kenaf and Mesta in respect of smoothness, earliness and high biomass production at progeny level in different regional stations.

2.1 Title of the experiment: Observation trial on some vegetable type Mesta for higher yield (leaves and calyx) production. (KM-6/2025)

In certain area of Bangladeshi peoples are using Mesta leaf and pericarp of Mesta as vegetable. Some strains were collected from different parts of the country. These collected materials will be studied to develop high yielding vegetable Mesta containing desirable traits. For the fulfillment of Sustainable Development Goals (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, respectively, breeding division has taken this study to select the high-yielding superior genotypes from the collected materials for developing new variety.

Expected output: Vegetable Mesta genotypes will be developed.
Date of initiation and duration: Mid-April 2025 to January 2026.
Name of investigators: M.H. Rashid, S.K. Biswas, A. Hasan & M.G. Mostofa.
Location: Manikganj and Rangpur
Experimental details:
Materials: Three genotypes viz., Acc. 1740, VM-A, VM-B, VM-C with two control variety BJRI Mesta 2 and BJRI Mesta 4.
Layout and design: RCBD with three replications, unit plot size: 3 m x 2 m = 6 sq. m.
Record to be kept:

1. Date of sowing, germination and harvesting time.

2. Plant population after final thinning and at harvesting time.
3. Number of leaves, weight of leaves per plant.
4. Number of fruits per plant.
5. Weight of calyx per fruit.
6. Quality of leaf and calyx.
7. Weight of leaf and calyx per plot and other relevant data will be recorded.

Estimated cost: TK. 50,000/- per location including inputs and cultural practices.

2.2 Title of the experiment:

Preliminary yield trial (PYT) of Kenaf breeding lines (KM-7/2025)

Background and objectives: In order to develop new varieties of Kenaf, seventeen genotypes were grown in the green house premises of BJRI of August-September, 2016. A total of 192 successful crosses were obtained from 236 crosses with 17 cross combinations. Their F_1s and following generations were raised in the subsequent years at BJRI. Selection of desirable plant type was practiced from F_2 generation. Finally, three F_6 promising lines having different morphological characters were selected. These selected lines as well as an exotic genotype are upgraded at preliminary yield trial in 2024 for assessment of their yield and other yield contributing attributes. In 2025 this experiment will continue for 2nd year assessment of their yield and yield contributing attributes. To fulfill the SDG target (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of Kenaf lines for developing new variety.

Expected output: Breeding lines with distinct characters, higher yield and quality fibre.
Date of initiation and duration: Last week of March to September, 2025.
Name of investigators: S.K. Biswas, A. Hasan, M.H. Rashid & M.G. Mostofa.
Location: Dhaka, Manikganj and Monirampur.
Experimental details:
Materials: Four materials namely KBL16-31-4-1-1-1, KBL16-43-1-1-3-4, KBL17-15-3-4-4 and control variety BJRI Kenaf 5.
Layout and design: RCBD with three replications, unit plot size: 2 m x 1 m = 2 sq. m.

Record to be kept:
1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plant (in any) would be recorded and removed.
3. Plant population after final thinning and at harvest (110 DAS and 130DAS).
4. Plant height, base diameter of 10 randomly selected plants per plot.
5. Green weight with and without leaves, fibre and stick weight/plant and per plot.

Estimated cost: TK. 30,000/- per location including inputs and cultural practices.

3. TITLE OF THE PROJECT: FIELD EVALUATION OF ADVANCED STRAINS OF KENAF AND MESTA IN DIFFERENT AGRO-ECOLOGICAL ZONES

Objectives: To evaluate the yield and adaptability of different promising strains of Kenaf and Mesta at farmer's field in different regions as well as on stations.

3.1 Title of the experiment:

Set A: Advanced yield trial (AYT) of Kenaf breeding lines (KM-8A/2025)

Background and objectives: In order to develop new varieties of Kenaf, eleven genotypes were grown in the green house premises of BJRI of July-August, 2014. A total of 76 successful crosses were obtained from 143 crosses with 48 cross combinations. Their F_1s and following generations were raised in the subsequent years at BJRI. Selection of desirable plant type was practiced from F_2 generation. Finally, three F_6 promising lines having different morphological characters were selected and upgraded at preliminary yield trial (PYT) for assessment of their yield and other attributes under different agro-ecological condition in 2021 to 2023. On the basis of PYT results, two lines out of three are upgraded as AYT (Advanced Yield Trial) in 2024 for confirmation of their yield, adaptability and suitability at regional stations. In 2025 this experiment will continue for 2nd year assessment. To fulfill the SDG target (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of Kenaf lines for developing new variety.

Expected output: Breeding lines with distinct characters, higher yield and quality fibre.
Date of initiation and duration: Last week of March to September, 2025.
Name of investigators: M.H. Rashid, S.K. Biswas, A. Hasan & M.G. Mostofa.
Location: Manikganj, Kishoreganj, Rangpur and Monirampur.
Experimental details:
Materials: Two breeding lines viz., KBL17-1-9, KBL17-9-1 and control variety BJRI Kenaf 5.
Layout and design: RCBD with three replications, unit plot size: 3 m x 2 m = 6 sq.m
Record to be kept:

1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plant (in any) would be recorded and removed.
3. Plant population after final thinning and at harvest (120DAS).
4. Plant height, base diameter of 10 randomly selected plants per plot.
5. Green weight with and without leaves, fibre and stick weight/plant and per plot.

Estimated cost: TK. 40,000/- per location including inputs and cultural practices

Set B: Advanced yield trial (AYT) of kenaf mutant lines (KM-8B/2025)

Background and objectives: Twenty-eight mutant lines were developed from V-36 through acute and chronic gamma irradiation to create a new cultivar with a high fiber yield for commercial kenaf cultivation (Al-Mamun et al., 2020). Selection of suitable plant type was practiced in five environments to evaluate the yield performance of 28 mutant lines with BJRI Kenaf 4 (check) in 2019 and 2021 under PhD work (Al-Mamun et al., 2022). Considering their agronomic performance, the four M_9 mutants (ML9, ML36-10, ML36-24 and MLRing4P2) were selected for their high heterotic responses for fiber yield, stick yield, number of pods per

plant and smaller seed size. These four M_9 mutants were upgraded at a preliminary yield trial (PYT) to evaluate their yield and other attributes under different agro-ecological conditions from 2023 to 2024. Based on PYT results, three lines out of four are upgraded as AYT (Advanced Yield Trial) in 2025 for confirmation of their yield, adaptability and suitability at regional stations. To fulfill the SDG target (2.5 and 2.3) to increase the genetic materials and double the agricultural productivity, the breeding division has taken this study to select the high-yielding superior genotypes from the segregated population of kenaf mutant lines for developing new varieties.

Expected output: Breeding lines with distinct characters, early maturity, higher yield and quality fibre.

Date of initiation and duration: April to August 2025.

Names of investigators: M. Al-Mamun, M.G. Mostofa, M.H. Rashid, S. K. Biswas, A. Hasan and the respective scientists of the stations.

Location: Manikganj, Kishoreganj and Monirampur

Experimental details:
Materials: ML36-10, ML36-24, MLRing4P2; and control variety BJRI Kenaf 4.

Layout and design: RCBD with three replications and unit size will be 2.0 m × 1.0 m = 2.0 sq. m.

Record of being kept:
1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plants (if any) would be recorded and removed.
3. Observation of diseases and pest infestation.
4. Plant population after final thinning and at harvest (120 DAS).
5. Plant height, base diameter of 10 randomly selected plants per plot.
6. Green weight with and without leaves, fibre weight, and stick weight per plot.

Estimated cost: TK. 25,000.00 per location, including inputs and cultural practices.

3.2 Title of the experiment: Zonal yield trial (ZYT) of Kenaf promising lines for salt tolerance (KM-9 /2025)

Background and objectives: Kenaf (*Hibiscus cannabinus* L.) is an annual herbaceous dicotyledonous plant native to Asia and Africa belonging to the Malvaceae family which is cultivated for fiber purpose in Bangladesh. According to Kujoana *et al.* (2023), kenaf is an indispensable food, fibre and medicinal plant that can tolerate a variety of environmental conditions. Soil salinity is a serious abiotic stress to fiber crop cultivation which limits germination, affects roots as well as the biological systems leading to plant mortality, lower growth and development; and decrease in fiber yield (Majeed and Muhammad, 2019). The total saline area is about 0.88 million hectares in Bangladesh and maximum salinity occurs in the months of March-April (sowing time for jute), the peak dry season, and minimum in the months of July-August after the onset of monsoon rain (BARI, 1991). Millions of hectares of land throughout the world are too saline to produce economic crops and more land is becoming unproductive each year because of salt accumulation. A 30% land loss during the next 25 years

and a 50% land loss by the year 2050 are predicted to be the catastrophic worldwide repercussions of increased salinization of agricultural land (Lam *et al.,* 2022). Bangladesh Jute Research Institute has been working on kenaf crops and released five high yielding varieties but no salt tolerant variety has been developed till now (BJRI, 2023). So, it is a crying need to develop salinity tolerant kenaf variety to cultivate the saline zones as well as increasing the productivity. In order to develop new salt tolerant varieties of kenaf, four F_6 promising lines from crossing were selected and preliminary yield trial (PYT) was done for assessment of their yield and other attributes under different agro-ecological condition in 2015 to 2017. On the basis of PYT results, three lines out of four are upgraded as AYT (Advanced Yield Trial) in 2018 and 2019 for confirmation of their yield, adaptability and suitability at regional stations. On farm yield trial was done from 2020 to 2023. On the basis of AYT results, in 2024 at saline areas in southern regions, the selected two kenaf promising lines namely KBL-51 and KBL-73 were taken with the variety HC-95 (control) for assessment of ZYT at ten saline areas in southern regions for confirmation of their yield, adaptability and suitability keeping the objective of salt tolerant kenaf variety development in Bangladesh in the year of 2025.

Expected output: Breeding lines with distinct characters, higher yield and quality fibre under salinity.

Date of initiation and duration: Last week of March to September, 2025.

Name of investigators: M.G. Mostofa, M.H. Rashid, S.K. Biswas, A. Hasan and officer in-charge of the respective stations.

Location: Kaliganj & Shamnagar of Satkhira district; Dacop, Batiaghata, Paikgacha & Koira of Khulna district; Taltoli of Borguna district and Nilganj, Kolapara & Lotachapli of Patuakhali district.

Experimental details:

Materials: Two promising lines viz., KBL-51, KBL-73 and control variety HC-95

Methods:

At farmer's field: A plot of 7.5 decimal will be divided into three equal parts; each part of 2.5 decimal will be used for growing KBL-51, KBL-73 and HC-95 (control). Seeds will be sown on last week of March. Equal quantity of seeds of tested lines and control variety will be sown and equal plant population will be maintained for all treatments. Intercultural operations will be done in time simultaneously as per recommendations. Electrical Conductivity was recorded at 15 days interval from sowing to harvest. The experiment will be harvested at 110 and 120 days after sowing. The plots should be located preferably at road side.

Record to be kept:

1. Date of sowing, germination, average flowering and harvest.
2. Premature flowering plant (in any) would be recorded and removed.
3. Plant population after final thinning and at harvest (100 DAS and 120DAS).
4. Plant height, base diameter of 10 randomly selected plants per plot.
5. Green weight with and without leaves, fibre and stick weight/plant and per plot.

Estimated cost: TK. 20,000/- per location including inputs and cultural practices.

4. TITLE OF THE PROJECT: VARIETAL MAINTENANCE OF KENAF AND MESTA

Objectives: To maintain nucleus seed stock of released and pre-released varieties/lines of Kenaf and Mesta from which departmental needs and other scientists demand for experimental purpose as well as for breeder seed production will be fulfilled.

4.1(A) Title of the experiment: Maintenance of nucleus seed stock of Kenaf and Mesta (KM- 10A/2025)

Background and objectives: The old varieties, although well adapted may often be deteriorated for their varietal distinctness and uniformity with the age of cultivation due to lack of proper maintenance. Their purity for genotypic characteristics and potentialities will be maintained properly based on individual plant selection (Musibau *et al.,* 2018). It is routine work of Breeding Division. SDG target 2.3 by 2030, production and distribution of good quality of seed for doubling the agricultural productivity, breeding division maintains pure seed production for every year.

Expected output: Purity of Kenaf and Mesta varieties will be maintained.
Date of initiation and duration: July, 2025 to February, 2026.
Name of the investigators: S.K. Biswas, A. Hasan, M.H. Rashid, M.G. Mostofa & officers in stations.
Location: Manikganj and Rangpur.
Experimental details:
Materials: Kenaf varieties: HC-2, HC-95, BJRI Kenaf 3, BJRI Kenaf 4 and BJRI Kenaf 5
Mesta varieties: HS-24, BJRI Mesta 2(VM-1), BJRI Mesta 3, BJRI Mesta 4(VM-2) and BJRI Mesta 5
Methods:
Plot size: Two decimal lands for each of HC-95, BJRI Kenaf 3, BJRI Kenaf 4, BJRI Kenaf 5, BJRI Mesta 2 (VM-1) and BJRI Mesta 3, BJRI Mesta 5 and one decimal land for each of other varieties.
The varieties will be grown in separate blocks at Manikganj and Rangpur stations of BJRI keeping proper isolation distance from variety to variety. Any off-type as well as over growth and/or under growth plants will be removed carefully.

Records to be kept:
1. Date of sowing, germination, first flowering, weeding, thinning and harvest.
2. Off-type plants should be removed and recorded.
3. Observation on diseases and pest infestation.
4. Seeds of each variety will be collected at proper time.

Estimated cost: Tk. 40,000/- per location including inputs and cultural practices.

4.1(B) Title of the experiment: Maintenance of parents of Kenaf and Mesta (KM-10B/2025)

Background and objectives: To maintain different strains already in use and to be used as parents in different experiments for breeding purposes of improved Kenaf and Mesta varieties. SDG target 2.3 by 2030, production and distribution of good quality of seed for doubling the agricultural productivity, breeding division maintains pure seed production for every year.
Expected output: True breed parents will be maintained and used in future program.
Date of initiation and duration: August 2025 to January, 2026.
Location: Manikganj and Monirampur.

Name of the investigators: A. Hasan, S.K. Biswas, M.H. Rashid, M.G. Mostofa & officers of stations.
Experimental details:

Materials:
Kenaf: KBL-51, KBL-73, KBL17-1-9 and KBL17-9-1
Mesta: SM-5, Acc.1740, VM-A and VM-B

Methods: Each advanced line will be sown in one decimal land at JAES, Manikganj and Monirampur sub-station. Proper isolation distance will be maintained from strain to strain. Any off-type (if present) should be removed carefully. Seeds will be collected on individual plot basis.

Records to be kept:
1. Date of sowing, germination, first flowering, weeding, thinning and harvest.
2. Morphological characters study and recorded.
3. Observation on diseases and pest infestation.
4. Other characters of importance as directed by the research personnel.
5. Seeds of each line will be collected separately at right time.

Estimated cost: Tk. 30,000/- per location including inputs and cultural practices.

References

Akhter A., M. M. Rahman, M. A. Khaleque, M. H. Khatun and M. A. Rabbi (2015). Physico-chemical properties, lipids, glyceride and fatty acid compositions of Mesta (*Hibiscus cannabinus* linn.) seed oil.J. Chem. Bio. Phy. Sci. Vol.5, No.2; 1101-1105.

Allard, R.W. (1999). Principles of Plant Breeding (2nd Edition), Wiley, New York

Al-Mamun, M., Rafii, M., Oladosu, Y., Misran, A. B., Berahim, Z., Ahmad, Z., Arolu, F. and Khan, M. H. (2020). Genetic Diversity among Kenaf Mutants as Revealed by Qualitative and Quantitative Traits. *Journal of Natural Fibers*, 19(11), 4170-4187. doi:10.1080/15440478.2020.1856268

Al-Mamun, M., Rafii, M. Y., Misran, A. B., Berahim, Z., Ahmad, Z., Khan, M. M. H., and Oladosu, Y. (2022). Combining ability and gene action for yield improvement in kenaf (*Hibiscus cannabinus* L.) under tropical conditions through diallel mating design. *Scientific Reports*, 12(1), 1-22. doi: 10.1038/s41598-022-13529-y

Al-Mamun, M., Rafii, M., Oladosu, Y., Misran, A. B., Berahim, Z., Ahmad, Z., Arolu, F. and Khan, M. H. (2023). Heterosis and combining ability estimate on yield and yield-related traits in a half diallel cross of kenaf (*Hibiscus cannabinus* L.) in Malaysia. *Journal of Natural Fibers*, 1-18. doi: 10.1080/15440478.2023.2192541

Anonymous (2001). Plant Breeding Techniques: An Evaluation for Organic Plant Breeding. FiBL Dossier, 1st Edition. No. 2, September 2001. https://www.eco-pb.org/fileadmin/eco-pb/documents/concept_paper/plant_breeding.pdf

C. AGRONOMY DIVISION
C I. CROP MANAGEMENT DEPARTMENT
PROGRAMME AREA: IMPROVEMENT OF CULTURAL PRACTICES

1. TITLE OF THE PROJECT: EVALUATION OF PROMISING STRAINS OR VARIETIES OF TOSSA JUTE AGAINST SEEDING AND HARVESTING TIME, POPULATION, DENSITY AND OTHER FACTORS

Objectives: To evaluate the performance of different genotypes of tossa jute of different agronomic aspects in respect of yield and quality of fibre at different agro-ecological zones.

1.1. Title of the experiment: Determination of suitable sowing time on fibre yield and yield attributes of advanced breeding lines BJC-5002 and C-2262 of white jute (CMD-1/2025)

Background and objectives: Jute is the second largest fibre crop, in terms of cultivation, after cotton. The agricultural climate of Bangladesh is very much suitable for quality fibre production (Islam and Uddin, 2019). It is a rapid growing renewable biomass and photo-reactive crop with only 120 days harvesting period (Dempsey, 1975). Jute being the most important cash crop plays a major role in agriculture and our national economy. It is one of the cheapest and economical vegetable fiber after cotton, obtained from the skin or bast of plant's stem (Islam, 2009 and 2010) It also holds an important position in the industrial sector of Bangladesh. Now a days, jute is a burning issue in our country. However, national average yield is increased from 1.59 to 2.04 tons per hectare. It is happened due to use of high yielding jute varieties and production technologies, which together contributed toward higher yield (BBS, 2015). Jute cultivation area was 10% of agricultural land area. Jute production was 26% as of all agricultural crops. For this purpose, an advanced breeding line of white jute will be tested to ascertain the optimum time of sowing for higher fibre yield.

Expected output: The study aimed to generate information to plant breeders in respect of optimum sowing time for higher fibre yield of advanced breeding line of white jute.
Location: JAES, Manikganj; RS, Rangpur and SS, Jashore
Name of investigators: M. Ahmed, K. Kader, M. Shahadat Hossain, A.T.M. Morshed Alam and officer-in-charge
Date of initiation and duration: Three years from 2023 (3rd year).

Experimental details:
Treatments:

A. Advanced breeding line/Variety	B. Sowing time
L_1 = BJC-5002	D_1 = 20 March
L_2 = C-2262	D_2 = 30 March
V_3 = CVL 1(Control)	D_3 = 10 April

Design: Randomized complete block design will be followed with three replications. Unit plot size would be 4.0m x 2.5m. Space between plot to plot and around the field will be 1.0m and between replications 1.5m.

Procedure: Harvesting must be ensured on specific dates. Seeds will be sown in line of 30 cm apart. Other standard cultural and intercultural will be followed. The crops must be harvested at specific harvesting age/time.

Records to be kept:
1. Date of sowing and harvest.

2. Plant population plot^{-1} at harvest.
3. Plant height (m) of 10 randomly selected plants at harvest.
4. Base diameter (mm) of 10 randomly selected plants at harvest.
5. Fibre weight plot^{-1} (kg).
6. Stick weight plot^{-1} (kg).

Estimated cost: Tk. 30,000/- per station × 3 Locations = 90,000/-

1.2. Title of the experiment: Effect of sowing time on fibre yield and yield attributes of tossa jute at the age of 100 days (CMD-2/2025)

Background and objectives: The land and climate of Bangladesh is very much suitable for quality fibre production (Islam and Uddin, 2019). Jute is the second largest fibre crop, in terms of cultivation and production in the world after cotton. Bangladesh is the world's second-largest producer of jute after India, and the world's largest exporter of the fibre. It is a rapid growing renewable biomass and photo-reactive crop with only 120 days harvesting period (Dempsey, 1975). Jute being the most important cash crop plays a major role in agriculture and our national economy. It is one of the cheapest and economical vegetable fiber after cotton, obtained from the skin or bast of plant's stem (Islam, 2009 and 2010) It also holds an important position in the industrial sector of Bangladesh. Now a days, jute is a burning issue in our country. Recently, government has taken steps to open some of the closed public sector jute mills and private sector has established some new jute mills because of which domestic consumption of JAFs has increased. Government of Bangladesh passed an act for mandatory use of jute goods in packaging due to ensure higher domestic consumption of jute and jute goods. Demand of jute is increasing as these are widely considered an eco-friendly product. Currently, 85 percent of Bangladesh's yearly jute fibre output comes from Tossa Jute and the remaining 15 percent from White Jute. Roughly some 5,000 tons of jute seeds are imported to Bangladesh from India a year. However, national average yield is increased from 1.59 to 2.04 tons per hectare. It is happened due to use of high yielding jute varieties and production technologies, which together contributed toward higher yield (BBS, 2015). Now a days, it is a burning issue to fix the crop duration within 100 days as it is necessary to free up the land seasonally for rice cultivation. Socially and economically jute is an important crop in the Faridpur region. Thirty-six cropping patterns were identified based on jute. It is observed that the jute-based cropping patterns covered 43.49% of net cropped area (NCA) of Faridpur region. Among them, Wheat-Jute-T. Aman cropping pattern alone occupied6.74% of the NCA covering 33,045 hectares of land area. The second prevailing Onion-Jute-Fallow covers about 25,960 hectares area which is 5.29% of the NCA. Therefore, a field experiment is designed to evaluate the yield performance of BJRI developed tossa jute varieties at the age of 100 days (O-9897, BJRI Tossa Pat 5, BJRI Tossa Pat 8 & JRO-524) in different sowing time.

Expected output: The study will provide information on yield and yield attributes of BJRI tossa jute pertaining different sowing time when it will be harvested at the age of 100 days.

Name of investigators: M. Ahmed, K. Kader, M. Shahadat Hossain, A.T.M. Morshed Alam and officer-in-charge.

Location: Manikgonj, Rangpur and Jashore.

Duration: Three years from 2023 (3rd year)

Treatments

A. Variety	**B. Sowing date**
V_1 = BJRI Tossa Pat 9	D_1= 20 March
V_2 = BJRI Tossa Pat 8	D_2= 5 April
V_3 = O-9897	D_3= 20 April
V_4 = JRO-524	

Design: A randomized complete block design will be followed with three replications. Unit

plot size would be 4m x 2.5m. Space between plot to plot and around the field will be 1.0m and between replications 1.5m.

Procedure: Sowing must be ensured on specific dates. Seeds will be sown in line of 30 cm apart. Other standard cultural and intercultural practices will be followed. The crops will be harvested at the age of 100 days or the field duration of the crops will be 100 days.

Records to be kept:

1. Date of sowing and harvest.
2. Plant population plot^{-1} at harvest.
3. Plant height (m) of 10 randomly selected plants at harvest.
4. Base diameter (mm) of 10 randomly selected plants at harvest.
5. Fibre weight plot^{-1} (kg).
6. Stick weight plot^{-1} (kg).

Estimated cost: Tk. 30,000/- per station × 3 Locations = 90,000/-

1.3. Title of the experiment: Effect of high-density plant population (HDPP) against practicing line sowing in jute cultivation (CMD-3/2025)

Background and objectives: Jute (*Corchorus spp*.) is the principal cash crop in Bangladesh. Fibre produced from the plant's bark is usually called "jute." Jute plays a significant role in the economy of Bangladesh. Jute and jute-related exports contribute up to 8–10% of the nation's foreign exchange earnings. (BBS, 2022). The increasing demand for jute fibre and its value-added products around the world can only be met by increasing productivity (Kumar *et al.,* 2014). A high plant population favours a high yield of long-bast fibres for the textile industry (Amaducci *et al.,* 2002). A significant difference was observed due to the plant population among three varieties of tossa jute. Among them, the highest plant population was found in BJRI Tossa pat 9, the second highest plant population was found in BJRI Tossa pat 7 and, the lowest plant population was found in JRO-524(Ahmed *et al.,* 2023). For hemp fibre production, the proportion of stem in the total dry matter increased with increasing plant density and stem yield was maximum at 90 plants m^{-2} (Van der Werf *et al.,* 1995). White breeding jute BJC 5003 gave height fibre yield when its plant population was higher per square meter (Hossain *et al.,* 2015).

Wider space produces high-quality fibre. The highest fibre yield was found in the spacing (20×10) (Masum *et al.,* 2011). Low profitability from jute farming, declining jute area and negligible pulse area are the rising concerns of farmers of the Indo-Bangla subcontinent. Intercropping mungbean with jute using 3× 3× 3 spacing was found productive and profitable compared to sole cropping. Land equivalent ratios (LER) and area × time equivalent ratios (ATER) exceeded unity(Chakraborty *et al.,* 2022). Intercropping of black gram (Vigna mungo) for fodder in the widely spaced jute seed crop increased the jute seed equivalent yield by 31.3% (from 3.48 q to 4.57 q ha-1). Rice bean (Vigna umbellata) as intercrop in jute seed crop can also improve the JSEY by 30.5% (from 3.48 q to 4.54 q ha-1). Cowpea and green gram as intercrop in jute seed crops also increased the JSEY by 15.8 and 15.2 %, respectively(Okunlola & Ofuya, 2013). A higher plant population produces higher fibre. So, there is a huge scope to increase fibre production by maximizing plant population in per unit area. There is very little or no information on HDPP with wider gap between one set of HDPP and other set HDPP. It is necessary to find a sustainable planting system to increase the number of plants per unit area for higher fibre production. Our practising planting system produces 35-40 plant m^{-2} (Ahmed et al., 2023). This present study has taken to increase the number of plant population per unit area for higher fibre production. Our proposed planting method will produce a higher plant population and it will create broader gap between HDPR-to-HDPR which will ensure proper land use efficiency. At the same time, this planting method will create a new era for intercrops with jute.

Expected output:
i) The Number of plant populations per unit of land will be increased.
ii) Land use efficiency per unit area will be increased.
iii) Opportunity for intercropping in the jute field will be maximized.
iv) Weed management systems will be easier.

Location: JAES, Manikganj; SS, Jashore and Tarabo.
Name of investigators: M. Ahmed, Kader, M. Shahadat Hossain, A.T.M. Morshed Alam and officer-in-charge.
Date of initiation and duration: Three years from 2024 (2nd Year)
Experimental details
Treatments:

Planting Method	Variety
P_1 = Practicing line sowing (Control)	i) V_1= BJRI Tossa Pat 8
P_2 = Two-lines with 50cm gap planting method	ii) V_2= BJRI Tossa pat 9
P_3 = Three-lines with 55cm gap planting method	
P_4 = Four-lines with 75cm gap planting method	

Design: A randomized complete block design will be followed with three replications. Unit plot size would be 4.0m x 2.5m. Space between plot to plot and around the field will be 1.0m and between replications 1.5m.

Procedure: Sowing should be done in the last week of March and harvesting must be ensured on proper maturity. Seeds will be sown in lines 10 cm apart between two rows and after two rows 50cm space should be ensured in case of the two-row planting method. Similarly, seeds will be sown in lines 10 cm apart among three rows and after three rows 55cm space should be ensured in case of the three-row planting method. Again, seeds will be sown in lines 10 cm apart among four rows and after four rows 75cm space should be ensured in case of the four-row planting method. For control, the existing BJRI recommended planting method for line sowing should be followed. Other standard cultural and intercultural will be followed. Fertilizer doses and seed rate should be maintained accordingly to design.

Records to be kept:
1. Date of sowing and harvest.
2. Plant population plot^{-1} at harvest.
3. Plant height (m) of 10 randomly selected plants at harvest.
4. Base diameter (mm) of 10 randomly selected plants at harvest.
5. Fibre weight plot^{-1} (kg).
6. Stick weight plot^{-1} (kg).

Estimated cost: Tk. 30,000/- per station × 3 Locations = 90,000/-

1.4. Title of the experiment: Field evaluation and optimization of sowing date for climate-resilient white jute production under changing weather patterns (CMD-4/2025)

Background and objectives: Jute is the important fibre crop and the main cash crop in Bangladesh as well as the world. Jute plant improves soil productivity by its massive leaf fall and root proliferation in the field (Islam and Ahmed, 2012). Jute (Corchorus spp.) is an important natural fiber crop widely cultivated in tropical and subtropical regions. Among the two primary species, *Corchorus capsularis* (white jute) and *Corchorus olitorius* (tossa jute), white jute is valued for its fine fiber quality, early maturity, and adaptability to diverse agro-

climatic conditions (Haque et al., 2015). The development of improved jute varieties through breeding programs plays a crucial role in enhancing yield potential, fiber quality, and stress tolerance. Sowing date is a critical agronomic factor influencing the growth, development, and yield of white jute. Optimal sowing time varies by region and climatic conditions, with earlier sowing generally promoting higher fiber yield and better plant establishment (Rahman et al., 2019). Breeding lines serve as the foundation for developing superior jute cultivars with desirable agronomic traits. These lines are developed through systematic selection, hybridization, and evaluation under various environmental conditions (Islam et al., 2017). The identification and utilization of breeding lines contribute significantly to increasing productivity and sustainability in jute farming. Appropriate time of sowing is an important agronomic practice which deals with the increment of yield. Therefore, an experiment was undertaken to determine the optimum date of sowing for fibre production of white jute Breeding line at different locations of Bangladesh with the objectives: to identify high-yielding and climate-resilient breeding lines of white jute, to determine the suitable sowing date for maximizing fiber yield and environmental adaptability and to enhance jute productivity by identifying high-yielding breeding lines and optimum sowing date for different agro-climatic conditions.

Expected output: High-yielding and climate-resilient breeding lines and suitable sowing date for higher yield and environmental adaptability of white jute will be screened.
Date of initiation and duration: March, 2025 to 2028 (1st year)
Name of Investigators: Kamilia Kader, M. Ahmed, M. Shahadat Hossain and A.T.M. Morshed Alam
Locations: Manikganj, Rangpur, Chandina
Materials and Methods:
Design: RCBD, **Replication:** 3, **Plot size**: 4 m × 2.5 m (10 m^2).
Treatments:

Factor A: Planting Method	**Factor B: Sowing Date**
T_1 = CVL-1	S_1 = 15 March
T_2 = C-2262	S_2 = 30 March
T_3 = C-2234	S_3 = 15 April

Data will be kept:
1. Plant population m^{-2} at harvest.
2. Plant height (m) of 10 randomly selected plants at harvest.
3. Base diameter (mm) of 10 randomly selected plants at harvest.
4. Fibre weight (t ha^{-1}).
5. Stick weight (t ha^{-1}).

Estimated cost: Tk. 90,000 (3 Locations)

2. TITLE OF THE PROJECT: FIBER YIELD AND YIELD ATTRIBUTES OF KENAF AS AFFECTED BY VARIETY AND STAGE OF HARVEST

No Experiment

3. TITLE OF THE PROJECT: SEED YIELD AND YIELD ATTRIBUTES OF JUTE, KENAF & MESTA AS AFFECTED BY WEED MANAGEMENT, DATE OF SOWING AND STAGE OF HARVEST

Objectives: To evaluate the performance of different advanced genotypes of vegetable Jute & kenaf of different agronomic aspects in respect of yield and quality of fibre at different agroecological zones.

3.1 Title of the experiment: A study on the influence of sowing dates and spacing on seed yield and yield attributes of BJRI Deshi Pat Shak 1 (CMD-5/2025)

Background and objectives: Jute (Corchorus sp.) is also consumed as a leafy vegetable in many parts of the world (Daniel et al., 2014). Leaves of two cultivated jute species, C. olitorius L. and C. capsularis L. are used as vegetables (Furumuto *et al.,* 2002) mainly as a by-product of thinning jute fields at the seedling stage (Choudhary *et al*., 2013). The plant parts are palatable and have high nutritional value, containing lipids, protein, crude fiber, carbohydrate, vitamins (A, C, E) and the minerals calcium, sodium, potassium, phosphorus and iron (Choudhary *et al*., 2013; Dansi et al., 2008; Grubben and Denton, 2004; Odhav *et al*., 2007; Steyn *et al.,* 2001). Moreover, leafy vegetables are scarce in the market during early summer in Bangladesh. Jute can be an additional source of vegetables in this season. Jute is grown in about 0.8 million hectares of land by about 3.5-4.0 million farmers. To cultivate that amount of land, it requires about 5000 to 5500 tons of seed. One of the most important problems for jute production in Bangladesh is the no availability of quality seed at optimum time of sowing. Only about 15% - 20% quality jute seeds are supplied by institutional sources the Bangladesh Agricultural Development Corporation (BADC) but the rest of the seeds are produced and managed by the farmers themselves (Islam, 2009). Roughly some 5,000 tons of jute seeds are imported to Bangladesh from India a year. However, national average yield is increased from 1.59 to 2.04 tons per hectare. It is happened due to use of high yielding jute varieties and production technologies, which together contributed toward higher yield (BBS, 2015). Jute cultivation area was 10% of agricultural land area. Jute production was 26% as of all agricultural crops. (IJSG, 2012) Bangladesh Jute Research Institute (BJRI) has successfully developed a variety for vegetable purposes, which has full green broad leaf without a bitter taste with high nutritional value. Therefore, the determination of appropriate sowing date and spacing for quality seed production of evolved variety BJRI Deshi Pat shak-1 is a burning issue.

Expected output: The study aimed to generate information in respect of appropriate sowing time and spacing for higher seed yield of BJRI Deshi Pat shak-1

Location: Manikganj, Rangpur and Jessore

Name of investigators: M. Ahmed, K. Kader and officer in charge

Date of initiation and duration: Three years from 2023 (3rd year).

Experimental details:

Treatments:

A. Spacing	B. Sowing date
S_1 = 30 cm x 20 cm	D_1 = 1 August
S_2 = 35 cm x 20 cm	D_2 = 15 August
S_3 = 40 cm x 20 cm	D_3 = 30 August

Variety: BJRI Deshi Pat shak-1

Design: Randomized complete block design will be followed with three replications. Unit plot

size would be 4.0m x 2.5m. Space between plot to plot and around the field will be 1.0m and between replications 1.5m.

Procedure: Sowing must be ensured on specific dates. Seeds will be sown by maintaining specific spacing. Other standard cultural and intercultural practices will be followed. The crop will be harvested at 70-80% seed maturity level.

Records to be kept:

1. Date of sowing and harvest.
2. Plant population plot-1 at harvest.
3. No. of branches per plant of randomly selected 10 plants.
4. No. of pods per plant of randomly selected 10 plants.
5. No. of seeds per pod of randomly selected 10 pods.
6. 1000 Seed weight plot-1 (g).
7. Seed weight plot-1 (kg).

Estimated cost: Tk. 30,000/- per station × 3 Locations = 90,000/-

3.2. Title of the experiment: Agronomic investigation on the study of de-topping practice for maximizing seed yield of BJRI Tossa Pat 9 (CMD-6/2025)

Background and objectives: Jute is both cash and natural fiber producing crop of Bangladesh Bangladesh is the world 1st jute fiber producing country (Islam, 2007), where about 8.39 million tons of jute fibre were produced from 10.89 million acre of land and covered about 2.80% of the total cropped area and accounted for about 5 - 6% export earnings (BBS, 2021). Seed is the basic input for agricultural production. Quality seeds of an improved variety itself provide 20% additional yield of the crop (Hossain *et al*., 1994). Bangladesh requires about 5500-6000 tons jute and kenaf seeds in every year, of which only 10-15% is produced and distributed by the BADC (Ali *et al*., 2003). BADC is the only public sector of the country which produces and distributes to the growers. On the other hand, jute seed production areas are decreasing at an alarming rate due to unavailability of land. As a result, every year a huge amount of tossa jute and kenaf seeds are introducing through official and unofficial trades from neighboring country. Unofficial imports of jute and kenaf seed have no guarantee of its quality and are one of the major causes of low yield (Islam, 2009). The major challenge to increase seed production is the shortage of land for jute and kenaf seed cultivation. De-topping is a technique to increase branching of a plant through which jute seed yield may increase. Bangladesh Jute Research Institute (BJRI) had released an improved variety of quick growing, high-yielding and quality fiber of tossa jute (Corchorus olitorius L.) namely 'BJRI Tossa pat 9 (Sobuj Sona)' in March 2023. Seed production of jute variety can be increased through improved agronomic management including de-topping. De-topping is a technique where apical bud is removed to release the lower auxiliary buds from apical dominance for increasing the branches and stimulating development of auxiliary bud in each plant (Mollah *et al*., 2017). De-topping not only increase the number of plant branches but also increase number of flowers, fruits and seed yield (Mollah *et al*., 2015). Several reports showed that de-topping is effective to increase yield of maize, rice, jute seed and kenaf seed (Bhargavi *et al*., 2017; Mollah *et al*., 2015; Usman *et al*., 2007). However, this experiment is designed to find out the effect of de-topping on the jute seed yield.

Objectives:

To find out the suitable plant age for de-topping

To find out the appropriate spacing for the method and

To obtain maximum seed yield

Research Methodology:
Locations: Cumilla, Manikganj and Rangpur
Name of the investigators: K. Kader, M. Ahmed, M. Y. Sarker, M. Shahadat Hossain and A.T.M. Morshed Alam
Duration: Three years from 2024 (2nd)
Varaity: BJRI Tossa pat 9
Experimental details:
Treatments:

FactorA: Ages of de-topping	**Factor B: Planting Spacing**
D_0 = No de-topping (control)	S_1= 25 cm × 15 cm
D_1= 35 DAS	S_2= 30 cm × 15 cm
D_2 =45 DAS	S_3= 35 cm × 15 cm
D_3 =55 DAS	

Design: RCBD will be followed with three replications. The size of each unit plot would be 4m x 2.5m. Space between plot to plot and around the field will be 1.0m and between replications 1.5m.
Procedure: The experimental plot will be prepared first according to the design. Sowing should be done in July depending on environmental conditions. Plant age and spacing for de-topping will be strictly followed as per treatments. BJRI Tossa Part 9 will be used as a variety for this experiment. Standard cultural and intercultural practices will be followed as per BJRI's recommendation.

Records to be kept:
1. Date of sowing and harvest
2. No. of plant population after final thinning and at harvest.
3. Plant height (m) of 10 randomly selected plants from each plot at harvest.
4. No. of branch
5. No of pod/plant
6. No of seed/pod.
8.1000 seed weight.
9. Seed yield /plot

Estimated cost: Tk. 30,000/- per station × 3 Locations = 90,000/-

4. TITLE OF THE PROJECT: YEAR-ROUND VEGETABLE JUTE PRODUCTION

No Experiment

5. TITLE OF THE PROJECT: COST REDUCTION THROUGH MANIPULATION OF CULTURAL PRACTICES

5.1 Title of the experiment: Development of integrated weed management technology for jute cultivation (CMD-7/2025)

Background and objective: Jute (*Corchorus spp*) is a fibre crop of the Tiliaceae family with two cultivated species- *Corchorus capsularis* L. and *Corchorus olitorius s* L. Jute is the important fibre crop and the main cash crop in Bangladesh as well as the world. It is an important vegetable fiber and eco-friendly material for environment, jute fiber is also the cheapest vegetable fiber and it helps to make best quality industrial yarn, fabric, net, etc. Jute plant improves soil productivity by its massive leaf fall and root proliferation in the field (Islam and

Ahmed, 2012). Because a lot of economic importance in home and abroad as natural fiber with golden color and silky shine, completely biodegradable, most important fibre crop as well as cash crop with numerous environmental advantages jute is called the Golden fiber of Bangladesh. It has also much advantages over synthetics and protects the environment and maintains the ecological balance (Islam and Ahmed, 2012). Now-a-days more than 280 different types of jute goods are producing from jute those are exported to the different countries in the world (Proggaypon. 2020). In the country internal consume accelerate day by day through implementing mandatory Packaging Act-2010 included paddy, rice, wheat, maize, sugar, fertilizer, chili, turmeric, onion, ginger, garlic, pulses, coriander, potato, ata, flour, tush-khud-kura. For the versatile utilities of jute especially on environmentally improved effect demand of jute in home and abroad also is increasing day by day surprisingly in the recent years. Physical or mechanical weed management is now time consuming and laborious. Use of chemical herbicides in management of weed flora is getting prime importance day by day (Mukherjee, 2013). But it is not environment friendly. So Integrated weed management (IWM) is now very important for successfully jute production. IWM can be defined as the integration of more than one approach involving cultural, physical, biological, and chemical methods (Harker and O'Donovan 2013). It consists of both chemical and nonchemical approaches and focuses on keeping weed populations below a certain threshold level by optimizing control measures in a strategic and holistic way (Wilkerson *et al*., 2002). Herbicides are used as a last resort in IWM. It is integration of all possible measures with all other available technologies in compatible and effective manner to control the weeds by the most economical means, while posing the least possible risk to the human being and environment. It is a system that in the context of the associated environment and population dynamics of weed species, utilizes all suitable techniques and methods to maintain weed population below the economic injury level (Labrada and Parker, 1994). Therefore, this research programme will be conducted to find out the effect of integrated weed management (IWM) package combining agronomic practices with suitable chemical weed control methods along with other practices, to combat composite weed problem for sustainable jute cultivation in Bangladesh.

Expected output: Integrated weed management technology will be developed for jute cultivation

Date of initiation and duration: March, 2025 to August, 2028

Name of Investigators: M. Shahadat Hossain, M. Ahmed. Kamilia Kader and A.T.M. Morshed Alam

Locations: Manikganj, Rangpur, Faridpur and Dinajpur

Materials and Methods:

Design: RCBD, **Replication:** 3, **Plot size**: 4 m × 2.5 m (10 m^2).

Treatments:

	Weed management techniques
T_1	Hand weeding (HW) at 15 DAS + HW at 30 DAS + HW at 45 DAS
T_2	Spray Whip super and Sunrise through mixture at 10 DAS + Raking at 25 DAS + HW at 45 DAS
T_3	Spray Sunrise and Whip super separately at 10 DAS + Raking at 25 DAS + HW at 45 DAS
T_4	Control (no weeding)

Procedure: Considering critical period of weed competition (CPWC) will be 19-59 days of sowing. Seed rate 6 kg ha^{-1} with line to line spacing 20 cm; nitrogen dose 115 kg ha^{-1} with 3 splits of application at $1/3^{rd}$ as basal dose, $1/3^{rd}$ at 25 DAS and $1/3^{rd}$ at 45 DAS will be applied as cultural practice components of the integrated weed management (IWM) technology. Hand weeding and raking will be applied as physical and mechanical practice and early post

emergence selective herbicides Whip super 9 EC (Fenoxaprop-p-ethyl) and Sunrice 150 WG (Ethoxysulfuron) will be applied as per treatment as chemical practice one of the components of the IWM technology. BJRI Tossa Pat 9 (Sobuj Sona) will be used as the plant material in the study. As the standard prescription of BJRI, each of the plots was fertilized with TSP, MoP, gypsum and zinc sulphate @ 50, 60, 95 and 11 kg ha^{-1} were broadcasted at the time of final land preparation as basal dose. Only urea 250 kg ha^{-1} for 115 kg N ha^{-1} will be applied as cultural practice through 3 splits of application. Different intercultural operations and plant protection measures will be maintained as and when necessary.

Summed dominance ratio (SDR): Dominant weed species were identified using the summed dominance ratio (SDR) computed as follows (Janiya and Moody, 1989):

$$\text{SDR of a weed species} = \frac{[\text{Relative density (RD)} + \text{Relative dry matter (RDM)}]}{2}$$

Where,

$$\text{RD (\%)} = \frac{\text{Density of a specific weed species}}{\text{Total weed density}} \times 100$$

$$\text{RDM (\%)} = \frac{\text{Dry matter of a specific weed species}}{\text{Total weed dry matter}} \times 100$$

Percent yield increase over control: Percent yield increase over control (YOC) was calculated as:

$$\text{YOC (\%)} = \frac{(\text{Treatment plot yield} - \text{Weedy check plot yield})}{\text{Weedy check plot yieldDMC}} \times 100$$

Where, DWC = dry weight of weeds in weedy check plots
DWT = dry weight of weeds in treated plots

Data will be kept:

Growth, yield parameters and yield data

1. Plant population m^{-2} at harvest.
2. Plant height (m) of 10 randomly selected plants at harvest.
3. Base diameter (mm) of 10 randomly selected plants at harvest.
4. Fibre weight (t ha^{-1}).
5. Stick weight (t ha^{-1}).

Weed related data

7. Identification of weed species at 30 and 50 DAS twice.
8. Population of weed (no. m^{-2}) at 30 and 50 DAS twice.
9. Dry weight of weed (g m^{-2}) at 30 and 50 DAS twice.
10. Weed control efficiency
11. Summed dominance ratio (SDR), 12. Cost analysis

Phytotoxic data

12. Visual phytotoxicity (leaf yellowing, burning of leaf tip, stunting growth)
13. Degree of phytotoxicity (no toxicity, slight toxicity, moderate toxicity, severe toxicity,toxic plants kill)

Estimated cost: Tk. 1,20,000.00 (3 Locations)
Remarks: New experiment

5.2 Title of the Experiment: Study on the activities of weedicide samples for weed control in jute cultivation (CMD-8/2025)

Background & objective: Jute is an upland crop grown in the summer season in Bangladesh. It is the most important fibre crop as well as the cash crop of the country. Weed is one of the most important pests in jute which deteriorates the yield and quality of fibre to a considerable extent. Weeds affect light interception and passing of wind and affect photosynthesis in jute

plants and ultimately crop will receive stunted growth as a consequence yield of the crop will be reduced (Islam, M.M. and Rahman,2008), (Kundu,1959). The hot and humid environment in summer is highly favourable for weed germination and weed growth. As a result, weeding and thinning operations involve about 40% or more of the labour cost investment in jute cultivation. In Bangladesh, weeds are generally controlled by raking and niri (hand weeding) and weeding and thinning operations involve about 50% or more of the labour cost (Alam,2003). An effective weed management practice is necessary for higher crop production and better economic return (Gaffer *et al.,* 1988). Weedicide has effectiveness in terms of weed control in jute field. Different times Department of Agricultural Extension (DAE) submitted new weedicide at BJRI for field trials. Between crop plants and weeds factors for composition are chiefly water, light and mineral nutrients (Talukder, 1978). Therefore, a routine weedicide field trial experiment will be undertaken in different AEZ for Jute fibre production.

Expected output: Information will be generated about weedicides and their performance.
Location: JAES, Manikganj and RS, Tarabo at jute fibre production season.
Name of investigators: M. Ahmed, K. kader, M. Shahadat Hossain and A.T.M. Morshed Alam
Date of initiation and duration: Two years from 2025.

Experimental details:
Treatment:

SL.	Chemical Name	Weedicides	Target Weeds	Dose/ha
W_1	Quizalopfop-p-ethyl 5EC	Quisel 5EC, Agrisel Bangladesh	*E. colonum, C. rotundus, E. crusgalli D. sanguinalis*	650g/ha
W_2	Glufosinate-ammonium 30%	Super Fast 30SL, ORIENT IN. CHEMICAL CO. Internation	*E. colonum, D. sanguinalis C. diformis*	3L/ha
W_3	Quizalopfop-p-ethyl 5%	Queenfop 5EC, Century Agro Ltd.	*E. colonum D. sanguinalis*	650ml/ha
W_4	Ethoxy sulfuran 15 WDG	Duplex 15% WDG, Progress Agro Ind.	*A. rotundus,*	200gm/ha
W_5	Pendimethylin	Grande 38.7 CS, ACI Faormulation Ltd.	*P. distichum D. sanguinalis C. colonum C. rotundus*	650 ml/ha
W_6	2, 4-D Amine	Faro 72SL, Sotota Agro Saci.	*E. crusgali C. dactyion C. rotundus M. vaginalis*	20-25 ml/10 water/ha
W_7	Bensulfuranmethyl 4% + Acetochlor 14% wp	Labour 18 wp, Zim AGRO	*C. diformis E. colonum D. sanguinalis*	300gm/ha
W_8	Quizalopfop-p-ethyl 15% EC	Pran Out 15 ECPran Agro Ltd.	*E. colonum D. sanguinalis E. crusgali*	500ml/ha
W_9	Penoxsulam 3% + Cyhalofop-butyl 15%	Voice 18 OD, Genetica Industries Ltd.	*E. colonum D. sanguinalis*	2000ml/ha
W_{10}	Bensulfuranmethyl 4% + Acetochlor 14% wp	Arib 18 WP, Raindrop Crop Care	*E. crusgali*	750gm/ha
W_{11}	Quizalopfop-p-ethyl 5% W/W	Cleanflop 5EC, X-part Crop Solution	*E. colonum D. sanguinalis*	1000ml/ha
W_{12}	Quizalopfop-p-ethyl 5%	Kinzal 5 EC, Greentech	*E. crusgali C. rotundus*	650ml/ha
W_{13}	Glufosinate Ammonium 30%	Entrust 30 SL, M.M. INTERNATIONAL	*D. sanguinalis*	2.5L/ha

W_{14}	Bensulfuranmethyl 14% + Acetochlor 4% wp	Hitter 18 WP, M.S INTENSIVE CROP CARE	*S. juncoides* *E. fluctuans* *L. anagallis* *M. vaginalis* *S. zeylanica*	700gm/ha
W_{15}	Quizalopfop-p-ethyl 5%	Uzzalafop 5 EC, Utsa Crop Care	*E. colonum* *D. sanguinalis*	650 ml/ha
W_{16}	Quizalopfop-p-ethyl 5 EC	Lopat 5 EC, Blessing Agrovet Ins. Ltd.	*E. colonum* *D. sanguinalis*	1000 ml/ha
W_{17}	Quizalopfop-p-ethyl 5 % w/w	Clean Shot % EC, Basic Crop Care	*E. colonum* *D. sanguinalis*	1000ml/ha
W_{18}	Bensulfuron + Acetochlor	D-Suf 18 wp, Draupadi Bala Crop Care	*E. crusgalli*	750gm/ha
W_{19}	Glufosinate Ammonium	Gluset 20 SL, Defense Agro Care	*E. colonum* *D. sanguinalis*	600ml/ha
W_{20}	Glufosinate Ammonium + Oxyfluorefen	Clean Herb 39 SC, Seed Link	*E. colonum* *D. sanguinalis*	300ml/ha
W_{21}	Bensulfuron + Acetochlor	Astha 18 wp, Anabia Agro Ltd.	*E. colonum* *D. sanguinalis*	750ml/ha
W_{22}	Bensulfuron + Acetochlor	Kylian 18 wp, Max crop care	*E. crusgalli*	750ml/ha
W_{23}	Atrazine 13.2% + Dicamba 25.2%	Nactrazin 38.4SC	*E. colonum* *D. sanguinalis* *E. crusgali* *C. rotundus*	1.5 l/ha
W_{24}	Control (No weedicide)			

Design: A randomized complete block design will be followed with three replications. Unit plot size would be 4m x 2.5m. Space between plot to plot and around the field will be 1.0m.

Procedure: Seeds will be sown in line of 30 cm apart. Other standard cultural and intercultural practices will be followed. The crops will be sown on mid-March at Manikganj and last week of March at Tarabo. Weedicides will be sprayed 10-15 days after sowing or 2/3 leaves stage of weeds. After 20-30 days after spraying of weedicide data will be collected. BJRI Tossa Pat-8 will be used as variety.

Records to be kept:

1. Date of sowing, weedicide spray, data collection and harvest.
2. Identification of weed species at 20 days after spraying.
3. Number of weeds and fresh weight of specific weed per m^2 at 20-30 days after spraying.
4. Plant population $plot^{-1}$ at harvest, plant height (m), base diameter (mm) of 10 randomly selected plants at harvest, fibre and stick yield $plot^{-1}$ (kg).

Estimated cost: Tk. 20,000/- per station × 2 Locations = 40,000/-

References

Abeysiriwardena D.S., S.N. Jayanwardena, K.D.S. Kiriwaththuuduwage and S.W. Abeysekara (2005). Potential of broadcasting for making savings in seed, water and labour in irrigated rice production systems in Sri lanka. In: NATIONAL RICE PROGRAMMES, 2005. International Rice Research Institute. Pp 79-82.

Ahmed, I., M.S. Hossain, M.M. Islam, A.T.M.M. Alam and M.J. Alam. 2010. Effect of sowing dates on yield and yield attributes of tossa jute(o-795) in different locations of Bangladesh.J. Expt. Biosci.1(2):37-40.

Alam, A.T.M.M. (2003). Present status and future strategies of weed management in jute field.

Jute and Jute Fabrics, Bangladesh. Newsletter of Bangladesh Jute Res. Inst.January-March. p. 4-6.

Alam, M.A., Jannatul, F., Debnath, M.R., Hossain, M.S. and Islam, M.M. (2019). Reduction of Production Cost of Jute (BJRI Tossa Pat 5) as Influenced by Urea Top Dressing Dose and Period. Research Journal of Food and Nutrition Volume 3, Issue 3, 2019, pp 1-5.

Asaduzzaman, M. et. al 1991. Comparative studies if jute retting in water from different sources,B.J. Fib. Res.16(1&2):15-18.

Baeumer, k. and W.A.P. Bakermans (1973). Zero-tillage. Adv. Agron., 25(77):123.

BARI.1991-1992.Annual report, Gazipur -1701

BBS. 2015. Yearbook of Agricultural Statistics of Bangladesh. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.

Begum, S. A., Zaman, M. S. and Khan, A. S. M. M. R. 2015. Intercropping of root crops with chilli in charlandd of Mymensingh. ProgressiveAgriculture. 26: 109-114. (http://www.banglajol.info/index.php/PA).

Chakraborty A, Sarkar D, Satya P, Karmakar P and Singh N (2015) Pathways associated with lignin biosynthesis in lignomaniac jute fibres.Molecular Genetics and Genomics 290, 1523-1542.

Charles, L.W., Harban, L., Bhardwaj and Venito, K. B. 2002. Kenaf production: fiber, feed and seed. p. 104. In Janick, J. and Whipkey (eds.) Trends in new crops and new uses: ASHS Press

Choudhary, S.B., H.K. Sharma, P.G. Karmakar, A.A. Kumar, A.R. Saha, P. Hazra, and B.S. Mahapatra. 2013. Nutritional profile of cultivated and wild jute (Corchorus) species.Aust. J. Crop Sci 7(13):1973–1982.

Dansi, A., A. Adjatin, H. Adoukonou-Sagbadja, V. Faladé, H. Yedomonhan, D. Odou, andB. Dossou. 2008. Traditional leafy vegetables and their use in the Benin Republic. Genet.Resour. Crop Evol. 55:1239–1256. doi: 10.1007/s10722-008-9324-z.

Das M, Banerjee S, Topdar N, Kundu A, Mir R, Sarkar D, Sinha M, BalyanH and Gupta P (2012) QTL identification for molecular breeding of fibreyield and fibre quality traits in jute.Euphytica 187, 175–189.

Dewan1 M. M. R., Harun Ar Rashid M., Nasim M. and Shahidullah S.M. (2017). Diversity of Crops and Cropping Systems in Jessore Region. Bangladesh Rice J. 21 (2): 185-202.

Ferdous, J., M.S. Hossain, M.A. Alim and M.M. Islam. 2020. Effect of weeding and herbicide management on fibre yield and yield attributes of tossa jute. Bangladesh Agronomy Journal. 23(1): 101-106.

Fukai, S. and B.R. Trenbath 1993. Process determining intercrop productivity and yields of component crops. Field Crops Res. 34: 247-271.

Furumuto, T., R. Wang, K. Okazaki, F.A. Hasan, and I.M. Ali. 2002. Antitumor promoters inleaves of jute (Corchoruscapsularis and Corchorusolitorius). Food Sci. Technol. Res. 8(3):239–243. doi: 10.3136/fstr.8.239.

Gaffer, M. A., T. M. T. Iqbal and M. S. Alam. 1988. "Weed and Seed" (in Bengali). Published by T. M. Jubair Bin Iqbal, Village- Monipotal, P.O. Meghai, Sirajganj. Pp. 221-238.

Ghosh, R.L.M and J.S. Patel.1945 Jute breeding experimental technique.*Agric.Res.Bull.,* 2.

Gomez, K. A. and A.A. Gomez. 1984. Statistical Procedures for Agricultural Research. Second Edn. John Wiley and Sons Inc., New York. pp. 97-111 and 304-307.

Gomez, K. A. and Gomez, A. A. 1984. Statistical Procedures for Agricultural Research. Second Edn. John Wiley and Sons. New York. Chichester, Brisbane, Toronto, Singapore. 680 P.

Grubben, G.J.H., and O.A. Denton. 2004. Plant resources of tropical Africa 2. Vegetables.PROTA Foundation, Wageningen, The Netherlands.

Gupta AP, Antil SR and Narwal PR. 1988. Effect of farm yard manure on organic carbon, available N and P contents of soil during different periods of wheat growth. *Journal of the Indian Society of Soil Science*. 36:269-273

Haque, M. S., et al. (2015). Genetic Variability and Correlation Study in Jute." Journal of Agricultural Sciences, 10(2), 45-52.

Harker, K. N and O'Donovan, J. T. 2013. Recent weed control, weed management, and integrated weed management. *Weed Technology.* **27:**1-11.

Hiron, N., Alam, N., Ahmed, F. A., Begum, R. and Alam S. S. 2006. Differential Fluorescent Banding and Isozyme Assay of *Hibiscus cannabinus L.* and *H. safdariffa L.* (Malvaceae). Cytologia. 71(2): 175-180.

Hossain, M. S., Islam, M. M., Ahmed, I., Alam, A.T.M.M. and Bhuiyan, M.S.H. 2012. Identification of species, density evaluation and green weight of weeds in tossa jute (Corchorus olitorius L.) growing areas of Bangladesh. Bangladesh J. Weed Sci. 3 (1 & 2): 19-24.

Hossain, M.S., M.M. Islam, I. Ahmed, M.S. Rahman and M.L. Rahman. 2015. Effect of sowing dates on fibre yield and yield attributes of white jute breeding line bjc-5003 at different locations of Bangladesh. Int. J. Sustain. Agril. Tech. 11(8): 01-06.

Hsieh C, Hsu KN, Hsieh CF and Hsu KN. 1996. Anxperiment on the organic farming of broccoli. Bulletin of Taichung District Agriculture Improvement Station. No.53 (35-40):18

https://climateknowledgeportal.worldbank.org/country/bangladesh/climate-data-historical

Islam, M. M. and M. Rahman. 2008. In: Hand book on agricultural Technologies of Jute, Kenaf and Mesta crops. Bangladesh Jute Research Institute, Manikmia Avenue, Dhaka-1207, Bangladesh. p.92.

Islam, M. M., et al. (2017). Breeding Strategies for High Yield and Quality Fiber in Jute. Plant Breeding and Genetics Journal, 12(3), 78-90.

Islam, M. S. and Ahmed, S. K. 2012. The Impacts of Jute on Environment: An Analytical Review of Bangladesh. *Journal of Environment and Earth Science.* **2(5):** 24-32.

Islam, M. S. and Ahmed, S. K. 2012. The Impacts of Jute on Environment: An Analytical Review of Bangladesh. *Journal of Environment and Earth Science.* **2(5):** 24-32.

Islam, M.M. (2010). Technological asvances in off-season jute seed production. J. Expt. Biosci., 1(1), 75-82.

Islam, M.M. 2009. In: Jute seed technology. 1st edition. Pub. by Md. Mahmudul Islam, 397, Middle Monipur, Mirpur, Dhaka- 1216. College Gate Book Binding and Printing, Mohammadpur, Dhaka. 160p.

Islam, M.M. and N. Uddin. 2019. Research and Development Advances of Jute Seed in Bangladesh: A Review, Haya Saudi J Life Sci., 4(2): 52-68.

Islam, M.M., & Rahman, M.M. (2008). Hand book on agricultural technologies of jute, kenaf and mesta crops. Bangladesh Jute Research Institute (BJRI), Dhaka.

Islam, M.M., K. R. Haque, A.A. Miah, N. Nuruzzaman and M.A. Rahman. 2010. Response of stage of harvest to yield, yield components and quality of jute fibre. B. J. Jute Fib. Res. 20(1): 9-15.

Karmegam N and Danial T. 2008. Effect of vermicompost and chemical fertilizer on growth and yield of hyacinth bean, Lablab purpureus (L.) Sweet. Dynamic Soil, Daynamic Plant. 2(1&2):77-81.

Khan N, Srivastava JP and Singh SK. 2010. Effect of biofertilizers on production potential of cauliflower (Brassica oleracea var. botrytis L.). Annales Horticulturae. 2(1):122-123.

Kundu, B.C. 1959.In: Jute in India. Ministry for Food and Agriculture. Govt. of India, New Delhi. P. 100 & 105.

Labrada, R. and Parker, C. 1994. Weed control in the context of integrated pest management.

In: Labrada R, Caseley JC and Parker C (eds.). Weed Management for Developing Countries. FAO. Rome. pp. 3-8.

Masnira. M.Y., Halim. R. A., Rafii M.Y, Mohdjani, S. and Martini, M. Y.,2015, Yield and quality of two kenaf varieties as affected by harvesting age, J. ISSAAS Vol. 21, No. 2: 129-142

Mir R, Rustgi S, Sharma S, Singh R, Goyal A, Kumar J, Gaur A, Tyagi A,Khan H, Sinha M, Balyan H and Gupta P (2008) A preliminary geneticanalysis of fiber traits and the use of newgenomic SSRs for genetic diversityin jute. Euphytica 161, 413–427.

Mitchell, J., Shu Fukai and Jayampathi Basnayake (2004). Grain yield of direct seeded and from planted rice in rainfed low lands of South East Asia. In: Procedings of the 4th International crop Science congress Brisbane, Australia, 26 Sep-1 Oct 2004. Pp 81-90.

Mostafizur A.B.M., Zaman M.A.U., Shahidullah S.M. and Nasim M. (2017). Diversity of Crops and Cropping Systems in Faridpur Region. Bangladesh Rice J. 21 (2): 157-172.

Mostofa MG (2012) Genetic divergence combining ability, heterosis and gene action for yield characters in Kenaf (H. cannabinus) Ph.D.Thesis, Dept. Genet. & Pl.Breed., Bangladesh Agril. Univ., Mymensingh, Bangladesh.

Mukul MM, Akter N, Islam MM, Bhuiyan MSH, Mostofa MG, Ghosh RK,Saha CK and Ali MA (2021) Morpho-phenetical study of high yieldingtossa jute variety BJRI Tossa Pat 7 (MG-1) for bastfibre yield and qualities.Heliyon 7, e08129.

Odhav, B., S. Beekrum, U.S. Akula, and H. Baijnath. 2007. Preliminary assessment ofnutritional value of traditional leafy vegetables in KwaZulu-Natal, South Africa. J. FoodCompos. Anal. 20(5):430–435. doi: 10.1016/j.jfca.2006.04.015.

Patel and Charugamba (1981). Potential for improving rice production in Tabo Region, Tanzania and its implications for village planning. Overseas Development of Natural Resources Institute, Arusha, Tanzinia.

Prasad, K.andSrivasta, R. C. (1991) Pigeon pea (Cajanuscajan) and soybean (Glycine max) intercropping system under rainfed situation. Indian J. Agric. Sci., 61: 243-246.

Prodhan AKMA, Rahman ML and Haque MA (2001) Effect of water stresseson growth attributes in Jute I. Plant height. Pakistan Journal of BiologicalSciences 4, 128–135, 10.3923/pjbs.2001.128.135

Proggaypon. 2020. Jut e Diversified Product list prepared by Jute Diversification Promotion Centre under the Ministry of Textile and Jute. Bangladesh Gazzet. Ministry of Textile and Jute. Section Jute-2. No.: 24.00.0000.119.99.001.15-202, Dated: 06 October 2020.

Quayyum, M. A. and Maniruzzaman, A. F. M. (1995) Effect of maize (Zea mays L.) and rice (Oryza sativa L.) with black gram (Phaseolus mungo). Indian J. Agron., 40(1):20-25.

Rahman S, Kaza MMH, Begum IA and Alam MJ (2017) Exploring the futurepotential of jute in Bangladesh. Agriculture 7, 96.

Rahman, M. A., et al. (2019). Effect of Sowing Date on Growth and Yield of Jute (Corchorus spp.). International Journal of Agronomy, 8(1), 112-123.

Rahman, M. M., M. L. Rahman A. K. Azad, M.Rahman and M. M. Hussain.2003. Impact of component technologies in jute production. Bangladesh J.JuteFib.Res. 24 (1-8):21-26

Rahman, M.M. 2010. Policy and prospect of jute and allied fibers with special reference to Bangladesh, Ministry of Textile &Jute.Govt. of the People's Republic of Bangladesh, Bangladesh Secretariat. Dhaka.pp-2.

Rayhan, S.M., Rahand, M.A. and H.A amin. 2008 Effect of Planting Time and Magnesium on the Growth and Yield of Jute Seed.Bangladesh Res. Publi. j.,1(4):303-311

Saha, C. K. 2011. Jute seed management in Bangladesh. International Seminaron Strengthening of Collaboration for Jute, Kenaf and allied Fibres Research and Development (held during June 8-9, 2011). International Jute Study Group (IJSG), Pp.92-97.

Sainju, U.M., B.P. Singh and W.F. Whitehead (2005). Tillage, cover crops, and nitrogen fertilization effects on cotton and sorghum root biomass, carbon, and nitrogen. Agr. J., 97(5), 1279-1290.

Santalla, M., A.P. Rodino, P.A. Casquero and A.M. de Ron 2001. Interactions of bush bean intercropped with field and sweet maize. European J. Agron. 15: 185-196.

Santalla, M., P.A. Casquero, A.M. de Ron 1999: Yield and yield components from intercropping improved bush bean cultivars with maize. Agron. Crop Sci. 183: 263-269.

Saturnino, H.M., J.N. Landers and E. Campos (2002). The environment and zero tillage. CEP, 70760: 533.

Sheikh, A.D., T. Rehman and C.M. Yates (2003). Logit models for identifying the factors that influence the uptake of new 'no-tillage' technologies by farmers in the rice-wheat and the cotton-wheat farming systems of Pakistan's Punjab. Agr. Systems, 75(1), 79-95.

Shipitalo, M.J. and R. Protz (1987). Comparison of morphology and porosity of a soil under conventional and zero tillage. Canadian J. Soil Sci., 67(3), 445-456.

Singh, A.K. B.U. Chowdhury, and B.A.M. Bouman (2002). Effects of rice establishment methods on crop performance, water use, and mineral nitrogen. In: water-wise rice production, procesings of a the matic workshop on waterwise rice production, 8-11 April 2002 at IRRI headquarters in Los banos, Philipines. Pp 76-89.

Singh, V.P. and R.K.Singh, editors (2000). Rainfed Rice: A Sourcebook of best practices and Strategies in Eastern India. International Rice Research Institute.292p.

Steyn, N.P., J. Olivier, P. Winter, S. Burger, and S. Nesamvuni. 2001. A survey of wild, green,leafy vegetables and their potential in combating micronutrient deficiencies in ruralpopulations. S. Afr. J. Sci 97(7–8):276–278.

Tadessse, T., Liben, M., Asseta, A. and Tadesse, Z. (2013). Effect of Transplanting on rice in Northwestern Ethiopia. Eth. J. Sci & Technol., Vol.VI, no.1: 47-54

Talukder, F. A. H. and Waseque, M.1978. "Weeds and their control with special reference to jute field weeds". Jute and Jute Fabrics-Bangladesh., 2: 23-30.

Uphoff, N. (2003). Higher yields with fewer external inputs? The system of rice intersification and potential contributions to agricultural sustainability. International Journal of Agricultural sustainability 1 (1): 21-28.

Wang, M.C., Peng, Z.Y. and G.M Xia. 2008. Proteomic analysis on a high tolerance introgession strain of Triticum aestivum/Thinopyrumponticum. Proteomics,8:1470-1489.

Warade SD, Desale SB and Shinde KG. 1995. Effect of organic, inorganic and bio-fertilizers on yield of onion bulbs cv. N-780. *Journal of Maharashtra agricultural universities.* 20(3):467-468.

Wilkerson, G. G., Wiles, L. J. and Bennett, A. C. 2002. Weed management decision models: pitfalls, perceptions, and possibilities of the economic threshold approach. *Weed Science.* **50:** 411–424.

YAS (2015) Yearbook of Agricultural Statistics. Peoples Republic ofBangladesh: Bangladesh Bureau of Statistics, Statistics and InformaticsDivision (SID) Ministry of Planning.

Zaman M. A. U., Pramanik s., Parvin N. and khatun A. (2017). Crop Diversification in Rangpur Region. Bangladesh Rice J. 21 (2): 132-152.

Zhou, C., Ohtani, Y., Sameshina, K. and Zhen, M. 1998. Selection of plant population of kenaf (Hibiscus cannabinus L.) as a paper making raw material on arid hillside land in China. *Journal Wood Science*. 44:296-302.

II. PHYSIOLOGY DEPARTMENT

PROGRAMME AREA: VARIETAL IMPROVEMENT OF JUTE, KENAF AND MESTA ON THE BASIS OF CROP-SOIL ENVIRONMENT RELATIONS

1. TITLE OF THE PROJECT: STUDIES ON GROWTH ANALYSIS OF PROMISING STRAINS OR VARIETIES.

1.1 Title of the experiment: Dry Matter Accumulation with Quality Dynamics Across Growth Stages in Advanced Breeding Line O-043-7-9 (Red) (Physio. 1/2025)

Background and objectives: Dry matter is the remaining portion after all of the water is evaporated out from the crop plants. Dry matter of the particular part of the plant is an indicator of the amount of nutrients that are deposited by the plant in particular plant part. The distribution of dry matter over the various organs of a plant is essentially due to the relative growth rates of these organs. Since growth depends on the availability of various essentials to the growing tissues. In case of jute, fibre is very important plant part. The higher the dry matter increasing in bark results higher fibre production of jute. Dry stalk yield is the ultimate factor which decides the final fibre yield (Puspha *et al.*, 2013). Vigorous vegetative growth prior to onset of flowering is very important for higher productivity of fibre (Talukder *et al*., 2001). During the development of genotypes selection such character like dry matter accumulation of different plant parts is very important. As such, it is pre-requisite to identify and quantify growth limitations of the variety (Debnath *et al*., 2018). Dry matter partitioning is also important for the determination of appropriate time of harvest for getting maximum production of fibre and stick (Alam and Islam, 2015). In this experiment the dry matter partitioning of advanced olitorius breeding line O-043-7-9(red) will be studied along with the popular jute variety BJRI Tossa pat 8. This variety becomes popular in Bangladesh due to its early and rapid maturing property. To release a new popular variety it is very important to find out the early maturing property.

Expected output:

- Dry matter partitioning of advanced *olitorius* breeding line O-043-7-9 (Red) will be found out.
- Appropriate harvest time of advanced *olitorius* breeding line O-043-7-9 (Red) will be found out for maximum economic benefits.
- Crucial growth period for O-043-7-9 (Red) will be found out.

Date of initiation and duration: March, 2025-August, 2027, (1st Year)

Date of sowing: Last week of March.

Location: JAES, Manikganj and JRRS, Rangpur

Name of the Investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Experimental details:

Treatments:

Variety/Line: 3	Harvest: 5
V_1= O-043-7-9 (Red)	H_1= 80 DAS
V_2= BJRI Tossa Pat 9 (Control)	H_2= 90 DAS
V_3= JRO-524	H_3= 100 DAS
	H_4= 110 DAS
	H_5= 120 DAS

Design: Randomized Complete Block Design (RCBD)

No. of replication: 3

Unit plot size: 3m × 4m

Procedures: The experiment will be conducted at Jute Agriculture Experimental Station, Manikganj and JRRS, Rangpur. Management practices will be done as per BJRI recommendation. Plants will be harvested at 70th day of sowing at an interval of 10 days up to 120

DAS. A sample of 10 plants will be collected from each replication where these plants will be subjected to analyze for distribution of dry matter and finally fibre quality will be tested.

Records to be kept:

1. Plant height (m)
2. Base diameter(mm)
3. Green weight of leaf, sticks, bark and root (g).
4. Dry weight of leaf, stick, bark and root (Oven dry) (g)
5. Fibre and stick weight after sun dry(g)
6. Quality of fibre (fibre strength, fineness and length)

Estimated cost: TK.1, 00000/-

1.2 Title of the experiment: Effect of plant growth regulator on Tossa Jute (*Corchorus olitorius L.)* sown under short day condition (Physio. 2/2025)

Background and objectives: In Bangladesh, tossa jute (*Corchorus olitorius*) plays a crucial role in the livelihoods of millions of peoples, from small farmers to industrial workers. Traditionally sown between late March and late April, this four-month crop (120 days) is harvested from early July to late July, often coinciding with aman paddy cultivation. However, this timing presents a dilemma for farmers. Harvesting early (105 days) ensures timely paddy transplanting but sacrifices jute yield. Conversely, maximizing jute yield by waiting until late July (120-125 days) delays paddy planting and potentially reduces its output. The ideal solution lies in advancing jute sowing to early March (1st week) and harvesting between late June and early July. This allows for optimal paddy transplanting (2nd-3rd week of July) while maximizing jute yield. Consequently, the critical factor becomes identifying suitable jute varieties adaptable to this early sowing window (1st-3rd week of March). But currently no jute variety is available which do not flower when sown early in March. One of the potential solution is to exogenously apply plant growth regulator.

Plant growth regulators (PGR) are chemical compounds which can alter plant physiological behavior. Auxin is a plant hormone that plays a crucial role in regulating plant growth and development. In short-day plants, auxin has been shown to delay flowering (Krekule *et al.* 1985 a,b). However, the exact mechanism by which auxin affects flowering in short-day plants is not yet fully understood. It has an inhibitory effect on flowering in short-day plants. On the other hand gibberellic acid (GA) is known to have positive effect on plant vegetative growth. GA treated jute plants were found relatively tall (Honi *et al*. 2020). This finding was similar to other fiber crops like hemp (Atal, 1961) and flax (Rastogi *et al.* 2013). So exogeneous application of auxin, GA and combination of both can help in delaying flowering in jute when sown under short day condition.

Expected output: Different concentration of auxin and GA will inhibit flowering upto 120 days in tossa jute when sown at 1st week of March.

Date of initiation and duration: March to August 2025

Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Location: Jute Research Regional Station, Rangpur

Experimental design and treatment: The experiment will be conducted following Randomized Complete Block Design (RCBD) with three replications. Treatments involving different concentrations of GA will be applied to jute plant from 10 days age after germination upto 60 days age of the plant.

Procedure: The seeds will be sown at 01 March, 2025 in pots and plants will be maintained as per BJRI recommendations. Plants will be harvested at 120 days age.

Records to be kept:

1. Days of emergence and harvest
2. Plant height(m), base diameter(mm), number of leaf, leaf area
3. Dry weights of leaf, stick, bark and root at every harvest(g)
4. Yield of fiber and stick(g)
5. Date of 1st flowering (Days after sowing)
6. Date of 50% flowering (Days after sowing)

Estimated cost: TK.10, 000/-

PROJECT 2. PHYSILOGICAL SCREENING OF GERMPLAM FOR WATER STRESS.

2.1 Title of the experiment: Morpho-Anatomical Responses of Tossa Jute Genotypes (*Corchorus olitorius*) to Waterlogging Stress (Physio. 3/2025)

Background and objectives: Waterlogging is a significant abiotic stress that negatively affects plant, growth, development, and productivity. It is characterized by excessive soil moisture and decreased oxygen availability. In areas where there is inadequate soil drainage and frequent heavy rainfall, this stress is very harmful. Waterlogging has a variety of effects on plants, including changes to their physiology, anatomy, and morphology. These alterations can then have an impact on crop quality and output. Waterlogging severely affects tossa jute (*Corchorus olitorius*), an essential crop for its superior natural fiber. Jute (*Corchorus spp.)*, a significant cash crop grown primarily in tropical and subtropical areas, is vital to the economies of Bangladesh and India (Islam et al., 2019). But tossa jute is susceptible to waterlogging stress, which is a big problem for farmers, especially in places where there is regular flooding or inadequate soil drainage. Under waterlogging stress, plants display a variety of anatomical and morphological responses. These include alterations in the morphology of the shoots and leaves, adventitious root growth, and the development of aerenchyma in the roots. Large air-filled spaces in root tissues, or aerenchyma development, improve internal aeration, facilitating improved oxygen transfer to buried roots and enhancing plant resistance to hypoxia (Colmer & Voesenek, 2009). The plant's capacity to withstand wet conditions is also greatly influenced by morphological adaptations, such as modifications to root length, stem diameter, and leaf area (Jackson & Colmer, 2005). Waterlogging has been shown to reduce photosynthetic efficiency, inhibit development, and lower the quality of the fiber in tossa jute (Kundu et al., 2018). The crop's economic worth may suffer as a result of these modifications. Therefore, it is crucial to comprehend the anatomical and morphological reactions of tossa jute to waterlogging in order to design mitigation techniques. This information can help breeding programs that aim to improve resistance of jute to waterlogging, guaranteeing consistent fiber quality and production even in harsh environmental circumstances. The purpose of this study is to examine the morphological and anatomical responses of the tossa jute genotype (*Corchorus olitorius*) to waterlogging stress and to determine the effects of these changes on the quality of the fiber. Through the integration of physiological, anatomical, and morphological research, our aim is to clarify the mechanisms that underlie the resistance of tossa jute jute's resistance to waterlogging and pinpoint crucial characteristics that help preserve fiber quality in stressful environments.

Expected output:

- To measure and compare the growth rates, anatomical changes, physiological responses, adaptation mechanisms and fiber quality of *Corchorus olitorius* under normal and waterlogged conditions.
- To provide recommendations for tossa jute (*Corchorus olitorius*) cultivation in regions prone to waterlogging.

Date of initiation and duration: March, 2025 to August, 2027

Name of the investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Locations: BJRI Head Office Dhaka.
Experimental details:
Factors to be evaluated:
Factor A (Tossa Jute Genotypes): FA_1 (Control) = BJRI Tossa Pat-9, FA_2= **Acc.** 5159**,** FA_3= **Acc.** 1306, FA_4= **Acc.** 1318.

Factor B (Growth Condition): FB_1 (control) =Normal watering conditions, with soil kept at field capacity. FB_2 =Waterlogged Group: Soil completely saturated with water, maintaining a water level 2-3 cm above the soil surface.

Design: Rendomized Complete Block Design (RCBD) and Completely Randomized Design (CRD) No. of replication: 3

Procedures:
Sowing jute seeds in pots filled with a standard potting mix. Allow seedlings to grow for 60-70 days until they reach a standard height. After that normal watering condition should be ensured for keeping the Control Group's soil at field capacity and for maintaining a water level above the soil surface Waterlogged Group's Soil should be completely saturated with water. Gradually increase water levels in the Waterlogged Group pots over 2 days to avoid shock. Waterlogged conditions will be maintained for a predetermined period (e.g., 30 days).

Data collection:
a. Morphological Parameters: Plant height, stem diameter, root length, and leaf area before and after the treatment period will be measured. Document any visible morphological changes such as adventitious root formation or changes in leaf color will be documented.
b. Anatomical Studies: Stem samples will be collected for anatomical studies. Prepare cross-sections of stems will be prepared using a microtome. Sections will be stained with appropriate stains (e.g., safranin and fast green) and will be observed under a microscope to assess aerenchyma formation and other anatomical changes.
Estimated cost: 1, 50,000/-

2.2 TITLE OF THE EXPERIMENT: Screening of Kenaf (*Hibiscus cannabinus L.*) germplasm for yield under different water logged conditions (Physio. 4/2025)

Background and objectives: Among different sources of natural bast fiber Kenaf (*Hibiscus cannabinus*) is one of the promising crops. Though kenaf is not native plant in our country but gradually it is gaining popularity among the farmers. This plant is known to capable of growing in diverse array of land condition, clay low land to sandy char areas. One of its major advantage is its ability to grow in problem soil without very much inter-cultural requirements. However, agricultural land area in our country is degrading due to intensive cultivation as well as climatic intervention. In this scenario, agricultural land is declining in organic as well as mineral nutrient content. Hence, kenaf cultivation can benefit the farmers by profitably utilizing the less cultivable land.

Water logging in low land area is a common problem in our country due to flash flood in the months of April-May and monsoon floods caused by heavy rainfall during June-August. This unwanted flooding may remain stagnant for a period of time hindering crop production for the time being. Since kenaf plant are known to withstand water logging condition for considerable

period of time, developing high yielding varieties of kenaf will alleviate such problem. In our country a few kenaf varieties are cultivated. Although Gene Bank of BJRI currently conserves a number of kenaf germplasm but little information is available about their potentiality as a suitable crop for water logged soil. These germplasm have wider gene pool with different types of biotic and abiotic tolerance. Screening of these germplasm is very important for searching variability and to isolate desirable genotype which can be successfully used for developing a new variety or used in crossing program for development of new variety of kenaf (Webber *et al.*, 2002). Genetic variability in existing genotypes is very important for development of variety with higher yield and other desirable agronomic traits. Variable genotype itself is also used as a pure line derived variety and it can be used as a parent for different varietal improvement program (Bertan *et al*., 2007). So, this study will be undertaken to screen out yielding kenaf germplasm under different water logging regimes.

Expected output: Different germplasm may perform differently which will help in further varietal development.

Date of initiation and duration: March to August 2025

Name of Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Location: Jute Research Regional Station, Rangpur
Experimental design and treatment: The experiment will be conducted following Randomized Complete Block Design (RCBD) with three replications. 20 kenaf germplasms will be tested under 20 cm and 30 cm of water depth with a duration of 30 days.

Procedure: The seeds of each genotype will be sown in pots. The seeds will be sown at 30 March, 2025 in pots and plants will be maintained as per BJRI recommendations. After 25 days five plant will be kept in each pot for proper growth of the crop plants. Water logging treatment will be initiated at 60 DAS. Plants will be subjected to different water logging treatments at 60 days after emergence. Plants will be harvested at 120 DAS.

Records to be kept:
1. Days of emergence and harvest (date)
2. Plant height (m), Base diameter (mm), no. of leaves at harvest, leaf area at harvest
3. Dry weights of leaf, stick, bark and root at harvest (g)
4. Yield of fiber and stick (g)
5. Number of adventitious roots
6. Formation of Arenchyma tissue
7. Percent mortality

Estimated cost: TK.10, 000/-

PROJECT 3: STUDIES ON JUTE, KENAF AND MESTA SEED PHYSIOLOGY (PRODUCTION AND STORAGE)

3.1 Title of the experiment: Effect of date of sowing and time of de-topping on reproductive phenology in BJRI Kenaf 5 (Physio.5/2025)

Background and objectives: Kenaf is a profitable new fiber crop that is gaining popularity in Bangladesh, especially in the char and haor area. It can give high-quality fiber with less care and labor even in marginal, fallow lands. At present, around 0.0634 million tons of kenaf are produced in the country which requires 490 tons of seed which is largely imported from foreign countries (AIS, 2022). To meet the increasing demand and expand the cultivated area the annual domestic seed production of kenaf needs to be increased. Farmers of our country remain engaged in the production of kenaf seed in the traditional way. In addition sowing date has a great impact on quality seed production. Sowing on optimum date can retard the growth of plant as a result production of seed as well as the quality may hamper. Improved agronomic practices can increase seed production several times. De-topping is a practice that affects positively lateral branching and ultimately seed production in many crops (Mollah et al., 2015). So, sowing and de-topping at appropriate time has synergistic effect on better expression of the crop growth to increase quality seed yield (Kumar et al., 2013; Mazumdar et al., 2009). For a better understanding of how the reproductive phenology and quality of BJRI Kenaf 5 are affected by de-topping and date of sowing needs to be studied.

Expected output:

- Effect of de-topping on reproductive phenology and seed quality of BJRI Kenaf 5 seed.
- Optimum date of sowing and time of de-topping for BJRI Kenaf 5 seed production will be identified

Date of initiation and duration: June, 2024- February, 2027 **(2nd year)**

Name of the investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Treatments:

Variety: BJRI kenaf 5

Date of sowing	Time of de-topping
D_1 = 15th June	T_1= No de-topping (Control)
D_2 = 01st July	T_2= Detopping at 30 DAS
D_3 = 16th July	T_3= Detopping at 40 DAS
	T_4= Detopping at 50 DAS

Location: JAES, Manikganj and JRRS, Dinajpur.

Design: Randomized Complete Block Design (RCBD) will be followed with three replications. Unit plot size will be 4m × 3m. The space between plots and replications will be 1m.

Methods: Seeds will be sown according to the treatment in a line 40 cm apart. Other standard cultural and intercultural practices will be followed. De-topping will be done as per treatment.

Records to be kept:

1. Date of sowing and harvest
2. Date of 1st and 50% flowering, pod formation and pod maturity
3. Plant population m^{-2} after final thinning and at harvest
4. Plant height (m) of 10 randomly selected plants from each plot at harvest
5. First branch initiation height
5. No. of branch $plant^{-1}$, pod $plant^{-1}$, seed pod^{-1},
7. Seed yield $plant^{-1}$
8. % Germination, Vigour index, Speed of germination

9. Vigour index
10.Speed of germination

Estimated cost: Tk.1, 50,000/-

3.2 Title of the experiment Effect of Plant Growth Regulators on Yield and Quality of Late Season Tossa Jute Seed (Physio.6/2025)

Background and objectives: Jute (*Corchorus* sp.) is the principal fiber crop of Bangladesh. It contributes about 3-4% of the foreign currency earnings from exports (EPB, 2020). Bangladesh is the largest supplier of jute and jute goods in the international markets meeting nearly 95% of world raw jute demand and about 60% of jute goods demand (Rahman, 2010). Among the various factors related to good production, seed quality plays the pivotal role. Quality seed of an improved variety itself can provide 20% additional jute yield (Hossain *et al*., 1994). Unfortunately, the availability of good quality jute seed in our country is far below than the total requirement. Farmers of the country often have to depend on market seed having poor quality. Hence, the production and quality of healthy jute seed as well as its quality storage is highly essential to ensure the higher yield of quality fiber in order to meet the challenging need for natural fiber. Bangladesh requires 4000- 4500 MT of jute seed annually whereas production in Bangladesh Agricultural Development Corporation (BADC) is only 800-1000 MT. The farmers produce 400-600 MT. Rest of the demand is met up by importing mostly from India (Pulok *et al*., 2014). Nevertheless, the country has to rely on the farmers' seed and it faces acute scarcity of quality jute seed every year. Normal sowing time of *olitorius* jute is in the month of April for fiber production and August-September is the sowing time for seed production of *olitorius* jute but seed production during August-December known as 'late season jute seed production technolgy'. Plant Growth Regulators (PGRs) encompass a broad category of compounds that promote, inhibit, or otherwise modify plant physiological or morphological processes. Some PGRs are plant hormones or their analogues; others are simply metabolic regulators. PGRs are classified as organic compounds that alter the growth and development of plants. Plant growth regulators are used as stimulant in many crops to enhance the growth and yield of crops. Chemical PGRs have been widely used in cotton production in an attempt to adjust plant growth and to improve lint yield and fiber quality (Cothren and Oosterhuis, 2000). Now-a-days many growth regulators are available in our country. However, the performances of growth regulators are not known for jute seed crops. From the above facts, the experiment was designed to find out the effect of different plant growth regulators on seed yield and quality of olitorius jute under 'late jute seed production technology'.

Expected output: Plant growth regulators may affect differently which will help to find out the effect of different plant growth regulators on seed yield and quality of olitorius jute under 'late jute seed production technology'.

Date of initiation and duration: July 2025 to February 2026

Name of Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Location: Jute Research Regional Station, Rangpur

Experimental design and treatment:
The experiment will be conducted following a randomized complete block design with three replications. Four growth regulators with different brand name such as Bionik, Litosen,

Okozim, and Rupali Bumper will be used in the experiment along with a control plot. The jute variety will be BJRI Tossa Pat 8 (Robi-1). The unit plot size will be 4m × 3m. The crop will be maintained as per BJRI recommendations. Plant growth regulators will applied at three different times of application i.e. vegetative at 70 DAS, flower initiation at 80 DAS and pod initiation stage at 90 DAS of the crop. The growth regulators will be applied according to company recommendation (Bionik @ 4ml/1L, Litosen@ 10ml/10L, Okozim @ 5ml/10L, and Rupali Bumper @ 5ml /10). The crop will be harvested after 120 DAS.

Records to be kept:
1. Plant height (m)
2. Base diameter (mm0
3. Branch plant^{-1}
4. Pod plant^{-1}
5. Seed pod^{-1}
6. Seed yield plant^{-1}(g)
7. 1000-seed weight (g)
8. Germination%
9. Vigor index

Estimated cost: TK.10,000/-

References

AIS,2022: Agriculture Information Service, Field Crop Cultivation, Production and Yield Condition, Ministry of Agriculture, Government of the People's Republic of Bangladesh, PP. 11.

Alam, A. T. M. M. and M. M. Islam. 2015. Dry matter partitioning of newly released variety O-795. *Annual Research Report, 2015-16.* PP 108-109.

Atal C. K. 1961. Effect of gibberellin on the fiebrs of hemp. Econ Bot. 15(2): 133–139.

Bertan, I., F. I. F. de Carvalho and A. C. de Oliverira. 2007. Parental selection strategies in plant breeding programs. J. Crop Sci. Biotech. 10 (4): 211-222.

Colmer, T. D., & Voesenek, L. A. C. J. (2009). Flooding tolerance: Suites of plant traits in variable environments. Functional Plant Biology, 36(8), 665-681.

Cothren, J. S. and D. M. Oosterhuis. (2000). The use of plant growth regulators in cotton production. In: J.M. Stewart, D.M. Oosterhuis, and J. Heitholt (eds.). Handbook of Cotton Physiology, Kluwer Publisher, New York.

Debnath, M. R., M. S. Rahman, M. M. Rahman and M. M. Islam. 2018. Dry matter partitioning of newly released variety BJRI Tossa pat 6. *Annual Research Report, 2018*. PP 108-112.

Honi, U., Amin, M. R., Kabir, S. M. T. *et al*. 2020. Genome-wide identification, characterization and expression profiling of gibberellin metabolism genes in jute. BMC Plant Biol. 20: 306. https://doi.org/10.1186/s12870-020-02512-2

Hossain, M. A., S. Haque, K. S. Sultana, M. M. Islam and A. L. Khandakar. (1994). Research on Late Jute Seed Production. Pub. Seed. Tech. Res. Bangladesh Jute Res. Inst., Dhaka. pp 176-178.

Islam, M. M. (2009). In: Jute seed technology. 1st edition. Pub. By Md. Mahmudul Islam, 397, Middle Monipur, Mirpur, Dhaka-1216. College Gate Book Binding and Printing, Mohammadpur, Dhaka. 160p.

Islam, M. S., Ali, M. H., & Jahan, M. A. (2019). Jute in Bangladesh: Trends and future

strategies. Journal of Agribusiness and Rural Development, 3(53), 307-318.
Jackson, M. B., & Colmer, T. D. (2005). Response and adaptation by plants to flooding stress. Annals of Botany, 96(4), 501-505.
Krekule, J., Pavlova, L. and Souckova, D. 1985b. Multiple sites of auxin action in flowering of long day and short day *Chenopodium*. Acta Hortic. 167: 37-46. DOI: 10.17660/ActaHortic.1985.167.3
Krekule, J., Pavlova, L., Souckova, D. *et al*. 1985a. Auxin in flowering of short-pay and long-day *Chenopodium* species. Biol Plant. 27: 310–317. https://doi.org/10.1007/BF02879868
Kumar, N., Srivastava, R.K., Singh, R.K., & Singh, M.V. (2013). Impact of sowing time and varieties on seed yield of jute in subtropical climatic zone of north eastern Uttar Pradesh. Springer, 36(6):571- 573.
Kundu, C., Mandal, S., Banerjee, A., & Ray, D. P. (2018). Physiological and biochemical responses of jute (Corchorus olitorius L.) genotypes to waterlogging stress. Plant Physiology Reports, 23(2), 268-278.

Majumdar, B., Das, S., Saha, A.R., Maitra, D.N., & Chowdhury, H. (2009).Development and use of a promising microbial consortium for jute retting. Jaf News, 7 (1):14-15.
Pulok, M. A. I., Hossain, M. M., Mazed, H. E. M. K., Mahabub, S. T. and Sharmin, S. (2014). Effect of storage containers on the seed quality attributes of deshi jute (*Corchorus capsularis* L.). International Journal of Business, Social & Scientific Research, 2(2): 100- 103.
Pushpa, K., N. K. Murthy and R. K. Murthy. 2013. Dry matter accumulation studies at different stages of crop growth in Mesta. *African Journal of Agricultural Research*. 8(3). PP 332-338.
Rahman, M. M. (2010). Policy and prospect of jute and allied fibers with special reference to Bangladesh, Ministry of Textile & Jute. Govt. of the People's Republic of Bangladesh, Bangladesh Secretariat. Dhaka. p 2.
Rastogi DA, Siddiqui A, Mishra B, Srivastava M, Pandey R, Misra P, *et al*. 2013. Effect of auxin and gibberellic acid on growth and yield components of linseed (*Linum usitatissimum* L.). Crop Breed Appl Biot. 13: 136–143.
Talukder, F. A. H., S. C. Chanda, A. K. M. G. Sarwar, P. K. Bhander and M. N. Islam. 2001. Early vegetative growth and fibre yield in Tossa Jute. *Pakistan Journal of Biological Sciences.* 4(6). PP 665-667.
Webber, C. L., H.L. Bhardwaj and V.K. Beldsoe. 2002. Kenaf production: Fiber, feed, and seed. In: J. Janick and A. Whipkey (eds.), trends in new crops and new uses. ASHS Press, Alexandria. p. 327-339.

II. PHYSIOLOGY DEPARTMENT

PROGRAMME AREA: VARIETAL IMPROVEMENT OF JUTE, KENAF AND MESTA ON THE BASIS OF CROP-SOIL ENVIRONMENT RELATIONS

1. TITLE OF THE PROJECT: STUDIES ON GROWTH ANALYSIS OF PROMISING STRAINS OR VARIETIES.

1.3 Title of the experiment: Dry Matter Accumulation with Quality Dynamics Across Growth Stages in Advanced Breeding Line O-043-7-9 (Red) (Physio. 1/2025)

Background and objectives: Dry matter is the remaining portion after all of the water is evaporated out from the crop plants. Dry matter of the particular part of the plant is an indicator of the amount of nutrients that are deposited by the plant in particular plant part. The distribution of dry matter over the various organs of a plant is essentially due to the relative growth rates of these organs. Since growth depends on the availability of various essentials to the growing tissues. In case of jute, fibre is very important plant part. The higher the dry matter increasing in bark results higher fibre production of jute. Dry stalk yield is the ultimate factor which decides the final fibre yield (Puspha *et al.*, 2013). Vigorous vegetative growth prior to onset of flowering is very important for higher productivity of fibre (Talukder *et al*., 2001). During the development of genotypes selection such character like dry matter accumulation of different plant parts is very important. As such, it is pre-requisite to identify and quantify growth limitations of the variety (Debnath *et al*., 2018). Dry matter partitioning is also important for the determination of appropriate time of harvest for getting maximum production of fibre and stick (Alam and Islam, 2015). In this experiment the dry matter partitioning of advanced olitorius breeding line O-043-7-9(red) will be studied along with the popular jute variety BJRI Tossa pat 8. This variety becomes popular in Bangladesh due to its early and rapid maturing property. To release a new popular variety it is very important to find out the early maturing property.

Expected output:

- Dry matter partitioning of advanced *olitorius* breeding line O-043-7-9 (Red) will be found out.
- Appropriate harvest time of advanced *olitorius* breeding line O-043-7-9 (Red) will be found out for maximum economic benefits.
- Crucial growth period for O-043-7-9 (Red) will be found out.

Date of initiation and duration: March, 2025-August, 2027, (1st Year)

Date of sowing: Last week of March.

Location: JAES, Manikganj and JRRS, Rangpur

Name of the Investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Experimental details:

Treatments:

Variety/Line: 3	Harvest: 5
V_1= O-043-7-9 (Red)	H_1= 80 DAS
V_2= BJRI Tossa Pat 9 (Control)	H_2= 90 DAS
V_3= JRO-524	H_3= 100 DAS
	H_4= 110 DAS
	H_5= 120 DAS

Design: Randomized Complete Block Design (RCBD)

No. of replication: 3

Unit plot size: 3m × 4m

Procedures: The experiment will be conducted at Jute Agriculture Experimental Station,

Manikganj and JRRS, Rangpur. Management practices will be done as per BJRI recommendation. Plants will be harvested at 70th day of sowing at an interval of 10 days up to 120 DAS. A sample of 10 plants will be collected from each replication where these plants will be subjected to analyze for distribution of dry matter and finally fibre quality will be tested.

Records to be kept:

7. Plant height (m)
8. Base diameter(mm)
9. Green weight of leaf, sticks, bark and root (g).
10. Dry weight of leaf, stick, bark and root (Oven dry) (g)
11. Fibre and stick weight after sun dry(g)
12. Quality of fibre (fibre strength, fineness and length)

Estimated cost: TK.1, 00000/-

1.4 Title of the experiment: Effect of plant growth regulator on Tossa Jute (*Corchorus olitorius L.)* sown under short day condition (Physio. 2/2025)

Background and objectives: In Bangladesh, tossa jute (*Corchorus olitorius*) plays a crucial role in the livelihoods of millions of peoples, from small farmers to industrial workers. Traditionally sown between late March and late April, this four-month crop (120 days) is harvested from early July to late July, often coinciding with aman paddy cultivation. However, this timing presents a dilemma for farmers. Harvesting early (105 days) ensures timely paddy transplanting but sacrifices jute yield. Conversely, maximizing jute yield by waiting until late July (120-125 days) delays paddy planting and potentially reduces its output. The ideal solution lies in advancing jute sowing to early March (1st week) and harvesting between late June and early July. This allows for optimal paddy transplanting (2nd-3rd week of July) while maximizing jute yield. Consequently, the critical factor becomes identifying suitable jute varieties adaptable to this early sowing window (1st-3rd week of March). But currently no jute variety is available which do not flower when sown early in March. One of the potential solution is to exogenously apply plant growth regulator.

Plant growth regulators (PGR) are chemical compounds which can alter plant physiological behavior. Auxin is a plant hormone that plays a crucial role in regulating plant growth and development. In short-day plants, auxin has been shown to delay flowering (Krekule *et al.* 1985 a,b). However, the exact mechanism by which auxin affects flowering in short-day plants is not yet fully understood. It has an inhibitory effect on flowering in short-day plants. On the other hand gibberellic acid (GA) is known to have positive effect on plant vegetative growth. GA treated jute plants were found relatively tall (Honi *et al*. 2020). This finding was similar to other fiber crops like hemp (Atal, 1961) and flax (Rastogi *et al.* 2013). So exogeneous application of auxin, GA and combination of both can help in delaying flowering in jute when sown under short day condition.

Expected output: Different concentration of auxin and GA will inhibit flowering upto 120 days in tossa jute when sown at 1st week of March.

Date of initiation and duration: March to August 2025

Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Location: Jute Research Regional Station, Rangpur

Experimental design and treatment: The experiment will be conducted following Randomized Complete Block Design (RCBD) with three replications. Treatments involving

different concentrations of GA will be applied to jute plant from 10 days age after germination upto 60 days age of the plant.

Procedure: The seeds will be sown at 01 March, 2025 in pots and plants will be maintained as per BJRI recommendations. Plants will be harvested at 120 days age.

Records to be kept:

7. Days of emergence and harvest
8. Plant height(m), base diameter(mm), number of leaf, leaf area
9. Dry weights of leaf, stick, bark and root at every harvest(g)
10. Yield of fiber and stick(g)
11. Date of 1st flowering (Days after sowing)
12. Date of 50% flowering (Days after sowing)

Estimated cost: TK.10, 000/-

PROJECT 2. PHYSILOGICAL SCREENING OF GERMPLAM FOR WATER STRESS.

2.1 Title of the experiment: Morpho-Anatomical Responses of Tossa Jute Genotypes (*Corchorus olitorius*) to Waterlogging Stress (Physio. 3/2025)

Background and objectives: Waterlogging is a significant abiotic stress that negatively affects plant, growth, development, and productivity. It is characterized by excessive soil moisture and decreased oxygen availability. In areas where there is inadequate soil drainage and frequent heavy rainfall, this stress is very harmful. Waterlogging has a variety of effects on plants, including changes to their physiology, anatomy, and morphology. These alterations can then have an impact on crop quality and output. Waterlogging severely affects tossa jute (*Corchorus olitorius*), an essential crop for its superior natural fiber. Jute (*Corchorus spp.)*, a significant cash crop grown primarily in tropical and subtropical areas, is vital to the economies of Bangladesh and India (Islam et al., 2019). But tossa jute is susceptible to waterlogging stress, which is a big problem for farmers, especially in places where there is regular flooding or inadequate soil drainage. Under waterlogging stress, plants display a variety of anatomical and morphological responses. These include alterations in the morphology of the shoots and leaves, adventitious root growth, and the development of aerenchyma in the roots. Large air-filled spaces in root tissues, or aerenchyma development, improve internal aeration, facilitating improved oxygen transfer to buried roots and enhancing plant resistance to hypoxia (Colmer & Voesenek, 2009). The plant's capacity to withstand wet conditions is also greatly influenced by morphological adaptations, such as modifications to root length, stem diameter, and leaf area (Jackson & Colmer, 2005). Waterlogging has been shown to reduce photosynthetic efficiency, inhibit development, and lower the quality of the fiber in tossa jute (Kundu et al., 2018). The crop's economic worth may suffer as a result of these modifications. Therefore, it is crucial to comprehend the anatomical and morphological reactions of tossa jute to waterlogging in order to design mitigation techniques. This information can help breeding programs that aim to improve resistance of jute to waterlogging, guaranteeing consistent fiber quality and production even in harsh environmental circumstances. The purpose of this study is to examine the morphological and anatomical responses of the tossa jute genotype (*Corchorus olitorius*) to waterlogging stress and to determine the effects of these changes on the quality of the fiber. Through the integration of physiological, anatomical, and morphological research, our aim is to clarify the mechanisms that underlie the resistance of tossa jute jute's resistance to waterlogging and pinpoint crucial characteristics that help preserve fiber quality in stressful environments.

Expected output:

- To measure and compare the growth rates, anatomical changes, physiological responses, adaptation mechanisms and fiber quality of *Corchorus olitorius* under normal and waterlogged conditions.
- To provide recommendations for tossa jute (*Corchorus olitorius*) cultivation in regions prone to waterlogging.

Date of initiation and duration: March, 2025 to August, 2027
Name of the investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Locations: BJRI Head Office Dhaka.
Experimental details:
Factors to be evaluated:
Factor A (Tossa Jute Genotypes): FA_1 (Control) = BJRI Tossa Pat-9, FA_2= **Acc.** 5159**,** FA_3= **Acc.** 1306, FA_4= **Acc.** 1318.

Factor B (Growth Condition): FB_1 (control) =Normal watering conditions, with soil kept at field capacity. FB_2 =Waterlogged Group: Soil completely saturated with water, maintaining a water level 2-3 cm above the soil surface.

Design: Rendomized Complete Block Design (RCBD) and Completely Randomized Design (CRD) No. of replication: 3

Procedures:
Sowing jute seeds in pots filled with a standard potting mix. Allow seedlings to grow for 60-70 days until they reach a standard height. After that normal watering condition should be ensured for keeping the Control Group's soil at field capacity and for maintaining a water level above the soil surface Waterlogged Group's Soil should be completely saturated with water. Gradually increase water levels in the Waterlogged Group pots over 2 days to avoid shock. Waterlogged conditions will be maintained for a predetermined period (e.g., 30 days).

Data collection:
a. Morphological Parameters: Plant height, stem diameter, root length, and leaf area before and after the treatment period will be measured. Document any visible morphological changes such as adventitious root formation or changes in leaf color will be documented.
b. Anatomical Studies: Stem samples will be collected for anatomical studies. Prepare cross-sections of stems will be prepared using a microtome. Sections will be stained with appropriate stains (e.g., safranin and fast green) and will be observed under a microscope to assess aerenchyma formation and other anatomical changes.
Estimated cost: 1, 50,000/-

2.2 TITLE OF THE EXPERIMENT: Screening of Kenaf (*Hibiscus cannabinus L.*) germplasm for yield under different water logged conditions (Physio. 4/2025)

Background and objectives: Among different sources of natural bast fiber Kenaf (*Hibiscus cannabinus*) is one of the promising crops. Though kenaf is not native plant in our country but gradually it is gaining popularity among the farmers. This plant is known to capable of growing in diverse array of land condition, clay low land to sandy char areas. One of its major advantage is its ability to grow in problem soil without very much inter-cultural requirements. However, agricultural land area in our country is degrading due to intensive cultivation as well as climatic

intervention. In this scenario, agricultural land is declining in organic as well as mineral nutrient content. Hence, kenaf cultivation can benefit the farmers by profitably utilizing the less cultivable land.

Water logging in low land area is a common problem in our country due to flash flood in the months of April-May and monsoon floods caused by heavy rainfall during June-August. This unwanted flooding may remain stagnant for a period of time hindering crop production for the time being. Since kenaf plant are known to withstand water logging condition for considerable period of time, developing high yielding varieties of kenaf will alleviate such problem. In our country a few kenaf varieties are cultivated. Although Gene Bank of BJRI currently conserves a number of kenaf germplasm but little information is available about their potentiality as a suitable crop for water logged soil. These germplasm have wider gene pool with different types of biotic and abiotic tolerance. Screening of these germplasm is very important for searching variability and to isolate desirable genotype which can be successfully used for developing a new variety or used in crossing program for development of new variety of kenaf (Webber *et al.*, 2002). Genetic variability in existing genotypes is very important for development of variety with higher yield and other desirable agronomic traits. Variable genotype itself is also used as a pure line derived variety and it can be used as a parent for different varietal improvement program (Bertan *et al*., 2007). So, this study will be undertaken to screen out yielding kenaf germplasm under different water logging regimes.

Expected output: Different germplasm may perform differently which will help in further varietal development.

Date of initiation and duration: March to August 2025

Name of Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Location: Jute Research Regional Station, Rangpur
Experimental design and treatment: The experiment will be conducted following Randomized Complete Block Design (RCBD) with three replications. 20 kenaf germplasms will be tested under 20 cm and 30 cm of water depth with a duration of 30 days.

Procedure: The seeds of each genotype will be sown in pots. The seeds will be sown at 30 March, 2025 in pots and plants will be maintained as per BJRI recommendations. After 25 days five plant will be kept in each pot for proper growth of the crop plants. Water logging treatment will be initiated at 60 DAS. Plants will be subjected to different water logging treatments at 60 days after emergence. Plants will be harvested at 120 DAS.

Records to be kept:
1. Days of emergence and harvest (date)
2. Plant height (m), Base diameter (mm), no. of leaves at harvest, leaf area at harvest
3. Dry weights of leaf, stick, bark and root at harvest (g)
4. Yield of fiber and stick (g)
5. Number of adventitious roots
6. Formation of Arenchyma tissue
7. Percent mortality

Estimated cost: TK.10, 000/-

PROJECT 3: STUDIES ON JUTE, KENAF AND MESTA SEED PHYSIOLOGY (PRODUCTION AND STORAGE)

3.1 Title of the experiment: Effect of date of sowing and time of de-topping on reproductive phenology in BJRI Kenaf 5 (Physio.5/2025)

Background and objectives: Kenaf is a profitable new fiber crop that is gaining popularity in Bangladesh, especially in the char and haor area. It can give high-quality fiber with less care and labor even in marginal, fallow lands. At present, around 0.0634 million tons of kenaf are produced in the country which requires 490 tons of seed which is largely imported from foreign countries (AIS, 2022). To meet the increasing demand and expand the cultivated area the annual domestic seed production of kenaf needs to be increased. Farmers of our country remain engaged in the production of kenaf seed in the traditional way. In addition sowing date has a great impact on quality seed production. Sowing on optimum date can retard the growth of plant as a result production of seed as well as the quality may hamper. Improved agronomic practices can increase seed production several times. De-topping is a practice that affects positively lateral branching and ultimately seed production in many crops (Mollah et al., 2015). So, sowing and de-topping at appropriate time has synergistic effect on better expression of the crop growth to increase quality seed yield (Kumar et al., 2013; Mazumdar et al., 2009). For a better understanding of how the reproductive phenology and quality of BJRI Kenaf 5 are affected by de-topping and date of sowing needs to be studied.

Expected output:

- Effect of de-topping on reproductive phenology and seed quality of BJRI Kenaf 5 seed.
- Optimum date of sowing and time of de-topping for BJRI Kenaf 5 seed production will be identified

Date of initiation and duration: June, 2024- February, 2027 **(2nd year)**

Name of the investigators: M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam

Treatments:

Variety: BJRI kenaf 5

Date of sowing	Time of de-topping
D_1 = 15th June	T_1= No de-topping (Control)
D_2 = 01st July	T_2= Detopping at 30 DAS
D_3 = 16th July	T_3= Detopping at 40 DAS
	T_4= Detopping at 50 DAS

Location: JAES, Manikganj and JRRS, Dinajpur.

Design: Randomized Complete Block Design (RCBD) will be followed with three replications. Unit plot size will be 4m × 3m. The space between plots and replications will be 1m.

Methods: Seeds will be sown according to the treatment in a line 40 cm apart. Other standard cultural and intercultural practices will be followed. De-topping will be done as per treatment.

Records to be kept:

1. Date of sowing and harvest
2. Date of 1st and 50% flowering, pod formation and pod maturity
3. Plant population m^{-2} after final thinning and at harvest
4. Plant height (m) of 10 randomly selected plants from each plot at harvest
5. First branch initiation height
5. No. of branch $plant^{-1}$, pod $plant^{-1}$, seed pod^{-1},
7. Seed yield $plant^{-1}$

8. % Germination, Vigour index, Speed of germination
9. Vigour index
10.Speed of germination

Estimated cost: Tk.1, 50,000/-

3.2 Title of the experiment Effect of Plant Growth Regulators on Yield and Quality of Late Season Tossa Jute Seed (Physio.6/2025)

Background and objectives: Jute (*Corchorus* sp.) is the principal fiber crop of Bangladesh. It contributes about 3-4% of the foreign currency earnings from exports (EPB, 2020). Bangladesh is the largest supplier of jute and jute goods in the international markets meeting nearly 95% of world raw jute demand and about 60% of jute goods demand (Rahman, 2010). Among the various factors related to good production, seed quality plays the pivotal role. Quality seed of an improved variety itself can provide 20% additional jute yield (Hossain *et al*., 1994). Unfortunately, the availability of good quality jute seed in our country is far below than the total requirement. Farmers of the country often have to depend on market seed having poor quality. Hence, the production and quality of healthy jute seed as well as its quality storage is highly essential to ensure the higher yield of quality fiber in order to meet the challenging need for natural fiber. Bangladesh requires 4000- 4500 MT of jute seed annually whereas production in Bangladesh Agricultural Development Corporation (BADC) is only 800-1000 MT. The farmers produce 400-600 MT. Rest of the demand is met up by importing mostly from India (Pulok *et al*., 2014). Nevertheless, the country has to rely on the farmers' seed and it faces acute scarcity of quality jute seed every year. Normal sowing time of *olitorius* jute is in the month of April for fiber production and August-September is the sowing time for seed production of *olitorius* jute but seed production during August-December known as 'late season jute seed production technolgy'. Plant Growth Regulators (PGRs) encompass a broad category of compounds that promote, inhibit, or otherwise modify plant physiological or morphological processes. Some PGRs are plant hormones or their analogues; others are simply metabolic regulators. PGRs are classified as organic compounds that alter the growth and development of plants. Plant growth regulators are used as stimulant in many crops to enhance the growth and yield of crops. Chemical PGRs have been widely used in cotton production in an attempt to adjust plant growth and to improve lint yield and fiber quality (Cothren and Oosterhuis, 2000). Now-a-days many growth regulators are available in our country. However, the performances of growth regulators are not known for jute seed crops. From the above facts, the experiment was designed to find out the effect of different plant growth regulators on seed yield and quality of olitorius jute under 'late jute seed production technology'.

Expected output: Plant growth regulators may affect differently which will help to find out the effect of different plant growth regulators on seed yield and quality of olitorius jute under 'late jute seed production technology'.

Date of initiation and duration: July 2025 to February 2026

Name of Investigator: M. M. Hasan, M. Hasan, M. K. H. Pradhan, M. M. Rahman and Dr. A.T .M. Morshed Alam
Location: Jute Research Regional Station, Rangpur

Experimental design and treatment:
The experiment will be conducted following a randomized complete block design with three

replications. Four growth regulators with different brand name such as Bionik, Litosen, Okozim, and Rupali Bumper will be used in the experiment along with a control plot. The jute variety will be BJRI Tossa Pat 8 (Robi-1). The unit plot size will be 4m × 3m. The crop will be maintained as per BJRI recommendations. Plant growth regulators will applied at three different times of application i.e. vegetative at 70 DAS, flower initiation at 80 DAS and pod initiation stage at 90 DAS of the crop. The growth regulators will be applied according to company recommendation (Bionik @ 4ml/1L, Litosen@ 10ml/10L, Okozim @ 5ml/10L, and Rupali Bumper @ 5ml /10). The crop will be harvested after 120 DAS.

Records to be kept:
1. Plant height (m)
2. Base diameter (mm0
3. Branch plant^{-1}
4. Pod plant^{-1}
5. Seed pod^{-1}
6. Seed yield plant^{-1}(g)
7. 1000-seed weight (g)
8. Germination%
9. Vigor index

Estimated cost: TK.10,000/-

References

AIS,2022: Agriculture Information Service, Field Crop Cultivation, Production and Yield Condition, Ministry of Agriculture, Government of the People's Republic of Bangladesh, PP. 11.

Alam, A. T. M. M. and M. M. Islam. 2015. Dry matter partitioning of newly released variety O-795. *Annual Research Report, 2015-16.* PP 108-109.

Atal C. K. 1961. Effect of gibberellin on the fiebrs of hemp. Econ Bot. 15(2): 133–139.

Bertan, I., F. I. F. de Carvalho and A. C. de Oliverira. 2007. Parental selection strategies in plant breeding programs. J. Crop Sci. Biotech. 10 (4): 211-222.

Colmer, T. D., & Voesenek, L. A. C. J. (2009). Flooding tolerance: Suites of plant traits in variable environments. Functional Plant Biology, 36(8), 665-681.

Cothren, J. S. and D. M. Oosterhuis. (2000). The use of plant growth regulators in cotton production. In: J.M. Stewart, D.M. Oosterhuis, and J. Heitholt (eds.). Handbook of Cotton Physiology, Kluwer Publisher, New York.

Debnath, M. R., M. S. Rahman, M. M. Rahman and M. M. Islam. 2018. Dry matter partitioning of newly released variety BJRI Tossa pat 6. *Annual Research Report, 2018*. PP 108-112.

Honi, U., Amin, M. R., Kabir, S. M. T. *et al*. 2020. Genome-wide identification, characterization and expression profiling of gibberellin metabolism genes in jute. BMC Plant Biol. 20: 306. https://doi.org/10.1186/s12870-020-02512-2

Hossain, M. A., S. Haque, K. S. Sultana, M. M. Islam and A. L. Khandakar. (1994). Research on Late Jute Seed Production. Pub. Seed. Tech. Res. Bangladesh Jute Res. Inst., Dhaka. pp 176-178.

Islam, M. M. (2009). In: Jute seed technology. 1st edition. Pub. By Md. Mahmudul Islam, 397, Middle Monipur, Mirpur, Dhaka-1216. College Gate Book Binding and Printing,

Mohammadpur, Dhaka. 160p.
Islam, M. S., Ali, M. H., & Jahan, M. A. (2019). Jute in Bangladesh: Trends and future strategies. Journal of Agribusiness and Rural Development, 3(53), 307-318.
Jackson, M. B., & Colmer, T. D. (2005). Response and adaptation by plants to flooding stress. Annals of Botany, 96(4), 501-505.
Krekule, J., Pavlova, L. and Souckova, D. 1985b. Multiple sites of auxin action in flowering of long day and short day *Chenopodium*. Acta Hortic. 167: 37-46. DOI: 10.17660/ActaHortic.1985.167.3
Krekule, J., Pavlova, L., Souckova, D. *et al*. 1985a. Auxin in flowering of short-pay and long-day *Chenopodium* species. Biol Plant. 27: 310–317. https://doi.org/10.1007/BF02879868
Kumar, N., Srivastava, R.K., Singh, R.K., & Singh, M.V. (2013). Impact of sowing time and varieties on seed yield of jute in subtropical climatic zone of north eastern Uttar Pradesh. Springer, 36(6):571- 573.
Kundu, C., Mandal, S., Banerjee, A., & Ray, D. P. (2018). Physiological and biochemical responses of jute (Corchorus olitorius L.) genotypes to waterlogging stress. Plant Physiology Reports, 23(2), 268-278.

Majumdar, B., Das, S., Saha, A.R., Maitra, D.N., & Chowdhury, H. (2009).Development and use of a promising microbial consortium for jute retting. Jaf News, 7 (1):14-15.
Pulok, M. A. I., Hossain, M. M., Mazed, H. E. M. K., Mahabub, S. T. and Sharmin, S. (2014). Effect of storage containers on the seed quality attributes of deshi jute (*Corchorus capsularis* L.). International Journal of Business, Social & Scientific Research, 2(2): 100- 103.
Pushpa, K., N. K. Murthy and R. K. Murthy. 2013. Dry matter accumulation studies at different stages of crop growth in Mesta. *African Journal of Agricultural Research*. 8(3). PP 332-338.
Rahman, M. M. (2010). Policy and prospect of jute and allied fibers with special reference to Bangladesh, Ministry of Textile & Jute. Govt. of the People's Republic of Bangladesh, Bangladesh Secretariat. Dhaka. p 2.
Rastogi DA, Siddiqui A, Mishra B, Srivastava M, Pandey R, Misra P, *et al*. 2013. Effect of auxin and gibberellic acid on growth and yield components of linseed (*Linum usitatissimum* L.). Crop Breed Appl Biot. 13: 136–143.
Talukder, F. A. H., S. C. Chanda, A. K. M. G. Sarwar, P. K. Bhander and M. N. Islam. 2001. Early vegetative growth and fibre yield in Tossa Jute. *Pakistan Journal of Biological Sciences.* 4(6). PP 665-667.
Webber, C. L., H.L. Bhardwaj and V.K. Beldsoe. 2002. Kenaf production: Fiber, feed, and seed. In: J. Janick and A. Whipkey (eds.), trends in new crops and new uses. ASHS Press, Alexandria. p. 327-339.

C. III. SOIL SCIENCE DEPARTMENT

PROGRAMME AREA: SOIL AND FERTILIZER MANAGEMENT

1. TITLE OF THE PROJECT: FERTILIZER RECOMMENDATION FOR NEW OLITORIUS VARIETIES OF BAST FIBRE CROP PRODUCTION UNDER MAJOR AEZs OF BANGLADESH (SSc Pro-1).

Objectives: Determining the fertilizer requirement is vital to achieving a sustainable higher yield of crops. The nutritional requirement of newly improved jute varieties may also be different. The fertility status of the soil is being altered in different AEZs under various agricultural practices. So, this project was undertaken to determine the fertilizer requirement of newly developed varieties of jute.

1.1 Title of the experiment: Interactive influential effects of Lime, Gypsum, and Magnesium on soil for plant nutrient availability in jute growing areas. (SSc. 1/2025)

Background and Objectives:

Soil is an obstacle to agricultural development and a concern regarding environmental securit y. Continuous crop cultivation under tropical conditions typically leads to severe declines in soil quality and, consequently, lower crop productivity (Holland et al., 2018). Soil acidity is regarded as one of the most important factors limiting crop growth and development, as well as the productive potential of fiber yield in Jute (FAO, 2015). Moreover, it is one of the most yield limiting factors that affect crop productivity (Sumner and Noble 2003; Fageria and Nascente 2014). Globally, approximately 50% of agricultural areas are affected by problems related to soil acidity (Von Uexküll and Mutert, 1995). According to Jarvis (1984) liming also promotes crop growth due to improved nodulation and increased N fixation through the increased abundance of compatible rhizobia and reduced constraints inhibiting the infection and nodulation of the host plant. It has been shown that liming can either improve N mineralization and subsequent beneficial effects on for cropping systems, including minimizing the inputs of nitrogen fertilizers (Holland et al., 2018). Moreover, the availability of Mg to crops depends on various factors such as soil texture, cation exchangeable capacity (Hariadi and Shabala, 2004), site specific climatic and anthropogenic factors, agronomic management practices, as well as crop species itself (Scheffer and Schachtschabel, 2002; Mikkelsen, 2010). Besides, Gypsum will change soil pH very slightly, yet it can promote better root development of crops, especially in acid soils, even without a big pH change. This is because the gypsum counteracts the toxic effect of soluble aluminum on root development. Aluminum occurs naturally in soil and often isn't a problem for crops. This information, particularly the long-term effects of lime and gypsum application in agricultural soils, is essential for the development of sustainable management practices that avoid N losses to the environment (Kemmitt et al., 2006; Liu et al., 2018). Keeping this in view, a field experiment was conducted to study the effects of lime, gypsum and magnesium sulphate on the (i) fibre yield of jute and (ii) acidity indices and their residual effect on nutrient status in soil (iii) What are the main changes in soil chemical properties amended with lime, gypsum, magnesium sulphate and lime + gypsum+ magnesium sulphate?

Expected Output: New finding/results will be generated in acid soil for Jute cultivation. Lime, Gypsum, and Magnesium effect on acid soil for jute cultivation. To know the changes of nutrient status in soil in jute growing areas.

Date of initiation and duration: 2023-2025
Date of sowing: Mid-March

Current Status: 3rd year
Name of investigators: Md. Abu Sayem Jiku; Abida Sultana; S.M. Shariarparvej; Md. Shamim-Al-Mamun, and Md. Kamrujjaman, and A.T.M Morshed Alam

Locations: Manikganj, Rangpur and Dinajpur.
Variety: BJRI Tossa Pat 9 (SobujSona)

Treatment:
The experiment was laid out in randomized complete block design (RCBD) with the following treatments, namely
(i) T1 = Control (no liming, gypsum, magnesium and no fertilizers, i.e., natural soil condition);
(ii) T_2 = Recommended dose of NPK
(iii) $T_3 = T_2$ + Gypsum (100 kg/ha)
(iv) $T_4 = T_2$ + Liming @1.2 t/ha)
(v) $T_5 = T_2 + MgSO_4\ 7H_2O$ (@ 10 kg/ ha)
(vi) $T_6=T_2+T_4+T_5$

Layout and Design:
i) RCBD with three replications
ii) Plot Size: 4 m × 2.5 m.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.

Procedure: Recommended cultural practices were followed up to maturity.

Data Recorded
Before set-up the experiment, soil samples (0-15 cm) from each plot were drawn and analyze for different parameters after their processing. Similarly, the harvest of the crop, soil samples (0-15 cm) from each plot were drawn and analyze for different parameters after their processing.
1. The pH of the soils and amendments (1:5 w/v) was measured using a combined pH electrode.
2. Electrical conductivity (EC) was measured using a conductivity electrode (Mettler-Toledo Ltd., Shanghai, China);
3. The total organic carbon (TOC) content of the soils was measured using the potassium dichromate external heating method;
4. The total N content was measured using the Kjeldahl method
5. The soil texture was measured using the hydrometer method
6. Cation exchange capacity (CEC) was measured using the ammonium acetate extraction-flame photometry method (Lu, 2000).
7. Different element analysis like Ca, Mg, N, P, K
Estimated cost: 60000/-

References:
Holland, J.A., Bennett, A., Newton, B., McKenzie, P., White, T., George, R., Pakeman, J.S., Bailey, D.A., Fornara, R. Hayes, 2018. Liming impacts on soils, crops and biodiversity in the UK: a review. Sci. Total Environ. 610, 316–332.

Food and Agriculture Organization – FAO, 2015. Status of the World's Soil Resources (SWSR)—Main report. Natural Resources and Environment Department, Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils (ITPS), Rome, Italy.

Von Uexküll, H.R., Mutert, E., 1995. Global extent, development and economic impact of

acid soils. Plant Soil 171 (1), 1–15.
Liu, X.Y., Rashti, M.R., Esfandbod, M., Powell, B., Chen, C.R., 2018. Liming improves soil microbial growth, but trash blanket placement increases labile carbon and nitrogen availability in a sugarcane soil of subtropical Australia. Soil Res. 56 (3), 235–243.
Kemmitt, S.J., Wright, D., Goulding, K.W.T., Jones, D.L., 2006. pH regulation of carbon and nitrogen dynamics in two agricultural soils. Soil Biol. Biochem. 38, 898–911.
Jarvis, S.C., 1984. The responses of two genotypes of white clover to addition of lime to an acid permanent grassland soil. J. Sci. Food Agric. 35, 1149–1158.
Fageria NK, Nascente AS (2014) Management of soil acidity of South American soils for sustainable crop production. In: Sparks DL (ed) Adv Agron 128:221–275
Sumner M, Noble A (2003) Handbook of soil acidity. In: Rengel Z (ed) Marcel Dekker, New York, pp 1–28
Mikkelsen, R. (2010). Soil and fertilizer magnesium. Better Crops 94, 26–28. www. researchgate.net/publication/308795926.
Hariadi, Y., and Shabala, S. (2004). Screening broad beans *(Viciafaba)* for magnesium deficiency. I. Growth characteristics, visual deficiency symptom and plant nutritional status. Funct. Plant Biol. 31, 529–537. doi: 10.1071/fp03201

1.2 Title of the Experiment: Optimizing Potassium for managing plant lodging and yield of *olitorius* jute (SSc.2/2025).

Background and Objectives:
Jute, an important and the largest natural fiber crop belonging to the genus Corchorus, family Malvaceae. Jute fiber is produced mainly from white jute (*C. capsularis*) and tossa jute (*C. olitorius*). This cash crop is the source of highly versatile environment friendly natural fibre and is the second only to cotton in terms of production and variety of uses (Islam *et al.* 2013). Considering all these facts, improvement of fiber yield and quality of jute is the prime need for Bangladesh. In this aspect, research regarding development of new high yielding variety of jute and determination of its fertilizer requirement is very important. In fact, these requirements vary within the same type of crop. For example, fertilizer demand of *C. olitorius* variety is higher than *C. capsularis* (Ali M.S. *et al*. 2017). The importance of N, P, K and S on the growth, yield and quality of fiber crops is well established (Ali M.S. *et al*. 2019).
Farmer thought higher dose of K give good quality fiber. But there is no such evidence, so it's now important to find out the effect of K on tossa jute (Robi-1). Considering the above facts we need to find out the optimum requirement of Potassium and all of these nutrients to achieve higher quality fiber and the maximum yield potential of Tossa-8 (Robi-1) jute variety.

Objectives: To assess the effect of potassium fertilizers on yield and quality parameters of BJRITossa pat-8 jute (*C. olitorius*).
Date of initiation and duration: 2022- 2024.
Current Status: 3rd year
Name of the investigators: Abida Sultana**,** Md. Abu Sayem Jiku; Syed Nazrul Islam; Md. Kamrujjaman, and A.T.M Morshed Alam

Methodology:

- **Experimental site**: Experiments will be conducted in the Jute Research Substation, Monirampur, Jashore
- **Treatments:**

N	P	K	S	(Kg/ha)
100	5	30	20	

100	10	60	20
100	15	90	20
100	5	120	20
100	10	150	20
100	15	180	20

Layout and Design: Randomized Complete Block Design (RCBD) with three replications.
Records to be kept:

- Plant height
- Base Diameter
- Green plant weight with leaves
- Green plant weight without leaves
- Fibre weight
- Stick weight
- Fibre length
- Fibre strength

References:

Ali MS, Hoque MM, Alim MA, Mahbubul I (2019) A Nutrient Combination That Can Affect Yield of Olitorius Jute. Science publishing group, ISSN: 2331-0669

Ali MS, Islam MM (2017) Economic Importance of Jute in Bangladesh: Production, Research Achievements and Diversification. International Journal of Economic Theory and Application, 4 (6), 45-57.

Islam S, Muhammad SA, Sazia S, Abu AS, Maksudul A, Shamim R, Rajib A. and Haseena K (2013) Improved salt tolerance of jute plants expressing the kat E gene from *Escherichia coli.*Turky J. Biology. 37: 206-211.

1.3 Title of the experiment: Influence of Mg, Zn & B on the growth & yield of BJRI Tossa Pat-8. (SSc.03/2025)

Background of the study

Jute is an eco-friendly and the major cash crop in Bangladesh. Jute holds an important position in the industrial sector of the economy of Bangladesh (Islam and Ali, 2017). Demand of jute fibre is being increased in the recent years both in home and abroad (Islam and Ali 2018). Jute (Corchorus sp.) is one of the most important fiber crops of this country. According to EPB, in the month of july-january 2022-23 fiscal year $117 million foreign currency earned. Bangladesh, the second largest producer of jute, produces the best quality jute in the world and leads the export market (Rayhan et al., 2008). Bangladesh is the largest supplier of jute and jute goods in the international market. The green leaves of jute contain minerals and proteins, which are edible and popular as a leafy vegetable. The primary macronutrients are Nitrogen (N), Phosphorus (P), and Potassium (K). Nitrogen is essential for plant development, since it plays a fundamental role in energy metabolism and protein synthesis. Besides Mg also plays important role in the growth and development of plant. Mg is the central core of the chlorophyll molecule in plant tissue. Mg also helps to activate enzyme systems. Thus, if Mg is deficient, the shortage of chlorophyll results in poor and stunted growth. Fertilization is one of the most important management practices because plant growth is directly related to plant nutrition i.e. fertilization. Crop nutrient uptake and crop yields are the principal factors that determine optimal fertilization practices (Ju and Christie 2011). Therefore, it is very important to apply fertilizers in an efficient way to minimize loss and to improve the nutrient use efficiency (Li et al. 2009). There are 7 essential plant nutrient elements defined as micronutrients [boron (B),

zinc (Zn), manganese (Mn), iron (Fe), copper (Cu), molybdenum (Mo), chlorine (Cl)]. They constitute in total less than 1% of the dry weight of most plants. Boron is a micronutrient critical to the growth and health of all crops. It is a component of plant cell walls and reproductive structures. Boron can be found in soil solution, adsorbed to soil surfaces, organic matter, and is part of soil mineralogy. Judicious application of fertilizer is one of the most effective means for maximizing jute yield. Cultivation of high yielding varieties, intensive cropping (Islam et al. 2017), loss of fertile top soil and losses of nutrient through leaching (Rahman et al. 2008, Singh et al. 2011, Somani 2008). At global scale, about one-third of arable soils are deficient in micronutrients, particularly in zinc (Cakmak et al. 2017). Foliar application of Zn reduces the micronutrient deficiencies and it is an efficient method because nutrients are easily absorbed through leaves and is best option to compensate micronutrient deficiencies in shorter period of time under rainfed regions (Nasiri et al. 2010). From the above facts, the experiment will be designed to find out the efficiency of foliar application of different fertilizers to be assured the better growth and yield of jute fiber.

Objectives:
i. To study the influence of Mg, Zn and B on jute fibre
ii. To find out optimum zinc, boron and magnesium fertilizer rates for maximizing growth and yield of jute.

iii. To find out the interaction effect between zinc, boron and magnesium on growth and yield of
jute fiber.
Duration of the experiment: 2023-2025.
Current Status: 3nd year
Date of sowing: Mid March.
Name of investigator: Tasnufa Karim Zhumur, Md. Abu Sayem Jiku; Abida Sultana; Md. Kamrujjaman, and A.T.M Morshed Alam

Experimental Details:
Layout and Design:
i) RCBD with 3 replications
ii) Unit Plot Size: :(2 X 3) = 6 m^2.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.
Experimental Procedure: The material will be grown in mentioned station with recommended spacing and sowing time. Fertilization and roughing along with other intercultural operation will be done in time. A close observation will be kept on disease and pest infestation.
Treatments: The treatments are followed by Zn B Mg $Kgha^{-1}$
T_1= Control
T_2= 4Zn+5B+2Mg
T_3= 5Zn+10B+3Mg
T_4= 10Zn+15B+5Mg
T_5= RDF
T_6= RDF+4Zn+5B+2Mg
Records to be kept:
i.Pre and post soil samples will be collected from experimental field.
ii.Plant population per/ at harvesting time.
iii.plant height
iv.Base diameter
v.Fibre Yield

References :

Islam, M. M. and Ali, M. S. (2017). Economic Importance of Jute in Bangladesh: Production, Research Achievements and Diversification. International Journal of Economic Theory and Application, 4 (6): 45-57

Rayhan, S.M.,Rahand, M.A. and H.A. Amin. 2008. Effect of planting Time and Magnesium on the Growth and Yield OF Jute Seed. Bangladesh Res. Pub.J., 1(4): 303-311.

Ju, X. and Christie, P. (2011). Calculation of theoretical nitrogen rate for simple nitrogen recommendations in intensive cropping systems: A case study on the North China Plain. Field Crops Res 124:450–458. doi:10.1016/j.fcr.2011.08.002.

Li, X., Lu, J., Wu, L. and Chen, F. (2009). The difference of potassium dynamics between yellowish red soil and yellow cinnamon soil under rapeseed (Brassica napus L.)–rice (Oryza sativa L.) rotation. Plant Soil 320: 141–151. doi: 10.1007/s11104-008-9879-7.

Islam. M.F., Islam, M.R., Jahiruddin, M. and Sarmin, T. (2017). Cropping pattern based micronutrient application for wheat-mungbean-T. aman crop sequence under Tista Meander floodplain soil at Rangpur. J Bangladesh Agri Uni 15(2):140–147. doi: 10.3329/jbau.v15i2.35055

Somani, L. L. (2008). Micronutrients for soil and plant health Agrotech Publishing Academy 74 pp

Rahman, M.T., Jahiruddin, M., Humauan, M.R., Alam M.J. and Khan. A.A. (2008). Effect of sulphur and zinc on growth, yield and nutrient uptake of boro rice (Cv. Brridhan 29). J Soil Nat 2:10-15

Singh, A. K., M. K. Meena and R. C. Bharati. (2011). Sulphur and zinc nutrient management in rice-lentil cropping system. International Conference on "Life Science Research for Rural and Agricultural Development" (pp: 66-67). 27-29 December, 2011, CPRS Patna (Bihar)

Cakmak, I., McLaughin, M.J. and White, P. (2017). Zinc for better production and human health. Plant soil 411:1-4. doi: 10.1007/S11104- 016-3166-9.

Islam, M. M. and Ali, M. S. (2018). Industrial Research Advances of Jute in Bangladesh. International Journal of Agricultural and Biosystems Engineering, 3 (1): 1-9.

Islam, M. M. and Ali, M. S. (2017). Agronomic Research Advances in Jute Crops of Bangladesh. AASCIT Journal of Biology, 3 (6): 34-46.

1.4 Title of the experiment: Influence of vermicompost, biochar and poultry manure on BJRI Tossa Pat 8 for fibre production(SSc. 4/2025)

Background and objectives:

Seed is the basic input for agricultural production. Bangladesh requires about 5500-6000 tons jute and kenaf seeds in every year, of which only 10-15% is produced and distributed by the BADC (Ali et al., 2003). Farmers of Bangladesh conventionally grow seed and fibre simultaneously from the same plant of jute. In recent year, the agro-ecological condition of the country has abruptly changed and jute seed production as a part of fibre crop is no longer remunerative. So, the country has been facing acute shortage of quality jute seed every year. Quality seeds of an improved variety itself provide 20 percent additional yield of the crop (Hossen M., 2008). Degradation of soil fertility is a major problem in agricultural production and the soil fertility of cropland is increasingly degraded since the introduction of green revolution in Bangladesh (Barmon & Tarafder, 2019). Better soil fertility with higher organic matter content is a prerequisite for sustainable crop production and organic manure can play a vital role in increasing soil fertility and crop production (Qulsum, 2020). Vermicompost is usually rich in microbes and diversity particularly bacteria, fungi and actinomycetes. The

compost prepared by earthworm contains several types of enzymes, hormones, vitamins, antibiotics and many essential nutrients needed for plant growth and also play important role in improving soil structure and water holding capacity, crop productivity and quality. (Marmeto, Santos, & Labindao, 2017). Vermicompost is associated in induction of high porosity, aeration, drainage, capacity to retain water and microbial activity (Ahmad, Aslam, Naeem, Idree, & Muhammad, 2021). Thus, applying vermicompost as organic manure to soil organic carbon, improving nutrient contents, enhancing cation exchange ability, microbial activities, microbial biomass carbon and enzymatic activities. Chemical fertilizer has also vast impact on jute seed production. In addition, impacts which are caused by over application of chemical fertilizers, energies, expenses of their production are the reasons for global tendency toward application of biofertilizers (Hashemzadeh, Mirshekari, Khoei, & Tarinejad, 2013). Poultry manure improves soil fertility condition by adding major and essential nutrients elements which improves nutrient

retention capacity. (Farhad, Saleem, & Cheema, 2009). Biochar is another soil amendmend agents which helps to improve soil physical,chemical and microbial condition resulting in improving crop productivity (Singh, Northup, Rice, & Prasad, 2022). To maximize yield integrated nutrient management is also necessary. Therefore, the experiment has been undertaken to find out the optimum doses of fertilizer and interaction for maximum output as well as to keep the soil fit for the years to come.

Expected output: To generate new knowledge about the impact of vermicompost, poultry manure, biochar and their interaction.
Date of initiation and duration: 2023-2025.
Current Status: 3rd year
Date of sowing: Mid-August
Name of the investigators: Md. Shamim-Al-Mamun, Abida sultana, Md. Abu Sayem Jiku; Md. Kamrujjaman, and A.T.M Morshed Alam

Locations: Faridpur, Jashore and Dinajpur
Materials: (Variety/ Srtain): BJRI Kenaf-4
Treatment:
T_1: No vermicompost + No poultry manure + No biochar (Control)
T_2: Vermicompost @ 4 t/ha
T_3: Recommended dose of chemical fertilizer (RDCF)
T_4: Poultry manure @ 5 t/ha
T_5: Biochar @ 3 t/ha
T_6: 125 % RDCF
T_7: 50 % RDCF + Cowdung @ 4 t/ha
T_8: 50 % RDCF + Biochar @ 2 t/ha
T_9: 75% RDCF + vermicompost @ 3 t/ha
T_{10}: Vermicompost @ 2 t/ha + Biochar @ 1 t/ha + Poultry manure @ 2 t/ha

Design and layout: RCBD with three replications.
Unit plot size: 3.0 m x 3.0 m. Space between plots, blocks and around the field 60 cm, 1.0 m and 1.0 m respectively. There will be 20 cm deep drain around each plot, block and around whole plot to drain out excess rain water.
Procedure: Experiment will be setup in month of Mid-August. The experiment will be conducted at the Jute Research Regional Station Faridpur, sub station Jashore and Dinajpur . Crop management will be done as per BJRI recommendation. Data will be collected on

harvesting stage. A sample of 10 plants will be collected from each plot where these plants will be subjected to analyze.

Records to be kept:
1. Initial and after harvest soil sample collection and analysis.
2. Date of sowing, germination, fertilizer application, harvest & other necessary information.
3. Plant population at final thinning and at harvest.
4. PH & BD of 10 randomly selected plants/Plot.
5. Count the pod/plant.
6. 1000 Seed wt.(g) /plot &
7. Total seed yield (t/ha).

Estimated cost: 50000/-

1.5 Title of the experiment: Impact of Manure Application on Soil Health and Yield-Contributing Characters in Jute Cultivation (SSc. 5/2025)

Manure improvement has been used in farmlands in China for thousands of years, and it is now the most effective manual way to increase SOM. Meanwhile, microbes within soil is an important component of soil function (Torsvik *et al.,* 2002) that are related with soil mineral nutrient release and plant disease resistance, and bacteria mineralization (Kindler *et al.,* 2006) is an important natural source of SOM. The evaluation of effects of manure application on the structure and functionality of soil microbial community is crucial to gaining a more holistic understanding of soil status under manure refinement. Moreover, manure are the critical factors influencing soil fertility and the primary sources of organic matter in the soil, which today have received much attention due to the importance of organic agriculture and the need to reduce environmental problems in sustainable way. Manures facilitate root penetration in the soil, increase root dry weight by improving soil physical properties, and play an essential role in controlling mobility, bioavailability, uptake, and disposal of metals (Shahid *et al.,* 2017). Haroon *et al.,* (2019) indicated that heavy metals were reduced by applying manure in different types and ratios in the field. Besides, jute plants can remove or immobilize various pollutants from the soil by employing different phytoremediation strategies, such as phytodegradation, phytoextraction, phytostabilization, etc. (Yan *et al.,* 2020). Inspecting rhizosphere soil microbial community structure shifts after manure application is an important method for determining the proper way to improve ecosystem services and soil function. Bacteria are the most abundant and diverse group of soil organisms (Plassart *et al.,* 2012) , and it is estimated that 1 g of soil contains more than 1,000,000 bacteria from thousands of different species

The microbes in the rhizosphere play important roles in terrestrial ecosystems and are sensitive indicators of soil quality, productivity, and sustainability (Cheng *et al.,* 2020). They also have important roles in plant nutrient uptake and resistance to adverse conditions (Chamkhi *et al.,* 2022; Pande, et al., 2021), both indirectly and directly, through symbiotic relationships (e.g., mycorrhizal) with plants. Many studies have found that organic material application is beneficial in promoting the soil organic matter contents and bacteria growth, which are important to further increase the effectiveness of soil nutrients, improve soil fertility, and enhance soil productivity (Bei, *et al.,* 2018;Zhang, et al., 2022). Ji et al., (2021) revealed that long-term usages of organic fertilizers resulted in the formation of potential functional groups, as well as interactions between soil microorganisms, likely due to the enhanced soil stability and buffering capacity of organic fertilizers. Lin *et al.,* (2012) found that different fertilizers had various impacts on soil bacteria. However, little was discovered about the jute rhizosphere microbial profile, and although manure treatment was employed in an earlier study, little was learned about the impact of different doses on metals accumulation and As accumulation of

jute rizosphere soils. The main aims of this study were to (1) explore metals accumulation and distribution in the soil and jute plants after long-term manure application; (2) investigate the effects of manure improvement on the structure of a microbial community and As biotransformations genes in the jute rhizosphere; and real-time quantitative polymerase chain reaction (qPCR), and Miseq high-throughput sequencing technologies were used to achieve these goals.

Expected Output: The findings would help to provide a better understanding of the impacts of manure application on metals accumulation and biotransformation in a soil−jute system.

Date of initiation and duration: 2023-2025

Date of sowing: March-April

Current Status: 2nd year
Name of investigators: Md. Abu Sayem Jiku; Abida Sultana; Md. Shamim-Al-Mamun, S.M. Shariarparvej; Md. Kamrujjaman, and A.T.M Morshed Alam

Locations: Faridpur, Jessore, and Patuakhali,
Variety: BJRI Tossa Pat 9 (SobujSona)
Treatment:

In this experiment, chemical fertilizers (CF) like urea, di-ammonium phosphate (DAP) and Muriate of potash (MOP) will be applied to supply N, P and K at standard doses in combination with treatments. Therefore, a total of five treatments are as follows:

T1= Control treatment (Natural condition)
T2= Chemical fertilizers only (CF): RD
T3= CF+FYM @ 5 t/ha
T4=CF+FYM@7.5t/ha
T5=CF+FYM@10t/ha
Layout and Design:

i) RCBD with three replications
ii) Plot Size: 4 m × 2.5 m.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.

Procedure: Recommended cultural practices were followed up to maturity.
Data Recorded

1. Before set-up the experiment, soil samples (0-30 cm) from each plot were drawn and analyse for different parameters after their processing. Similarly, the harvest of the crop, soil samples (0-30 cm) from each plot were drawn and analyse for different parameters after their processing.

2. EC, pH, total N, P, K, Ca, and Mg and micro-nutrients (Zn, Fe, Cu and Mn) and metals (Pb, Cd and As) will be analyzed by standard procedure.
3. DNA Extraction, Polymerase Chain Reaction (PCR) Amplification, and Real-Time Quantitative PCR: DNA will be extracted from the bulk and rhizosphere soils.
4. Statistical Analysis. The data will be presented as the average ± standard deviation of three replicates. The treatment effects could be assessed by analysis of variance, followed by comparisons of treatment means using the least significant difference at $p < 0.05$. Pearson correlation was used to evaluate the relationships between functional genes and soil properties.
Estimated cost: 300000/-

2. TITLE OF THE PROJECT: FERTILIZER RECOMMENDATION FOR NEW KENAF VARIETIES OF BAST FIBRE CROP PRODUCTION UNDER MAJOR AEZ OF BANGLADESH (SSPro-3).

Objectives: Fertilizer requirement is vital to achieve sustaining higher yield of crops and soil fertility. Fertility status of the soil is being changed in different AEZ under different agricultural practices. So, this project has been undertaken to make fertilizer recommendation to determine fertilizer requirement of newly developed kenaf varieties of jute.

2.1 Title of the experiment: Effects of different sources of organic manures and chemical fertilizers on growth & yield of BJRI developed kenaf variety and improve soil health. (SSc.6/2025).

Introduction: Jute is an eco-friendly and the major cash crop in Bangladesh. Jute holds an important position in the industrial sector of the economy of Bangladesh (Islam and Ali, 2017). Jute is the principal bast fibre crop of the World and a matter of pride to Bangladesh. Bangladesh and India produce over 92% of the total jute fibre of the world. Kenaf plays an important role in fibre production leading to more income with low-cost involvement. It is a short day, herbaceous fiber crop belonging to the family Malvaceae (H'ng et al., 2009). The Malvaceae family is noted for their economic and horticultural importance (Akinrotimi & Okocha, 2018).The production of jute and kenaf allied fibre crops in Bangladesh is decreasing day by day due to improper fertilizer management. In years to come, utilization of organic manure to meet crop nutrient requirement will be an unavoidable practice to enhance sustainable agriculture, this is because, the physical, chemical and biological properties of soil is generally improved by the addition of organic manures which in turn enhances crop productivity and maintains the quality of crop produce(Maheswarappa et al.,1999) . Although, in comparison to inorganic fertilizers, organic manures contain smaller quantities of plant nutrients. To use of inorganic fertilizer to increase yield has been found to be efective as a short-term solution but demands consistent use on a long-term basis. The high cost of inorganic fertilizers makes it uneconomical and out of reach to poor farmers and it is also undesirable due to its hazardous environmental effects (Olowoake.,2014) .Compost is an important resource for soil amendment in organic farming with the benefits of being environment-friendly. Composted manure helps to modify physical, chemical, and biological properties of the soil, provides slow release of nutrients and increases crop yield (Agbede et al. 2008; Moral et al. 2009). Composted organic manure especially from poultry wastes have been reported to improve mineral composition in tissues of vegetables such as Jute mallow (Mazen et al. 2010; Jonathan et al. 2012). The application of animal manure can improve soil structure by reducing bulk density and increasing soil porosity, water infiltration/percolation rate, and aggregate stability [Edmeades 2003 , Thangarajan et al.,2016]. Furthermore, manure-based amendments can stimulate soil microbial activity and biomass, as well as alter the composition and diversity of soil microbial communities [Liu et al.,2016 , Reardon et al.,2016]. Proper dose of nutrients is essential for each of the variety of jute for its optimum growth and yield. Judicial application of NPKS is also important to complete life cycle of jute plant (Sarker *et al*., 2000; Das *et al*., 1996). Therefore, it is essential to investigate the use of locally sourced organic materials which are environment friendly, cheap and probably an effective way of improving and sustaining the productivity of soils and fibre crops such as kenaf.Determination of nutrients rate for the varieties/strains are also pre-requisite for final release. Yet this organic manure and fertilizer plays an important role to increase the fibre quality. It is necessary to find a combination treatments which is economically profitable and at the same time gives yield which is very close to maximum yield potential and obviously improve soil health. So an experiment has been undertaken to observe the effects of organic and inorganic fertilizers on the growth, yield of the kenaf variety and improve the soil properties.

Objectives:
i. To find out the appropriate suitable interaction & nutrient management option for proper growth and higher yield of BJRI kenaf variety.
ii. To improve the soil health.
Date of initiation and duration: 2023-2025. (2023 1st year) .
Current Status: 3rd year
Date of sowing: Mid-March.
Name of investigators: Md. Kamrujjaman, Abida Sultana, Md. Abu Sayem Jiku, Ronzon Chandra Das and A.T.M Morshed Alam

Locations: Kishoreganj & Tarabo.
Treatments:
T_1= Control
T_2= (RDF)
T_3= 50% (RDF) + CD @ 1 tha^{-1}+ PM @ 1 tha^{-1}
+ VC @ 1 tha^{-1}
T_4= 50% (RDF) + CD @ 1.5 tha^{-1}+ PM @ 1.5 tha^{-1}
+ VC @ 1.5 tha^{-1}
T_5=75% (RDF) + CD @ 1.5 tha^{-1}+ PM @ 1.5 tha^{-1}
+ VC @ 1.5 tha^{-1}
T_6=75% (RDF) + CD @ 1.5 tha^{-1}+ PM @ 1.5 tha^{-1}+ VC @ 1.5 tha^{-1}
RDF= Recommended dose of fertilizer, CD= Cow dung, PM= Poultry manure, VC= Vermicompost.

Variety: BJRI kenaf HC-95, BJRI kenaf -4, BJRI kenaf-5 .
Layout and Design:
i) RCBD with three replications
ii) Unit Plot Size: 3 m × 2.0 m.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.
Procedure:
The concern varieties will be grown in mentioned research stations of BJRI by following their proper spacing and sowing time. Fertilization and roughing along with other intercultural operations will be done in time. A close observation will be kept on disease and pest infestation.

Records to be kept:
i.Pre soil test and post soil test.
ii.Plant population per/m^2 at 75 DAS,90 DAS,120 DAS.
iii.Plant height
iv.Base diameter
v.Fibre Yield
vi.Stick Yield
References:
Agbede TM, Ojeniyi SO, Adeyemo AJ (2008) Effect of poultry manure on soil physical and chemical properties, growth and grain yield of sorghum in South-West, Nigeria. Am Eurasian J Sust Agric 2:72–77
Akinrotimi, C. A., & Okocha, P. I. (2018). Evaluation of genetic divergence in kenaf (*H. cannabinus* L.) genotypes using agro-morphological characteristics. *Journal of Plant Sciences and Agricultural Research*, **2**(12), 1– 10
Das, K., Guha, B. and Pathak, D. (1996). Response of Capsularis to potassium fertilization. Ann. Agril. Res., 17 (2):188-189.

Edmeades, D.C. The long-term effects of manures and fertilisers on soil productivity and quality: A review. Nut. Cycl. Agroecosyst. 2003, 66, 165–180. [CrossRef]

H'ng, P. S., Khor, B. N., Tadashi, N., Aini, A. S. N., & Paridah, M. T. (2009). Anatomical structure and morphology of new kenaf varieties. *Asian Journal of Scientific Research*, **2**(3), 161– 166

Islam, M. M. and Ali, M. S. (2017). Economic Importance of Jute in Bangladesh: Production, Research Achievements and Diversification. International Journal of Economic Theory and Application, 4 (6): 45-57.

Jonathan SG, Oyetunji OJ, Olawuyi OJ, Asemoloye MD (2012) Growth responses of *Corchorus olitorius* Lin. (Jute) to the application of organic manure as an organic fertilizer. Acad Arena 4(9):48–56

Liu, T.; Chen, X.Y.; Hu, F.; Ran, W.; Shen, Q.R.; Li, H.X.; Whalen, J.K. Carbon-rich organic fertilizers to increase soil biodiversity: Evidence from a meta-analysis of nematode communities. Agric. Ecosyst. Environ. 2016, 223, 199–207. [CrossRef]

Maheswarappa, H. P., Nanjappa, H. V., Hegde, M. R. & Prabhu, S. R. Infuence of planting material, plant population and organic manures on yield of East Indian galangal (Kaempferia galanga), soil physico-chemical and biological properties. Indian J. Agron. 44(3), 651–657 (1999).

Mazen A, Faheed FA, Ahmed AF (2010) Study of potential impacts of using organic manure in the amendment of desert reclaimed soil on wheat and Jews mallow plants. Braz Arch Biol Technol 53(4):917–930. https://doi.org/10.1590/S1516-89132010000400022

Moral R, Paredes C, Bustamante MA, Marhuenda-Egea F, Bernal MP (2009) Utilisation of manure composts by high-value crops: safety and environmental challenges. Bioresour Technol 100(22):5454–5460. https://doi.org/10.1016/j.biortech.2008.12.007

Olowoake, A. A. Infuence of organic, mineral and organomineral fertilizers on growth, yield, and soil properties in grain amaranth (Amaranthus cruentus L.). J. Org. 1(1), 39–47 (2014)

Reardon, C.; Wuest, S.B. Soil amendments yield persisting effects on the microbial communities: A 7- year study. Appl. Soil Ecol. 2016, 101, 107–116. [CrossRef]

Sarker, A. K. and Bandopaddhay, P. K. (2000). Effect of potassium, boron and crop age on the yield and quality of white jute (Corchorus capsularis). Indian Agr., 26: 212-216.

Thangarajan, R.; Bolan, N.S.; Tian, G.; Naidu, R.; Kunhikrishnan, A. Role of organic amendment application on greenhouse gas emission from soil. Sci. Total Environ. 2013, 465, 72–96.

3. TITLE OF THE PROJECT: FERTILIZER RECOMMENDATION FOR SEED PRODUCTION OF OLITORIUS JUTE UNDER DIFFERENT AEZ OF BANGLADESH (SSPro-4)

Objectives: Bangladesh is facing jute seed scarcity every year. About 14% of the total demand can supply GO/NGO agencies. The rest of the requirement is fulfilled by the farmer's own management and importing from neighboring country. BJRI has been developed different varieties of jute. Fertilizer management on seed production of these new varieties yet not been conducted. To minimize the seed scarcity of jute through increase of seed yield it needs proper fertilizer management. For large scale production of seed, modern technology is needed. Bangladesh Jute Research Institute has developed late jute seed production technology. A balanced fertilizer is needed for maximum seed yield per unit plot. So this project has been under taken for recommendation of fertilizer for seed production of jute at late season.

3.1 Title of the experiment: Combined effect of Vermicompost and Inorganic fertilizers on the yield and seed quality of (*Corchorus Olitorius L.*) (SSc. 7/25)

Background:

Jute is a long, soft, lustrous and shiny bast fibre plant that can be spun into coarse, strong and long-lasting threads. Jute plays an important role in household food security and nutrition. Jute can almost grow anywhere in Bangladesh,which is sometimes overlooked by people. Also, despite its nutritional and economic importance, it has been neglected by scientific research and development in Bangladesh. It can be found in the wild but it can also be grown in a farm. It is considered nutritious and known as the golden fiber (Islam, 2013). It is a hard plant that is resistant to pests and requires little care. Food production in the country as well as its distribution and consumption by the population has consequent impact on the overall nutritional status of the society. Whereas, reports show that there is enough food to feed the country, but still, many Bangladeshis continue to experience hunger and become malnourished due to inadequate intake of nutritious food. This situation may reflect that Bangladeshis lack sufficient awareness on utilizing the available edible foods that can be found within the surroundings, such as indigenous plants that grow unnoticed within the areas like jute. Every year farmers face jute seed problem. Only 15.84 percent need of jute seeds are met by Bangladesh Agricultural Development Corporation (Anonymous, 1999). Rest quantity of jute seed is solely produced and utilized by the farmers themselves. Sometimes farmers failed to produce quality seed because of improper management, imbalance fertilizer application or lack of appropriate production practices. Quality seeds of an improved variety itself provide 20 percent additional yield of the crop (Hossain et al., 1994). Organic crop production has positive impacts such as soil conservation and improvement of soil fertility that consequently sustain food production forfuture generations, stability and food security in diversified cultures and environmental impact using manures, plant residues and vermicomposts (Pierre et al. 2015). Excessive and indiscriminate use of chemical fertilizers leads to soil degradation and impose a serious threat to human health (Fujimoto, 1998; Pierre et al. 2015). This practice should graduallyshift to organic farming for sustainable crop production system. This study was carried out to determine the performance of jute in terms of growth and yield as influenced by fertilizer variations and to determine the best level of vermicompost combined with inorganic fertilizer.

2.Objectives :

i) To determine the best level of vermicompost combined with inorganic fertilizer.
ii) To promote organic farming for quality jute seed production.

3.Duration of the experiment : 2024-2026 (2nd year) .
Current Status: New
4. Date of sowing : Mid July.
5. Name of investigator : Tasnufa Karim Zhumur, Abida Sultana, Md. Abu Sayem Jiku, Md. Kamrujjaman, and A.T.M Morshed Alam

6. Locations: Kishoreganj, Manikganj & Madarganj.
7. Experimental Details :

Layout and Design:

iv) RCBD with 3 replications
v) Unit Plot Size: :(3 × 3)= 9 m^2.
vi) Space between plots and blocks 60 cm and 1.0 m respectively.

Experimental Procedure:
The concerned variety will be grown in mentioned station of BJRI with recommended spacing and sowing time. Fertilization and roughing along with other intercultural operation will be done in time. A close observation will be kept on disease and pest infestation.
Treatments:

Treatments: kg/ha
T_1 – Control
T_2 – (RDF)
T_3 – 25% (RDF) + VC @ 1.5 tha^{-1}
T_4 – 50% (RDF) + VC @ 1.5 tha^{-1}
T_5 – 75% (RDF) + VC @ 1.5 tha^{-1}
T_6 – (RDF) + VC @ 1.5 tha^{-1}

RDF= Recommended dose of fertilizer, VC= Vermicompost.
Variety: CVL-1.

Records to be kept:

i. Pre and post soil samples will be collected from experimental field.
ii. Date of Sowing
iii. Technical height
iv. Date of first flowering
v. Plant population per/m^2
vi. Number of branches per plant
vii. Number of pods per branch
viii. Number of seeds per pod
ix. Date of harvesting
x. Weight of 1000 seeds
xi. Seed moisture content
xii. Seed germination percentage

References :

Islam, M. (2013).Biochemistry, Medicinal and Food values of Jute (Corchorus capsularis L. and C. olitorius L.) leaf: A Review. International Journal of Enhanced Research in Science Technology & Engineering. Vol. 2 Issue 11, November- 2013, pp: (35-44).
Anonymous, 1999. Proceedings of National Seminar on Seed Industry Development. p50. Seed Industry Promotion Unit, Dhaka.
Hossain, M. A. F. A. Talukder, H. Islam; G. Morshed and A. Khan, 1994, Seed Production

through transplanting Jute Seedling. Ann. Rep. (1992-94). Bangladesh Jute Res. Inst. Dhaka.
Pierre, T.G., DC Paul, A.P. B. Irenikatche, K Esaie, AC Emile, DD Gustave. (2015). Response of Jute Mallow (Corchorus olitorius L.) to organic manure and inorganic fertilizer on a ferruginous soil in North- eastern Benin. Journal of Applied Biosciences 92:8610 – 8619.
Fujimoto, G. O. Adeoluwa, O. O. Oyekunle, M. Shridhar, M. K. C.,Makinde, E. A. and Olowoake, A. A. 2008. Comparative evaluation of organo- mineral fertilizer (OMF) and mineral fertilizer (NPK) on yield and quantity of maize. Nigerian Journal of Soil Science18:132-137

3.2 Title of the experiment: Effect of the Tea Waste and NPK Fertilizers on Soil Characteristics and Jute Seed Production (SSc. 8/2025)

Background and Objectives:

The continuous increase of the global population puts great pressure on the environment and food production. To maintain the food demand and to ensure the nutrition of a continually increasing population of the world, the usage of a high rate of fertilizers for high crop production and additional natural resources need to be accepted and employed. Soil sandification is a serious issue due to the increasing rate of around 50,000 to 70,000 km2 of area every year, and the estimated economic loss is approximately 42 billion USD (UNEP, 1997). Sandy soils mainly occur in the northern part of Bangladesh (FAO/ UNDP, 1988). About 43 percent of the total geographical area of Bangladesh is affected by various forms and degrees of degradation. The sandy soils have low soil nutrient contents, a negligible content of carbon stock and alkaline nature (Laghari et al., 2015).Therefore, high doses of chemical fertilizers are required, because of the increasing grain demand of the increasing population (Pan et al., 2018). But, the continuous sole application of chemical fertilizer into agriculture fields causes soil degradation and low crop quality. The co-application of organic and inorganic amendments is a sensible fertilization strategy for sustainable agriculture and the environment, especially in low fertility soils (Pan et al., 2018).To document these, different approaches had been conducted using different levels of N fertilizers and organic amendments (Pan et al. 2018; Razaq, et al., 2017). Phosphorus and potassium are also important for plant growth and physiological reactions for low fertility soil (Mi, et al., 2018; Wang et al., 2019). However, the overuse of chemical fertilizers obviously declines the soil quality and crop yield (Mi et al., 2018; Guo et al., 2010).

Empirically, biochar has sorption capacity that might trap inor-ganic N (Lan et al., 2017), organic compounds, micro-and macro-elements (Wang et al., 2015), decrease soil bulk density (Lim et al., 2016) and improve the soil water holding characteristics (FAO, 2010). It also reduces N losses by leaching (Wang et al., 2015). There are numerous types of biochar based on the raw materials (agricultural wastes, forest residues, organic wastes materials) from which it is made. Among different organic materials, TW improves soil water holding capacity, reduces soil bulk density and nutrients losses, and may also improve soil physical, chemical and biological properties, thus improve plant growth and grain yield. Tea is a popular drink in most of the countries of the world. Tea consumption in Bangladesh and India and Pakistan occurs with a small amount of milk, sugar, and water, while in China, Japan, United Kingdom, Ireland, and Canada people use a considerable quantity of milk (Sharma et al., 2008). Consequently, a huge amount of tea wastes are being generated every day. To manage environmental and economic issues as well as to improve soil quality and crop production in problem soils, most studies have focused on crop straw or organic manure-derived biochar as

soil amendments. In this context, it is very important to evaluate the effect of tea wastes on growth and production of Jute crops and sandy soil properties. In the context, the objective of the present study will be to assess the potentiality of tea waste for improving properties and fertility status of problem soils like sandy soil and contributing to desirable jute growth, development and production of seed. The co-application of organic and inorganic amendments is a sensible fertilization strategy for sustainable agriculture and the environment, especially in low fertility soils (Pan et al., 2018). Therefore, the specific objectives of our study are:
i) To determine the basic properties of tea waste and Optimization of the tea waste doses for jute seed production. ii) To quantify the effect of tea waste on the biochemical properties of sandy soil and the changes of physio-chemical properties of soils and iii) To evaluate the effects of tea waste on seed production of Jute .

Expected Output: we hypothesize that application of tea waste will i) improve the physio-chemical and biochemical properties of sandy soil. ii) Exert positive effect on growth and yield attributes of jute seed production. ii) optimization of the tea waste doses for jute seed production.
Date of initiation and duration: 2023-2025
Date of sowing: Mid March
Current Status: 3rd year
Name of investigators: Md. Abu Sayem Jiku; S.M. Shariarparvej; Abida Sultana; Md. Shamim-Al-Mamun, Md. Kamrujjaman and A.T.M Morshed Alam

Locations: Manikganj, Faridpur and Dinajpur,
Variety: BJRI Tossa Pat 9 (SobujSona)
Treatment:
In this experiment, tea wastes used as TW and chemical fertilizer used as CF. Chemical fertilizers (CF) like urea, di-ammonium phosphate (DAP) and Murate of potash (MOP) will be applied to supply N, P and K at standard doses in combination with treatments. Therefore, a total of six treatments are as follows:
T1= Control without an amendment (CK);
T2= Chemical fertilizers (CF): Recommended Dose
T3= CF+TW @2.5t/ha
T4=CF+TW@5t/ha
T5=CF+TW@10t/ha
T6= CF+ TW@15 t/ha
Layout and Design:

i) RCBD with three replications
ii) Plot Size: 4 m × 2.5 m.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.

Procedure: Recommended cultural practices were followed up to maturity.
Data Recorded
4. Before set-up the experiment, soil samples (0-30 cm) from each plot were drawn and analyse for different parameters after their processing. Similarly, the harvest of the crop, soil samples (0-30 cm) from each plot were drawn and analyse for different parameters after their processing.
5. The basic chemical analysis of tea wastes, and sandy soil will be analyzed including EC, pH, total organic carbon (TOC), total N, P, K, Ca, and Mg, C:N, and micro-nutrients (Zn, Fe, Cu and Mn).
Estimated cost: 60000/-

References:

United Nations Environment Programme (UNEP), 1997. Children and the environment. J. Environ. Health Perspect. 105, 370 -371.

FAO-UNDP, 1988. Land resources appraisal of Bangladesh for agricultural development. Report 2: agroecological regions of Bangladesh. Report prepared for the Government of the People's Republic of Bangladesh by the Food and Agriculture Organization of United Nations, United Nations Development Programme. BGD/81/035, Technical report 2, pp 1 -570.

Laghari, M., Mirjat, M.S., Hu, Z.; Fazal, S., Xiao, B., Hu, M. 2015. Effects of biochar application rate on sandy desert soil properties and sorghum growth. Catena, 135, 313 - 320.

Pan, F., Yu,W.; Ma, Q., Zhou, H.; Jiang, C., Xu, Y. 2018. Do organic amendments improve the synchronism between soil n supply and wheat demand? Appl. Soil Ecol. 125, 184 - 191.

Lam, S.S., Liew, R.K., Cheng, C.K., Rasit, N., Ooi, C.K., Ma, N.L., Ng, J.H., Lam, W.H., Chong,C.T., Chase, H.A. 2018. Pyrolysis production of fruit peel biochar for potential usein treatment of palm oil mill effluent. J. Environ. Manag. 213, 400 -408.

Lim, T.J., Spokas, K.A., Feyereisen, G., Novak, J.M. 2016. Predicting the impact of biochar additions on soil hydraulic properties. Chemosphere 142, 136.

FAO (Food and Agriculture Organization of the United Nations). 2010. What Wood fuels Can Do to Mitigate Climate Change. FAO Forestry Paper No. 162.

Sharma, V., Kumar, H.V., Rao, L.J.M. 2008. Influence of milk and sugar on antioxidant potential of black tea. Food Res. Int., 41, 124 -129.

Mi, W.; Brookes, P.C.; Liu, Y.; Wu, L. Effect of inorganic fertilizers with organic amendments on soil chemical properties and rice yield in a low-productivity paddy soil. Geoderma 2018, 320, 23–29.

Wang, R.; Yao, Z.; Lei, Y. Modeling of soil available phosphorus surplus in an intensive wheat–maize rotation production area of the North China Plain. Agric. Ecosyst. Environ. 2019, 269, 22–29.

Razaq, M.; Salahuddin; Shen, H.; Sher, H.; Zhang, P. Inflfluence of biochar and nitrogen on fifine root morphology, physiology, and chemistry of acer mono. Sci. Rep. 2017, 7, 5367.

Guo, J.H.; Liu, X.J.; Zhang, Y.; Shen, J.L.; Han, W.X.; Zhang, W.F.; Christie, P.; Goulding, K.W.; Vitousek, P.M.; Zhang, F.S. Signifificant acidifification in major Chinese croplands. Science 2010, 327, 1008–1010.

4.0 TITLE OF THE PROJECT: FERTILIZER RECOMMENDATION FOR SEED PRODUCTION OF KENAF AND MESTA UNDER DIFFERENT AEZ OF BANGLADESH (SSPro-5)

Objectives: Bangladesh is facing jute seed scarcity every year. About 14% of the total demand can supply GO/NGO agencies. The rest of the requirement is fulfilled by the farmer's own management and importing from neighboring country. BJRI has been developed different varieties of jute. Fertilizer management on seed production of these new varieties yet not been conducted. To minimize the seed scarcity of jute through increase of seed yield it needs proper fertilizer management. For large scale production of seed, modern technology is needed. Bangladesh Jute Research Institute has developed late jute seed production technology. A balanced fertilizer is needed for maximum seed yield per unit plot. So this project has been under taken for recommendation of fertilizer for seed production of jute at late season.

4.1 Title of the experiment: Growth, yield and quality of kenaf seed as influenced by vermicompost, biochar and poultry manure (SSc.9/2025)

Background and objectives:
Seed is the basic input for agricultural production. Bangladesh requires about 5500-6000 tons jute and kenaf seeds in every year, of which only 10-15% is produced and distributed by the BADC (Ali et al., 2003). Farmers of Bangladesh conventionally grow seed and fibre simultaneously from the same plant of jute. In recent year, the agro-ecological condition of the country has abruptly changed and jute seed production as a part of fibre crop is no longer remunerative. So, the country has been facing acute shortage of quality jute seed every year. Quality seeds of an improved variety itself provide 20 percent additional yield of the crop (Hossen M., 2008). Degradation of soil fertility is a major problem in agricultural production and the soil fertility of cropland is increasingly degraded since the introduction of green revolution in Bangladesh (Barmon & Tarafder, 2019). Better soil fertility with higher organic matter content is a prerequisite for sustainable crop production and organic manure can play a vital role in increasing soil fertility and crop production (Qulsum, 2020). Vermicompost is usually rich in microbes and diversity particularly bacteria, fungi and actinomycetes. The compost prepared by earthworm contains several types of enzymes, hormones, vitamins, antibiotics and many essential nutrients needed for plant growth and also play important role in improving soil structure and water holding capacity, crop productivity and quality. (Marmeto, Santos, & Labindao, 2017). Vermicompost is associated in induction of high porosity, aeration, drainage, capacity to retain water and microbial activity (Ahmad, Aslam, Naeem, Idree, & Muhammad, 2021). Thus, applying vermicompost as organic manure to soil organic carbon, improving nutrient contents, enhancing cation exchange ability, microbial activities, microbial biomass carbon and enzymatic activities. Chemical fertilizer has also vast impact on jute seed production. In addition, impacts which are caused by over application of chemical fertilizers, energies, expenses of their production are the reasons for global tendency toward application of biofertilizers (Hashemzadeh, Mirshekari, Khoei, & Tarinejad, 2013). Poultry manure improves soil fertility condition by adding major and essential nutrients elements which improves nutrient
retention capacity. (Farhad, Saleem, & Cheema, 2009). Biochar is another soil amendmend agents which helps to improve soil physical,chemical and microbial condition resulting in improving crop productivity (Singh, Northup, Rice, & Prasad, 2022). To maximize yield integrated nutrient management is also necessary. Therefore, the experiment has been undertaken to find out the optimum doses of fertilizer and interaction for maximum output as well as to keep the soil fit for the years to come.

Expected output: To generate new knowledge about the impact of vermicompost, poultry manure, biochar and their interaction.
Date of initiation and duration: 2023-2025.
Current Status: 3rd year
Date of sowing: Mid-August
Name of the investigators: Md. Shamim-Al-Mamun, Abida Sultana, Md. Abu Sayem Jiku, Md. Kamrujjaman, and A.T.M Morshed Alam

Locations: Faridpur, Jashore and Dinajpur
Materials: (Variety/ Srtain): BJRI Kenaf-4
Treatment:
T_1: No vermicompost + No poultry manure + No biochar (Control)
T_2: Vermicompost @ 4 t/ha

T_3: Recommended dose of chemical fertilizer (RDCF)
T_4: Poultry manure @ 5 t/ha
T_5: Biochar @ 3 t/ha
T_6: 125 % RDCF
T_7: 50 % RDCF + Cowdung @ 4 t/ha
T_8: 50 % RDCF + Biochar @ 2 t/ha
T_9: 75% RDCF + vermicompost @ 3 t/ha
T_{10}: Vermicompost @ 2 t/ha + Biochar @ 1 t/ha + Poultry manure @ 2 t/ha
Design and layout: RCBD with three replications.
Unit plot size: 3.0 m x 3.0 m. Space between plots, blocks and around the field 60 cm, 1.0 m and 1.0 m respectively. There will be 20 cm deep drain around each plot, block and around whole plot to drain out excess rain water.
Procedure: Experiment will be setup in month of Mid-August. The experiment will be conducted at the Jute Research Regional Station Faridpur, sub station Jashore and Dinajpur . Crop management will be done as per BJRI recommendation. Data will be collected on harvesting stage. A sample of 10 plants will be collected from each plot where these plants will be subjected to analyze.

Records to be kept:
1. Initial and after harvest soil sample collection and analysis.
2. Date of sowing, germination, fertilizer application, harvest & other necessary information.
3. Plant population at final thinning and at harvest.
4. PH & BD of 10 randomly selected plants/Plot.
5. Count the pod/plant.
6. 1000 Seed wt.(g) /plot &
7. Total seed yield (t/ha).
Estimated cost: 50000/-

4.2 Title of the Experiment: Influence of Different Organic and Inorganic Fertilizer Level on Maximizing Productivity and Seed Quality of BJRI Kenaf 5 (SSc. 10/2025).
Background: Kenaf plays an important role in fibre production leading to more income with low-cost involvement. At present, around 0.08- 0.09 million tons of kenaf is produced in the country from 0.04 million hectares of land (Mostofa, 2012) which required 480 tons of seed. Hiron *et al.* (2006) stated that kenaf can give high yield even in the marginal, fallow and char lands with less care. Kenaf seed supply in the country is far lower than that of the demand. Farmers are not well aware of kenaf seed production technology and therefore, the shortage of supply of quality seed in planting time hinders the production and expansion of this crop. At present farmers are using poor quality kenaf seed supplied by the local and exotic sources. Hence, the production of quality kenaf seed in the country is very much essential to meet the increasing demand and expansion of this valuable crop (Mollah *et al.,*2015). The plant nutrients played a vital role on maximizing productivity as well as its quality. At present, utilization of organic manure to meet crop nutrient requirement will be an unavoidable practice to enhance sustainable agriculture, this is because, the physical, chemical and biological properties of soil is generally improved by the addition of organic manures which in turn enhances crop productivity and maintains the quality of crop produce (Maheswarappa et al.,1999). Although, in comparison to inorganic fertilizers, organic manures contain smaller quantities of plant nutrients. To use of inorganic fertilizer to increase yield has been found to be efective as a short-term solution but demands consistent use on a long-term basis. The high cost of inorganic fertilizers makes it uneconomical and out of reach to poor farmers and it is also undesirable due to its hazardous environmental effects (Olowoake.,2014). Composted manure helps to

modify physical, chemical, and biological properties of the soil, provides slow release of nutrients and increases crop yield (Agbede et al. 2008; Moral et al. 2009). The application of animal manure can improve soil structure by reducing bulk density and increasing soil porosity, water infiltration/percolation rate, and aggregate stability [Edmeades 2003, Thangarajan et al.,2016]. Judicial application of NPKS is also important to complete life cycle of jute plant (Sarker *et al*., 2000; Das *et al*., 1996). Use of locally sourced organic materials which are environment friendly, cheap and probably an effective way of improving and sustaining the productivity of soils. Therefore,It is necessary to find a treatment combination which is economically profitable and at the same time gives yield which is very close to maximum yield potential and obviously improve soil health. So, an experiment has been undertaken to observe the influence of different organic and inorganic fertilizer level on maximizing productivity, seed quality and economics of BJRI kenaf 5.

Objectives:

i. To find out the suitable interaction & nutrient management option for proper growth and higher seed yield of BJRI kenaf 5.

ii. To find out a proper treatment combination where quality seed produce with low-cost involvement.

iii. To improve the soil health in long term basis.

Date of initiation and duration: 2023-2025. (2023 1st year).

Current Status: 3rd year

Date of sowing: Mid july.

Name of investigators: Abida Sultana, Md. Abu Sayem Jiku, S.M. Shahriar Parvej, Md. Kamrujjaman, and A.T.M Morshed Alam

Locations: JRRS**,** Kishoreganj & JRSS, Dinajpur, JAES,manikganj

Treatments:

T_1= Control

T_2= (RDF)

T_3= 50% (RDF) + FYM@ 1 tha^{-1} + CD @ 1 tha^{-1}+ PM @ 1 tha^{-1} + BM @ 1 tha^{-1}

T_4= 50% (RDF) + FYM@ 1.5 tha^{-1} + CD @ 1.5 tha^{-1}+ PM @ 1.5 tha^{-1} + BM @ 1.5 tha^{-1}

T_5=75% (RDF) + FYM@ 1 tha^{-1} + CD @ 1 tha^{-1}+ PM @ 1 tha^{-1} + BM @ 1 tha^{-1}

T_6=75% (RDF) + FYM@ 1.5 tha^{-1} + CD @ 1.5 tha^{-1}+ PM @ 1.5 tha^{-1} + BM @ 1.5 tha^{-1}

T_7=75% (RDF) + FYM@ 5 tha^{-1}

T_8=75% (RDF) + CD @ 5 tha^{-1}

T_9=75% (RDF) + PM @ 5 tha^{-1}

T_{10}=75% (RDF) + BM @ 5 tha^{-1}

(RDF= Recommended dose of fertilizer, FYM= farm yard manure, CD= Cow dung, PM= Poultry manure, BM= Bone meal.)

Variety: BJRI kenaf-5.

Layout and Design:

i) RCBD with three replications
ii) Unit Plot Size: 3 m × 2.0 m.
iii) Space between plots and blocks 60 cm and 1.0 m respectively.

Procedure:

The concern varieties will be grown in mentioned research stations of BJRI by following their proper spacing and sowing time. Fertilization and roughing along with other intercultural operations will be done in time. A close observation will be kept on disease and pest infestation.

Records to be kept:
i.Pre soil test and post soil test.
ii.Plant population per plot at harvest.
iii. Average Plant height(cm)
iv. Pod/ plant
v. Seed Yield/plot(g)
vi. 1000 seed weight (g)
vii. Seed Yield (t/ha)
Estimated Cost: 90000/-

References:

Mostafa, M. G., 2012. Genetic divergence combining ability, Heterosis and gene action for yield characters in kenaf (*Hibiscus cannabinus L.*). Ph. D Thesis, Dept. Genet. & Pl. Breed. Bangladesh Agril. Univ. Mymensingh, Bangladesh. P.14.

Hiron, N., Alam, N., Ahmed, F. A., Begum, R. and Alam, S. S., 2006. Differential Fluorescent Banding and Isozyme Assay of *Hibiscus cannabinus L.* and *H. safdariffa L.* (Malvaceae). Cytologia. 71(2): 175-180.

Mollah, A. F., Rahman, M.M., Tareq, M.Z., Hasan M.M. and Hoque, A.B.M.Z.,2015, Yield and quality of kenaf seed as influence by detopping and spacing under transplanting methood, *Int J Appl Sci Biotechnol*, Vol 3(4): 626-634.

Maheswarappa, H. P., Nanjappa, H. V., Hegde, M. R. & Prabhu, S. R. Influence of planting material, plant population and organic manures on yield of East Indian galangal (Kaempferia galanga), soil physico-chemical and biological properties. Indian J. Agron. 44(3), 651–657 (1999).

Olowoake, A. A. Influence of organic, mineral and organomineral fertilizers on growth, yield, and soil properties in grain amaranth (Amaranthus cruentus L.). J. Org. 1(1), 39–47 (2014)

Agbede TM, Ojeniyi SO, Adeyemo AJ (2008) Effect of poultry manure on soil physical and chemical properties, growth and grain yield of sorghum in South-West, Nigeria. Am Eurasian J Sust Agric 2:72–77

Moral R, Paredes C, Bustamante MA, Marhuenda-Egea F, Bernal MP (2009) Utilization of manure composts by high-value crops: safety and environmental challenges. BioresourTechnol100(22):5454–
5460. https://doi.org/10.1016/j.biortech.2008.12.007

Thangarajan, R.; Bolan, N.S.; Tian, G.; Naidu, R.; Kunhikrishnan, A. Role of organic amendment application on greenhouse gas emission from soil. Sci. Total Environ. 2013, 465, 72–96.

Sarker, A. K. and Bandopaddhay, P. K. (2000). Effect of potassium, boron and crop age on the yield and quality of white jute (Corchorus capsularis). Indian Agr., 26: 212-216.

Das, K., Guha, B. and Pathak, D. (1996). Response of Capsularis to potassium fertilization. Ann. Agril. Res., 17 (2):188-189.

5. TITLE OF THE PROJECT: FERTILIZER RECOMMENDATION FOR BAST FIBRE CROP PRODUCTION UNDER PROBLEM SOIL OF BANGLADESH (SSPro-5).

5.1 Title of the Experiment: Effect of Organic Fertilizers on the Growth and Yield of Jute Under Salinity Stress Conditions (SSc. 11/2025).

Jute (*Corchorus spp.*) is a vital natural fiber crop extensively cultivated in South and Southeast Asia, particularly in Bangladesh and India, where it plays a critical role in the economy and rural livelihoods (Islam et al., 2020). However, jute cultivation is increasingly threatened by soil salinity, a major abiotic stress affecting agricultural productivity in coastal and arid regions. Salinity stress hampers plant growth and development by disrupting water uptake, causing ion toxicity, and impairing nutrient balance, ultimately reducing yield (Munns & Tester, 2008).
In recent years, the use of organic fertilizers has gained attention as a sustainable approach to mitigate the negative effects of salinity on crop growth. Organic amendments such as compost, farmyard manure, and biofertilizers improve soil structure, increase microbial activity, and enhance nutrient availability, thereby promoting plant resilience under stress conditions (Rady et al., 2016). Specifically, organic fertilizers can enhance the soil's buffering capacity and facilitate better water retention, helping plants cope with osmotic stress induced by high salinity levels (Abd El-Gawad et al., 2020).
For jute, which is moderately sensitive to salinity, the application of organic fertilizers may provide a viable strategy to sustain growth and fiber yield in salt-affected areas. Nevertheless, empirical evidence on the efficacy of organic amendments under salinity stress in jute cultivation remains limited. Therefore, it is essential to investigate how organic fertilizers influence the physiological responses, biomass accumulation, and fiber yield of jute under saline conditions to develop adaptive cultivation practices.

Objectives:

1. Evaluate the impact of organic fertilizers on soil physicochemical properties and nutrient availability.
2. Assess the effects of organic fertilizer applications on the yield, quality, and stress tolerance of jute.
3. Compare organic fertilizers with conventional fertilizers in terms of effectiveness, environmental impact, and economic viability

Methodology:
Materials: RCBD with BJRI Tossa Pat 5
Current Status: **New**
Location: Patuakhali, Monirampur and Faridpur.
Investigators: Md. Kamrujjaman, Md. Abu Sayem Jiku, Abida Sultana, and A.T.M Morshed Alam

Treatments:
T1: Control (No amendment); T2: Cowdung (15 t/ha); T3: Cowdung (18 t/ha); T4: Cowdung (20 t/ha); T5: Vermicompost (3t/ha); T6: Vermicompost (4t/ha); T7: Vermicompost (5t/ha); T8: Chemical fertilizers (Urea, TSP, MoP)-RDF

Plan of Activities
1. Soil sample collection. (Initial and post harvest)

2. Physical Properties: Bulk density, porosity, water-holding capacity.
3. Chemical (pH, EC) and Nutrient Analysis. (N, P, K, S, Ca, Mg, Zn, B, Fe,Mn and OM)
4. Morphological Characteristics (PP/m2,PH, BD, Green wt. with and without leaves, FY and SY etc.

Expected Outputs:

1. Improved Soil Health for Enhanced organic matter, and nutrient availability in saline soils.
2. Reduced dependency on chemical fertilizers and improved soil sustainability.
3. Guidelines for farmers on sustainable jute farming using organic fertilizers.

References

Abd El-Gawad, H. G., El-Sayed, A. A., & El-Bassiouny, H. M. S. (2020). Role of organic and bio-fertilizers in alleviating salinity stress on crop plants. *Plant Archives*, *20*(1), 3491–3498.
Islam, M. S., Hasanuzzaman, M., & Nahar, K. (2020). Jute production in changing climatic conditions. In M. Hasanuzzaman (Ed.), *Plant Ecophysiology and Adaptation under Climate Change* (pp. 355–370). Springer.
Munns, R., & Tester, M. (2008). Mechanisms of salinity tolerance. *Annual Review of Plant Biology*, *59*, 651–681.
Rady, M. M., Osman, A. S., & Abd El-Mageed, T. A. (2016). Integrated application of organic and bio-fertilizers enhances salinity tolerance of tomato. *Communications in Soil Science and Plant Analysis*, *47*(5), 593–605.

6. TITLE OF THE PROJECT: CROPPING PATTERN BASED RESEARCH

6.1 Title of the Experiment: Assessment of fertilizer recommendation for Maize-Jute-T.Aman cropping pattern for increasing system productivity in different AEZ of Bangladesh (SSc. 12/2025)

Background and Objectives:
The 21st century faces multiple challenges like climate change, population growth, food shortage, poverty, hunger, accelerated land cover change and environmental degradation (Neamatollahi et al., 2017). Bangladesh also suffers regularly from several natural calamities due to climate change which may worsen in the future (Rokonuzzaman et al., 2018). About 1 billion people stay hungry every day in the world due to the inadequate food supply and the figure will increase to 2 billion by 2050. Bangladesh is one of the most densely populated countries in the world. The total land area of Bangladesh is about 14.84 M ha (million hectares) of which 3.74 M ha (25% of the total) is not available for agriculture due to use for urban areas, industrial buildings, rural homesteads, roads and other infrastructure. Due to various development activities, the agricultural land is decreasing at about 0.73% per annum (Hasan et al., 2013) but population is increasing at a rate of 1.3% per year (BBS, 2015). The net area of Bangladesh for crop cultivation declined to 7.84 M ha in 2011 from 8.85 M ha in 1985 (BBS, 2012). The existing situatuation in agriculture sector contributes 18% of the gross domestic product of the country and generates employment opportunity for 47% people of the country (World Bank, 2013). Land and water are the key factors for sustainable agricultural development for a nation. Due to the rapid change in population and urbanization, land and water resources are becoming very limited. Increasing system productivity in a planned way is

an important base for attaining food security. In this regard, improved cropping pattern, better management practices are essential to enhance agriculture productivity. Maize-Jute-T.Aman cropping pattern may influence the system productivity in our country**.** Subsequently, crop optimization has received extensive attention in recent years and improve cropping pattern have been developed to determine the optimal use of the available resources for maximizing the net benefits subjected to some constraints (Osama et al., 2017). The objectives of the research project titled ‘’Assesment of fertilizer recommendation for Maize-Jute-T.Aman cropping pattern for increasing system productivity in different AEZ of Bangladesh‘’ are as follows:

Objectives:

- To evaluate the current fertilizer recommendations for the Maize-Jute-T.Aman cropping pattern in different AEZ of Bangladesh
- To determine the specific nutrient management of the Maize-Jute-T.Aman cropping pattern.
- To evaluate the performances of the Maize-Jute-T.Aman cropping pattern under different fertilizer treatments.
- Based on the field trial results and crop performance evaluations, the research aims to update and optimize the fertilizer recomnmendations for the Maize-Jute-T.Aman cropping pattern in different AEZ of Bangladesh.
- To evaluate the feasibility of increasing income through increasing cropping intensity and productivity by growing three crops in a year in the same piece of land.

Expected output: A fertilizer recommendations will be made for Maize-Jute-T.Aman cropping pattern in different AEZ of Bangladesh

Date of initiation and duration: 2023-2025
Current Status: 3rd year
Date of sowing: Mid – March
Name of investigators: Md. Shamim-Al-Mamun, Abida sultana, Md. Kamrujjaman, Md. Abu Sayem Jiku and A.T.M Morshed Alam

Locations: Manikganj, Rangpur and Dinajpur.
Materials (variety/strain): BJRI Tossa Pat 8 (Rabi-1)
Treatments:

Fertilizer (g/plot);	**Urea**	**TSP**	**MoP**	**Gypsum**
T1 = RDF of sole Jute	217	50	120	111.11
T2 =As per FRG 2018	163	20	80	27.7
T3 =50% of FRG 2018	81.5	10	40	13.85
T4=75% of FRG 2018	122.25	15	60	20.77
T5=125% of FRG 2018	203.75	25	100	34.62

Layout and Design:

iv) RCBD with three replications
v) Unit Plot Size: 4 m × 2.5 m.
vi) Space between plots and blocks 60 cm and 1.0 m respectively.

Procedure:

The concern variety will be grown in mentioned research stations of BJRI by following their proper spacing and sowing time. Fertilization and roguing along with other intercultural operations will be done in time. A close observation will be kept on disease and pest infestation.

Records to be kept:

1. Initial and after harvest soil sample collection.
2. Plant height and base diameter of 5 randomly selected plants/plot.
3. Plant population at harvest
4. Green wt. with and without leaves.
5. Fibre Yield
6. Stick Yield

Estimated cost: 70000/-

References:

BBS (Bangladesh Bureau of Statistics) (2012). Yearbook of Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Government of People's Republic of Bangladesh, Dhaka.

BBS. (2015). Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka, Bangladesh.

Hasan, N.M., Hossain, M.S., Islam, M.R. and Bari, M.A. (2013). Trend in availability of agricultural land in Bangladesh. National food policy capacity strengthening programme (NFPC-SP), FAO (Rome) pp. 1-72.

Neamatollahi E, Vafabakhshi J, Jahansuz MR, Sharifzadeh F (2017). Agricultural optimal Cropping pattern determination based on fuzzy system. Fuzzy information and Engineering. 9, 479–491.

Osama S, Elkholy M, Kansoh RM (2017). Optimization of the cropping pattern in Egypt. Alexandria Engineering Journal. 56, 557–566.

Rokonuzzaman M, Rahman MA, Yeasmin M, Islam MA (2018). Relationship between precipitation and rice production in Rangpur district. Progressive agriculture, 29(1): 10-21.

World Bank, 2013. Bangladesh Poverty Assessment: Assesing a Decade of progress in Reducing Poverty, 2000-2010. Bangladesh Development Series Paper No. 13.

D. PEST MANAGEMENT DIVISION
D I. PLANT PATHOLOGY DEPARTMENT
PROGRAM AREA: MANAGEMENT OF DISEASES
PROJECT 1: INVESTIGATION ON THE SOURCES OF DISEASES OF JUTE AND ALLIED FIBRE CROPS

Objectives: Since germination and seed health is the pre requisite for the production of quality seeds and good fibre yield, therefore, study on germination and seed health status due to different seed borne fungal infections in jute, kenaf and mesta is basic requirement before sowing them in the field.

1.1 Title of the experiment: Seed health study of jute, kenaf and mesta collected from different sources (PPD-1/2025)

Background and Objectives: Investigation on different seed borne fungal organisms that cause fungal diseases and some saprophytes which are also responsible for seed borne diseases of jute and allied fibre crops. Plant Pathology Division of BJRI, Dhaka made a routine health test of jute seeds of two cultivated species (*Corchorus capsularis* and *Corchorus olitorius*) obtained from different research stations as well as from the contact growers and observed that the three major fungal pathogens, viz. *Botryodiplodia theobromae*, *Colletotrichum corchori* and *Macrophomina phaseolina* cause black band, anthracnose and stem rot diseases, respectively were frequently seed transmitted. During the survey, the highest seed borne infection by *B. theobromae, C. corchori* and *M. phaseolina* were recorded as 30 %, 37% and 51%, respectively (Anon. 1990). Fakir (2001) reported that jute suffered from 12 different diseases. Of all these diseases, 10 were known to be seed borne. Among the seed borne diseases, except leaf mosaic (caused by virus), all other diseases were caused by fungal pathogens. Islam et al (2003) reported that total seed borne infections were minimum in breeder seeds and that of maximum in farmers' seeds. Negative relationship between were observed in between % germination and % total fungal pathogens. Seeds having higher seed borne infections caused significantly higher amount of diseases development in the field. It may also be noted that under improper storage, the organisms cause damping of the seed samples. In soil, the pathogens become active and cause seedling blight also. Moreover, they can over winter through the alternate host. Since, infected seeds are the main sources of fungal diseases and, therefore, it is important to know the incidence of seed borne fungal infections is a basic need. With a view of above discussion, the present study has been under taken to determine the seed health status before sowing in the field.

Expected output: Production of disease-free quality seeds and good fibre yield.

Date of initiation and duration: January to May, 2025

Name of the investigator: S. M. A. Haque, M. M. Hasan, and S. Sarmin

Locations: Plant Pathology laboratory, BJRI.

Experimental details: Seed samples of Breeder and TLS from different jute growing region of Bangladesh will be collected and tested by blotter method in the laboratory of Plant Pathology Department, BJRI following ISTA (1999). Primary seed sample of 10g will be randomly taken from 10 different positions of a seed lot. All the primary seed samples will be mixed thoroughly to make a composite sample. Thus, each composite sample will be 100 g of seeds. As the size of each composite sample was 100g, so it will be regarded as submitted sample. The submitted seed samples were kept in plastic container. All the seed samples will be labeled properly and preserved in Plant Pathology Department of BJRI at 5^0 C till the samples for conducting respective research. Seed germination and health status will be done following ISTA (1999). After 10 days of incubation, the seeds will be examined under stereomicroscope for detection of different fungal pathogens. After incubation, the seeds will be examined under stereomicroscope and the pathogens will be identified by following the key of (Sutton 1980). Percentage of seed borne infection will be determined for recommendation

Estimated cost: Tk. 10,000/-

Remarks: This attempt will be helpful in getting disease free quality seeds and good fibre yield.

PROJECT 2: SCREENING OF GERMPLASM/ACCESSIONS FOR DISEASE RESISTANT/TOLERANT OF JUTE, KENAF AND MESTA

Objectives: i) To screen the resistant/tolerant germplasm from exotic and indigenous accession of gene bank.

ii) To improve the fibre crops by selection of germplasm.

2.1 Title of the experiment: Screening of germplasm of jute against stem rot and anthracnose (PPD-2/2025)

Background and objectives: Fibre crops of jute, kenaf and mesta are attacked by stem rot and anthracnose affecting yield and quality of fibre (Fakir, 2001). According to Varadarajan and Patel (Varada Rajan and Patel. 1943) the fungus is seed-borne and they also reported that the nature and extent of damage varied in different varieties at different places. There are several experiments which were conducted in the past but so far, no resistant/tolerant varieties were found in jute either of the two species, even at least at cultivar level (Mandal, *et al*., 2000; Mahaptra *et al*., 1994; Kar *et al*., 2009). This hazard arises due to lack of resistance in jute plant. Improvement of crop is handicapped as there is a limitation in advance line against disease resistant. So, monitoring of advance lines from different sources and selection under heavy inoculum potential in the field is an effective method for isolation against disease resistant. After field monitoring, the tested selected lines for resistance against fungal pathogens under controlled condition in the green house and will be recommend as the promising lines for the utilization in future research programme.

Materials to be used:

Total Number of Accessions belong to Capsularis: 84

Total Number of Accessions belong to Olitorius: 40

Total Number of Accessions belong to Kenaf: 78

SL NO.	*Corchorus capsularis*	*Corchorus olitorius*	Kenaf
1.	A-72	A-1076	A-1602
2.	A-77	A-1118	A-1607
3.	A-80	A-1327	A-1610
4.	A-81	A-1749	A-1613
5.	A-83	A-1770	A-1616
6.	A-86	A-1776	A-1617
7.	A-88	A-1792	A-1618
8.	A-90	A-1854	A-1619
9.	A-95	A-2632	A-1620
10.	A-100	A-2645	A-1627
11.	A-101	A-2511	A-1628
12.	A-102	A-3423	A-1641
13.	A-103	A-3037	A-1643
14.	A-104	A-3460	A-1646
15.	A-106	A-3539	A-1648
16.	A-108	A-1133	A-1649
17.	A-110	A-1135	A-1653
18.	A-111	A-1136	A-1659
19.	A-116	A-1137	A-1662
20.	A-117	A-1138	A-1663
21.	A-118	A-1139	A-1665
22.	A-119	A-1140	A-1668
23.	A-120	A-1141	A-1672
24.	A-121	A-1142	A-1676
25.	A-122	A-1143	A-1681
26.	A-124	A-1228	A-1682

SL NO.	*Corchorus capsularis*	*Corchorus olitorius*	Kenaf
27.	A-129	A-1233	A-1683
28.	A-130	A-1256	A-1685
29.	A-133	A-1263	A-1689
30.	A-135	A-1266	A-1690
31.	A-137	A-1436	A-1565
32.	A-138	A-1439	A-1568
33.	A-140	A-1500	A-1569
34.	A-145	A-1956	A-1570
35.	A-148	A-2404	A-1582
36.	A-149	A-2670	A-1586
37.	A-141	A-2353	A-1589
38.	A-150	A-3542	A-1597
39.	A-152	A-3659	A-1564
40.	A-153	A-1524	A-1584
41.	A-160		A-1585
42.	A-164		A-1590
43.	A-167		A-1593
44.	A-169		A-1594
45.	A-173		A-1596
46.	A-177		A-1598
47.	A-178		A-1599
48.	A-179		A-1601
49.	A-154		A-1603
50.	A-159		A-1606
51.	A-401		A-1608
52.	A-635		A-1612
53.	A-666		A-1622
54.	A-882		A-1623
55.	A-887		A-1624
56.	A-888		A-1625
57.	A-889		A-1629
58.	A-891		A-1650
59.	A-894		A-1651
60.	A-896		A-1652
61.	A-474		A-1658
62.	A-568		A-1666
63.	A-658		A-1667
64.	A-940		A-1671
65.	A-984		A-1673
66.	A-2147		A-1674
67.	A-2170		A-1677
68.	A-2919		A-1678
69.	A-2040		A-1684
70.	A-2447		A-1686
71.	A-2523		A-1687
72.	A-3647		A-1692
73.	A-4929		A-1694
74.	A-5300		A-1823

SL NO.	*Corchorus capsularis*	*Corchorus olitorius*	Kenaf
75.	A-5302		A-1824
76.	A-2197		A-1826
77.	A-2169		A-1821
78.	A-2575		A-1825
79.	A-633		
80.	A-2159		
81.	A-5059		
82.	A-105		
83.	A-157		
84.	A-895		

Expected output: Selection of tolerant/ resistant germplasm will be utilized in breeding programme to develop resistant varieties.
Date of initiation and duration: March - September, 2025
Name of the investigator: S. Sarmin, S. M. A. Haque, and M. M. Hasan
Locations: JAES (Manikganj), Kishoreganj
Experimental details:
Materials: Different accessions will be collected from Gene Bank of BJRI for this study.
Procedure: Inoculum will be prepared by growing cultures of the *Macrophomina phaseolina* and *Colletotrichum corchori* on the wheat barn or on old jute seed powder medium. This pure culture will be applied in the soil before final land preparation to build up inoculum potential is the soil. The seeds of each treatment will be sown in 3 rows of 3m long. To build up more inoculum potential rouged out of stem rot infected plants from other experimental plots will be collected, chopped and spread in the soil time to time. Intercultural operations and application of fertilizer will be done as usual.
Records to be kept:

1. Date of sowing, germination, weeding, thinning and harvest.
2. Individual disease incidence will be recorded separately
3. Disease reaction of individual line will be assessed finally on the basis of percentage of affected plant in each line.
4. Selection of tolerant/ resistant lines.

Estimated cost: Tk. 20,000/-

2.2 Title of the experiment: Phenotypic screening of kenaf germplasm for resistance to *Mesta yellow vein mosaic virus* (PPD- 3/2025)

Background and objectives: Kenaf plays an important role in fibre production leading to more income with low-cost involvement. It is a short day, herbaceous fiber crop belonging to the family Malvaceae (H'ng *et al*., 2009). It is composed of diverse types of useful components such as stalk, leaves and seeds with various useful portions namely fibers, fiber strands, proteins, oils, and allelopathic chemicals (Akinrotimi & Okocha, 2018). Kenaf can be grown under ample weather condition But, in recent years, it has been found that the yellowing of leaf in kenaf field causing a huge damage in fiber and seed production of kenaf. This symptom is increasing year after year in different location of Bangladesh. In recent years, it has been seen the yellowing of kenaf leaf in the field. Survey revealed that 90% incidence of the disease and yield loss due to this disease alone was found to be 12.78- 17.45 % with respect to fibre yield and 18.91- 23.83% with respect to seed yield Considering the above fact, the present study will be undertaken to find out the resistance sources for controlling leaf yellowing disease of kenaf.
Location: Natural field of Kishoreganj.
Investigators: M. M. Hasan, S. M. A Haque, and S Sarmin
Status of the Experiment: Ongoing
Date of initiation and duration: March 2025 to November 2025.
Experimental Details:
Plot size: 60 m^2 with 50 x 20 cm spacing.
Plant materials: In this study, we will use 20 kenaf plants selected from 298 genotypes, originating

from different parts of Bangladesh. The seeds will be sown in cultivated field soil. The kenaf cultivar HC95 will be included as susceptible control.

Procedure: Kenaf plants will be screened from March till September when the whitefly population was high to favour disease development in the years 2025 for MeYVMV resistance using field assays and natural infection with whiteflies at the Regional Station, Kishoreganj. The plants will be maintained properly by providing row to row and plant to plant spacing at 50 cm and 20 cm, respectively. The infector row method, in which two test rows alternating with spreader rows of the susceptible cultivar HC95 will be sown, will be adopted in the field to evaluate MeYVMV infection.

Records to be kept:

1. Date of sowing, germination, weeding, thinning and harvest.
2. Disease incidence must be recorded after sowing
3. Selection of tolerant/ resistant lines.

Estimated cost: Tk. 25,000/-

PROJECT 3: CONTROL OF DISEASES OF JUTE AND ALLIED FIBRE CROPS USING DIFFERENT TECHNOLOGIES

Objectives: Jute, kenaf and mesta plants are attacked by different fungal pathogens and cause loss of yield and quality of fibre of jute and allied fibre crops. Therefore, study on different technologies for the control of fungal diseases of jute and allied fibre crops is needed.

3.1. Title of the experiment: Evaluation of new spray fungicides against pathogens of jute, kenaf and Mesta (PPD-4/2025)

Background and objectives: Jute (*Corchorus capsularis* L. and *Corchorus olitorius* L.) is one of the main cash crops of Bangladesh. It accounts for 6% of the foreign currency earnings from exports (Islam, 2009). As per Jute Exporters Association, 600-700 core taka jute goods exported every month in 120 countries included 25 European Union countries. Millions of people earn their livelihood from agricultural and industrial activities based on jute and allied fibres crops. Moreover, beyond the farmland and factory, jute and jute goods keep alive the transport sector, the service sector like banks and insurance and the agro-industrial job market. Jute suffers from 13 different diseases and 10 of them are seed borne (Fakir, 2001). Seeds having higher seed borne infection results to significantly higher amount of disease development in the field. Among the seed-borne fungal diseases, stem-rot, black-band and anthracnose caused by *Macrophomina phaseolina* (Tassi, Goid.), *Botryodiplodia theobromae* and *Colletotrichum corchori* (Ikata and Yoshida, 1940), respectively are frequently transmitted through jute seeds (Fazli and Ahmed, 1960; Ahmed, 1966; Fakir *et al*., 1991). Soft rot and wilt caused by *Sclerotium rolfsii* and *Rhizoctonia solani*, respectively also cause considerable yield losses to the crop. Study on yield loss due to seed borne diseases of jute is 8-20% depending on the severity of jute diseases from year to year (Ahmed and Sultana, 1985). Plant Pathology Department, Bangladesh Jute Research Institute has screened a number of fungicides since its' inception. Among all the screened fungicides, Dithane M-45 (Mancozeb) has been recommended as foliar spray. Some new fungicides fungal are available in the market which are needed to be evaluated against the diseases of jute and allied fibre crops as per decision of Pesticide Technical Advisory Committee meeting.

Objectives: Supplied fungicides will be evaluated for controlling fungal diseases as per requirement of Sub - PTAC.

Name of the investigator: S. M. A. Haque, M. M. Hasan, and S. Sarmin

Locations: JAES (Manikganj) and Kishoreganj regional station of BJRI

Date of initiation and duration: April to November, 2025.

Treatments: 26 New fungicides such as Force 35% SC, Nirmul 35% SC, Capture 75% WP, Suba 27.5 SC, Proten top 32.5 SC, Zimcazim 75% WP, Adistar Top 35%SC, Kazim 50% WP, Projapoti 50SC, Novizeb 72 WP, Shafi 69WP, Thiacizole 50SC, Recentzim 50% DF, Faicoderma 2X108 WP, Trithiazole 80WP, ZARI 35 SC, Makkazeb 80WP, Bongozim 50%

DF, Therapy 1WP, Tebu gold 28 SC, Hunchat Plus 75WP, Kiazim 52.5 WP, Atlast 30 SC, Dithane M-45 and Control.

Expected output: Efficacy of candidate fungicides will be known for recommendation to the farmer to controll fungal jute diseases.

Experimental details:
BJRI deshi pat 9 and BJRI tossa pat 8 jute variety will be grown in 2x2.5m^2 plot following RCBD with 3 replications. Disease incidence will be counted before spray. Fifteen new fungicides supplied by different companies will be sprayed as proposed doses. Disease incidence will be counted after spray. Percent reduction of infestation will be calculated.
Estimated cost: Tk. 35000.00

3.2 Title of the experiment: Integrated Approach for the Management of Field Diseases of Olitorius Jute (*Corchorus olitorius* L., Var. BJRI Tossa pat 8) (PPD-5/2025)

Name of the investigator: M. M. Rahman, W. Islam, A. Islam, S. M. A. Haque and M. M. Hasan,

Background and objectives:
Jute (*Corchorus* spp. L.) is one of the important commercial bast fibre crop in Bangladesh and plays a vital role in the country's economy, particularly in south and western part of Bangladesh with special reference to Faridpur region which contributes about 35% (25 million ha) of jute areas in Bangladesh and 42% (40 million bales) of total jute production of the country. (Islam *et al*. 2021) reported that jute export earnings reached Tk. 10,000 crore ($116.14 crore) in FY 2021 by exporting 282 jute and jute-based goods to 135 countries and the earnings broken all records of the previous 12 years.
The land and climatic conditions of Bangladesh are congenial for the production of high-quality jute but sometimes fibre production and quality are damaged by different field diseases due to high rainfall and humidity during seedling to maturing stage. Among many field diseases, stem rot is the most important disease of jute (De 2020, Sarkar and Gawande 2016), affecting both the species viz., *Corchorus olitorius* (tossa jute) and *C. capsularis* (white jute). It is prevalent in all the jute growing areas of the world. It causes significant reduction in yield and quality of the fibre. Average yield loss due to this disease is about 10%, but it can go up to 35-40% in severe condition (Roy *et al*, 2008). De (2020) also stated that among all diseases of jute, stem rot incited by *Macrophomina phaseolina* is economically most important and producing various symptoms, like, damping-off, seedling blight, leaf blight at seedling stage, stem rot, collar rot, stem break, root rot at adult plant stage and brown spot-on pods especially in seed crop. Other important diseases of jute are anthracnose, black band, soft rot, jute mosaic, and root knot nematode. Recently die back of jute crops are observing in different region of Bangladesh and gradually increasing with introduction of new varieties of jute, especially in jute seed crop. Most of the diseases are seed, soil, as well as air borne. Flowering stage which is also congenial for the seed borne infection of *Macrophomina phaseolina* (Tassi) Goid (causing stem rot and root rot of jute), *Colletotrichum gloeosporioides* (causing jute anthracnose) and seed discoloration by various fungi (Akanda and Fakir 1985, Ghosh 1999, Ghosh 1983, Mandal 2001) decreasing seed production and quality also.
Management of fungal diseases of jute and allied fiber crops involves management of soil condition for soil borne diseases, treatment of seed with fungicides for seed borne diseases and application of fungicides to check the air borne spores, or good combination of both (De 2020).

Regarding chemical management of jute diseases, Sarkar and Gawande (2016) reported that, when symptoms are observed in the field and if there is an increasing tendency, they recommended that fungicides should be applied. Carbendazim 50WP@ 2 g/l water or Copper-oxychloride 50WP @ 5-7g/l water or Mancozeb @ 5 g/ l water which were provided good control. In case of stem rot, they also found that if the infection is very high alternate sprays of copper-oxychloride - Carbendazim- Copper-oxychloride (total three sprays) given good control. In case of seedling blight and damping off symptom at the very early stage of the crop one spray of Copperoxychloride or Carbendazim gives good

protection. In case of soft rot, spraying of copper-oxychloride should be directed towards the ground level. In case of jute mosaic, spraying of Imidacloprid or Thiamethoxam could prevent the spread of the diseases. De (2014) and Anon. (2014) sprayed of Carbendazim 50 WP @ 2g/l or Dithane M 45 @ 5g/l or Copper oxychloride 50 WP @ 5-7 g/l or Tebuconazole 25.9 EC @ 0.1% and found effective when the disease incidence is 2% or more is recommended. Dey (2019) also reported that foliar spraying of carbendazim 50WP @0.2% was most effective for maximization of quality jute seed with economic viability.

Besides those, bio-fungicides are another option to manage plant disease now a day. Bio-fungicides are formulations of living organisms that are used to control the activity of plant pathogenic fungi and bacteria. The concept of bio-fungicides is based upon observations of natural processes where beneficial microorganisms, usually isolated from soil, hinder the activity of plant pathogens. The mechanisms of action of bio-fungicides are broad in nature but are grouped as follows: By competing with pathogens for nutrients with the rhizosphere, by directly killing plant pathogens and by indirect killing using secreted bioactive molecules against the plant's pathogens. Tricost is a bio-fungicide containing 2 x 106 CFU/ml min Trichoderma spp. effectively controls wilt, Root rot, Dieback and Fruit rot causing by seed and soil borne plant pathogens like *Sclerotium* spp, *Pythium* spp, *Phytophthora* spp, *Fusarium* spp, *Rhizoctonia* spp, *Sclerotinia* spp and *Ustilago* spp. which infects different kinds of (Anon. 2023).

Different types of pathogens require various methods of control, prevention, and diagnosis. In almost all cases, removal of the source of the pathogen is an important means of reducing damage to the crop. If weedy plant species within the field itself or in nearby unmanaged land are capable of harboring pathogens that can affect the crop, identification and removal of these weeds would reduce the risk of economic loss (Byron *et al*. 2023). Timely weed control is a vital factor for disease management as because weeds are the most important barrier for jute production. Ghorai (2013) reported that the jute yield reduction might up to 70%, if crop remains un-weeded. In disease development weeds can interact with pathogens in several ways. Wisler and Norris (2005) stated that weeds can serve as reservoir alternative hosts of pathogens and their vectors, overwintering resources for non- mobile pathogens and may be obligate hosts for pathogens where such hosts are a required part of the pathogens life cycle and weeds serve as primary source of inoculum. Jute pathogens especially *M. phaseolina* and *S. rolfsii* have a very wide host range, which includes a good number of weeds also. The pathogens from these weeds serve as source of inoculum for the jute crop. To avoid this timely weeding should be done. Proper sanitation reduces the possibility of the disease to a great extent (Sarkar and Gawande 2016). So, the weed management also may be a major component for integrated approach for jute disease controls.
For disease management there are no true resistant varieties in *C. olitorius* (Kar *et al*., 2009). Over relying on only chemicals also develop fungicide-resistant strains of plant pathogens, resurgence, lethality to beneficial organism and loss of biodiversity (Meena *et al*. 2014).
So, the development of a cost-effective, eco-friendly and socially compatible protocol of Integrated Disease Management (IDM) for productivity enhancement and quality improvement in fibre crops may be noble strategies for jute disease management. Integrated crop management system is a holistic approach/strategy for developing, innovative and more effective solution, which provides long term management in a sustainable manner (Roy *et al*., 2008). Thus, due to the importance of disease and difficulty of their control through prevalent methods, it seems that there is an urgent need for the development of integrated management approach by a combination of several methods that may most effectively coupled to manage the diseases. So, the integrated disease management and control approach may be the most effective, durable and relatively safe for farmers who can't rely on synthetic pesticides only. Under these backdrops, the present study was undertaken with the following objectives.

Objectives:

1. to find out effective disease management strategies of jute fibre and seed crop of BJRI Tossapat-8.
2. to produce disease free quality jute seeds of BJRI tossa pat-8 (Robi-1).

Expected output: Development of a strategy for disease-free quality jute fibre production and jute seed production of BJRI Tossa pat 8 (Robi-1).

Experimental details: Five treatments will be applied as 8 combinations/modules (M) including untreated control as following.

Treatments

T_1 = Carbendazim Soil application @ 0.2%
T_2 = Foliar Spray of Mancozeb @ 0.2%
T_3 = Trichost 1% WP- Soil application
T_4 = W3= (Three times weeding)
T_5 = W1= (one time weeding and untreated control)

Integration (Combination) of 5 Treatments

Modules (M)	Treatments details
M1 =	(T_1 T_2W2) = (Soil app.of Carbendazim @ 0.2% (2 g/plot) +Foliar Spray of Mancozeb @0.2% (2 g/l water) + W2=2 times weeding)
M2 =	(T_1 T_2W3) = (Soil app. of Carbendazim @ 0.2% (2 g/plot) +Foliar Spray of Mancozeb @0.2% (2 g/l water) + W3= three times weeding)
M3 =	(T_2 T_3W2) = (Foliar Spray of Mancozeb @ 0.2% (2 g/l water+Soil app. Trichost@1% (1.5 g/plot)- broad cast before the last ploughing +W2= two times weeding)
M4 =	(T_2 T_3W3)=(Foliar Spray of Mancozeb @0.2% (2 g/plot)+Soil app. Trichost@1% (1.5 g/plot)- broad cast before the last ploughing +W3= three times weeding)
M5 =	(T_3W2) = (Soil application Trichost@1% (1.5 g/plot)- broad cast before the last ploughing +W2=two times weeding)
M6 =	(T_3W3) = (Soil application Trichost@1% (1.5 g/plot)- broad cast before the last ploughing +W3= three times weeding)
M7 =	(T_4 W3) = (3 times Weeding only)
M8 =	(T_5 W1) = Control plot = 1 time weeding only)

Variety: BJRI Tossa pat 8 (Robi-1)
Locations and Design: Field experiment will be designed in RCBD with three replications with plot size 3 m × 2 m at Regional Station Faridpur and JAES Manikganj.
Season: Fibre and seed crops

Records to be kept:

A). (For fibre season)

1. Date of sowing and germination.
2. Record of disease incidence at least 4 times.
3. Plant population at harvest.
4. Plant height and base diameter at harvest.
5. Fibre and stick weight/plot.

B. (For seed season)

1. Date of sowing and germination
2. PP/plot at harvesting
3. Diseased plants (%)
4. No. of pods/plant
5. No. of seeds/pod
6. Seed yield/plot
7. Discolored pods (%)
8. Germination (%)

9. Seed infection (%)
10. Seedling vigor

The data will be analyzed by Statistix 10 software for statistical analysis.

Date of initiation and duration: March 2025 to March 2025.
Estimated cost: TK. 40,000/- (per year)

3.3 Tittle of the experiment: Investigating the Antagonistic Abilities of Trichoderma spp. for Bio-Control (PPD-6/2025)

Background and Objectives

A comprehensive research program is imperative to address the multifaceted challenges faced by the jute (Corchorus spp.), a pivotal sector in countries like Bangladesh, responsible for approximately 70% of the global jute supply. The growing global environmental consciousness, coupled with the escalating rejection of synthetic materials, positions jute as an increasingly attractive, eco-friendly alternative. However, the sustainability of jute production is severely hampered by the prevalence of diseases and attacks from pathogens, leading to substantial yield losses. This research program aims to tackle this critical issue by focusing on the implementation of bio-control measures, specifically leveraging the potential of Trichoderma spp.

Bangladesh's prominence as a major jute exporter underscores the economic significance of the industry, making it imperative to enhance the resilience of jute crops against diseases and pathogens. The research program aligns with global sustainability goals, particularly in the context of promoting environmentally friendly materials. With Bangladesh playing a pivotal role in the jute market, investing in bio-control measures not only safeguards economic interests but also fortifies the nation's standing as a leading producer and exporter.

Jute cultivation, though adaptable to various soil types, faces significant constraints due to diseases and attacks from pathogens such as seed-borne fungal diseases, stem rot, and anthracnose. These ailments contribute to substantial yield losses and a decline in fiber quality. The renewed interest in bio-control strategies within the agricultural community stems from their eco-friendly nature, long-lasting effects, and inherent safety features. Trichoderma spp., specifically, emerge as promising bio-control agents, inhibiting the growth of soil-borne pathogens through various mechanisms, including the production of lytic enzymes, proteolytic enzymes, and a diverse array of antibiotics toxic to macro- and microorganisms.

The utilization of Trichoderma in Bangladesh as a bio-control agent against soil and seed-borne pathogens aligns with the global shift towards ecological approaches to plant protection, reducing dependence on chemical pesticides. Trichoderma not only combats pathogens but also colonizes plant roots, decomposes residues, and contributes to the biodegradation of fertilizers and pesticides.

By elucidating the mechanisms such as mycoparasitism, competition for resources, antibiosis, and the production of extracellular lytic enzymes by Trichoderma spp., the research aims to offer practical insights for the prevention of phytopathogens. Additionally, the program delves into the complex process of mycoparasitism, exploring the attraction and growth of Trichoderma towards its host, potentially through chemotropism. The induction of systemic resistance by Trichoderma spp. is a crucial aspect that will be assessed by inoculating the bio-control fungus at different times or sites than the pathogenic attack.

This research program not only addresses the urgent need for enhancing the resilience of jute crops but also aligns with global sustainability goals. By leveraging the bio-control potential of Trichoderma spp., the program holds the promise of revolutionizing jute cultivation, making it more robust, sustainable, and environmentally friendly. Through a comprehensive exploration of the interactions between Trichoderma spp. and jute pathogens, the research endeavors to provide bio control agent for a more resilient and eco-conscious jute farming.

Expected output: Identification of antagonistic Trichoderma sp. for controlling soil borne pathogens.
Date of initiation and duration: Jute season, 2025.
Name of the investigator: M. M. Hasan, S. Sarmin, and S. M. A. Haque
Locations: JAES, Manikgonj.
Experimental details:
Methodology:
Experiments will be set in a randomized block design (RBD), maintaining three replications for each treatment. The plot size was 3 × 2 m. A spacing of 50 cm between rows and plants and a total of 20 plants per plot will be maintained. Experimental field will be prepared by one deep ploughing, followed by three harrowing and leveling leading to fine and well-pulverized soil. Before the final leveling of the field, NPK will be applied in the form of urea (40 kg), single superphosphate (80 kg), and muriate of potash (60 kg) as a basal application. Urea as nitrogenous fertilizer will be applied at 20 kg/ha each after 30 days of transplanting and 60 days of transplanting as a top dressing. Seeds of jute cultivar CLV-1 Will be sown in the field. *Trichoderma spp* will be applied in the soil just before sowing. Three foliar sprays of Mancozeb were given at 30, 45, and 60 days after germination. The untreated plot served as controls.
The following are the treatments at VRC:
1. Th (SA + FS)
2. Th (SA) + Mancozeb (FS)
3. Mancozeb (FS)
4. Control
(Th = Trichoderma spp (CFU count 2 × 107/g),
Mancozeb = INDOFIL M-45, SA = soil application, FS = foliar spray)
Estimated cost: Tk. 30,000/-
Remarks: New experiment.

3.4 Tittle of the experiment: Impact of environmental changes (temperature, rainfall and humidity) on the incidence of diseases of jute. (PPD-7/2025)

Background and objectives: Fiber crops include jute, cotton, hemp and kenaf. Among them jute (*Corchorus capsularis* L. and *Corchorus olitorius* L.) is one of the main cash crops of Bangladesh. Jute dominates among fiber crops having about 7,37,000 m tons annual production. Jute leads the country's list of export crops and is ranked third in terms of area cultivated and it is confined mainly to the low-lying areas of the Brahmaputra-Jamuna and Padma flood plains. Jute suffers from 13 different diseases and 10 of them are seed borne (Fakir, 2001). Besides this, jute is that crop which is highly photosensitive and requires long day period for vegetative growth and short-day period for vegetative growth and short-day period for seed production Because of the requirement of long day period for fiber production jute crop has to stand in the field up to August-September. As weather parameters play a pivotal role in the infection process and spread of pathogen and it also influences the expression of susceptibility/resistance of the host plant during post-infection phases the present investigation has been undertaken to study the influence of weather parameters such as temperature, humidity and rainfall on the emergence of different fungus associated with jute diseases.
Objectives:
- To find out environmental (temperature, rainfall and humidity) effect for disease infection on jute plants and find out the relationship between temperature, rainfall, humidity and disease incidence.
- To share and collect observations and data on any increased disease under climate change.
- To perceive the effect of changes of temperature, rainfall and humidity on the incidence of major diseases of jute.
- To assess the impacts of environmental change on yields of jute crops.
- To understand the epidemiology and the infection process of different fungi in jute

Expected output: Incidence of disease and yield loss due to different climatic conditions.
Date of initiation and duration: Jute season, 2025
Name of the investigator: S. Sarmin, S. M. A. Haque, and M. M. Hasan
Locations: Jute Research Regional Station, Kishoregonj, Jute Research Regional Station, Rangpur, Jute

Research Regional Station, Cumilla, Jute Research Regional Station, Jessore, Jute Research Sub-Station, Patuakhali, Jute Research Sub-Station Maderganj, Jamalpur

Experimental details:

Methodology: Seeds of CVL-1 and Robi -1 will be used for these experiments. Collected seeds will be subjected to germination and health test in the laboratory of Plant Pathology Department, BJRI by blotter method following the rules of ISTA (1999). Seeds with more than 80% germination and no fungal infection will be selected as the study material. Experimental plots will be prepared at jute research regional Research Station, Kishoregonj, jute research regional stations, Rangpur, jute research regional stations, Cumilla, Jute research regional station, Jessore, Jute research regional station, Patuakhali. Seeds will be sown on last week of March both in 2023. Experimental plots comprised of 2.5m x 4m blocks with block-to-block distance 1 m. Line sowing method was followed having 30 cm line to line distance. To allow the frequent natural development of fungal diseases in jute plot no seed treatment or no application of fungicide will be done but weeding and thinning. Jute diseases will be recorded at one month interval up to before harvesting from each plot for four times. The experiment will be conducted with two varieties and three replications. Particular disease development in each month for each plot will be calculated by deducting the percentage of disease incidences from the cumulative percentage of disease incidences for the respective month. Linear regression lines, correlation matrix and regression coefficients of temperature, rainfall and humidity from multiple regression equations will be calculated following Simple lessons from biometry (Zaman, *et al.*, 1982). Regression models of different disease incidences on temperature, rainfall, humidity have been estimated using simple and stepwise methods as our independent weather parameters (temperature, rainfall and humidity) will be highly collinear. Data on temperature, rainfall and humidity will be collected from the meteorology office, Agargaon, Dhaka.

Estimated cost: Tk. 70,000/-

PROJECT 4: SURVEY ON DISEASE OF FIBRE CROPS

Objectives: i) To know the different disease incidences in different agro-ecological zones of jute and allied fiber crops.
ii) To take necessary steps as and when necessary to control the disease incidences of jute and allied fiber crops.

4.1. Title of the experiment: An investigation into the pathological conditions affecting jute and allied fiber crops (PPD- 9/2025)

Background and objectives: Since the severity of diseases of jute and allied fiber crops varies from variety to variety and region to region, thus surveillance and monitoring of disease incidences is essential for forecasting which indicate correct timing for management of disease incidences. Survey on diseases of jute and allied fiber crops will provide to take the necessary control measures at proper time specially to know the percentage of different diseases in different jute varieties at different agro ecological zones. Comparative assessment of incidence of jute diseases in experimental plots and farmers' fields will be studied. In order to know the disease incidences in different locations, particularly in different regional and substation of BJRI and its' surroundings farmers' field a survey format has been prepared as per requirement which is attached here with.

Expected output: Incidence of disease yield loss due to occurrence of diseases could be measured for the current year as follows.

Date of initiation and duration: Jute season, 2025

Name of the investigator: S. M. A. Haque, M. Majibar Rahman, M. M. Hasan, M.A. Islam, and S. Sarmin

Locations: Regional stations and Sub stations of BJRI and its' surroundings farmers' field.

Experimental details:

Source of data: Experimental plots and adjacent farmer's fields of selected regional stations of BJRI.

Methodology: Data on different disease incidences will be collected using a survey format developed for the purpose and keeping the objectives in view. Direct observation and laboratory study will also be the source of research information.

Estimated cost: Tk. 30,000/-

(A) Survey on diseases of jute and allied fiber in experimental plots and farmers' field in Different Jute-growing regions of Bangladesh
Department of Plant Pathology, Bangladesh Jute Research Institute

Sl. No.	Location	Variety	Area (m^2)		Previous crop	Total No. of plants	No. of infested plants							
			Experimental plot	Farmers field			Stem rot	Die back	Anthracnose	Root knot	Black band	Mosaic	Soft rot	Remarks

Signature and date

Literature Cited

Akanda M. A. M. and Fakir G. A. 1985. Prevalence of major seed borne pathogens of jute. Bangladesh J. Plant Pathol. 1: 76.

Akinrotimi, C. A., & Okocha, P. I. (2018). Evaluation of genetic divergence in kenaf (*H. cannabinus* L.) genotypes using agro-morphological characteristics. *Journal of Plant Sciences and Agricultural Research*, 2(12), 1– 10

Anonymous. 1990. Control of fungal diseases by chemical fungicides. Ann. Rep. BJRI. Dahka. pp. 151-177.

Anonymous. 2014. Annual Report. Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata. p. 74-75.

Anonymous. 2023. Haychem Bangladesh Limited. https://haychembd.com/product/tricost-1-wp/. Barrackpore, Kolkata 700120, India. pp 38.

Byron, D., Treadwell and Peter D. 2023. Weeds as Reservoirs of Plant Pathogens Affecting Economically Important Crops1 Morgan. Original publication, UF/IFAS Extension. HS1335, p 1-7.

De R. K. 2020. Disease Spectrum in Jute and Their Management, Edition 1st Edition, Imprint Apple Academic Press, Pages 49, (eBook ISBN 9780429321849)

De, R. K. 2014. Search for new fungicides against stem rot of jute (Corchorus olitorious L. and C. capsularis) caused by Macrophomina phaseolina (Tassi) Goid. J. Mycopathol. Res. 52: 217-225.

Dey, R. K. 2019. Jute Diseases: Diagnosis and Management, Tech. Bull. No. 04/2019. ICAR- Central Research Institute for Jute and Allied Fibres, (Indian Council of Agricultural Research), Barrackpore, Kolkata 700120, India. pp 38.

Fakir, G.A. 2001. List of seed borne diseases of important crops occurring in Bangladesh. Seed Pathology Laboratory, Dept. Plant Path. BAU, Mymensingh. pp.7-8.

Ghorai A. K., Chowdhury H., Kumar M and Kumar S. 2013. Technology for weed management in jute. Indian Farming 63(6): 12–14.

Ghosh T. 1983. Hand book on Jute. FAO plant production and protection paper 51: 219.

Ghosh T. 1999. Co-operation but with caution. *In:* Jute and allied fibres - Agriculture and processing (eds), Palit, P. Pathak, S and Singh, DP. Central Research Institute for Jute and Allied Fibres (CRIJAF). Key note address, xi-xiv.

H'ng, P. S., Khor, B. N., Tadashi, N., Aini, A. S. N., & Paridah, M. T. (2009). Anatomical structure and morphology of new kenaf varieties. *Asian Journal of Scientific Research*, 2(3), 161– 166

Islam R. and Abedin J. S. 2021. The Economy. News alerts from the business standard. https://www.tbsnews.net/economy/jute-exports-rise-record-31-fy21-291742.

Islam, M. M., K. Sultana, M. M. Hussain, M. G. Mostafa, M. R. Islam, M. L. Rahman and M. A. Kashem, 2003. Inoculation Times with Strains of *Macrophomina phaseolina* and *Colletotrichum corchori* on the Seed Yield Contributing Characters of Late Jute Seeds. Plant Pathology Journal, 2: 21-27.

Islam, S. 2009. Comparative efficacy of BAU- Biofungicide and Tilt in controlling disease of rice. An M. S. Thesis submitted to the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh.

ISTA. 1999. International Rules for Seed Testing, International Seed Testing Association, *Seed Sci & technol,* Zurich, Switzerland. P.333.

Kar, C.S., Kundu, A., Sarkar. D., Sinha, M.K. and Mahapatara B.S. 2009. Genetic diversity in jute (*Corchorus capsularis*) and its' utilization. A review. Indian Journal of Agricultural Sciences. 79. 587- 91.

Mahapatara A.K., Mandal, R.K., Saha, M.N. Guha Roy, Kumar, D. and Gupta, D. 1994. Field evaluation of white jute (*Corchorus capsularis* L.) germplasm pp. 1-31.

Mandal R.K. 2001. Seed borne fungi of jute. J. Interacademicia 5(3): 402-405.

Mandal, R.K., Sarker, S and Saha, M.N. 2000. Field evaluation of white jute (*Corchorus capsularis*) against *Macrophomina phaseolina* (Tass) Goid. Environment and ecology 18: 814-818.

Meena P. N., Roy A., Gotyal, B. S., Mitra S. and Satpathy S. 2014. Eco-friendly management of major diseases in jute (*Corchorus olitorius* L.), *Journal of Applied and Natural Science* 6 (2): 541-544.

Research Institute for Jute and Allied Fibres, (Indian Council of Agricultural Research),

Roy A, De R.K. and Ghosh S.K. 2008. Diseases of bast fibre crops and their management. *In:* Jute and

allied fibres Updates. (eds) Karmakar PG, Hazra SK, Ramasubramanian T, Mandal RK and Sen HS). Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata, pp. 217-241.

Sarkar S. K. and Gawande S.P. 2016. Diseases of Jute and allied fibre crops and their management. *J. Mycopathol. Res. 54(3): 321-337.*

Sutton, B. C. 1980. The *Coelomycetes*. Commonwealth Mycological Institute. Kew, Surrey, England. 696.

Varada Rajan, B.S. and Patel, J.S. 1946. Seed transmission of stem rot of jute and its control. Indian J. Agril. Sci. 26: 193-206.

Wisler G. C. and Norris R. F. 2005. Interactions between weeds and cultivated plants as related to management of plant pathogens. Weed Science. 53: 914-917.

Zaman, S. M. H., Rahim, K, and Howlader, Manotosh. 1982. Simple lesion from biometry. Bangladesh Rice Research Institute, Joydevpur, Dhaka.p.171.

D II. ENTOMOLOGY DEPARTMENT
PROGRAMME AREA: MANAGEMENT OF INSECT PEST

1. TITLE OF THE PROJECT: INFESTATION STATUS OF INSECT AND MITE PEST OF JUTE AND ALLIED FIBRE CROPS

Objective: To study insect and mite pest infestation among the promising lines of jute and allied fibre crops and compare with a standard variety at different locations.

1.1 Title of the experiment: **Study on the pest status of promising lines of jute and allied fibre crops in different locations (Ento-1/2025)**

Background and objective: Jute is an important cash crop for more than three millions small farm households, the largest industry, producing about one-third of manufacturing output, and the largest agricultural export commodity in Bangladesh. For releasing a variety, pest susceptibility of promising line must be determined. Every year, some promising lines of jute, kenaf and Mesta are supplied by Breeding Division of BJRI to conduct comparative study on the insect and mite pest infestation. This year, the study will be conducted in different locations with a view to determining the pest susceptibility among the promising lines and existing standard variety for helping breeders to develop new varieties.

Expected output: Pest infestation status of promising lines will be known.
Status of program: Regular program
Date of initiation and duration: April/2025-September/2025.
Name of investigators: S. Ahmmed, M. S. Polan and M. N. Islam
Locations: Manikganj**,** Kishoreganj, Faridpur, Rangpur, Comilla and Jashore
Test Materials:
C. olitorius **:** T_1= A-6099, T_2= O-0512-6-2-G, T_3 = BJRI Tossa pat 9 (Check variety)
C. capsularis **:** T_1=C- 2262 , T_2=C-870, T_3 =CC-45, T_4= CVL-1, T_5=Shoshi, T_6=BJRI Deshi pat 7
H. cannabinus **:** T_1= KBL-51, T_2= KBL-73, T_3 = HC-95

Experimental details: According to Gomez and Gomez (1984), promising lines of *Corchorus* spp. and *Hibiscus* spp. along with standard varieties will be sown in 2x2.1m^2 plot following RCBD with 3 replications in different locations of BJRI. Agronomical practices and fertilizer doses will be applied as per recommendation. No plant protection measures will be taken till harvest to facilitate the natural pest infestation. Percentage of infestation, rating score and Percent damage Index (PDI) of yellow mite infested plants will be recorded twice in a month during the peak period of infestation. Apion infestation (Top shoot attack) will be recorded at seedling stage and bores/plant will be recorded at the time of harvest and Amount of Damage (AD) will be calculated following Pradhan's (1998) formula.

Rating score
The intensity of damage by yellow mite is to be scored following 0-5 rating scale in given below:

0- Fresh and healthy leaves without any changes in colour
1- Slight changes in colour of leaves
2- Downward curling of leaves
3- 1 to 3 infested leaves dropped from the top
4- All infested leaves fall prematurely but top shoot alive
5- Top shoots dead

Apion infestation index (0-3 scale) has been developed to measure apion resistant /tolerant variety.

Infestation score	Intensity of attack
0 = highly resistant/ tolerant	0 bore / plant
1 = Resistant / tolerant	1 bore / plant
2 = Susceptible	2 bore / plant
3 = Highly susceptible	3 bore / plant

The Percent Damage Index (PDI) of yellow mites to be calculated as follows:

$$PDI = \frac{\text{Sum of numerical rating} \times 100}{\text{Total no. of plants observed} \times \text{Maximum score}}$$

In case of Apion infestation, the Amount of Damage (AD) will be calculated as per following formula:

$$\text{Amount of Damage} = \frac{\text{Extent} \times \text{Intensity}}{100}$$

Where,
Intensity = Average number of knots/bore in attacked stems, Extent = Percentage of stem attack

Records to be kept:

1. Name of preceding crops
2. Date of sowing
3. Date of infestation of each pest
4. Total plant/plot and infested plant/plot
5. Yellow mite infested plants
6. Rating score
7. Number of top shoot attack
8. Date of harvest
9. Number of apion bore/plant (0-3 Rating scale)
10. Meteorological data (Temperature, relative humidity, rainfall etc.)

Estimated cost: Tk. 30000

2. TITLE OF THE PROJECT: HOST TOLERANCE/RESISTANCE AGAINST PEST OF JUTE AND ALLIED FIBRE CROPS

Objectives: Exploring the sources of resistance against target pests of jute and allied fibre crops

2.1 Title of the experiment: Screening of jute germplasm for tolerance/resistance against yellow mite and jute apion (Ento-2/2025)

Background and objectives: Major insect pests infesting jute includes jute stem weevil (*Apion corchori* Marshall), jute hairy caterpillar (*Spilarctia obliqua* Wlk.), jute semilooper (*Anomis sabulifera* Guen) and jute yellow mite (*Polyphagotarsonemus latus* Banks) (Rahman and Khan, 2010). Screening of numerous jute germplasm has been done against yellow mite and apion under greenhouse and field conditions. The more germplasm are screened, the more possibility of getting sources of resistance. Therefore, this experiment will be conducted to find out germplasm that have tolerance capability against yellow mite and apion.

Expected output: Tolerant/resistant jute germplasm will be identified to supply breeders for developing tolerant variety.
Status of program: Regular program
Date of initiation and duration: April/2024-September/2025.
Name of the investigators: S. Ahmmed, M. S. Polan and M. N. Islam

Locations: Kishoreganj and Cumilla

Test Materials:

- One hundred accession of *C. olitorius*: 1038, 1086, 1100, 1101, 1107, 1110, 1118, 1186, 1234, 1245, 1246, 1247, 1249, 1261, 1394, 1528, 1857, 1860, 1963, 1965, 1980, 2028, 2093, 2181, 2381, 2509, 2767, 3034, 3036, 3039, 3088, 3510, 3646, 3724, 3726, 3727, 3729, 3730, 3758, 3760, 3802, 3809, 3862, 3875, 3887, 3888, 4178, 4260, 4461, 4553, 4575, 4674, 4692, 4694, 4792, 4870, 5008, 5041, 5103, 5118, 5120, 5121, 5122, 5123, 5133, 5138, 5141, 5142, 5145, 5146, 5148, 5149, 5150, 5152, 5155, 5159, 5160, 5162, 5163, 5167, 5172, 5175, 5295, 5304, 5310, 6055, 6062, 6063, 6066, 6067, 6068, 6069, 6070, 6071, 6072, 6076, 6083, 6084, 6085 along with BJRI tossa pat 8 check variety

Experimental details:
One hundred germplasm of *C. olitorius* will be collected from Gene Bank Department of BJRI and will be for this experiment. Germplasm of *C. capsularis* along with standard varieties will be sown in 2m line following RCBD with three replications (Gomez and Gomez, 1984). The crop will be grown during April-August following standard package of agronomic practices recommended for the region. Incidence of pests will be recorded at weekly intervals starting from ten days after germination till harvest of the crop. No control measures against any pest will be adopted in this experiment and the plants will be subjected to natural infestation. Observations on the number of plants and leaves infested by a particular pest will be recorded from randomly selected ten plants in each plot and percent plant infestation will be calculated. Similarly, based on top ten leaves of the selected plants (total 100 leaves) percent leaf infestation will be determined following rating scale. Yellow mite infestation will be recorded as per rating scale (0-5) developed by Jalil et al. (1997). Apion infestation will also be recorded. After harvesting and retting in normal procedure fiber and stick yield will be recorded. Data obtained on the pest incidence and fiber yield will be statistically analyzed as outlined by Cochran and Cox (1963).

Records to be kept:

i) Name of variety or accessions number
ii) Date of sowing
iii) Total plant/plot and infested plant/plot
iv) Date of infestation
v) Alternate host
vi) Index of mite infestation (Rating score)
vii) Bore/plant (Rating score)
viii) Weather report (Rainfall, Humidity and Temperature etc.)
ix) Fibre weight and stick weight

Estimated cost: Tk. 25,000.00

2.2 Title of the experiment: Screening of Kenaf germplasm for tolerance/resistance against spiral borer and mealybug (Ento-3/2025)

Background and objectives: Kenaf belongs to Malvaceae family is important fibre producing crops considered as raw materials for paper-pulp production. Farmers are using its stem in vegetable garden, betel leaves plantations and as fuel. Spiral borer (*Agrilus acutus*) and mealybug (Hemiptera) are two important pests of kenaf. Spiral borer makes spiral shape gall at the basal region of the stem for what gall region become weak and as a result the stem cannot withstand at any sudden jerks resulting from the windy rainy weather and cause considerable loss of yield. Mealybug attacks in the top shoot of the plant, which blocks growth of top-shoot, causes shortening of internodes and bushy as well as stunted. Use of the pesticides to control these pests is costly and hazardous to human health and environment. The control of spiral

borer with pesticide is difficult because the insect remain concealed most of the time of its life cycle inside the stem of the host plant. Thus the development of kenaf germplasm with resistance to spiral borer and mealybug is thought to be a practical and environmental friendly means. Therefore, screening programme of kenaf and mesta cultivars of diversified germplasm against spiral borer and mealy bug will be conducted for identifying tolerant/resistant germplasm of kenaf against spiral borer and mealybug.

Expected output: Tolerant kenaf germplasm will be identified to provide breeders for developing resistant variety.
Status of program: Regular program
Date of initiation and duration: April/2024; 2024-2025.
Name of the investigators: M. S. Polan, S. Ahmmed and M. N. Islam.
L**ocations:** Faridpur regional station
Test Materials:

- 100 accessions of *H. cannabinus* along with check variety HC-95.

Experimental details:
One hundred (100) germplasm of kenaf will be collected from Gene Bank Department of BJRI. Germplasm of kenaf along with standard varieties will be cultivated in 2m long line following RCBD with three replications (Gomez and Gomez. 1984). The recommended package of agronomic practices for kenaf cultivation will be followed from sowing onwards. The target pests will adopt no plant protection measure with a view to facilitating maximum infestation of insect (Rahman and Khan, 2010). Observation regarding percent of plant infestation (PPI) and Amount of Plant Damage (APD) will be recorded during the infestation period from the plots as per following Pradhan's (1998) formula.

$$\text{PPI} = \frac{\text{No. of plant damaged}}{\text{No. of plant observed}} \times 100$$

$$\text{APD} = \frac{\text{Extent} \times \text{Intensity}}{100}$$

Where,
Extent = PPI
Intensity = Mean gall length (cm)
Intensity of Attack = this may be calculated from the mean gall length of ten affected plants for each line.
Seeds of the resistant germplasm (if found) will be collected for further trial.
Records to be kept:

i) Name of variety or accession number
ii) Date of sowing
iii) Total no. of plants per line
iv) No. of infested plant/line
v) Gall length per plant
vi) Plant height
vii) Weather condition (Temperature, humidity, rainfall, and drought)
viii) Soil condition and alternate host will be recorded

Estimated cost: Tk. 30,000.00

2.3 Title of the experiment: Effect of gamma radiation (γ) on jute varieties (*C. olitorius*) for developing jute yellow mite tolerant variety (Ento-4/2025).

Background and Objectives:
Jute is an important renewable natural fibre crop next to cotton (Das et al. 2014) which

contribute in national economy of Bangladesh through earning considerable foreign currency and involving lots of people in jute cultivation and jute business. It is an important cash crop that emerged as the largest industry, producing about one-third of manufacturing output, and the largest agricultural export commodity in Bangladesh. For releasing a yellow mite tolerant variety, pest susceptibility of promising material must be evolved. Host plant resistance is an important part of the IPM concept. It is one of the best ways to reduce losses caused by insects. Nuclear techniques like X-rays, gamma rays, ultraviolet rays which causes induced mutations in plants with exclusively new gene combinations are recently being used in the agricultural sector for various purposes including development of host plant resistance. Gamma radiation is used in different sectors of agriculture for application in sterilization and preservation of food (Maity et al., 2008; Hyun-Pa et al., 2006 and Bari et al., 2003). Gamma rays are the most energetic ionizing radiation having energy level from nearly 10 kilo electron volts (keV) to several hundred keV and penetrate rapidly through the polysaccharide granules Bao et al. (2005). Gamma radiations are also environmentally sound with least damage to the seeds. Therefore, in the present study seeds of O-9897 jute variety were exposed to different doses of gamma irradiation with following objectives

1. To know the most promising doses imparting germination percentages.
2. To screen out the most suitable doses imparting tolerance against jute yellow mite.

Expected output: Jute yellow mite tolerant/ resistant mutant variety will be developed
Status of program: New
Date of initiation and duration: March/2024 and 5 years
Name of the investigators: , M. S. Polan, S. Ahmmed, A. Islam and M. N. Islam
Locations: Manikganj and Central station, Dhaka
Test Materials: O-9897

Experimental details:
F1 Seeds of O-9897 treated with different doses of gamma radiation (25 Gy, 50Gy, 100Gy, 200Gy, 400Gy) at Atomic Energy Commission, Savar, Dhaka will be sown in plot of JAES, Manikganj. Unirradiated seeds of O-9897 will be treated as negative control. The crop will be grown using standard agronomic practices. No plant protection measures will be taken till harvest to facilitate the natural pest infestation. Percentage of infestation, rating score and Percent damage Index (PDI) of yellow mite infested plants will be recorded at 30, 50 and 70 days after sowing during the peak period of infestation.

Rating score
The intensity of damage by yellow mite is to be scored following 0-5 rating scale in given below:
0- Fresh and healthy leaves without any changes in colour
1- Slight changes in colour of leaves
2- Downward curling of leaves
3- 1 to 3 infested leaves dropped from the top
4- All infested leaves fall prematurely but top shoot alive
5- Top shoots dead
Estimated cost: Tk. 50,000.00

2.4 Title of the experiment: Varietal assessment of popular tossa jute varieties against jute yellow mite under field condition (Ento-5/2025)

ackground and Objectives:
Jute is an important cash crop for more than three millions small farm households, the largest industry, producing about one-third of manufacturing output, and the largest agricultural export

commodity in Bangladesh. Yellow mite is an important pest with high polyphagous feeding behavior reported to infest more than 100 different plant species including jute and its damage can adversely affect plant morphology and physiology (Hath, 2000; Grinberg, 2005). This year, the study will be conducted in defined locations with a view to determining the comparative susceptibility against jute yellow mite among the existing popular tossa jute varieties for helping jute growers.

Expected output: Status of resistance/tolerant level of tossa varieties against yellow mite will be known
Status of program: Regular program
Date of initiation and duration: March/2025-September/2025.
Name of the investigators: S. Ahmmed, M. N. Islam, S. Noman, M.S. Polan and A. Islam
Locations: JAES, Manikganj; Tarabo, Narayanganj and Central station, Dhaka

Experimental details:
BJRI popular tossa jute (*Chorcorus olitorius*) varieties with one exotic variety namely OM-1, BJRI tossa pat 4 (O-72), BJRI tossa pat 5 (O-795), BJRI tossa pat 6 (O-3820), O-9897, BJRI tossa pat 7(MG1), BJRI tossa pat 8, BJRI tossa pat 9 and JRO-524 will grown in the experiment. For natural occurrence and incidence of yellow mite, jute will be grown in in (2.1 m x 2 m) plots in lines at 30 cm spacing with 5-7 cm between the plants following Randomized complete Block Design (RCBD) with three replications in the Research Farm of Manikganj Faridpur and Jessore. All the standard agronomic practices will be followed for during the jute growing. No plant protection measures will be adopted. The observation on the incidence of mites infestation such as yellow mite population (number/cm^2 on 2 unfolded leaves) will be recorded at 55 DAS, 70 DAS and 85 DAS on ten randomly selected plants per plot using 1 cm x 1cm white hard paper quadrate with 10x magnifying lens. The mean number of mites and fibre yield for each treatment will be calculated and compared with one way analysis of variance (ANOVA).The weekly mean of the meteorological data on maximum and minimum temperature, morning and afternoon relative humidity (RH) and total rainfall during the crop growing period will be recorded.

Rating score
The intensity of damage by yellow mite is to be scored following 0-5 rating scale in given below:
0- Fresh and healthy leaves without any changes in colour
1- Slight changes in colour of leaves
2- Downward curling of leaves
3- 1 to 3 infested leaves dropped from the top
4- All infested leaves fall prematurely but top shoot alive
5- Top shoots dead
Record to be kept:

1. Date of sowing
2. Date of infestation
3. Total plant/plot and Infested plant/plot
4. Percent infestation
5. The intensity of damage by yellow mite is to be scored following 0-5 rating scale
6. Weather record
7. Date of harvest
8. Yield record

Estimated cost: Tk. 40,000.00

3. TITLE OF THE PROJECT: MANAGEMENT OF INSECT AND MITE PEST

Objectives:

i) To determine the efficacy of new pesticides recommended by Sub-PTAC for standardization
ii) To know details information about the life cycle of jute insect.
iii) To find out alternate of chemical pesticides.

3.1 Title of the experiment: Effectiveness of new acaricides on jute yellow mite under field condition (Ento-5/2025)

Background and objective: New acaricides supplied by different pesticide companies will be evaluated against jute yellow mite under natural condition to know their effectiveness.

Expected output: Efficacy of candidate acaricides will be determined for recommendation to the jute growers for controlling jute yellow mite.

Status of program: Regular program

Date of initiation and duration: March/2024-September/2025.

Name of the investigators: S. Ahmmed, M. N. Islam, M.S. Polan and A. Islam

Locations: JAES, Manikganj; Tarabo, Narayanganj and Central station, Dhaka

Experimental details:

A standard jute variety 0-9897 will be grown in 2x2.1m^2 plot following RCBD with 3 replications in different locations of BJRI (Gomez and Gomez, 1984). Normal agronomical practices for jute cultivation will be followed. No plant protection measures will be taken to facilitate natural infestation of yellow mite (Rahman and Khan, 2010). When sufficient infestation (more than 60% plants) is noticed, selected three different doses of candidate acaricides and Sunmectin (as standard) @ 1.2 ml litter of water will be sprayed in the field. Fresh water will be sprayed in the control plots. Each treatment single dose of each pesticide will be replicated 3 times. Leaf samples will be collected before spray and 24, 48 and 72 hours after spray for counting mite population under binocular microscope. Percent reduction of mite infestation will be recorded at 5 and 7 days after spraying of acaricides.

Estimation of pest population

The pest's population will be counted individually one day before and 3, 5 and 7 days after spraying in each plot for both the first and second spraying during jute growing season. Per cent reduction of different pests was calculated by applying the correction factor as per Henderson and Tilton (1955) as follows:

$$\text{Corrected \% mortality} = 100 \quad \left(1 - \frac{T_a x C_b}{T_b x C_a}\right)$$

Where T_a= number of insects after treatment, T_b = number of insects before treatment, C_a = number of insects in untreated plot after treatment, C_b = number of insects in untreated plot before treatment.

In case of % reduction of plant infestation,

$$\text{\% Reduction} = \frac{\text{No. of mite infested plant in control - No. of mite infested treated plant}}{\text{No. of mite infested plant in control}} \times 100$$

Record to be kept:

i. Date of sowing
ii. Date of infestation
iii. Mite population per square centimeter of leaf before spray and 24, 48 and72 hrs after spray
iv. Total plant/plot and Infested plant/plot
v. Date of spray
vi. Yield record
vii. Weather record (Rainfall, Humidity and Temperature etc.)

Estimated cost: Tk. 20,000

3.2 Title of the experiment: Evaluation of insecticides against jute hairy caterpillar under field and laboratory condition (Ento-6a/2025)

Background and objectives: Jute is an important renewable natural fibre crop next to cotton (Das et al. 2014) which contribute in national economy of Bangladesh through earning considerable foreign currency and involving lots of people in jute cultivation and jute business. Jute hairy caterpillar, *Spilosoma obliqua* (walker) belongs to the family Arctiidae of lepidoptera order is a polyphagous insect causing serious damage to a variety of crops (Bhattacharya *et al.*1995). Candidate insecticides supplied by different pesticide companies as per decision in Pesticide Technical Advisory Sub-Committee (Sub-PTAC) meeting will be tested in the field to determine their efficacy for controlling jute hairy caterpillar.

Expected output: Efficacy of candidate insecticides will be determined for recommendation to jute growers for controlling jute hairy caterpillar.

Status of program: Regular program

Date of initiation and duration: April/2024; two seasons (2024-2025).

Name of the investigators: M. S. Polan, S. Ahmmed, A. Islam and M. N. Islam,

Locations: JAES, Manikganj, Tarabo, Narayanganj and Central station, Dhaka

Experimental details

Jute plants of 0-9897 will be grown in 2x2.1m^2 plot following RCBD with 3 replications in different locations of BJRI (Gomez and Gomez, 1984). No plant protection measures will be taken to facilitate the natural buildup of jute hairy caterpillar population. However, normal agronomical practices will be followed (Rahman and Khan, 2010). When sufficient natural field infestation is noticed, selected three different doses of new insecticides and Imidachlor 10 WP (Standard) will be sprayed. Control plots will be treated with fresh water. Total population of hairy caterpillar will be counted before spray and percent reduction of infestation will be recorded from the field after 3 and 5 days of spray according to Abbott's formula (1925).

$$\text{Corrected mortality \%} = \frac{\text{n in } C_o - \text{n in T}}{\text{n in } C_o} \times 100$$

Where, n= Insect population, T= treated, C_o=control

Records to be kept:

1. Date of sowing
2. Date of infestation of jute hairy caterpillar
3. Concentrations/doses of insecticide
4. Total and infested plant/plot
5. Population of insect per plot before and at 3rd and 5th day after spray
6. Date and time of insecticides application
7. Yield record
8. Weather report (Rainfall, Humidity and Temperature etc.)

Estimated cost: Tk. 25,000.00

3.2 Title of the experiment: Evaluation of insecticides against mealybug under field and laboratory condition (Ento-6b/2025)

Background and objectives: Kenaf, an annual crop, has been grown in tropical region as a source of bast fibre crop for cordage and textile production. The traditional use of kenaf focuses on its fibre production, such as a making rope, sacks, canvaces and carpets. However, mealybug belongs to the Hemiptera order is a polyphagous insect causing serious damage to a variety of crops including kenaf. Candidate insecticides supplied by different pesticide companies as per decision in Pesticide Technical Advisory Sub-Committee (Sub-PTAC) meeting will be tested in the field to determine their efficacy for controlling jute hairy caterpillar.

Expected output: Efficacy of candidate insecticides will be determined for recommendation

to jute growers for controlling mealybug.
Status of program: new program
Date of initiation and duration: April/2025; two seasons (2025-2026).
Name of the investigators: S. Ahmmed, M. S. Polan, A. Islam and M. N. Islam,
Locations: JAES, Manikganj, Tarabo, Narayanganj and Central station, Dhaka

Experimental details
Jute plants of 0-9897 will be grown in 2x2.1m^2 plot following RCBD with 3 replications in different locations of BJRI (Gomez and Gomez, 1984). No plant protection measures will be taken to facilitate the natural buildup of jute hairy caterpillar population. However, normal agronomical practices will be followed (Rahman and Khan, 2010). When sufficient natural field infestation is noticed, selected three different doses of new insecticides and Imidachlor 10 WP (Standard) will be sprayed. Control plots will be treated with fresh water. Total population of mealybug will be counted before spray and percent reduction of infestation will be recorded from the field after 3 and 5 days of spray according to Abbott's formula (1925).

$$\text{Corrected \%} = \frac{n \text{ in } C_o - n \text{ in } T}{n \text{ in } C_o} \times 100$$

Where, n= Insect population, T= treated, C_o=control
Records to be kept:

1. Date of sowing
2. Date of infestation of jute hairy caterpillar
3. Concentrations/doses of insecticide
4. Total and infested plant/plot
5. Population of insect per plot before and at 3rd and 5th day after spray
6. Date and time of insecticides application
7. Yield record
8. Weather report (Rainfall, Humidity and Temperature etc.)

Estimated cost: Tk. 25,000.00

3.3 Title of the experiment: Effectiveness of different weed extracts to control jute yellow mite (Ento-7/2025)

Background and objectives: Jute is a renewable natural fibre popularly known as the golden fibre. It is one of the cheapest and strongest natural fibres. Jute is second only to cotton in world's production of textile fibers. It is a biodegradable and eco-friendly. It has many advantages over synthetics and protects the environment and maintains the ecological balance. Jute is one of the few crops, which can be grown in the monsoon season, and can be rotated with rice to restore the soil fertility and structure. The leaves of jute plants enrich the fertility of the soil for sustained agriculture, and have good nutrition value as vegetables. Use of jute sticks as fuel and fencing material as substitute for wood prevents deforestation. Therefore, the increased global concern for the environment, the future prospects for jute remains high (Rahman et al., 2016).Yellow mite, *Polyphagotarsonemus latus* Banks (Acari: Tarsonemidae) is one of the major pests of jute (Rahman, and Khan, 2006). Weed is the promising sources of botanical pesticides those are attributed to insecticidal properties for many insects (Sagheer et al., 2013; Alkan et al., 2015). Therefore, this study aimed to investigate the insecticidal activity of some available weeds against jute yellow mite. So far, there is no available information on insecticidal potential of the weeds against insect pests and mite pest of jute and allied fibre crops. The following objectives of this study are stated as-

- To screen out some weeds attributed to insecticidal potential against jute yellow mite
- To investigate insecticidal activity of weed extract in different solvents
- To evaluate the efficacy of most promising weed extract under field condition

Expected Output: Economic and environment friendly weed (botanicals) pesticides will be

identified as alternative to chemical pesticide.
Location(S): Central station, Dhaka, JAES, Manikganj
Name of the investigator(S): S. Ahmmed, M. N. Islam and M.S. Polan.
Status of program: New program
Date of initiation and duration: April/2025; two seasons (2025-2026).
Expected ending date: December, 2025

Materials: Mutha (*Cyperus rotundus*), **Durba** (*Cynodon dactylon*), **Fuska begun** (*Physalis heterophylla*), **Helencha** (*Jussiaea repens*), **Chanchi** (*Alteranthera sessilis*), **Boro dodhia** (*Euphorbia hirta*), **Chapra** (*Eleusine indica*), **Hajardana** (*Phyllanthus Niruri*), **Saknotey** (*Amaranthus viridis*), **Kantanotey** (*Amaranthus spinosus*), **Dhaki shak** (Fern) (*Dryoyteris fillix-mas*), **Bishkatali** (*Persicaria hydropiper*), **Lojjaboti** (*Mimosa pudica*), **Lantana** (), **Hatishur** (*Heliotropium indicum*), **Ghagra** (*Xanthium strumarium*), **Nakful** (*Acmella ciliata*), **Telakucha** (*Coccinia grandis*), **Goatweed** (*Ageratum conyzoides*), **Bishkatali leaf** (*Persicaria hydropiper*) along with **Helthion** (as standard) at recommended dose.

Methodology: Jute seeds of O-9897 variety will be sown in 2x2.1m^2 plot following RCBD with 3 replications (Gomez and Gomez, 1984) in the field of Central station, Dhaka and JAES, Manikganj. This experiment will be conducted to determine the efficacy of above mentioned weed extracts to control yellow mite. These materials are selected based on their insecticidal properties to evaluate against jute yellow mite where distilled water will be used as negative control and neem oil as positive control.

Preparation of extract:
Collected plant material from the plants or available source will be dried well in sunlight separately. Then these materials have to be powdered with the help of grinder. This seed powder is soaked in water in the ratio of 1:20 (100 g of powder in 2 liters of water) overnight to produce the extract. This extract should be sifted through a sieve and sprinkled on the opposite side of the mite infested jute young leaves.
When sufficient natural infestations build up in the plots, selected doses of weed extracts along with neem oil will be sprayed on the infested plots. The control plots will be kept untreated and each treatment will be replicated 3 times. Number of infested plants will be recorded before spray and 5th and 7th days after spray and percent reduction of mite infestation will be calculated.
Estimation of pest population
The pest's population will be counted individually one day before and 3, 5 and 7 days after spraying in each plot for both the first and second spraying during jute growing season. Per cent reduction of different pests was calculated by applying the correction factor as per Henderson and Tilton (1955) as follows:

$$\text{Corrected \% mortality} = 100\left(1-\frac{T_a x\, C_b}{T_b x\, C_a}\right)$$

Where T_a= number of insects after treatment, T_b = number of insects before treatment, C_a = number of insects in untreated plot after treatment, C_b = number of insects in untreated plot before treatment.
In case of % reduction of plant infestation,

$$\text{\% Reduction} = \frac{\text{No. of mite infested plant in control- No. of mite infested treated plant}}{\text{No. of mite infested plant in control}} \times 100$$

Records to be kept:
1. Date of sowing
2. Dates of spray

3. No. of mite infested plants/plot before and after spray
4. Total plant/plot and Infested plant/plot
5. Intensity of attack
6. Date of re-infestation
7. Date of harvest
8. Fibre yield/plot
9. Weather report (Rainfall, Humidity and Temperature etc.)

Estimated cost: Tk. 100000.00

3.4 Title of the experiment: Effect of nitrogenous fertilizer on yellow mite infestation in *Corchorus* spp. (Ento-8/2025)

Background: Yellow mite is an important pest with high polyphagous feeding behavior reported to infest more than 100 different plant species including jute and its damage can adversely affect plant morphology and physiology (Hath, 2000; Grinberg, 2005). The tossa jute (*C. olitorius*) suffers more due to infestation as compared to jute (*C. capsularis*). As a result, yield loss has been estimated to the extent of 42% in jute plants (Pandit, 2002). Studies on the effect of nitrogenous fertilizer on infestation of yellow mite in jute need to be measured. In light of the above, the present investigation will be carried out to study infestation of yellow mites under variable regimes of nitrogenous fertilizers, which may be useful for framing the management options for yellow mite in jute.

Objectives:

1) To study the effect of nitrogenous fertilizers on yellow mites infestation.

Status of program: Ongoing program
Date of initiation and duration: April/2025 (third season).
Name of the investigators: M. S. Polan, S. Ahmmed and M. N. Islam
Locations: JAES, Manikganj

Methodology: A field experiment will be conducted in Randomized complete Block Design (RCBD) with three replications in the Research Farm of Jute Agriculture Experimental Station, Manikganj during 2024 cropping seasons. Seeds of jute (O-9897) will be sown in (2.1 m x 2 m) plots in lines at 30 cm spacing with 5-7 cm between the plants. Various doses of nitrogen will be applied in the experimental plot as basal application during land preparation to record its effect on yellow mite infestation. All the standard agronomic practices except fertilizer application will be followed for raising the jute crop. No plant protection measures will be adopted. There will four treatments with various level of Urea(N), TSP(P), MOP(K) (kg/ha) (80: 50: 60; 100: 50: 60; 120: 50: 60 and 140: 50: 60) as basal dose and control plot without NPK. Additional 100 kg of urea will be top dressed after 45 days of sowing. The following sources of NPK will be used: N, Urea (46% N); P, Tipple super phosphate (48% P); K, muriate of potash (60% K). Yellow mite population (number/cm^2 on 2 unfolded leaves) will be recorded at 55 DAS, 70 DAS and 85 DAS on ten randomly selected plants per plot using 1 cm x 1cm white hard paper quadrate with 10x magnifying lens. The mean number of mites and fibre yield for each fertilizer treatment will be calculated and compared with one way analysis of variance (ANOVA). Duncan's multiple range test will be used to determine significant difference ($P<0.05$) between the treatments (means of numbers for each fertilization treatment). Economic parameters such as cost of production, net return and benefit cost ratio (BCR) will be calculated by considering all inputs and outputs. Simple correlation between mite population and fibre yield at different crop stages, as well as, different levels of nitrogen will be computed.

Record to be kept:

9. Date of sowing
10. Date of infestation

11. Total plant/plot and Infested plant/plot
12. Percent infestation
13. The intensity of damage by yellow mite is to be scored following 0-5 rating scale
14. Weather record
15. Date of harvest
16. Yield record

Expected output: It may be useful for framing the management options for yellow mite in jute.

Estimated cost: Tk 25,000.

3.5 Title of the experiment: Comparative study of the performance of chemical, botanical and bio insecticides against jute yellow mite (Ento-9/2025).

Background and objectives: Jute (*Corchorus* sp.) under the genus of *Corchorus* and family of Malvaceae, predominantly a self-pollinated crop which is a natural inhabitant of the tropical and subtropical region of the world. Jute one of the most important natural fiber crops after cotton which is eco-friendly, easily biodegradable, improve the soil health and environment. Demand of jute is increasing day by day due to global awareness on "save the environment". But the fact is that insect pests of jute namely jute yellow mite is very much devastating for jute production. The yellow mite is extremely polyphagous and attacks plants of about 60 families worldwide. The yellow mite infested plant remains stunted and the fibre yield can be reduced by up to almost 75% under both field and net house conditions. Integrated Pest Management is one of the most popular pest management strategies in all over the world. This experiment will be conducted to evaluate the performance of IPM against jute yellow mite in jute..

Expected output: The best integrated pest management strategy for controlling jute yellow mite will be found out.

Status of program: New program

Date of initiation: Jute season, 2024-25

Name of the Investigators: A. Islam, S. Ahmmed, M. N. Islam, M. S. Polan and M. S. Noman

Location: JAES, Manikganj

Experimental details: Jute plants of BJRI Tossa Pat-8 will be grown in 2x2.1m^2 plot following RCBD with 3 replications in JAES, Manikganj and Faridpur Station of BJRI (Gomez and Gomez, 1984). The soil will be treated with $CaCO_3$ before sowing. Seed will be treated with chemical insecticide Imidachloprid. After sowing the normal agronomical practices like weeding as when necessary, fertilizer application and other intercultural operation will be conducted in due time (Rahman and Khan, 2010). When natural field infestation is noticed, the treatments will be applied. Abamectin 1.2% (2ml/L) will be used as chemical treatment, Neem oil extract (2ml/L) as botanical insecticide and K-mite as bio-insecticide will be applied. The data on the yellow mite infestation will be recorded after 7 days and 15 days of the application of the insecticides for the evaluation of the efficacy of the treatments.

Treatments:

Treatment 1: Chemical Treatment
Treatment 2: Botanical insecticide
Treatment 3: Bio-insecticide
Treatment 4 : Water (Control)

Record to be kept:

i. Date of sowing
ii. Date of infestation
iii. Mite infested plant per plot before treated
iv. Mite infested plant per plot after treated
v. Date and Time of treatment application
vi. Yield record

Estimated Cost: Tk. 20,000

3.6 Title of the Experiment: Effect of different date of sowing on major insect pest infestation on Kenaf (*Hibiscus cannabinus*) and Jute (*Corchorus capsularis* L. and *Corchorus capsularis*) varieties during fiber growing season (Ento-10/2025)

Background and objectives: Jute is a renewable natural fiber popularly known as the golden fiber. It is one of the cheapest and strongest natural fiber. Jute (*Corchorus capsularis* and *C. olitorius* L.), a fiber crop native to India, is of great economic and medicinal importance (Rahman and Khan, 2006). Use of jute sticks as fuel and fencing materials as substitute for wood prevent deforestation. Therefore, the increased global concern for the environment, the future prospects for jute remains high (A. Rahman *et.al,* 2016). Major insect pests infesting jute includes jute stem weevil (*Apion corchori* Marshall), jute hairy caterpillar (*Spilarctia oblique* Wlk), jute semilooper (*Anomis sabulifera* Guen) and jute yellow mite (*Polyphagotarsonemus latus* Banks) (Rahman and Khan, 2010). Yellow mite, *Polyphagotarsonemus latus* Banks (Acari: Tarsonemidae) is one of the major pests of jute (Rahman and Khan, 2006). Damage caused by insect pests to jute is very noteworthy as pests become more and more resistant to pesticides (Roy, 2014). This experiment will be undertaken with a view to find out the variation of infestation of major insect pests in tossa jute according to different sowing date.

Objectives:

i. To find out the infestation of major insect pest at different date of sowing
ii. To monitor the abundance of major insect pest of tossa jute and kenaf at different environmental condition
iii. To determining the major insect pest status of tossa jute and kenaf varieties for helping breeders to evolve new varieties

Expected output: Major insect pest status of kenaf and deshi jute will be known.
Status of program: New program
Date of initiation and duration: Jute fiber growing season, 2025
Name of the Investigators: A. Ghosh, M. S. Noman, S. Ahmmed, M.S. Polan & M. N. Islam
Location: Monirampur, Faridpur.

Methodology: Kenaf (Kenaf HC-95), Tossa pat (Tossa pat 9) and Deshi Jute (BJRI Deshi Pat10) will be grown on 20th March 2025, 5th April 2025, 20th April 2025 and 5th May 2025 in the fields of Monirampur sub-station of BJRI. The unit plot size will be 2.1m X 2m, plot to plot distance will be 1.0 m and block to block distance will be 2.0 m. The study will be arranged in a Randomized Complete Block Design (RCBD) with 3 replications. The natural infestation of major insect pests will be encouraged to build up in the field. Agronomic practices and fertilizer dosage will be applied as per recommendation. No plant protection measures will be taken till harvest.

Records to be kept:

i. Date of sowing
ii. Date of infestation
iii. Total plants per plot
iv. Infested plants per plot
v. Percent infestation
vi. Date of harvest
vii. Weather condition (Rainfall, Humidity and Temperature)

Estimated cost: TK. 60,000.00

PROJECT 4: CHEMICAL ANALYSIS

4.1 Title of the experiment: Identification of bioactive compound of mahogany seed extract for controlling jute yellow mite (Ento-12)

Objectives

- to identify bioactive compound of mahogany seed extract attributed to acaricidal properties
- to investigate efficacy of identified bioactive compound against jute yellow mite

Expected outcome: Promising acaricidal bioactive compound for controlling yellow mite will be known.
Status of program: New program
Date of initiation and duration: 2025
Name of the Investigators: S. Ahmmed, M.S. Polan & M. N. Islam
Location: Dhaka.
Methodology:
HPLC and LC_MS method following standard protocol will be used for identification of bioactive compound of mahogany seed extract.
Estimated cost: TK. 1,00000.00

PROJECT 5: ECOLOGY OF INSECT AND MITE PEST OF JUTE AND ALLIED FIBRE CROPS

5.1 Title of the experiment: Species Identification of Adult Jute Insects Based on DNA (Ento-11/2025)

Background and objectives: Identification of species is a key part of the recognition and description of biodiversity. Traditional identification (morphological) needs experts like taxonomists and trained technicians who can clearly identify taxa, as it needs special skills and vast experience. But there has been a substantial decrease in the number of taxonomists and other experts. Therefore, alternative and accurate methods of identification are necessary that non-experts can do it very easy way. DNA-based identification methods have been the most promising approaches instead of morphological data for identifying the taxa.
The Life Barcode project was introduced to encourage DNA barcoding as a global standard for sequence-based eukaryote identification. DNA barcoding is a technique for amplifying a 648 bp region of the mitochondrial *cytochrome-c oxidase* subunit 1 (*COI*) gene to ensure rapid and accurate identification of a wide range of biological specimens. Nowadays, DNA barcoding has become a powerful tool for the successful identification of insects. On the basis of the COI gene, several rapid diagnostic approaches have been established, such as real-time PCR, PCR-RFLP (restriction fragment length polymorphisms), microfluid dynamic array techniques and loop-mediated isothermal amplification (LAMP). In Bangladesh, a molecular diagnostic method for rapid and reliable identification of jute insects has not been developed.

Expected outcome: Identification of jute insects based on molecular technique.
Status of program: New program
Name of the Investigator (s): M. S. Noman, M. R. Amin, S. Ahmmed, M.S. Polan, M. N. Islam, R. K. Ghosh & M. N. Islam
Location: BJRI Faridpur and BJRI Dhaka.
Experimental details:
Sample collection and preservation
Samples will be collected from BJRI, Faridpur and will be preserved in absolute ethanol and for long term use it will be stored in -20^{o}C.

DNA extraction and DNA Barcodes amplification

DNA will be extracted from the one leg of adult using DNA mini kit. The Universal primers (LCO-1490 and HCO-2198) will use in PCR for DNA Barcodes amplification. The presence bands of correct size will detect using gel electrophoresis.

DNA sequencing

The DNA will be purified using a DNA purification kit and then sequence directly using sanger sequencing. To get correct sequences, every sample will be sequenced in two directions using same primers that will be used in PCR.

Sequences analysis

Sequence assembly will be performed by DNAMAN 5.2.2.0 and the sequences with low quality will be detected for further analysis. The multiple alignments of sequences will be done by Clustal X (Version 1.83). The obtained sequences of COI gene (barcoding region) will be submitted to BOLD for making alignments with the standard sequences.

Neighbor Joining Tree (NJ)

In order to verify the identification results, NJ tree will be applied for phylogenetic analysis among the samples and related species that will be obtained from GeneBank database. MEGA version 4.0.2 will be used to build the NJ tree.

Expected cost: Tk. 80000.00

5. TITLE OF THE PROJECT: SURVEY ON PEST OF FIBRE AND SEED CROPS OF JUTE AND ALIED FIBRE

Objectives: Survey will be conducted to know the nature of incidence, intensity and peak period of insect and mite pest attack which is important for the development of forecasting system that will be helpful for economic control of jute pest.

5.1 Title of the experiment: Investigation on infestation of insect and mite pest and their natural enemy (such as predatory mite etc) on jute and allied fibre and their seed crops (Ento-12/2025)

Background and objectives: Jute (*Corchorus capsularis* and *C. olitorius*), a fibre crop native to India, is of great economic and medicinal importance (Rahman and Khan, 2006). Damage caused by insect pests to jute is very noteworthy as pests become more and more resistant to pesticides (Roy, 2014). Farmers need agricultural information to eradicate miss-concepts about the specific pest, to raise their level of knowledge of pest management and eventually to help in their decision making process (Aimé et al., 2002). Decisions of farmers are influenced by available management options, their knowledge and the experience about the pest (Bharat et al., 2011). Correct identification of insect pests is necessary in order to avoid economic damage being sustained and retain beneficial insects. Often it may be difficult to identify the insects causing the particular damage. If this is the case, the next option available is to examine the symptoms of crop damage. Use the diagnostic tool to help to identify the insect pest causing the damage. Insects can damage crops throughout the growing season but seedlings and podding crops are most at risk. It is also important to assess any crop damage as soon as it is observed, and determine if further damage is likely to occur. Options available for the control of the particular insect pest can then be explored.

The incidence of insect and mite pest infestation varies from variety to variety and region to region. Survey on jute and allied fibre insect and mite is needed to obtain record on this time of appearance, peak period of infestation and to take necessary control measures at proper time specially to know the percentage of different insect and mite pest incidence at different jute varieties at different agro ecological zones and comparative assessment of incidence of jute insect and mite in experimental plots and farmers' fields.

Expected output: It will be helpful to forecast pest infestation and their natural enemy can be used as bio-control agent and advice jute growers for necessary future action.
Status of program: Regular program
Date of initiation and duration: April/2025; regular
Name of the investigator: M. S. Noman, S. Ahmmed, M. N. Islam, A. Islam and M. S. Polan
Locations: All stations of BJRI and farmer's field adjacent to BJRI stations.
Experimental details:
Source of data: Experimental plots and adjacent farmer's fields of selected regional stations of BJRI.

Methodology: Data on insect and mite pest of jute and allied fibre crops will be collected through a format (Developed by Entomology Department) from all stations of BJRI and farmer's field adjacent to BJRI stations. Four sampling site will be selected randomly for data collection in each plot/field. Each sample size area will be $1m^2$.

Record to be kept:

1. Date of sowing
2. Name of variety
3. Name of previous crops
4. Name of sampling plot size
5. Total plant/plot and Infested plant/plot
6. Name of insect pests
7. Date of initial infestation of pests
8. weather report

Estimated cost: Tk. 20,000.00

Survey on insect of jute and allied fibre crops in experimental plots and farmer's field of different Jute-growing regions of Bangladesh
Department of Entomology, Bangladesh Jute Research Institute, Dhaka-1207

Sl no.	Location	Variety/ Sowing date	Area (m^2)		Previous crops	Total No. of plants	No. of infested plants							
			Experimental plot	Farmer's field			Mite	Apion	Hairy caterpillar	Semilooper	Mealy bug	Spiral borer	Kenaf beetle	Remarks

Literature cited:

1. Abbott, W.S. (1925). A method of computing the effectiveness of an insecticide. *Journal of Economic Entomology*, 18 : 265-267.
2. Abdul Sadat and Kaushik Chakraborty (2015). Insect pest constrains of jute and its control by biological agents under modern Eco-Friendly sustainable production system, 2(3): 316-321.
3. Aimé, H., Bokonon, G., Hugo, de, G. and Peter, N. (2002). Socio-economic impact of biological control of mango mealy bug in Benin. *Agriculture Ecosystem and Environment,* 93: 367–378.
4. Anonymous: 50 years of research on jute and allied fibres agriculture-agolden jubilee volume 1948-1997. ICAR-Central research institute for jute and allied fibres CRIJAF), Barrackpore, Kolkata, West Bengal (1999).
5. Aslam, M., Razak, M., Akthar, W., Faheem, M. and Ahmad, F. (2005). Effect of sowing date of wheat aphid (*Schizaphis graminum* Rondani) population. *Pakistan Entomology*, 27: 79-82.
6. Sagheer, M., Hasan, M., Ali, Z., Yasir, M., Ali, Q., Ali, K., ... & Khan, F. Z. A. (2013). Evaluation of essential oils of different citrus species against Trogoderma granarium (Everts)(Coleoptera: Dermestidae) collected from Vehari and Faisalabad districts of Punjab. *Pakistan. Pak. Entomol*, *35*, 37-41.
7. Alkan, N., & Fortes, A. M. (2015). Insights into molecular and metabolic events associated with fruit response to post-harvest fungal pathogens. *Frontiers in plant science*, *6*, 160575.
8. Bari, M. L., Nazuka, E., Sabina, Y., Todoriki, S., & Isshiki, K. (2003). Chemical and irradiation treatments for killing Escherichia coli O157: H7 on alfalfa, radish, and mung bean seeds. *Journal of Food Protection*, *66*(5), 767-774.
9. Bharath, K.T.P., Govinda, G.V. and Nita, K. (2011). Decision making pattern of male and female farmers in horticultural farming. *International Journal of Engineering and Management Science*, 2(2): 97-101
10. Bhattacharya, P.K.; Ram W.H, and Sarker S. (1995). *Spilosoma obliqua* (Walker): economic importance, biology, host range and breeding for resistance in soybean. *Agricultural Revolution*. India. 16(l&2):23-40.
11. Cochran W.G., Cox G.M. (1963). Experimental Design. John Willey & Sons, New York, USA.
12. Das H, Poddar P, Haque S, Pati S, Poddar R, Kundu CK.(2014). Seed yield and economics of white jute as influenced by different dates of sowing, spacing and topping schedule in Terai region of West Bengal. *International Journal of Farm Sciences*, 4(4):51-58.
13. Denmark, H.A., 1980. Broad mite, Polyphagotarsonemus latus (Banks). FDACS-DPI *Bureau of Entomological Circular*, 213, Pp. 2.
14. Gomez, K. A. and Gomez, A. A., (1984). *Statistical Procedures for Agriculture Research*. John Weley and Sons. Inc., New York, pp. 67-265.
15. Grinberg, M., R.P. Treves, R. Palevsky, L. Shomer and V. Soroker (2005). Interaction between cucumber plants and the broad mite, *Polyphagotarsonemus latus*: from damage to defense gene expression. *Entomologia Experimentalis et Applicata*, *.115*, 135–144
16. Hath, T.K. (2000). Distribution of yellow mite (Banks) population on leaves of different jute varieties. *Environmental Economics, 18 ,* 578-580
17. Henderson LF, Tilton EW. (1955). Tests with acaricides against brown wheat mite. *Journal of Economic Entomology*. 48:157–167.

18. Jalil A.F.M.A., Sultan. N, Zaman A.K.M.A., Banu H, Khandaker S. (1997). Development of rating method for screening of yellow mite resistant varieties of jute, *Bangladesh Jute and allied Fibre Research*, 22(2).40-46.
19. Kabir, A.K.M.F., 1975. White mite, Hemitarsonemus latus (Banks) Ewing. In jute pests of Bangladesh. Bangladesh Jute Research Institute. Dhaka, Bangladesh, Pp. 28-33.
20. Kundu, B.C. (1956). Jute: World's foremost bast fibre II. Technology, marketing, Production and utilization. *Economic Botany*, 10: 203-40.
21. Maity, J. P., Kar, S., Banerjee, S., Chakraborty, A., & Santra, S. C. (2009). Effects of gamma irradiation on long-storage seeds of Oryza sativa (cv. 2233) and their surface infecting fungal diversity. *Radiation Physics and Chemistry*, *78*(11), 1006-1010.
22. Mondal, S., Singh, R.P., Crossa, J., Huerta-Espino, J., Sharma, I., Chatrath, R., Singh, G.P., Sohu,V.S., Mavi, G.S., Sukuru, V.S.P., Kalappanavar, I.K., Mishra, V.K., Hussain, M., Gautam, N.R., Uddin, J., Barma, N.C.D., Hakim, A. and Joshi, A.K. (2013). Earliness in wheat: a key to adaptation under terminal and continual high temperature stress in South Asia. *Field Crop Research*, 151: 19-26.
23. Pandit, N.C., Rao, P.V. and Chakraborty, A.K. (2002). Studies on the biotic and abiotic factors on the incidence of yellow mite of jute. *In*: *Annual Report*: 2000-2001 and 2001-2002, Central Research Institute for jute and Allied Fibres, Barrackpore, pp. 71.
24. Pathak, S. (1991). Economics of jute cultivation. *Annal of Agricultural Research*, 12: 177-80.
25. Pradhan S. K.,(1998). Evaluation of jute and kenaf/mesta germplasm for pest resistance. IJO, BJRI, Dhaka. 61-66.
26. Rahman, A., Islam, K., Jahan, M., & Islam, N. (2016). Efficacy of three botanicals and a microbial derivatives acaricide (Abamectin) on the control of jute yellow mite, Polyphagotarsonemus latus (Bank). *Journal of the Bangladesh Agricultural University*, *14*(1), 1-6. https://doi.org/10.3329/jbau.v14i1.30588.
27. Rahman, S. and Khan, M.R. (2006). Incidence of pests and avoidable yield loss in jute, *Corchorus olitorius* L. *Annals of Plant Protection Science*, 14(2): 304–305.
28. Rahman, S. and Khan, M.R. (2010). Integrated management approach for control of the pest complex of olitorius jute, Corchorus olitorius L, *Journal of Plant Protection Research,* 50(3):340–346.https://doi.org/10.2478/v10045-010-0058-5.
29. Rai, A.B., Satpathy, S., Gracy, G.R., Swamy, T.M.S. and Rai, M. (2007). Yellow mite, *Polyphagotarsonemus latus* Banks menace in chilli crop. *Vegetable Science*, 34: 1-13.
30. Roy, N. (2014). Role of *Chorchorus capsularis* phytochemicals on the feeding dynamics of *Diacrisia casignetum* Kollar (Arctiidae: Lepidoptera). *Journal of Entomology and Zoology Studies*, 2(4): 227-236.
31. Satpathy, S., Gotyal, B.S. and Selvaraj, K. (2014). Integrated Pest Management in Jute and Mesta. *In*: Jute and Allied Fibres, *Processing and value addition*, Nag, D. and Ray, D.P. (Eds.), New Delhi Publishers, New Delhi. pp. 1-307.
32. Song, H. P., Kim, D. H., Jo, C., Lee, C. H., Kim, K. S., & Byun, M. W. (2006). Effect of gamma irradiation on the microbiological quality and antioxidant activity of fresh vegetable juice. *Food microbiology*, *23*(4), 372-378.
33. Yardin, E.N. and C.A. Edwards (2003). Effects of organic and synthetic fertilizer sources on pest and predatory insects associated with tomatoes. *Phytoparasitica*, 31, 324-329

ANNUAL RESEARCH PROGRAM-2025

E. FIBRE QUALITY IMPROVEMENT DIVISION
E I. POST HARVEST PROCESSING DEPARTMENT

PROGRAMME AREA: IMPROVEMENT OF FIBRE QUALITY THROUGH POST HARVEST PROCESSING

1. TITLE OF THE PROJECT: DEVELOPMENT AND UPGRADATION OF RETTING TECHNIQUE FOR BAST FIBRE CROPS

Objective: To search for new retting microbes to generate new scientific data for increasing retting performance and production of good quality Jute and Allied Fibre (JAF) crops.

1.1 Title of the experiment: Isolation and identification of jute retting bacterial strains from different natural sources and study their retting properties (FQI-01/2025)

Background and objectives: Retting is traditionally carried out in water bodies and basically it is a microbiological process. At present, the most promising retting process is the water based microbiological retting (Candilo *et al.*, 2010). In another sense, the process of separation and extraction of fibres from non-fibrous tissues and woody part of the stem through dissolution and decomposition of pectins, gums and other mucilaginous substances without damaging the cellulose is called retting (Haque *et al.,* 2003). It is accomplished by the joint action of different microorganisms, mostly bacteria present in retting water. Jute retting is generally completed within 15 to 21 days depending on type of bast fibre plants, age of plants, pH and temperature of water, and the presence of efficient bacterial populations (Pallesen, 1996). During micro-biological retting, depolymerization of pectin is operated by pectinases (Zhang *et al.,* 2000). Efficient pectinolytic bacterial strains with low cellulolytic activity can improve fibre quality, reduce the time of retting and evade environmental pollution that arises due to retting. Thirty-eight (38) pure bacterial strains were isolated and screened for their polygalacturonase (PG), pectin lyase (PNL) and cellulase activity (Das *et al.*, 2012). Therefore, if we are able to develop an efficient of pectinolytic bacterial inoculums package, it can be possible to solve the water shortage problem of jute retting and shorten the retting period with environmentally friendly. So, it is very essential to isolate bacterial populations with higher enzymatic activities as well as pectinolytic activities that may accelerate retting performance and improve fibre quality.

Information relating to retting with microbial population as well as bacterial population on jute is very limited over the world.
Therefore, the present study will be conducted as a routine program with the following objectives.

i. To isolate promising pectinolytic bacterial strains
ii. To increase the retting performance

Expected output: The promising bacterial strains will be isolated that may accelerate the retting performance and improve the fibre quality of JAF crops.
Date of initiation and duration: March/2020 – December/2025
Status of the experiment: 4th year: 2025
Name of the investigators: M. Younus Ali, A. F. Mollah, M. Munir Hossain, Jannatul Ferdous and Umme Hafsa Timmi
Experimental details:
Experimental location: FQID Laboratory, BJRI, Dhaka.
Sample collecting location: JAES, Manikganj; JRRS, Rangpur, Faridpur and JRSS, Monirampur
Experimental Materials: Jute retting water, green jute plants, jute ribbons, sterile dH_2O, LB media, NA media, NaCl, Citrus pectin, PGA, xylan, xylose, glucose, CMC, DNS reagent, agar, etc.
Jute variety: BJRI tossa pat-8 (Robi-1).
Design and Layout: CRD for retting trial with the isolated bacterial strains with three replications.

Methods: Forty bacterial isolates were isolated from collected jute retting water samples during 1st year. In 2nd year, eleven bacterial strains were screened out from the forty isolates by agar well diffusion assay. In 3rd year, jute retting will be conducted with the screened isolates at lab condition. The bacterial strains will be grown in LB/NA solid and broth media using standard microbiological methods (Aneja, 2003). Then their retting properties will be assessed on green jute stem or green ribbons in sterile conditions in the laboratory. Jute plants will be grown in Central Station, Dhaka. The green jute ribbons will be brought to FQID laboratory, and the retting activities will be performed with the isolated bacterial strains.

Records to be kept:
(i) Sources of isolates
(ii) Date and time of collection
(iii) Morphological properties of the isolated bacterial strains
(iv Retting period (days)

(v) Experimental data on fibre quality, such as fibre color, strength, fineness, brightness, etc.
Estimated cost: Tk. 3,00,000/- (Approx.).

Remarks: Isolated bacterial strains/ microbes promising to jute ret will be preserved at – 80˚C freezer in 50% glycerol stock for long term. These will be used in large scale retting trials in brick cemented retting tanks/ channels of BJRI under lab and field conditions.

References

Aneja KR, 2003. Expts.in microbiology, plant pathology and Biotechnology. *New age international pub*. 4thed: 121-211.

Candillo M, Bonatti PM, Guidetti C, Focher B, Grippo C, Tamburini E, and Mastromei G, 2010. Effects of selected pectinolytic bacterial strains on water-retting of hemp and fibreproperties.*Journal of Applied Microbiology.***108** 194-203.

Das B, Tripathi S, Chakraborty A, Ghosh S, Majumdar B, and Chakrabarti K, 2012. Screening and Molecular characterization of pectinolytic bacterial strains from jute retting water bodies.*Res. J. of Microbiology* **7(1)** 50-58.

Haque MS, Ahmed Z, Asaduzzaman M, and Firoza A, 2003.Distribution and activity of microbial population for jute retting and their impact on water of jute growing areas of Bangladesh. *Pakistan J. Biol,***5(6)** 704-706.

Pallesen BE, 1996. The quality of combine-harvested fibre flax for industrials purposes depends on the degree of retting. *Industrial Crops and Products.***5** 65-78.

Zhang J, Henriksson G, and Johansson G, 2000.Polygalacturonase is the key component in the enzymatic retting of flux. *J. Biotechnol*., 81: 85-89.

1.2 Title of the experiment: Retting period and fibre properties of different advanced breeding lines of jute (FQI-02/2025)

Background and objective: Jute is a unique crop of major economic importance in Bangladesh. Jute retting is a biological process in which fibres are extracted by decomposing the plants through the joint action of different aquatic microorganisms, like bacteria and fungi present in water. Retting process with some other factors influences the main characteristics, which indicate the quality of fibre like strength, colour, luster and texture (IJSG, 2009). The quality of fibre is largely determined by the efficiency of the retting process. In retting, pectin materials are broken down and the fibres are liberated (Bhattacharayya, 1971 -74).

Release of high yielding varieties of jute (*capsularis* and *olitorius*) are a running process. Information on the retting properties of advanced breeding lines is a pre-requisite. This information will be helpful to the breeders for releasing as a variety and to the end users (farmers) for obtaining the better-quality fibre. So, the present study will be undertaken to evaluate the retting and fibre properties of three advanced breeding lines of *C. capsularis* and *C. olitorius* jute.

Expected output: The information generated will be helpful to the breeders for releasing as variety and to the farmers for obtaining good quality fibre that helps them for getting higher price.

Name of the investigator: Jannatul Ferdous, Umme Hafsa Timmi, A. F. Mollah, M. Munir Hossain. & M. Ataur Rahman

Location: JRSS, Monirampur; JAES, Manikganj.

Experimental Details:

Treatments: The experiment was taken under two sets viz. set-1 for Tossa and set-2 for Dessi.

Set-1 (Tossa)	**Set-2 (Deshi)**
T_1 = O-043-7-9 (Red)	T_1 = BJC-5002
T_2 = O-0419-3-1(G)	T_2 = C-2262
T_3= Rani	T_3 = CVL-1 (control)
T_4= BJRI Tossa Pat-9 (control)	

Design and Layout: RCB design with 3 replications. Unit plot size: 3.0 m x 4 m.

Methods: The advanced breeding lines of jute under treatment will be grown with the check varieties following recommended agricultural practices. Plants of each advanced breeding line along with the check varieties will be harvested at the plant age of 110-120 days and will be retted in identical conditions. Fibres will be extracted, washed & dried. Data will be recorded and analyzed in respect of colour, strength, percent cuttings and other morphological properties.

Date of initiation and duration: April – December 2025.

Records to be kept:

i) Date of sowing
ii) Age at harvest
iii) Sources of retting water
iv) Date of retting and extracting
v) PH, BD and fibre yield

vi) Fibre properties, colour, percent cuttings, etc.

Estimated cost: Tk. 50,000/-

References

Bhattacharyya SK, 1971-74. Retting of jute-key process that needs more attention. *Jute Bulletin*, 194-198.

IJSG, 2009. Low cost retting of jute/ kenaf/ mesta for quality up-gradation, *JCI and BJRI,CFC.*

1.3 Title of the experiment: Retting period and fibre properties of different advanced breeding lines of kenaf (FQI-03/2025)

Background and objective: Jute is a unique crop of major economic importance in Bangladesh. Jute retting is a biological process in which fibres are extracted by decomposing the plants through the joint action of different aquatic microorganisms, like bacteria and fungi present in water. Retting process with some other factors influences the main characteristics, which indicate the quality of fibre like strength, colour, luster and texture (IJSG, 2009). The quality of fibre is largely determined by the efficiency of retting process. In retting, pectin materials are broken down and the fibres are liberated (Bhattacharayya, 1971 -74).

Release of high yielding varieties of kenaf and mesta are a running process. Information on the retting properties of advanced breeding lines is a pre-requisite. This information will be helpful to the breeders for releasing as a variety and to the end users (farmers) for obtaining the better-quality fibre. So, the present study will be undertaken to evaluate the retting and fibre properties of three advanced breeding lines of *Hibiscus cannabinus* and *Hibiscus sabdariffa*

Expected output: The information generated will be helpful to the breeders for releasing as variety and to the farmers for obtaining good quality fibre that help them for getting higher price.

Name of the investigator: Umme Hafsa Timmi, Jannatul Ferdous, M. Younus Ali. A. F. Mollah, M. Munir Hossain & M. Ataur Rahman

Location: JRSS, Monirampur; JAES, Manikganj.

Experimental Details:
Treatments: The experiment was taken for three following advance lines of kenaf

T_1 = KBL-73
T_2 = KBL-51
T_3= BJRI kenaf-5 (control)

Design and Layout: RCB design with 3 replications. Unit plot size: 3.0 m x 4 m.
Methods: The advanced breeding lines of kenaf under treatment will be grown with the check varieties following recommended agricultural practices. Plants of each advanced breeding lines along with the check varieties will be harvested at the plant age of 110-120 days and will be retted in identical conditions. Fibres will be extracted, washed & dried. Data will be recorded and analyzed in respect of colour, strength, percent cuttings and other morphological properties.

Date of initiation and duration: April – December, 2025.
Records to be kept:
i) Date of sowing
ii) Age at harvest
iii) Sources of retting water
iv) Date of retting and extracting
v) PH, BD and fibre yield
vi) Fibre properties, colour, percent cuttings, etc.
Estimated cost: Tk. 50,000/-
References
Bhattacharyya SK, 1971-74. Retting of jute-key process that needs more attention. *Jute Bulletin*, 194-198.
IJSG, 2009. Low cost retting of jute/ kenaf/ mesta for quality up-gradation, *JCI and BJRI,CFC.*

1.4 Title of the experiment: Optimization of ribbon retting techniques (FQI-4/2025)
Background
Jute is the main naturally decomposable fibre crop of Bangladesh. Jute is environmentally friendly and plays an important role in enrich soil health and economy of Bangladesh. The extraction of quality fibre depends on ideal quality open retting water. The retting and extraction processes have a significant effect on the quality of the fibre produced as well as

the cost of fibre production. It has an also impact on the final product's quality and market competitiveness. In Bangladesh, most of the farmers have to ret jute in poor quality water due to lack of sufficient rainfall in the season. The farmers ret their jute through conventional methods if retting water is available. Bangladesh Jute research Institute has developed ribbon retting technique of jute and allied fibre crops using lower amount of water with producing quality fibre. Ribbon retting reduces retting time of conventional retting by 4–5 days as well as reduces requirement of water by 50% (Banik *et al*., 2003). But, this ribbon retting technique has not yet become more popular till to date. But this method of retting has a great importance in the present aspect. Therefore, due to the current climatic changes, the jute retting activities must be accelerated by the ribbon retting technique along with the conventional method of retting. Because jute retting through ribbon retting required less retting period and produced quality fibre. According to the report recently published by International Trade, Statistical Bulletin, 2021, Food and Agriculture Organization of the United Nations, Rome, 2022, Bangladesh has produced more amount of jute fibre than India in the financial years 2017-18, 2018-19, 2019-20 and 2020-21. In the current global situation, the shortage of jute retting water is being observed during the jute production season. In spite of having enough water, farmers are deprived of obtaining good quality jute fibres due to the lack of proper knowledge regarding jute jak making and jak covering. In such a situation, optimization of ribbon retting technique becomes very important. In this retting, jute barks will be ribboned and retted instead of whole jute plants for obtaining good quality fibre. In this case, jute barks of different ages of plants can be retted/ decomposed with different forms of treatments. For example, jute barks can be submersed in water on the same day or after one day or two days for retting in water. Again, by reducing or increasing the thickness of jak making with jute barks, and decomposing the jak etc. The farmers are now more interested in ribbon retting process if water is shortage. Therefore, ribbon retting technique may be more acceptable if maintained submersing interval of barks in water for proper retting of jute and allied fibre crops and ribboning by auto power ribboner. As a result, farmers will be able to ret their jute in a very short time and with less water through which the farmers will benefit more financially. Therefore, the experiment will be conducted for the following objectives.

Objectives

i. To obtain submersing interval of jute barks and thickness of jak in water
ii. To determine proper harvesting and retting time.

Expected Output

The information generated on retting activities about proper harvesting and retains times will be helpful to the farmers for increasing good quality fibre yield.

Duration: March 2023– December 2025 (3 years) (1st year: 2023).

Name of investigators: M. Younus Ali, A. F. Mollah, M. Munir Hossain, Umme Hafsa Timmi, Jannatul Ferdous, & M. Ataur Rahman

Location: JAES, Manikganj, JRRS Rangpur and Faridpur

Experimental Details

Materials: Seeds of BJRI Tossa Pat-8, green plants, bamboo, rope, tin levels, etc.

Plot size: 34.25 decimal

Design & layout: RCB with three replications.

Date of sowing: Last week of March in each year (2023, 2024, 2025).

Status of the experiment: on going

Sowing method: Line sowing

Experimental treatments:

Factor A. : Time of retting	Factor B.: Thickness of jak
1. immediate retting of ribbon	1. 1.5 feet
2. Ribbon retting after 12 hours	2. 2.0 feet
3. Ribbon retting after 24 hours	3. 2.5 feet

Procedure: The seeds of BJRI Tossa Pat-8 will be sown in last week of March in each year in 34.25 decimal land and other activities following BJRI recommended cultural practices. The jute plants will be harvested at different ages of growing phase. The plants will be retted in open water retting pond and artificial polythene lined mini retting tank with treatment wise. The retted fibres will be extracted, washed and dried in clear sunlight and will be processed for analysis.

Records to be kept:

1. Date of sowing
2. Date of harvest
3. Plant height (PH)
4. Base diameter (BD) (Basal, middle and top portion)
5. Thickness of bark (Basal, middle and top portion)
6. Weight of submersing jute ribbons
7. Retting time
8. Physical properties of fibre
9. Fibre colour
10. Cutting percentage
11. Fibre grade and other relevant data

Estimated cost: Tk. 1,20,000/- (Approx.).

Reference

Banik, S., M. K. Basak, D. Paul, P. Nayak, D. Sardar, S.C. Sil, B.C. Sanpui, and A. Ghosh. 2003. Ribbon retting of jute - a prospective and eco-friendly method for improvement of fibre quality. Industrial Crops and Products, 17(3):183-190.

FAO. 2022. Jute, kenaf, sisal, abaca, coir and allied fibres Statistical bulletin 2021. Rome.

Husain, F. 2011. Introducing new and improved jute retting technique across in Bangladesh. 31, Katalyst.

2. TITLE OF THE PROJECT: EVALUATION OF FIBRE QUALITY OF JAF CROPS WITH DIFFERENT MANAGEMENT PRACTICES

2.1 Title of the experiment: Preparation of Jute and allied fibre album (FQI-05/2025) (New)

Background: Jute is one of the cheapest natural fibres next to cotton in BD (M.K Gupta 2015). Jute is known as the Golden fibre due to its golden yellowish color and its importance (Jawad Ahmad,2012). Bangladesh Jute Research Institute has released 56 varieties so far. Among those Deshi Jute 28, Tossa Jute 19, Kenaf 5 and Mesta 4. It is very difficult to identify fiber of so many varieties together. So, fiber album can be made so that the feature of the all fiber can be seen at a glance and easily identified all varieties fiber. It is a long, soft, shiny fibre that can be spun into coarse, strong threads. Strongest of all natural fibres and considered as fibre of the future. Jute fibres are composed primarily of the plant materials cellulose, lignin and pection (Prashant B. Shelar, 2014). It belongs to the genus *Chorchorus* and family, Tiliaceae.

Objectives:

(1) To identify all the fibre of jute and allied crops at a glance.
(2) To find out physical properties of different fibre.

Expected output: The information generated will be helpful to all scientists for identifying all fiber properties at a glance and decoration different jute fiber in a album that are also helpful for farmers that help them for getting higher price.

Name of the investigator: Umme Hafsa Timmi, Md. Younus Ali and Jannatul Ferdous, M. Ataur Rahman. A. F. Mollah & M. Munir Hossain

Location: Laboratory of Fiber Quality Improvement Division, Dhaka. And Manikgonj

Experimental Details:

Materials: Seeds of Deshi, Tossa , Kenaf and Mesta green plants, bamboo, rope, tin levels etc.

Plot size: 1.0 m^2

Design and layout: RCB design.

Date of sowing:

Status of the experiment: New

Duration: 2025

Sowing method: Line sowing

Experimental treatments:

A) Deshi Jute

- CVL-1
- CVE-3
- CC-45
- BJRI Deshi pat 5
- BJRI Deshi pat 6
- BJRI Deshi pat 7
- BJRI Deshi pat 8
- BJRI Deshi pat shak 1
- BJRI Deshi pat 9
- BJRI Deshi pat shak 2
- BJRI Deshi pat shak 3
- BJRI Deshi pat 10

B) Tossa Jute

- O-9897
- BJRI Tossa pat 3
- BJRI Tossa pat 4
- BJRI Tossa pat 5
- BJRI Tossa pat 6
- BJRI Tossa pat 7
- BJRI Tossa pat 8
- BJRI Tossa pat 9

C) Kenaf

- HC-2
- HC-95
- BJRI Kenaf 3
- BJRI Kenaf 4

D) Mesta

- HS-24
- BJRI Mesta 2
- BJRI Mesta 3
- BJRI Mesta 4

Procedure: The seeds of Deshi, Tossa, Kenaf and Mesta will be sown in first week of April in this year in one location following BJRI recommended cultural practices. The plants will be harvested at 120 ages of Deshi, Tossa, Kenaf and Mesta growing phase. The plants will be retted in retting pond separately. The retted fibres will be extracted, washed, and dried in clear sunlight.

Records to be kept

1. Date of Sowing
2. Date of harvest.
3. Plant height (PH)
4. Base Diameter (Basal, middle and top portion)
5. Bark Thickness (Basal, middle and top portion)
6. Fibour colour.
7. Physical Properties (Fiber Strength, brightness, fineness)

References:

1) M.K. Gupta, R. K. Srivastava, Himanhu Bisaria 2015. Potential of Jute Fibre Reinforced Polymer Composites.
2) Jawad Ahmad, Mohamed Masfak Arili, and cut Rahmawati 2022. Performance of concrete reinforced with jute fibres (natural fibres)
3) Prashant B. Shelar and Narendra Kumar U. 2014. A short Review on Jute fibre Reinforced composites.
4) P misra, s. Naik published in the international Jowrnal of Management 2012. A Golden Fibre for sustainable Packaging.
5) S. Saha, A. Roy, S. Sen Published in the International Jounal of Scientific and Engineering 2017. An overview on its Extraction Charactenstices and Application

2.2 Title of the experiment: Development of pickle from BJRI Vegetable Mesta-1 (FQI-06/2025)

Background/Rationale

Mesta (*Hibiscus sabdariffa*) is one kind of allied fibre crop belonging to the family *Malvaceae.* Bangladesh Jute Research Institute (BJRI) has released a variety Mesta named as BJRI Mesta-1. It is also known as BJRI Sabji Mesta-1. It's another name is Roselle. The calyx of Sabji Mesta-1 is considered as a good source of antioxidants. It is also used as vegetables, pickles, jams etc. The roselle calyx is brightly colored and rich in different nutrients such as anthocyanins, organic acids, pectin, etc. (Da-Costa et al., 2014). The calyxes of roselle have been widely used in medicines and foods such as syrup, refreshing drinks, wines, jams, and natural food colorants (Da-Costa et al., 2014 and Ifie et al., 2017). The leaves/calyces are traditionally prepared in beverage as they are rich in anthocyanins, which have antioxidant properties and are useful in diuretic and sedative treatments (Carvajal et al., 2005). Anthocyanidin is one of the natural water-soluble pigments and in phenolic compounds (Da-Costa et al., 2014). More and more people recognize that food not only satisfies hunger but also provides a variety of health benefits. Besides their vibrant colors, anthocyanins also have antioxidant and bioactive properties linked to certain health benefits; for example, they have properties linked to anti-diabetic, anti-inflammatory, and anti-cancer effects.

The economic interest of Roselle varieties lies in their dried calyxes that are used worldwide in the production of beverages, juices, sauces, liqueurs, wines, and preserves; it is also used as a source of natural dye for foods due to the presence of anthocyanins (Juliani et al., 2009).
In particularly, it may help promote weight loss, reduce the growth of bacteria and cancer cells, and support the health of the heart and liver. Research has uncovered some health benefits linked to drinking Roselle tea. Mesta calyx and leaves also contains various vitamins: Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3 and Vitamin C; different minerals like Calcium, Magnesium, Phosphorus, Potassium, Sodium, Iron, and protein, fat, fibre, carbohydrate, total crude protein, anthocyanin etc. that quickly relieves physical depression. In Bangladesh, a few farmers are farming of Roselle/BJRI Sabji Mesta-1 in traditional system. We want to produce this very scientifically.
In compared to staple cereals, starch, fibre, vitamins, and minerals content in Mesta calyxes are higher which needs to be utilized for addressing nutritional security in the country by promoting Mesta pickles and other dry foods as an alternative source of food. But it is rarely used as processed products like processing into pickles and other processed products. Hence, the present study has undertaken to develop pickles and tea from BJRI Sabji Mesta-1 for its detail's storage and acceptability studies.

Objective(s)

To develop Mesta pickles and tea using BJRI Sabji Meata-1
To study the shelf life of the anticipated pickles

Materials and methods

Fresh calyxes of Mesta will be collected from the Mesta plants grown at JAES, Manikganj. Then it will be processed according to the following treatments.

Variety: BJRI Mesta-1 (VM-1), and BJRI Mesta-4 (VM-2)
Design: CRD
Treatments:

T_1 = Traditional oil pickle
T_2 = Pickles using 6% salt +5% acetic acid + 0.1%KMS + Sugar + Mustard oil
T_3 = Pickles using 6% salt + 5% apple cider vinegar +0.1%KMS + Sugarcane gour +Mustard oil
T_4 = Pickles using 6% salt + 5% glacial acetic acid +0.1%KMS + Zero cal tablet + Mustard oil

Variety: BJRI Mesta-2 (VM-1), and BJRI Mesta-4 (VM-2)
Replication: Three

Data to be recorded: Color, taste, acidity, pH, ascorbic acid, fat, carbohydrate, moisture, ash, protein, β-carotene, carotenoid, anthocyanin, total phenol, amino acid compositions, minerals, textural properties, sensory attributes and microbial activities etc.
Investigator (s): M. Younus Ali, J. Ferdous, M.G.F. Chowdhury, M.A.F. Mollah, and M. Ataur Rahman
Date of initiation: Three years from March 2024
Date of completion: February 2026
Expected output/benefit: Underutilized calyx will be utilized into probiotic pickles as year round products.

Location: Central station, BJRI, Dhaka and JAES, Manikganj
Status: New
Estimated cost: 350000/
Source of fund: BJRI
Priority: General

2.3 Title of the experiment: Assessment of BJRI kenaf as feed and fodder crops (FQI-07/2025) (New)

Background and objective: Kenaf is a short day seasonal herbaceous fibre crop belongs to the Malvaceae family (*Hng.et.al,2009.*) It consists of several parts such as stalk, seeds, leaves and numerous valuable percentages of fiber strands, strands of fiber, allopathic chemicals, and protein oils. Kenaf used to manufacture paper, fiber boards, bioplastic, textile, and bio-composites. Kenaf can be Kenaf leaves in phenolics and antioxidants, serve as vegetables in Asia. Kenaf compounds are vital plant-based medicines lotion with 15%. Kenaf seed oil & 0.1% kenaf leave extract show optimal stability. Kenaf is quick growing and attained 3 m within 3 months and yielded huge amounts of biomass. Therefore, several crops can be found in a single growing season. BJRI already has developed several kenaf varieties for fiber whereas no variety yet be suggested for feed and fodder crops. BJRI Gene bank has several kenaf accessions and requires them to be tested for their prospects as feed and fodder crop. As it can be grown in marginal and fellow land. In Bangladesh we have several fellow and marginal lands for instance Charland, salinity problem soil, haor and Shady land. If we could grow kenaf to this land and then utilize it for feed and fodder, we must mitigate the scarcity of feed and fodder for our livestock sector. Due to some agronomic and genetic characteristics kenaf could be a vital source for feed and fodder crops. Keanf is palatable and the whole plant possesses around 18-20 % protein that has been used as food, feed, and fodder. Besides, no toxicity to living cells has been reported. Therefore, this study has been considered to determine the BJRI kenaf prospects as feed and fodder crop. The specific objectives are.

i. To determine the nutritional values and palatability of selected BJRI kenaf varieties and accessions
ii. To assess the BJRI kenaf accessions for biomass production at pre-flowering stages

Treatment:

Selection of 10 BJRI kenaf (Varieties and accessions) at the following ages
50 DAS
60 DAS
70 DAS
80 DAS

Date of the initiation and duration: March 2024 to December 2025.

Name of the investigators: M. Ataur Rahman, M. Munir Hossain & A. F. Mollah,

Experimental Location: Fiber quality Laboratory BJRI Dhaka, Manikganj, BCSIR Lab Dhaka.

Experimental details

Materials: Ten selected BJRI Kenaf varieties and accessions

Methods:

- Determination of crude fiber content: The crude fiber content has been estimated by insoluble formic method (Deymic et al., 1981).
- Determination of lipid content: The lipid content has determined according to soxlhet method extraction using the hexane like solvent (Aocs 1990).

- Determination of protein content: The content in proteins has been determined by the method of kjeldahi (Aocs, 1990).
- Micro nutrient composition characterization (Phosphorus, potassium, sodium, magnesium and calcium determination: The content of these minerals in kenaf leaves, napier grass, para grass has been determined after the sample mineralization Houba et al. method.
- Determination of water content: The content in water has been determined by the method (AOCS, 1990).

Records to be kept.

i. Date of sowing
ii. Age at harvest
iii. Time of collection
iv. Nutritional values of different growing stage
    50 days kenaf
    60 days kenaf
    70 days kenaf
v. Note down lab-oriented data.

Estimated costs: Tk. 15,0000.

Reference:

Deymie, B., J.L. Mutton and D. Simon, 1981. Techniques of analyses and controls in the food industries. Vol.4: analyze of food components. Aoaria, Paris, pp:490
Heuzé, V., Tran, G., Giger-Reverdin, S., Lebas, F. (2020). Available at: https://www.feedipedia.org/ node/395.
H'ng, P.S., Khor, B.N., Tadashi, N., Aini, A.S.N. and Paridah, M.T., 2009. Anatomical structures and fiber morphology of new kenaf varieties. Asian Journal of Scientific Research, 2(3), pp.161-166.
Houba, V.W., I.Van Vark, Walinga and J.J Vander Lee, 1989. Plant analysis procedure (part 7, chapter 2.3) Department of soil sciences and plant analysis , wageningen, the Netharlands.

2.4 Title of the experiment: Study on fibre quality and yield attributes of JAF crops as influenced by harvesting time and retting period in the coastal region of Bangladesh. (FQI-8/2025) New

Background: Jute (Corchorus olitorius and Corchorus capsularis) and kenaf (Hibiscus cannabinas) are vital bast fibre crops widely cultivated in tropical and subtropical regions. Among these, Bangladesh holds a prominent position as one of the world's leading producers and exporters of raw jute and jute bared products. These crops play a significant role in the rural economy, contributing to both employment and income generation for small holder farmers, especially in the coastal regions where salinity and water logging often restrict the cultivation of other crops (Islan *et al*.,2013). The coastal region of Bangladesh offers unique argo-ecological conditions which influence jute and kenaf growth, fibre quality, and yield. However, one of the critical determinants of fibre quality and yield is the harvesting time. Harvesting either too early or too late can significantly reduce fibre strength, fineness and overall yield (Paul *et al.,* 2015). Similarly, the retting process, a microbial decomposition of pectins that bind the fibre to the stem, greatly affects fibre separation, color, and texture. The retting period, influence by water quality, temperature, and duration, needs to be optimized to balance between fibre quality and environmental sustainability (Hossain *et al.,*2011) Despite the importance of these factors, limited region- specific research has been conducted to determine the ideal harvesting stage and retting duration for maximizing both fibre quality and yield, particularly in the coastal belt of Bangladesh. This knowledge gap calls for systematic field investigations, considering the rising global demand for eco-friendly natural fibers and the ongoing shift from synthetic to biodegradable materials. This study aims to evaluate the influence of harvesting time and retting period on the fibre quality and yield characteristics of jute and kenaf under coastal climatic conditions. The outcomes are expected to support farmers in adopting best practices,

improve fibre market ability, and promote sustainable jute production in the region.

Objectives:
 To determine the optional harvesting time for maximizing fibre yield and quality in jute and kenaf crops.
 To evaluate the influence of retting period on fibre characteristics such as color, strength, and fineness.
Expected output: The information will be generated on fibre yield and properties of JAF crops grown in the coastal region of Bangladesh.
Design and layout: RCB design with three replications. Unit plot size: 4.0m × 3.0m
Treatment: Set A
A. Harvesting time:
A 1 = 90 days after germination
A 2 = 100 days after germination
A 3 = 110 days after germination
A 4 = 120 days after germination
B. Variety:
D 1 = BJRI Deshi Pat 8
D 2 = BJRI Deshi Pat 9
D 3 = BJRI Deshi Pat 10
Line to line distance 20 cm, plot to plot distance 60 cm, Block to Block distance 1.0 m.
Recommended dose of fertilizer and intercultural operations.

Set B:
C. Harvesting time
T 1 = 90 days after germination
T 2 = 100 days after germination
T 3 = 110 days after germination
T 4 = 120 days after germination
D. Variety:
K 1 = HC-95
K 2 = BJRI Kenaf 3
K 3 = BJRI Kanaf 4
Records to be kept:
1. Date of sowing and germination
2. Age of harvest
3. Plant population at harvest
4. PH, BD, Fibre and stick yield.
5. Fibre properties and colour.
6. Date of retting and extraction

Name of the investigators:
M. A. Alam, M. Munir Hossain, M.A.F. Mollah and A. A. Bakki

References:
1. Islam, M.S.,Ali, M. Y., & Hossain, M.A. (2013). Growth and yield of jute as influenced by sowing date and variety under the coastal region of Bangladesh. Journal of Agroforestry and Environment, 7(1), 109-112.
2. Paul, N.K., Foy, B. & Akter,S. (2015). Effect of harvesting stages on fibre yield and quality of jute. Bangladesh journal of Agricultural Research, 40 (3), 431-438. Https: //doi.org/10.3329/bjar.v40i3, 25493
3. Hossain, M.D., Begum, S., & Sultane, S. (2011). Effect of retting time on the quality of jute fibre. Bangladesh journal of jute fibre. Bangladesh journal of Scientific and Industrial Research, 46(2), 225-228.

3. TITLE OF THE PROJECT: DEVELOPMENT OF RIBBONER AND RETTING TECHNOLOGIES FOR WATER SCARCE AREAS OF BANGLADESH.

Objective: To mitigate the jute retting problem in a scarce water environment in sustainable manner.

3.1 Title of the experiment: Improvement of existing auto power jute ribboner (FQI-09/2025)

Background: Water scarcity for retting of jute, kenaf and mesta is a serious problem in jute growing areas of Bangladesh during harvesting time. In traditional method of retting, requires a large volume of water. Vidya *et al.* (2018) reported that the retting of whole plants requires large volume of water (about 500 liters) to obtain one kg dry fibre in traditional method. In this method, retting completes in 15 to 20 days. The defective retting due to shortage of available water, the retted fibres turn into undesirable steel grey colour called "*shamla*" colour of jute. Beside this, the high cost of manual labour are the major constrains in the traditional method. Vidya *et al.* (2018) also reported that ribbon retting completes within 6–8 days in normal water as compare to 15–20 days in traditional method. In this context, retting of jute in minimum water with shorter retting period is the crying need for the jute growers. With this idea in mind, BJRI already has developed an auto power jute ribboner. But, at present, due to the shortage of jute retting water and the awareness of the friendly environment, it has become very important to develop a flexible and handy type machine (easy to carry) for ribboning of jute. Beside this, the future of jute is likely to be brighter in the coming days in view of increasing demand for jute in the global market including in domestic market. In this view, it is very important to design and manufacture as small size as possible, portable and more efficient auto power jute ribboner machine using lesser energy power for ribboning of bark from the jute plants based on existing auto power jute ribboner. That is why; this experiment has under taken for following objectives.

Objectives:

i. To improve the existing auto power jute ribboner cost effectively for better efficiency.
ii. To modify the ribboner to produce intact sticks instead of broken one for jute, kenaf and mesta.

Expected output: The improved auto power jute ribboner will be used in cost effectively for solving the retting water problem in water scarce areas of Bangladesh.

Name of the investigator: M. Younus Ali, Ferdous Janntul Ferdous, A. F Mollah, M. Munir Hossain, M. Ataur Rahman and Umme Hafsa Timmi.

Trial location: Central station, Dhaka, JAES, Manikganj

Experimental details:

Date of initiation and duration: April–
December/2025. **Materials:** i) Auto power jute
ribboner, ii) Jute plants, etc. **Methods:**
The jute plants will be grown in different trial locations. The improved auto power jute ribboner will be as small size as possible, handy and portable. Then the jute ribboning and retting trial will be done in different trial locations.
Records to be kept:
i) No. of plants per decimal
ii) Weight of plants per decimal
iii) Weight of green ribbons per decimal
iv) Time required for ribboning per decimal jute plants
v) Fresh weight of ribbon and
vi) Fresh weight of jute stick
vii) Efficiency of the machine.
Estimated cost: Tk. 10,00,000/-

References

1. Adhikary MM, Saha D, and Biswas SK, 2005. Post harvest operation in jute. *In Jute cultivation in India—theory and practices*. 43–47. Kalyani Publishers.
2. Ahmed ZM, Haque S, Akhter F, and Begum M, 2003. Study of the chemical composition of different pipeline varieties of jute fibres. *Pakistan Journal of Biological Sciences* 6(16): 1463–1467.

3.2 Title of the experiment: Development of controlled retting system with a view to utilizing minimum amount of water at field condition (FQI-10/2025)

Background and Objectives:

Conventional water retting (CWR) has long been practiced to obtained natural bast fiber in tropical and subtropical regions. Among different retting approaches, CWR is feasible to produce a massive volume of uniform bast fiber with minimum input cost without changing basic cellulosic structures (Narkpiban & Poonsawat, 2020) and able to yield the fiber with minimum process at product manufacturing steps (Ali *et al.,* 2015). Although it yields homogeneous bast fiber utilizing less inputs costs, nowadays this process experiences severely for continuous supply of retting water. It is a time-consuming process and requires a huge quantity of water for retting (Ray *et al.,* 2016). CWR requires 20 to 25 times of water to biomass, typically 10,000 kg of substrates, requires approximately 432 m^3 of water. Currently, these waters are utilized from freshwater sources and after retting discharge into the aquatic ecosystem (Nabiha Huda *et al.* 2012; Ray et al. 2016). Scarcity of retting water hindered its commercial cultivation, however, the presence of more than thirty types of plant organic compounds pollutes the aquatic ecosystem (Majumdar *et al*., 2019; Zawani *et al.,* 2015). Nowadays, the scarcity of freshwater frequently appears. Hence, open water bodies compete with others agricultural and non-agricultural sectors and climate change effect resulted low or uneven precipitations has led the problems to the peak. Therefore, a massive amount of plants biomass is simultaneously placed in the retting niche, which is detrimental for both the fiber and aquatic ecosystems. Since this can have serious consequences, it is imperative to look for an alternative solution is desperately needed to address this issue. The main objective of this experiment is to get rid of the complications of existing retting problems whereas specific objectives are.

i. To reduce time, water requirements, and operating cost for retting purpose

ii. To obtain quality fiber by achieving desired retting

Expected Output: A controlled retting system will be developed to ease the current complications of the CWR
Date of initiation and duration: April 2024 to December 2029

Status of the experiment: New experiential learning in the year of 2025 jute growing season

Name of the investigator: M. Munir Hossain, A. F. Mollah, Jannatul Ferdous, Umme Hafsa Timmi and M. Ataur Rahaman
Experimental Details:

Experimental locations: BJRI Dhaka, head quarter, regional station Chandina, Cumilla

Materials and Methods: The hypothesis behind this experiment is to provide appropriate growing conditions for the retting microbes and recycle retting water. Within the 5-year experimental period, a series of experiments will be conducted to optimize several components of the process.
Figure 1 presents a hypothetical illustration of the process. One variety of mature Deshi, Tossa, and Kenaf plants will be used to make a retting niche.

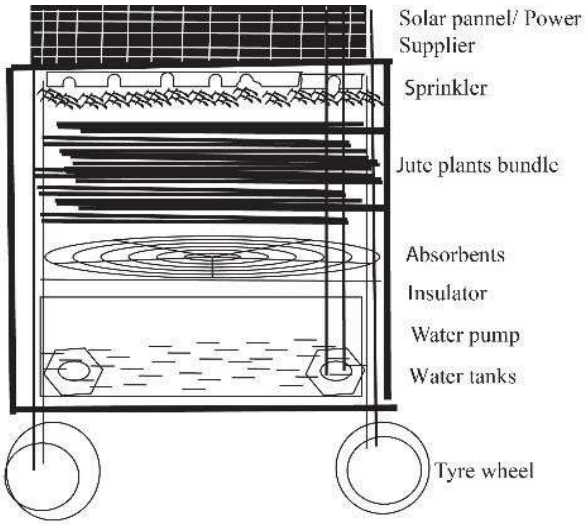


Figure 1: A hypothetical illustration of jute plants retter and its parts

Records to be kept:

i. Date of retting initiation and attainment
ii. Plants age in days
iii. Liquor and substrates ratio.
iv. Temperature in each day during retting period
v. Operation and material cost

Estimated cost: 500,000/ (approximately)

References:

Ali, M. R., Kozan, O., Rahman, A., Islam, K. T., & Hossain, M. I. (2015). Jute retting process: present practice and problems in Bangladesh. Agricultural Engineering International:CIGR Journal, 17(2).

Majumdar, B., Chattopadhyay, L., Barai, S., Saha, A. R., Sarkar, S., Sarkar, S. K., Mazumdar, S. P., Saha, R., & Jha, S. K. (2019, Jun 15). Impact of conventional retting of jute (Corchorus spp.) on the environmental quality of water: a case study. Environ Monit Assess, 191(7),440. https://doi.org/10.1007/s10661-019-7589-7

Narkpiban, K., & Poonsawat, T. (2020). Optimizing Cellulose Extraction from Kenaf (Hibiscus Cannabinus L.) Fiber by Selective Retting and Hydrothermal Pretreatment. Journal of Natural Fibers, 1-14.

Ray, D. P., Saha, S. C., Sarkar, A., & Ghosh, R. K. (2016). Production of quality jute fibre through accelerated retting. International Journal of Bioresource Science, 3(2), 57.

Zawani, Z., Abdullah, L. C., & Abdan, K. (2015). Characterization of kenaf fibre-retting wastewater. International Journal of Science and Research, 4(6), 314-317.

JUTE FARMING SYSTEMS DIVISION

PROGRAMME AREA: TECHNOLOGY VERIFICATION, ADOPTION AND IMPACT STUDIES ON JUTE AND ALLIED FIBRE CROPS

1. TITLE OF THE PROJECT: Cropping Systems Study in Different AEZs

1.1 Title of the experiment: Development of jute seed containing alternate cropping pattern against existing farmers' pattern for medium-high land in Manikganj and Jamalpur (JFS-01/2025)

Background and objectives:

Jute is a major fibre crop in our country. Jute alone contributes about 1.58% to GDP without involving any foreign investment. In 2015-2016, 1.36 million tons of jute fibre was produced from 6.78 lac hectare of land that covers about 4.46% of total land area (BBS, 2018). Jute fibre is reinforced into the soil to make it stronger. In Manikganj area, farmers generally practice Maize–Red Amaranth–Brinjal or Chili cropping pattern. Maize production is expanding day by day on the premise of its return to contribute. Continuous cropping of maize has driven to soil fertility depletion and subsequent low crop yields (Gichuru et al., 2003; Tumuhairwe et al., 2007). On the other hand, jute produce large amount of organic materials that enriched the soil nutrient status. The leaves and roots of jute left after harvest enrich the soil with micronutrients, maintaining soil fertility (Gani et al., 2002). Integrated use of organic residues and mineral fertilizers reduced the cost of mineral fertilizer need by 25% (Bokhtiar and Sakurai, 2005) and by up to 50% (Kiani et al., 2005).

To cultivate that amount of land, it requires about 5000 to 5500 tons of seed (Ali et al. 2003). One of the most important problems for jute production in Bangladesh is the non-availability of quality seed at proper time of sowing. Only about 15%-20% quality jute seeds are supplied by institutional sources however the rest amount of quality seeds yet to be managed to supply (Islam and Uddin 2019). On the other hand, jute seed production areas are decreasing at an alarming rate due to unavailability of land (Karim et al. 2020). As a result, every year a huge amount of tossa jute seeds are introducing through official and unofficial trades from neighboring country. Among different popular cropping pattern jute seed is totally absent and/or few. For tossa jute seed production farmers have to sacrifice their high value winter vegetables crop and after harvesting they have very little number of cropping pattern. Jute seed containing cropping pattern will increase cropping intensity, ensure our desired jute seed and also sustainable development.

In this situation jute-based cropping pattern practiced with maize and vegetable so that famers produce more food, fibre and jute seed within a limited area that can help the farmers to increase yield and soil fertility. As a result, cropping intensity will be increased and farmers will be benefited. Considering the following facts, the present experiment has been undertaken to study the economic feasibility of growing jute seed containing cropping pattern in different locations.

Expected output: Jute seed containing pattern will be established

Date of initiation and duration: November 2024 to October 2026

Name of the Investigators: M.B. Hossain, M.S. Hossain, M.S. Hasan, S.M.A. Haque, M.S. Mamun and A.K.M.S. Hossain

Materials and methods: The experiment consists of jute seed containing cropping patterns and will be conducted in Jute Research centre, Jagir, Manikganj and Madarganj, Jamalpur. The detailed cropping pattern presented in below:

Cropping pattern:	**Crop variety:**
T_1: Maize-Relay jute-Jute Seed	Mustard: Tori-7 or BARI sharisha-14 or 17
T_2: Mustard- Jute shak-Jute-Jute shak seed	Maize: BARI Hybrid Maize-17 Jute: BJRI Tossa Pat 8 or 9
T_3: Onion-Relay jute-Jute seed	Jute shak: BJRI Deshi Pat shak 2 or 3
T_4: Okra-Summer onion-Jute seed	Okra: BARI Okra-2
T_5. Farmers' pattern	Onion: BARI Onion-6 Summer Onion: BARI Onion-5

The experiment will be laid out in Randomized complete block design with three replications. The component crops of each pattern will be grown with recommended cultivation technique. The possible sowing time of the individual crops of the cropping pattern presented below.

Cropping pattern	**Crop-i**	**Crop-ii**	**Crop-iii**	**Crop-iv**
Maize-Relay Jute-Jute seed	Jan.-Feb.	April-May	Aug.	-
Mustard- Jute shak-Jute-Jute shak seed	Nov.	Feb.	April-May	Aug.
Onion-Relay jute-Jute seed	Nov.	March	Aug.- Sept.	-
Okra-Summer onion-Jute seed	Dec.	March (Early)	Aug.	-
Leafy vegetables– Maize–T. Aman (Control)	Farmers' practices			

Records to be kept:

1. Name of the farmers with address,
2. Soil analysis (Initial and post status)
3. Date of sowing and harvest,
4. Turn Around Time (TAT)
5. Cost of inputs, labour,
6. Yield of main product and by product
7. Production Efficiency (PE),
8. Cost and return analysis (FA and F pattern),
9. Land Utilization Index (LUI)

Estimated cost: Tk. 90000.00 per year **Remarks:** On-going (2nd year)

1.2 Title of the experiment: Performance of alternate cropping pattern Soybean–Jute–T. Aman against farmer's cropping pattern Soybean–Fallow–T. Aman in medium high land of Noakhali region (JFS-02/2025)

Background and objectives: Cropping pattern is the yearly sequence and spatial arrangement of crops or of crops and fallow on a given area (Chandrasekaran et al. 2010). An efficient cropping pattern must ensure the most outstanding efficiency of land, fertilizer, irrigation water and other inputs. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Hussain, 1996). Farmers choose crop for cultivation based on a variety of criteria including physical, social and economic consideration. However its worth noting that best farming techniques always include certain cropping patterns and cropping system to increase productivity and maintain soil fertility. Soybean -Fallow-T.aman is a major cropping pattern in Noakhali and lakshmipur district covering 30% of Net Cropped Area of Noakhali and 28.75%of lakshmipur district (DAE, Noakhali & Lakshipur). There has an ample opportunity to increase system productivity through intensification by the inclusion of jute in between the existing cropping pattern. With environmental awareness growing worldwide, various countries are increasingly turning to natural fibers in order to mitigate the ecological damage caused by the use of synthetic fibers, resulting to higher demand and market value for jute. So, jute cultivation will help to increase the economic return of the farmer and improve soil health. Moreover, Bangladesh has to spend a huge amount of foreign

exchange on imports of edible oils and oilseeds to meet the increasing demand of its population. The value of imports is increasing year after year Bangladesh has to spend 24000 crore taka to import in every year to meet the demand of edible oil of the country. Now Ministry of agriculture has a target to meet up 40 % demand of edible oil by growing oil seed crop locally. So improved variety of soybean will contribute to increased production of edible oil. On the other hand, as a legume crop soybean improve soil fertility through the symbiotic association with microorganisms, such as rhizobia, which fix the atmospheric nitrogen and make nitrogen available to the host and other crops by a process known as biological nitrogen fixation (BNF). Legume crop will increase the nitrogen use efficiency. Legumes included in the cropping system improve the fertility of the soil and the yield of crops. Jute along with soybean will contribute to a great extent to improve soil health. Potential adaptation of jute in the existing pattern will increase cropping intensity, productivity and additional income of the farmers. Farm-level adaptation of oil yielding crop, jute and rice based cropping pattern need to be evaluated using improved variety to understand research and development output.

As a result, area under jute cultivation will be increased and fallow land can be utilized and made productive which will be economically beneficial for farmers. So, addressing the above issue a program needs to be undertaken to improve the existing farming system.

Expected output:

- Development of a cropping pattern involving three crops
- Improvement of farmers socio-economic condition through increasing cropping intensity and income.

Date of initiation and duration: April 2023 to March 2026

Name of investigators: M.B. Hossain, M.S. Hasan, M. Hossain M.S. Hossain and A.K.M. S. Hossain

Location: Jute Research Regional Station, Cumilla

Treatments: i) Soybean–Fallow–T. Aman (Existing pattern)
ii) Soybean–Jute–T. Aman (Alternate pattern)

Materials and methods: Design: RCBD, **Replication:** 6, **Plot size**: 20 m^2

Items	Soybean–Fallow–T. Aman	Soybean–Jute–T. Aman
Variety	Farmers' practice	Soybean: BINA Soybean 7 Jute: BJRI Tossa Pat 8 T. Aman: BRRI dhan75, BRRI dhan87
Seed rate ($kgha^{-1}$)	Farmers' practice	Soybean: 60, Jute: 6 and T. Aman: 25
Sowing time	Farmers' practice	Soybean: Mid of December Jute: 1st week of of April T. Aman: 2nd week of August
Fertilizer: (Urea-TSP-MoP-Gyp-$ZnSO_4$, $kgha^{-1}$)	Farmers' practice	Soybean: 55-150-120-90-8-10 Jute: 160-25-30-45-11 T. Aman: 150-52-50-60-0
Pest control	Farmers' practice	As and when necessary
Harvest time	Farmers' practice	At maturity

Records to be kept:

1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)

5. st and return analysis (FA and F pattern) 10. Land Utilization Index (LUI)

Estimated cost: Tk. 50000.00 per year **Remarks:** On-going (3rd year)

1.3 Title of the experiment: Development of Farmer's Alternative cropping pattern Watermelon-Jute-T. aman against existing Farmers' pattern Watermelon-Fallow-T. Aman at coastal area in Patuakhali (JFS-03/2025)

Background and objective: Cropping pattern is the yearly sequence and spatial arrangement of crops or of crops and fallow on a given area (Chandrasekaran et al. 2010). Watermelon - Fallow- T. aman is one of the popular cropping pattern among farmers of greater Barisal region which covers 22230 hectare land (M Ibrahim et al. 2017). Watermelon is a salt-sensitive or moderately tolerant crop in terms of yield and fruit quality characteristics (Abdullah U. et al. 2020). During Kharif-1 season more than 90% of the land remains fallow, where jute can be cultivated. Moreover, there has an ample opportunity to increase system productivity through intensification by the inclusion of jute in between the existing cropping pattern (Mahmud et al. 2020).As a result, cropping intensity will be increased and fallow land can be utilized and made productive which will be beneficial for farmers. In contrast to the current Farmers' (F) pattern of Watermelon-Fallow-T. aman in the coastal region of Patuakhali, Bangladesh, the creation of a Farmer's Alternative (FA) cropping pattern composed of Watermelon, Jute, and T. aman can offer a number of advantages. The FA cropping pattern can help farmers produce more and earn more money while preserving the health of the land and water supplies. In Bangladesh's coastal area during the dry season, watermelon may be produced as a high-value cash crop. Yet following the watermelon harvest, farmers frequently keep the area fallow until the monsoon season, when they plant T. aman, a variety of rice that needs a lot of water. Because to erosion, nutrient depletion, and water constraint during the dry season, this technique has the potential to degrade soil. Farmers usually use imbalance dose of chemical fertilizer in cultivation of different crop in pattern (Karim and Aktar, 2015). They normally follow traditional cultivation practices. So, to improve the existing farming practice a program needs to be undertaken with a view to increase cropping intensity and overall income of the farmers incorporating jute cultivation in their farming system. Other objectives of the program are to introduce improved technology and new crop variety and to engage non-working people in different agricultural practices and activities. Overall, the development of the FA cropping pattern can be a promising strategy for sustainable agriculture and rural development in the coastal region of Patuakhali, Bangladesh.

Expected output: Development of three cropped pattern introducing a new crop

Date of initiation and duration: January 2023 to January 2026

Name of investigators: A. A. Bakky, M. S. Hasan, M. B. Hossain, M.S. Hossain and A.K.M. S. Hossain

Location: Jute Research Sub-station, Kalapara, Patuakhali.

Materials and methods:

Design: RCBD with 3 replications, Plot size: 3m × 3 m

Items	Watermelon-Fallow-T. aman	Watermelon-Jute-T. aman
Variety	Farmers' practice	Jute: BJRI Tossa pat 9 T. aman: BRRI dhan49 Watermelon: Sugaer Queen
Seed rate ($kgha^{-1}$)	Farmers' practice	Jute: 6 kg/ha, T. aman: 25 kg/ha, Watermelon: 4 kg/ha

Sowing time	Farmers' practice	Jute: 20 March T. aman: 20 August Watermelon: 16 January
Fertilizer: (Urea-TSP-MoP-Gyp-$ZnSO_4$, $kgha^{-1}$)	Farmers' practice	**Jute:** 195-50-30-110 Half of Urea, full TSP and full MoP will be applied during final land preparation. Remaining half of the Urea will be applied on 40-45 days old plants. **T. Aman:** 150-52-50-60 1/3 rd of Urea, full TSP, full MoP and full Gypsum will be applied during final land preparation, 1/3rd of urea will be applied after 15 days after transplanting, 1/3rd of Urea will be applied before 5-7 days of booting stage. **Watermelon:** 195-60-130-66 All of TSP, MoP and Gypsum should be applied in pit 5-7 days prior to seedling planting and mixed thoroughly with the soil. Urea should be applied around the plant as side dressing at 15, 35, 55, and 75 DAP under moist soil condition and mixed thoroughly with the soil as soon as possible for better utilization.
Pest control	Farmers' practice	As and when necessary
Harvest time	Farmers' practice	Jute- Last week of July, T. aman- Second week of November, Watermelon- Mid March 2023

Records to be kept:

1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
5. st and return analysis (FA and F pattern)
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)
10. Land Utilization Index (LUI)

Estimated cost: 50000/- **Remarks:** On-going (2nd year)

1.4 Title of the experiment: Development of alternate cropping pattern Foxtail Millet–Pat shak–Kenaf–T. Aman against existing farmers' pattern Millet–Jute–T. Aman in the Flood Plain Chars of Jamalpur (JFS-04/2025)

Background and objectives: Chars are newly developed lands in different riverbeds. The active floodplain and non-saline char land soils occur mainly in Kurigram, Lalmonirhat, Sirajgonj, Pabna, Rajshahi, Jamalpur, Manikganj, Faridpur, Kushtia, Shariatpur, Madaripur and Chandpur (Sattar and Islam, 2010). Char land areas are estimated to be 0.72 million hectares in Bangladesh which is about 5% of the country area and about 6.5 million people (5% of the country's population) live there (EGIS, 2000). The alluvial charlands are most suitable for crop cultivation. There are noticeable difference between Charland ecosystem and the mainstream agriculture. Generally charland farmer cultivate local variety of different crops following indigenous crop production practices. Charland have a lower cropping intensity because of many constrains. Low fertility along with low water holding capacity cause significant yield losses of the crops grown in the charland. Technological intervention through collective approach with modern high yielding short duration crop varieties following suitable agronomic management practices could play a potential role for increasing cropping intensity

and economic return through minimizing yield gap. Jute Farming Systems Division of BJRI has been trying to develop a new cropping pattern for Old Brahmaputra Flood Plain Chars of Jamalpur. In Jamalpur region Farmers usually practiced Millet-Fallow-T. Aman in flood plain chars. Millets are very popular and widely grown in the char areas as it demands less inputs and care. Kenaf fiber is one of the famous natural fibers used as reinforcement in polymer matrix composites. Kenaf, a jute substitute, can produce large amounts of biomass, thus, it is currently used as a renewable source of raw materials for paper pulp production (Al-Mamun et al. 2020). Kenaf is an environmentally friendly plant that produces a fleshly component that is known by Kyoto Protocol to be efficient in decreasing worldwide temperature (Mohd Rifaat, 2008). According to Karimi et al. (2014), kenaf may be a viable cellulose source for both economical and environmentally friendly production. Due to mandatory jute packaging law, diversified uses of fibre and climate change issue, the demand of fibre crops especially kenaf is increasing day by day due to its lower cultivation cost (Hossain, 2014). Apart from this, kenaf can be easily grown in unfavorable ecosystem like flood plain char land with minimum care. As the increasing demand of kenaf fibre, production should be ensured by introducing kenaf in the cropping pattern at char land. There is a scope for increasing cropping intensity by incorporating kenaf to ensure food security as well as fibre production.

Expected output: Development of four cropping pattern. Improvement of farmers life through increasing cropping intensity. At least 15% to 20% higher system production is expected from the proposed pattern

Name of investigators: M. R. Roy**,** M. S. Mamun, M. S. Hasan, M. B. Hossain, M.S. Hossain and A.K.M.S. Hossain.

Date of initiation and duration: January 2024 to January 2026

Location: Jamalpur

Treatments: i) Millet–Jute–T. Aman (Existing pattern)
ii) Foxtail Millet–Pat Shak–Kenaf–T. Aman (Alternate pattern)

Materials and methods:

Materials and methods: Design: RCBD, **Replication:** Disperse (6), **Plot size**: 500 m^2

Items	Fallow–Fallow–T. Aman	Wheat–Jute–T. Aman
Variety	Farmers' practice	Millet: BARI Kaun-4 Pat Shak: BJRI Deshi Pat Shak 1 Kenaf: BJRI Kenaf HC-95 and T. Aman: BRRI dhan 93
Seed rate ($kgha^{-1}$)	Farmers' practice	Millet: 18, Mungbean: 40, Kenaf: 20 and T. Aman: 30
Sowing time	Farmers' practice	Millet: 2nd week of November Pat shak: 1st week of March Kenaf: 3rd week of April T. Aman: 3rd week of August (Double Transplanting)
Fertilizer: (Urea-TSP-MoP-Gyp-$ZnSO_4$-Boron $kgha^{-1}$)	Farmers' practice	Millet: 140-100-90-50-4-0 Pat Shak: 80-30-20-20 Kenaf: 160-25-30-45-11-0 T. Aman: 165-120-60-50-0-01
Pest control	Farmers' practice	As and when necessary
Harvest time	Farmers' practice	At maturity

Records to be kept:

1. te of sowing and harvest
2. st of inputs, labour
3. eld of main product and by product
   st and return analysis
4. il analysis (Initial and post status)
5. rn Around Time (TAT)
6. Rice Equivalent Yield (REY)
7. Production Efficiency (PE)
8. Land Utilization Index (LUI)

Estimated cost: Tk. 50000.00
Remarks: New

1.5 Title of the experiment: Development of Farmer's Alternative (FA) cropping pattern Groundnut-Jute-T. Aman against existing Farmers' (F) pattern Groundnut-Fallow-T. Aman in southern coastal region of Bangladesh (JFS-05/2025)

Background and objective: Cropping patterns are the sequences and combinations of crops grown on a given piece of land over a period of time. They are influenced by various factors such as climate, soil, water, market and socio-economic conditions. Agriculture in coastal regions of Bangladesh faces significant challenges due to climate change impacts, including soil salinity and waterlogging. In Bangladesh, cropping patterns are predominantly rice-based, especially in the coastal areas. Traditional cropping patterns, such as fallow periods followed by T. Aman rice cultivation, may not be sustainable in the long term. However, continuous rice cultivation has negative impacts on the soil health, crop diversity and nutritional security. The adoption of alternative cropping systems, such as the integration of groundnut and jute alongside T. Aman rice, offers potential solutions to enhance resilience and productivity in these areas. Also, There is a need to diversify the cropping patterns by introducing other crops that can enhance the profitability and sustainability of the farming system. Groundnut and BJRI Deshi pat-10 are well known for their tolerance to saline conditions and can provide additional income sources for farmers. Jute is a fibrous crop with high economic and environmental value and can also improve the soil fertility, water retention and erosion control. Groundnut is a leguminous crop that can fix atmospheric nitrogen and enrich the soil. Groundnut can also provide edible oil, protein, and fodder for the farmers. For these reasons, there is a need for rigorous scientific research to assess the feasibility and benefits of such alternative cropping patterns in coastal agriculture.
The objective of this study is to develop a farmer's alternative (FA) cropping pattern of groundnut-jute-T. aman rice against the existing farmer's (F) pattern of fallow-fallow-T. aman rice in the coastal area of Bangladesh. The specific objectives are:

- To compare the yield and yield components of groundnut, jute, and T. aman rice under the FA and F cropping patterns.
- To evaluate the economic returns and benefit-cost ratio of the FA and F cropping patterns.
- To identify the constraints and opportunities of adopting the FA cropping pattern by the farmers in the coastal area of Bangladesh.

Expected output: A cropping pattern involving three crops will be developed. Thus, the cropping intensity and farmer's income will be increased or in other words, socio- economic improvement of the farmers will happen.
Date of initiation and duration: March 2024 to September 2026
Name of investigators: A. A. Bakky, M. S. Hasan, M. B. Hossain, M. S. Hossain and A.K.M. S. Hossain.

Location: Jute Research Substation, Kalapara, Patuakhali.
Materials and methods:
Design: RCBD with 3 replications, Plot size: 4m × 2.5 m

Items	Fallow–Fallow–T. Aman	Groundnut–Jute–T. Aman
Variety	Farmers' practice	Jute: BJRI Deshi pat 10 T. Aman: BRRI dhan 51 Groundnut: Tri Dana (DM-1)
Seed rate ($kgha^{-1}$)	Farmers' practice	Jute: 6 kg/ha, T. Aman: 25 kg/ha, Groundnut: 105 kg/ha
Sowing time	Farmers' practice	Jute: Last week of March T. aman: 1st week of August Groundnut: 2nd week of December
Fertilizer: (Urea-TSP-MoP-Gyp-$ZnSO_4$-Boron $kgha^{-1}$)	Farmers' practice	Jute: 195-50-30-110 T. Aman: 150-52-50-60 Groundnut: 30-170-90-180-5-11
Pest control	Farmers' practice	As and when necessary
Harvest time	Farmers' practice	Jute- Last Week of July; T. Aman- 1st week of December; Groundnut- 3rd week of March.

Records to be kept:
Plot Information, Crop Variety Information, date of sowing, Fertilizer Application Data, cost and return of FA and F pattern, main product and by- product Data, Weather Data and as per required.

Estimated cost: 80000.00 **Remarks:** New

1.6 Title of the experiment: Increasing Cropping Intensity and Productivity of Coastal Region in Bangladesh through Jute Inclusion in Mung Bean-Fallow-T. Aman Rice Cropping Pattern (JFS-06/2025)

Background & Objective:
The coastal zone agriculture of Bangladesh frequently faces climate variability effects more adversely than the other parts of the country (Dasgupta et al., 2014; Karim, 2006; Mainuddin et al., 2019). Rising sea levels, increased saltwater invasion and intrusion, and changing rainfall patterns along with more frequent extreme weather events are the reality of the coastal region (Bhuiyan et al., 2012). The salinity is unevenly distributed and varies with the land types of the coastal region but can retard crop growth and depress yield (Haque, 2006). Due to this condition, crop production is the main challenge for the coastal zone. Crop intensification in the salt-affected coastal region is essential to boost local crop production, which relies mostly on a single long-duration rice per year (Sarkar et al., 2022). Moreover, the low-yielding traditional T. aman (monsoon season) rice is usually harvested late (Paul et al., 2021b; Shahadat et al., 2019). After harvesting rice, most of the lands remain fallow due to excessive wet conditions, salinity, and so on (Zahan et al., 2023). Also, mung bean is grown in three seasons in a year in Bangladesh and more than 70% mung bean area is concentrated in the three southern districts viz. Patuakhali, Barisal, and Noakhali within AEZ 13 and 18 and Patuakhali alone occupies about 30% area (Mondol et al., 2013). Traditional crop rotation practices, such as leaving fields uncultivated for certain periods of time before growing T. Aman rice, could not be viable in the future. Nevertheless, the persistent practice of rice production has detrimental effects on soil fertility, crop variety, and nutritional stability. The use of alternative cropping systems, such as the incorporation of jute alongside mung bean and T. Aman rice, presents promising alternatives to improve resilience and production in these regions.

Additionally, it is necessary to vary the cultivation patterns by introducing alternative crops that might improve the profitability and sustainability of the agricultural system. The BJRI Deshi Pat 8 varieties are renowned for their high resilience to saltwater environments, making them a valuable source of additional income for farmers. Jute is a fibrous crop that possesses significant economic and environmental worth. Additionally, it can enhance soil fertility, retain water, and limit erosion. Therefore, it is necessary to conduct thorough scientific research to evaluate the practicality and advantages of implementing different cropping patterns in coastal agriculture.

This experiment is undertaken to assess the feasibility of growing Jute into Mung bean-fallow-T. *aman* rice cropping pattern to improve soil fertility and the system productivity. The specific objectives are:

- To compare the yield and yield components of Mungbean, jute, and T. aman rice under the FA and F cropping patterns.
- To evaluate the economic returns and benefit-cost ratio of the FA and F cropping patterns.
- To identify the constraints and opportunities of adopting the FA cropping pattern by the farmers in the coastal area of Bangladesh.
- Effect of jute inclusion in Mung bean-Fallow-T. aman rice cropping pattern on soil fertility status.

Expected Output:
A cropping pattern involving three crops will be developed. Thus, the cropping intensity and farmer's income will be increased or in other words, socio-economic improvement of the farmers will happen. Also, Mung bean-Fallow-T. aman rice cropping pattern will increase soil fertility status.
Date of initiation and duration: December 2024 to April 2026

Name of investigators: A. A. Bakky, M. S. Hasan, M. B. Hossain, M.S. Hossain and A.K.M. S. Hossain.

Location: This research will be conducted at Jute Research Substation, Kalapara, Patuakhali under AEZ no. 13 (Ganges tidal floodplain).

Materials and methods:
Design: RCBD with 3 replications, Plot size: 2m × 2m

Items	Fallow–Fallow–T. Aman	Mung bean –Jute–T. Aman
Variety	Farmers' practice	For Jute: BJRI Desi pat 8 For T. aman: BRRI dhan 51 Mung bean: BARI Mug 6
Seed rate ($kgha^{-1}$)	Farmers' practice	Jute: 6 kg/ha, T. aman: 25 kg/ha Mung bean: 12 kg/ha
Sowing time	Farmers' practice	Jute: Last week of March T. aman: 2nd week of August. Mung bean: 1st week of December
Fertilizer: (Urea-TSP-MoP-Gyp-$ZnSO_4$-Boron	Farmers' practice	**For Jute:** Urea- 195 kg/ha, TSP- 50 kg/ha, MoP- 30 kg/ha, Gypsum- 110 kg/ha. Half of Urea, full TSP and full

kgha^{-1})		MoP will be applied during final land preparation. Remaining half of the Urea will be applied on 40-45 days old plants. **For T. aman:** Urea- 150 kg/ha, TSP- 52 kg/ha, MoP- 50 kg/ha, Gypsum- 60 kg/ha. 1/3 rd of Urea, full TSP, full MoP and full Gypsum will be applied during final land preparation, 1/3rd of urea will be applied after 15 days after transplanting, 1/3rd of Urea will be applied before 5-7 days of booting stage. **For Mung bean:** Urea- 32 kg/ha, TSP- 103 kg/ha, MoP- 8 kg/ha, Gypsum- 11 kg/ha. All fertilizer should be applied as basal during final land preparation.
Pest control	Farmers' practice	As and when necessary.
Harvest time	Farmers' practice	Jute: 1st week of August T. aman: 3rd week of November Mungbean: 3rd week of March

Records to be kept:
Plot Information, Crop Variety Information, date of sowing, Soil Sampling Information, Yield Data, Weather Data and as per required.

Estimated cost: 80, 000/-

1.7 Title of the experiment: Development and evaluation of alternate cropping patterns against existing farmers' pattern Boro–Fallow–T. Aman for medium high land (JFS-07/2025)

Background and objectives: Cropping patterns refer to the annual sequence and spatial arrangement of crops and fallow periods within a specific area, aiming to optimize the use of land and resources such as fertilizers, irrigation water, and other inputs for maximum efficiency (Harwood, 1974). The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Hussain, 1996). Bangladesh is mainly a rice-producing country, where approximately 80% of the cultivated land is used for growing crops in three distinct seasons annually. The Boro–Fallow–T. Aman cropping pattern dominates many regions, especially in medium high land areas, covering approximately 26.92% of the total net cropped area. In this system, Boro rice is grown in the dry season, followed by a fallow period, and then Transplanted Aman (T. Aman) rice in the wet season. Although this pattern is widely practiced, the fallow period leads to underutilization of land, resulting in low cropping intensity, reduced annual productivity, and limited farm income. Moreover, intensive rice monoculture contributes to soil nutrient depletion, especially nitrogen and potassium, and increases dependence on irrigation, posing environmental concerns such as groundwater depletion and higher production costs. Jute alone contributes about 1.58% to GDP without involving any foreign investment. In 2015-2016, 1.36 million tons of jute fibre was produced from 6.78 lac hectare of land that covers about 4.46% of total land area (BBS, 2018).The introduction of non-rice crops like mustard, mungbean, and kenaf into rice-based systems offers multiple benefits. Mustard and mungbean, being short-duration crops, can fit into the fallow period, increasing cropping intensity. Mungbean, a legume, contributes to soil fertility

through nitrogen fixation, while mustard provides economic returns as an oilseed crop. Kenaf, a fiber crop, is well-suited to medium high land and can diversify income sources while requiring less irrigation than Boro rice. These crops, when integrated with T. Aman rice, have the potential to improve system productivity, economic returns, and sustainability compared to the existing Boro–Fallow–T. Aman pattern. Previous studies in Bangladesh have demonstrated that incorporating pulses and oilseeds into rice-based systems can enhance soil organic matter, improve nutrient balance, and increase rice equivalent yield (REY). For instance, experiments in the High Barind Tract and other regions have shown that patterns like Mustard–Mungbean–T. Aus–T. Aman or Potato–Mungbean–T. Aman result in higher yields and economic returns compared to traditional patterns. However, the specific combination of Mustard–Mungbean–T. Kenaf–T. Aman has not been extensively evaluated, particularly for medium high land, which is characterized by seasonal flooding and specific soil conditions.
So,addressing the above issue a program needs to be undertaken to evaluate the feasibility, productivity, and profitability of an alternative jute containting cropping pattern in comparison to the conventional Boro–Fallow–T. Aman in Bangladesh's medium highland areas.

Expected output:

- Jute containing cropping pattern will be developed
- Improvement of farmers socio-economic condition through increasing cropping intensity and income.

Date of initiation and duration: March 2025 to March 2027
Name of investigators: M. S. Hossain, M. S. Mamun, M. B. Hossain, M. S. Hasan, and A.K.M. S. Hossain.
Location: Jute Research Sub Station, Madarganj, Jamalpur
Treatments:
T_1: Mustard-Mungbean- T. Kenaf-T. Aman
T_2: Mustard-T. Kenaf -T. Aman
T_3: Boro-Fallow-T. Aman

Materials and methods:
Design: RCBD with 3 replications, Plot size: 5M X 4M

Items	Boro-Fallow-T. Aman	Mustard- T. Kenaf -T. Aman	Mustard-Mungbean- T. Kenaf-T. Aman
Variety	Farmers' practice	Mustard: BARI Sarisha 14 Kenaf: HC-95 T. Aman: Tulsimala	Mustard: BARI Sarisha 14 Mungbean: BARI Mung 8 T. Kenaf: HC-95 T. Aman: Tulsimala
Seed rate ($kgha^{-1}$)	Farmers' practice	Mustard: 5 T. Kenaf: 15 T. Aman: 25	Mustard: 5 Mungbean: 20 T. Kenaf: 15 T. Aman: 25
Sowing time	Farmers' practice	Mustard: 3rd week of November T. Kenaf: 3rd week of March T. Aman: 3rd week of July	Mustard: 3rd week of November Mungbean: 2nd week of February T. Kenaf: 3rd week of March T. Aman: 3rd week of July
Fertilizer: (Urea-TSP-	Farmers' practice	Mustard: 100-150-70-100 T. Kenaf: 120-40-50-50-0	Mustard: 100-150-70-100 Mungbean:30-70-40-50-0

MoP-Gyp-$ZnSO_4$, $kgha^{-1}$)		T. Aman: 150-52-50-60-0	T. Kenaf: 120-40-50-50-0 T. Aman: 150-52-50-60-0
Pest control	Farmers' practice	As and when necessary	As and when necessary
Harvest time	Farmers' practice	At maturity	At maturity

Records to be kept:

1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
5. st and return analysis (FA and F pattern)
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)
10. Land Utilization Index (LUI)

Estimated cost: Tk. 50000.00 per year **Remarks:** On-going (1st year)

2. TITLE OF THE PROJECT: JAF Crop Based Agroforestry Systems

2.1 Title of the experiment: Evaluation of pat shak with summer vegetables as intercrop under orchard-based agroforestry (JFS-8/2025)

Background and objectives: Bangladesh is one of the world's most densely populated countries, struggling to feed its 165.8 million people (BBS, 2018). If the current growth rate of 1.37% continues, the population could reach 180 million by 2025, intensifying challenges related to land and resources. With only 14.39 million hectares of land, per capita availability has decreased by 0.05 hectares per person per year since 1989 (Hasan and Bari, 1996). Agricultural and forest areas are shrinking, leaving little room for expansion (BFD, 2011). Mono-cropping may yield well under ideal conditions, but it falters when inputs are limited (Altieri et al., 2015). Thus, integrating trees and crops through agroforestry emerges as a viable solution, employing full intercropping or relay cropping to maximize yields sustainably (Parrotta et al., 2015). This system can meet farmers' needs while promoting environmental health, reducing tree establishment costs, and generating income during tree maturation (BJRI, 2017). Currently, per capita vegetable consumption in Bangladesh stands at just 53g, well below the recommended 200 gm, leading to increased reliance on cereals and rising malnutrition. Despite growing demand, vegetable production areas are declining as rice and wheat cultivation expands.

Planting mango, guava, banana, and citrus trees alongside vegetables in agroforestry systems could significantly enhance socio-economic development and environmental sustainability. Conducting experiments on the early growth and yield of these combinations will identify the most effective tree-vegetable pairings, benefiting fruit tree growers and promoting stability in production.

Expected output: Development of pat shak containing cropping pattern under agroforestry.
Date of initiation and duration: 2023 to 2026
Location: Manikganj, and Kolatia, Dhaka.
Investigators: M.S. Hasan, M.B. Hossain, M.S. Hossain, S.M.A. Haque and A.K.M. S. Hossain.
Design: RCBD with 3 replications, Plot size: 4m×5m
Treatments:

T_1: Mukhikachu + Pat shak + Orchard
T_2: Bottle or Sponge gourd + Pat shak + Orchard
T_3: Okra + Pat shak + Orchard
T_4: Sole orchard (Control)

Materials and methods

Crops	Mukhikachu	Bottle/Sponge gourd	Okra	Pat shak	Mango
Variety	BARI Mukhikachu-2	BAR Lau-2/ White Proud Hybrid	BARI Dherosh-2	BJRI Deshi pat shak1	BARI Amm-3
Method	Line	Pit	Line	As intercrop	-
Sowing date	March-April	March-April	March-April	Every 2 months	-
Harvesting date	July-August	July-August	July-August	40-50 days aged plant	-

Output: Pat shak containing cropping pattern will be developed under Mango Based Agroforestry. Cropping intensity and farmer's income will be increased.

Records to be kept:

1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
5. st and return analysis (FA and F pattern)
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)
10. Land Utilization Index (LUI)

Estimated cost: Tk. 50,000.00 per year

Remarks: On-going (2nd year)

2.2 Title of the experiment: Performance evaluation of pat shak with turmeric as intercrop under mango-based agroforestry (JFS-9/2025)

Background and objectives: Bangladesh is among the world's most densely populated countries, struggling to feed its 165.8 million people (BBS, 2018). With a growth rate of 1.37%, the population could reach 180 million by 2025, leading to significant challenges in resource management. The nation has only 14.39 million hectares of land, and per capita land availability has decreased by 0.05 hectares per person annually since 1989 (Hasan and Bari, 1996). Both agricultural and forest areas are declining, with little room for expansion (BFD, 2011). While monocropping can be effective under ideal conditions, it often fails when inputs are reduced (Altieri et al., 2015). Therefore, integrating trees and crops through agroforestry presents a viable solution, utilizing full intercropping or relay cropping techniques (Parrotta et al., 2015). This method not only maximizes yields but also supports environmental sustainability (Nair, 1990). By catering to farmers' needs, agroforestry can help meet their basic requirements while combating environmental degradation. It offers multiple benefits, including lower tree establishment costs and income generation during off-seasons (BJRI, 2017).

Despite the crucial role of vegetables in a balanced diet, Bangladesh's per capita vegetable consumption is just 53 gm, far below the recommended 200 gm, leading to increased malnutrition and reliance on cereals. As vegetable demand rises, the area dedicated to vegetable cultivation is decreasing due to the expansion of rice and wheat production.

Integrating mango trees with vegetable cultivation in agroforestry systems could greatly enhance socio-economic development and environmental health. Conducting experiments on the growth and yield of these combinations will identify optimal tree-vegetable pairings, providing stable benefits for fruit tree growers.

Expected output: Development of a cropping pattern featuring Pat shak with intercropped turmeric in a mango-based agroforestry system.
Date of initiation and duration: 2023 to 2025 Horticultural Research Station (HARS), **Location:** JARC, Manikganj
Investigators: M. B. Hossain, M. S. Hossain, M. S. Hasan, S.M. A. Haque and A.K.M. S. Hossain.
Design: RCBD with 3 replications, Plot size: 4m × 5m
Treatments:
T_1: Turmeric + BJRI Deshi Pat shak 1 + Mango
T_2: Turmeric + BJRI Mesta 2 (VM-1) + Mango
T_3: Sole Mango

Materials and methods

Crops	Turmeric	Pat shak	Pat shak	Mango
Variety	BARI Holud 8 & 9	BJRI Deshi pat shak 1	BJRI Mesta-2 (VM-1)	BARI Aam-3
Method	Line	As intercrop	As intercrop	-
Sowing date	02-January-01 April	Every 2 months	02-January-01 April	-
Harvesting date	November-December	40-50 days aged plant	02 May-20 October	-

Records to be kept:
1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
5. st and return analysis (FA and F pattern)
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)
10. Land Utilization Index (LUI)

Estimated cost: Tk. 50,000.00 per year **Remarks:** On-going (2nd year)

2.3 Title of the experiment: Performance evaluation of BJRI developed jute and kenaf varieties for seed production under agroforestry system (JFS-10/2025)

Background and objectives: With increasing concerns over the environmental impact of synthetic fibers, the demand for kenaf is on the rise, highlighting the need for greater fiber production. However, the area cultivated for allied fibers has declined due to a scarcity of quality seeds, a major challenge in Bangladesh.
Farmers can produce kenaf seed crops on their homesteads, farmlands, and within orchard-based agroforestry systems for economic benefit. Most homesteads and orchards focus on fruit and timber agroforestry, but management practices are often poor, lacking proper plant selection and planting techniques. By introducing high-yielding, fast-growing tree species and modern management techniques, farmers can optimize their land use. There are often sufficient spaces within early-stage tree plantations for growing kenaf, which requires minimal tillage and can thrive in the moisture-retentive conditions of July to September

(Rahman and Bala, 2009).

The unavailability of quality seeds at the appropriate sowing time hampers production. Although BJRI-developed kenaf varieties are well-received by farmers, the government's seed production efforts (BADC) fall short of meeting demand. To address this, it is essential to encourage farmers to cultivate their own seeds using BJRI varieties and technology. However, kenaf seed crops often compete with high-value winter vegetables, making farmers hesitant to interplant (Alim et al., 2016). Selected farmers will receive kenaf seeds and guidance on cultivating it either as a sole crop or intercropped with existing crops (Mamun et al., 2017).

Expected output:

- Documentation of present status of jute and kenaf seed cultivation in agroforestry system
- Development of a new cropping pattern

Date of initiation and duration: 2023 to 2026

Location: Sylhet region, Rangpur, Dinajpur, Manikganj

Investigators: M. B. Hossain, M. S. Hasan, M. S. Hossain and A.K.M.S. Hossain.

Design: RCBD with 3 replications, Plot size: 3m × 3 m

Treatments:

T_1: HC-95 (BJRI Kenaf-2) + Mango or Citrus

T_2: Jute (BJRI Tossa Pat 9) + Mango or Citrus

T_3: Sole seed crop

Crops	Kenaf	Jute	Mango	Citrus
Variety	HC-95	BJRI Tossa Pat 9	BARI Mango 4	BARI Malta 1
Method	Line	Line	-	-
S/D	August	August	-	-
H/D	December	December	-	-

Records to be kept:

1. me of the farmers with address
2. te of sowing and harvest
3. st of inputs, labour
4. eld of main product and by product
5. st and return analysis (FA and F pattern)
6. il analysis (Initial and post status)
7. Turn Around Time (TAT)
8. Rice Equivalent Yield (REY)
9. Production Efficiency (PE)
10. Land Utilization Index (LUI)

Estimated cost: Tk. 50,000.00 per year **Remarks:** On-going (2nd year)

3. TITLE OF THE PROJECT: Socio-Economic Studies

3.1 Title of the activity: Study on cost and return of jute and allied fibre crops cultivation at farm level in different areas of Bangladesh (JFS-11/2025)

Background and objectives: Bangladesh has been particularly benefited through the jute and allied fibre (tossa jute, white jute, kenaf and mesta) trading and industries. According to world market it is notable feature that in recent years demand for tossa jute and kenaf has been expanding steadily. Tossa jute fibre which is of greater strength and of superior qualities than white jute, as well as is of good high value and demand in exporting countries. As a result, the jute growers are accelerating *C. olitorius* (Tossa) jute cultivation over *C. capsularis* (White) jute to get better quality and price of jute fibre. Kenaf fibre crop cultivation increased day by day due to easy cultivation, low production cost, wide adaptability, less fertilizer requirement. Besides, kenaf cultivation is getting popularity to the farmers due to their industrial demand. Therefore, it is important to know the situation of jute and allied fibre crops production at farm level under changing circumstances. With this end in view the present study has been undertaken to find out the area, cost and return of jute and allied fibre crops cultivation and to identify the socio-economic constraints.

Expected output: Documentation of the factors associated with expanding jute and allied fibre crops cultivation and present scenario of cultivation cost.
Date of initiation and duration: April to December, 2025
Name of Investigators: A.K.M. S. Hossain, M. B. Hossain, M. S. Hasan, M. S. Hossain S.M. A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, and M.S. Mamun.
Locations: Faridpur, Cumilla, Narayanganj, Patuakhali, Manikganj, Rangpur, Dinajpur, Kishoreganj, Jashore, Tangail, Habiganj, Gazipur, Shariatpur, and Jamalpur

Materials and methods: Structured questionnaire survey will be conducted during 2024 jute and allied fibre crops growing season for collecting the associated data on production activity. The survey will be conducted at five locations where jute and allied fibre crops is grown intensively. A total sample of 250 farmers (20-30 farmers from each location) will be selected randomly. Tabular method will be used for analyzing the data. Scientists of the regional/sub-stations of BJRI, concerned personnel from DAE and Jute Directorate will be included in the

data collection, processing during the study. More over local school teacher may also be included in the survey process for data collection.
Records to be kept: List of farmers with address, date of sowing and harvest, cost of cultivation, main product and by-product yield, market price of product and by-product**.**
Estimated cost: Tk. 300000.00 **Remarks:** On-going activity

3.2 Title of the activity: Cost and return study of JAF seed crops at contract growers of BADC, JD and demo farmers of BJRI and DAE (JFS-12/2025)

Background and objectives: Quality seed is the prerequisite for increasing the yield and production of any crop, which is true for jute crops as well. In every year Bangladesh requires about 6000 metric tons quality seeds but BADC produce and supplies about 10-12% of the total seed requirement. Rest of the seed requirement farmers managed or procured themselves from local market at the time of jute sowing period. Under the circumstances to solve the problem and to meet up the shortage of jute seeds in the country, BJRI has developed late jute seed production technology. With this technique jute seed can be sown from August to October. But now the technique is not widely practiced in the farmer's level. In winter season farmers are not interested to produce late jute seeds as sole crop. Jute Farming Systems Division (JFSD) of BJRI bears the responsibilities to transfer and disseminate the transferable technologies of agricultural research to the farmers through agril extension official. With this end in view validation and fine tuning and also of popularization of the technologies at farm level are needed. Now-a-days, this technology is practiced at limited scale to the farmer's field. With this end in view, the present study has been undertaken to assess the performance of late jute seed production technology at contract growers of BADC and farmers.
Expected output: Documentation of the cost, return and socio-economic constraints for the production of late jute seed crop.
Date of initiation and duration: September, 2024 to March, 2026
Name of Investigators: M. S. Hasan, M. B. Hossain, A.K.M. S. Hossain, M. S. Hossain, S.M. A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, and M.S. Mamun.
Locations: Faridpur, Cumilla, Narayanganj, Patuakhali, Manikganj, Rangpur, Dinajpur, Kishoreganj, Jashore, Chapainawabganj, B. Baria and Kushtia.
Materials and methods: Structured questionnaire survey will be conducted during 2023 JAF seed growing season for collecting the associated data on production activity. The survey will be conducted at seven different locations where JAF seed are grown. A total sample of 220 producers (20 producers from each location) will be selected randomly. Tabular method will be used for analyzing the data. Co-ordination from the respective scientists at research stations of BJRI, concerned personnel from DAE, BADC and Jute Directorate will be included in need for data collection during the study.
Records to be kept: List of producers with address, date of sowing and harvest, cost of cultivation, main producer yield and market price
Estimated cost: Tk. 220000.00 **Remarks:** New experiment

3.4 Title of the experiment: Study on cost and return of transplanting jute cultivation practice at farm level in selected regions of Bangladesh (JFS-13/2025)

Background and objectives: Jute is one of the major cash crops in Bangladesh. It is of immense importance in the economy of Bangladesh. It is a significant source of income and employment for millions of farmers, laborers, and workers involved in jute cultivation, processing, and manufacturing. The jute industry contributes to foreign exchange earnings through exports and plays a crucial role in reducing the trade deficit. Moreover, beyond the

farm land and factory jute and jute products keep alive transport sector, servicing sectors like banks and insurance and agro-industrial job market. For this reason, jute cultivation necessitates to undertake a farm level agro economic study on jute production. On the other hand while farmers making production decision, they consider cost of production against yield of the relevant crops. The cost of production of individual crop vary from farmer to farmer and location. The reason is that farmers generally practice different technologies/input depending upon their economic abilities Transplanting jute technique has been popularizing in some areas of Bangladesh. This technique helps to reduce weeding cost and facilitates proper space and nutrient uptake. With this end in view the present study has been undertaken to find out the area, cost and return of transplanting jute cultivation and to identify the socio-economic constraints for jute production.

Expected output:

- Documentation of present scenario of transplanting jute cultivation cost.

Date of initiation and duration: April to December, 2025

Name of Investigators: M. B. Hossain, M. S. Hasan, A.K.M.S. Hossain, M. S. Hossain S.M. A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, and M.S. Mamun.

Locations: Jashore, Chuadanga, Mymensingh, Dinajpur, Sherpur and Jamalpur

Materials and methods: Structured questionnaire survey will be conducted during 2024 jute growing season for collecting the associated data on production activity. The survey will be conducted at five locations where jute is grown intensively. A total sample of 150 farmers (30 farmers from each location) will be selected randomly. Tabular method will be used for analyzing the data. Scientists of the regional/sub-stations of BJRI, concerned personnel from DAE and Jute Directorate will be included in the data collection, processing during the study. Moreover, local school teacher may also be included in the survey process for data collection.

Records to be kept: List of farmers with address, date of sowing in seedbed, transplanting and harvest, cost of cultivation, main product and by-product yield, market price of product and by-product**.**

Estimated cost: Tk. 100000.00 **Remarks:** New

4. TITLE OF THE PROJECT: Technology Transfer

4.1 Activity: Field days, farmers' training and technology transfer workshop for JAF crops (JFS-14/2025)

Background and objectives: Jute Farming Systems Division (JFSD) of BJRI bears the responsibilities to transfer and disseminate the transferable technologies of agricultural research to the farmers through agril-extention official. With this end in view validation and fine tuning and also of popularization of the technologies result demonstration, field days, training, seminar and workshops are important events for technology dissemination at farm level. To disseminate jute-based cropping pattern technologies and introduce improved varieties of jute, training is essential for improving farmers' knowledge and skill who are the ultimate users of the technologies. Therefore, the present study has been undertaken to motivate and popularize the technologies to the farmers through training, demonstration and field days, to introduce proven research findings of jute and jute-based farming systems and technical know-how to farmers and to receive feedback and to have research and extension dialogue on potentials and limitation of transferable technologies of JAF crop.

Expected output: Farmers will be motivated and technologies will be popularized at farmers' level.

Date of initiation and duration: January to December, 2025

Locations: BJRI Dhaka, Manikganj, Faridpur, Rangpur, Kishoreganj, Chandina, Dinajpur, Monirampur, Habiganj, Gazipur, Shariatpur, Jamalpur and Tarabo

Name of Investigators: A.K.M.S. Hossain, M.B. Hossain, M.S. Hossain, M.S. Hasan, S.M.A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, M. A. Islam and M.S. Mamun

Materials and methods: Field day and training programmes will be conducted in different jute growing areas BJRI Dhaka, Manikganj, Faridpur, Rangpur, Kishoreganj, Chandina, Dinajpur, Monirampur, Habiganj, Gazipur, Shariatpur, Jamalpur and Tarabo of Bangladesh on modern technology of jute and allied fibre crops and seed production. Field days will be carried out at the existing areas of jute village and jute block.

A workshop will be organized on newly developed technology with the participation of DAE, NARS, SCA, JD, University, seed trader, farmer leader, and other related stakeholder personnel in BJRI, Dhaka.

SL No.	Name of station	Number of field day at fibre season	Number of field day at Seed season	Number of workshop
1.	BJRI, Dhaka	04	04	01
2.	Jute Agricultural Experimental Station, Manikganj	02	02	0
3.	Jute Research Regional Station, Rangpur	02	02	01
4.	Jute Research Regional Station, Faridpur	03	03	01
5.	Jute Research Regional Station, Kishoreganj	02	02	0
6.	Jute Research Regional Station, Chandina	02	01	0
7.	Jute Research Sub-Station, Monirampur	02	02	0
8.	Jute Research Sub-Station, Dinajpur	01	01	0
9.	Jute Research Sub-Station, Tarabo	01	01	0
10.	Jute Research Sub-Station, Patuakhali	02	02	0
11.	Jute Research Sub-Station, Madarganj	02	02	0
	Total	**23**	**22**	**03**

Records to be kept:

1. List of farmers with address,
2. Rapporteur report,
3. Stakeholders' opinions,
4. Technology related information

Estimated cost: Tk. 800000.00 **Remarks:** On-going programme

4.2 Activity: Pilot production of new varieties through field trial, jute villages and jute blocks for fibre (JFS-15/2025)

Background and objectives: Bangladesh Jute Research Institute has evolved a number of improved tossa, deshi, kenaf and mesta varieties and management techniques for better yield. Recently Bangladesh Jute Research Institute has developed a number of high yielding JAF crop varieties (BJRI Deshi Pat 10, BJRI Tossa Pat 8, BJRI Tossa Pat 9, HC-95 and BJRI Kenaf-4) which are not yet disseminated extensively to the farmers. Its yield potential is higher than other older variety. As a result, farmers can easily fit this variety in their cropping pattern. If we can transfer this technology among the farmers, they will get higher yield. As a result, the farmers will be financially benefited. One of the mandates of Jute Farming Systems Division (JFSD) is to transfer and disseminate the BJRI evolved technologies to the farmers through agril. extension official. In this consideration, JFSD has initiated "field trial, jute village and jute block" concept to make research findings demonstration more participatory by the farmers. Considering the above facts, the programme has been undertaken to assess the suitability of released varieties and potential technologies in farmers' environment and to identify farmers'

constraints for adoption of technologies and generate feedback for further development.
Expected output: Adoption of BJRI technologies through motivating farmers
Date of initiation and duration: March to December 2025
Name of Investigators: M. S. Hasan, A.K.M.S. Hossain, M.B. Hossain, M.S. Hossain, S.M.A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, M. A. Islam and M.S. Mamun
Materials and methods: New varieties of jute seeds of BJRI will be distributed among 854 jute growers with a total area of 57 hectares of land in the jute villages and jute blocks in the different areas of Bangladesh. Since MLT sites of different regional/sub-stations of BJRI do not exist with deputed manpower, extension work for BJRI evolved varieties and technologies are continuing through the new concept of Jute Village and Jute Block. Five to eight acres of farmers land are considering as "Jute block" involving 10-15 farmers in a group. Similarly more than one block in a particular area are considering as "Jute Village". The programme will be conducted in collaboration with respective divisions, regional/sub-stations of BJRI and mainly local DAE office.

SL No.	Name of station	Number of on-farm field trail			Number of block		Pat shak/ Mesta shak
		Deshi	Tossa	Kenaf	Tossa	Kenaf	
1.	JFSD, BJRI, Dhaka	0	20	20	0	0	20
2.	JAES, Manikganj	0	25	05	2	1	15
3.	JRRS, Rangpur	0	40	25	2	2	15
4.	JRRS, Faridpur	0	45	5	2	0	15
5.	JRRS, Kishoreganj	0	15	25	2	2	15
6.	JRRS, Chandina	05	20	15	2	2	15
7.	JRS, Monirampur	05	25	5	2	0	10
8.	JRS, Dinajpur	0	15	15	2	2	10
8.	JRS, Tarabo	0	15	5	1	1	10
10.	JRS, Patuakhali	05	10	15	2	0	14
11.	JRS, Madarganj	0	20	15	2	0	10
Total		**15**	**240**	**150**	**19**	**11**	**149**

Records to be kept:

List of farmers with address
Variety
Date of sowing and harvesting
Intercultural operations (weeding, thinning etc.)
Land preparation
Pesticides application
Fertilizer doses
Human labour
Fibre yield and stick yield.
Farmers' opinions

Estimated cost: Tk. 2327600.00 **Remarks:** On-going programme

4.3 Title of the activity: Jute seed production through field trial and jute block approach (JFS-16/2025)

Background and objectives: Jute cultivation was about 7.98 lac hectares in Bangladesh in the year 2016 (BBS 2016). Area under jute has been increasing day by day, so the demand of jute seed has increased. It requires about 6000 metric tons of jute seed. Among this amount, only 10-12% is distributed by the BADC. Rest of the seed came from farmers own production and exotic source (Indian seed), of which the larger one is exotic source. In addition, the market price of jute seed is not satisfied to compare with the production cost. On the other hand, the farmers are very reluctant to produce jute seed by sacrificing their land at the cost of rabi crops. It is thought that intercropping would be an alternative to produce jute seed with vegetables without involving any this late seed crop might face immense competition with winter crops in

terms of sharing lands and relative profitability. In winter season farmers are not interested to produce late jute seeds as sole crop but it fitted the late jute seed production with winter crops especially with chili, brinjal, tomato, lalshak, reddish, beans. BJRI developed some technologies on jute seed production as intercropping system which are not yet disseminated. So, seed production problem can solve and meet up the shortage of jute seed as farmer's level to produce jute seed as intercropping system. Therefore, this study has undertaken to assess their agronomic suitability and economic viability of winter crops with late jute seed crop as intercropping system to make farmers self- sufficient in jute seed requirement.

Expected output:

- Popularization of jute seed cultivation method through sole and, intercropping with rabi crops.

Date of initiation and duration: *August 2024 to March 2025*

Location: Manikganj, Rangpur, Monirampur, Faridpur, Cumilla, Patuakhali, Kishoreganj and Madarganj

Name of investigators: M. S. Hossain, M. S. Hasan, M. B. Hossain, A.K.M. S. Hossain, S.M. A. Haque, M.M. Rahman, A. A. Bakky, K.M. Hossain, R. Abdullah, M.S. Noman, M. Hossain, M. Y. Ali, and M.S. Mamun.

Date of sowing/transplanting: August to December, 2025

Design: Dispersed replication

Materials and methods:

Varieties: Recently released JAF varieties: BJRI Tossa Pat 9, BJRI Tossa Pat 8, BJRI Deshi Pat 9, BJRI Deshi Pat 10, HC-95 and BJRI Kenaf 5

Farmers will be selected from different vegetables (rabi season) growing areas who are interested to grow jute seed crop in the coming season to cultivate the BJRI's newly released variety BJRI Deshi Pat-10, BJRI Tossa Pat-8 and HC-95.. Jute seed will be sown in the border or mixed crop with chilli, brinjal, tomato, lalshak, indian spinach, spinach, reddish, bean etc. But in case of transplanting, jute seedlings will be transplanted in the border area and in the centre point of vegetable seedlings (Tomato, Brinjal and Chilli) keeping one/two centre point gap in both row and column. In both cases jute plant will be kept maximum 10% of vegetable crops. Land preparation, fertilizer application, intercultural operations etc. would be done in time simultaneously for every crop as per recommendations. No additional management care and fertilizer application will be taken for the jute seed crop except planting and harvesting. Pest and disease control measures would be taken as and when necessary.

A total of 357 plots will be set up. Programmes will be executed by the respective regional/sub-stations of BJRI mainly with the collaboration of DAE. BJRI authority will be engaged a high-power co-ordination committee to supervise this programme.

SL No.	Name of station	Number of on-farm field trail		Number of block		Number of field trail for shak
		Tossa	Kenaf	Tossa	Kenaf	Pat shak/Mesta shak
1.	JFSD, BJRI, Dhaka	10	10	0	0	25
2.	JAES, Manikganj	20	10	1	2	5
3.	JRRS, Rangpur	20	10	5	2	5
4.	JRRS, Faridpur	25	5	5	0	5
5.	JRRS, Kishoreganj	05	25	0	5	5
6.	JRRS, Chandina	10	10	2	2	5
7.	JRS, Monirampur	20	0	2	5	5
8.	JRS, Dinajpur	10	0	1	1	5
9.	JRS, Tarabo	05	5	0	0	5

10.	JRS, Patuakhali	10	5	0	0	5
11.	JRS, Madarganj	15	10	2	2	5
Total		**150**	**95**	**18**	**19**	**75**

Records to be kept: List of farmers with address, date of sowing, germination, weeding, thinning, input use including top dressing, harvest etc. Requirement of human labour for land preparation, seed sowing, fertilizer application, manuring, pesticides application, irrigation etc. with the quantity and price of inputs, interest on working capital, rental value of land, vegetables yield, fibre yield, stick yield, price of all products, cost of fibre and economic return etc. data will be recorded

Estimated cost: Tk. 2750000.00 **Remarks:** On-going

References

ADB (Asian Development Bank). 2004. Master Plan Forest Production, Govt. Bangladesh, Ministry of Forest and Environent, Dhaka. p. 66.

Alam, M. S. M. A. Quayum and M. A. Islam, 2010, Crop Production in the Haor Areas of Bangladesh: Insights from Farm Level Survey, The Agriculturists 8(2): 88-97 (2010).

Alim, A. 1978. A Handbook of Bangladesh jute. EFFAT Begum, Dhaka. 218.

Alim, M. A., Islam, M. M. and Hasan, M. S. 2016. Validation and Up-calling of Off season jute seed production in jute growing areas of Bangladesh, TF-11C, KGF Funded Project, BARC, Farmgate, Dhaka-1215, pp. 01-34.

Al-Mamun, M., M. Rafii, Y. Oladosu, A. B. Misran, Z. Berahim, Z. Ahmad, F. Arolu, and M. H. Khan. 2020. Genetic diversity among kenaf mutants as revealed by qualitative and quantitative traits. Journal of Natural Fibres 19 (11):4170–87. doi:10.1080/15440478.2020.1856268.

Altieri, M. A., Nicholls, C.I., Henao, A. and Lana, M. A. 2015. Agroecology and the design of climate change-Resilient farming systems. Agron. Sustain Dev. 35: 869–890.

Anonymous. 2016. Statistical Year Book of Bangladesh 2015. Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning.

Arshad, M., Amjath-Babu, T.S., Aravindakshan, S., Krupnik, T.J., Toussaint, V., Kächele, H., Müller, K., 2018. Climatic variability and thermal stress in Pakistan's rice and wheat systems: a stochastic frontier and quantile regression analysis of economic efficiency. Ecol. Indic. 89, 496–506.

Barisal jute farmers aspire to hike market price by their profuse cultivation. Yarns and fibers. 2023. Available online: https://www.yarnsandfibers.com/news/textile-news/barisal-jute-farmers-aspire-to-hike-market-price-by-their-profuse-cultivation/ (Accessed on February 20 2023)

BBS. 2016. Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics. Ministry of Planning and Statistics Division, Govt. of People's Republic of Bangladesh, Dhaka. p. 170.

BBS. 2018. Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics. Ministry of Planning and Statistics Division, Govt. of People's Republic of Bangladesh, Dhaka. p. 170.

BFD (Bangladesh Forest Department). 2011. Homepage, Bangladesh Forest Department, www.bforest.gov.bd (Accessed December) 2011.

BJRI (Bangladesh Jute Research Institute), 2017. Pat, Kenaf and Mesta Phosholer Procholito Jat, Manik Miah Avenue, Dhaka, Bangladesh.

Bokhtiar, S.M. and K. Sakurai, 2005. Effects of organic manure and chemical fertilizer on soil fertility and productivity of plant and ratoon crops of sugarcane. Arch. Agron. Soil Sci., 51: 325-334.

Chandrasekaran B, Annadurai K, Somasundaram E 2010: A Textbook of Agronomy. New Age International (P) Limited, New Delhi, India. pp. 182

Chandrasekaran B, Annadurai K, Somasundaram E 2010: A Textbook of Agronomy. New Age International (P) Limited, New Delhi, India. pp. 182.

Costinot, A., Donaldson, D., Cory Smith, C., 2016. Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. J. Pol. Econ. 124(1), 205–248.

Dasgupta, S., Huq, M., Khan, Z.H., Murshed, M., Ahmed, Z., Mukherjee, N., Khan, M.F., and Pandey, K. (2014). Cyclones in a changing climate: the case of Bangladesh.*Climate and Development* **6(2)**: 96-110. https://doi.org/10.1080/17565529.2013.868335.

EGIS (Environmental and Geographical information System). 2000. Riverine Chars in Bangladesh- environmental dynamics and management issues. Environment and GIS Support Project for Water Sector Planning (EGIS). University Press Ltd. ISBN 984 05 1580 2.

EGIS (Environmental and Geographical information System). 2000. Riverine Chars in Bangladesh- environmental dynamics and management issues. Environment and GIS Support Project for Water Sector Planning (EGIS). University Press Ltd. ISBN 984 05 1580 2.

Engel, R. W. (1978). The importance of legumes as a protein source in Asian diets. In: Proceedings of the 1st International Mung Bean Symposium, pp. 35–39. Los Banos, Philippines.

Ferdous, J., Alim, M. A., Sultan, M. T., & Sultana, A. (2018). Effect of harvesting age on fibre yield and yield contributing characters of highly salt tolerant C. Capsularis variety BJRI Deshi Pat-10. International Journal of Multidisciplinary Comprehensive Research, 1(6), 4-7

Gani, M.N. Alam, A.K.M.M, Islam, M.R. Rahman, M.M. Nuruzzaman, M. and Iqbal, S. 2002. Agronomic characteristics of jute, kenaf and their plant biomaterials effect on soil nutrient. Journal of Agronomy, 1: 80-82. DOI: 10.3923/ja.2002.80.82

Gautam, O.P. 1979. Keynote address presented at the XI Annual Workshop of All India coordinated Agronomic Research Projects. Jawharlal Neheru Krishi Vyswa. Vidyalaya, Jabbalpur, India.

Geethalakshmi, V., Palanismy, K., Aggarwal, P.K., et al. 2009. Impact of climate change on rice, maize and sorghum productivity in Tamil Nadu. In: Aggarwal PK (ed.), Global climate change and Indian agriculture: Case studies from the ICAR network project. New Delhi: Indian Council of Agriculture Research (ICAR), pp. 13–18.

Ghimire, T. B.; Thakur, N. S. Constraint and opportunity of raw jute production: A case Study of eastern Terai, Nepal. Agron. Jour. Nep. 2013, 3, 117-122.

Gichuru MP, Bationo A, Bekunda MA, Goma HC, Mafongonya PL, Mugendi DN, Murwira HM, Nandwa SM, Nyathi P, Swift MJ (2003). Soil fertility management in Africa: A regional perspective. Academy science publishers (ASP) in association with the tropical Soil Biology and Fertility of CIAT. Nairobi, p. 306.

Haque, S.A. (2006). Salinity problems and crop production in coastal regions of Bangladesh. *Pakistan Journal of Botany* **38**(5): 1359-1365.

Hazra, S. K. and D. P. Singh, 1997. Paper making from bast fibre crops- Aspects and Prospects. Technical Bulletin, Series No. 4. CRIJAF, p. 56.

Hossain, D. 1996. Relative profitability from alternative cropping patterns under irrigated conditions in selected areas of Bogra district. M. S. Ag. Econ. Thesis. Bangladesh Agricultural University, Mymensingh.

Hossain, M. 2014. Jute and Jute Industry. Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207. p 135-168.

Hossain, S. M. A., Bari, M.N., Haque, M. A. 1996. Agroforestry in Bangladesh, Village and Farm Forestry Project. SDC, Dhaka and Bangladesh Agricultural University,

Mymensingh. pp. 21-29.
Hsiao, T.C. 1973. Plant responses to water stress. Ann. Rev. Plant Physiol. 24, pp. 519-570.
Ibrahim, M., Zaman, M. A. U. Mostafizur, A. B. M. and S. M. Shahidullah. 2017. Diversity of crops and land use pattern in Barisal region. Bangladesh Rice Journal. 21 (2): 57-72.
Ibrahim, M., Zaman, M., Mostafizur, A., & Shahidullah, S. (2018). Diversity of Crops and Land Use Pattern in Barisal Region. Bangladesh Rice Journal, 21(2), 57–72.
Islam, M. R., Rahman, M. M., & Islam, M. A. (2020). Exploring farmers' insight on cropping pattern for sustainable crop production in the char lands of Bangladesh. Sustainability, 14(3), 1745
Johansen, C. Waseque, M. and S. Begum. 1985. Effect and interaction of photoperiod, water stress and nitrogen on flowering and growth in jute. Field Crop Research. 12: 397-406.
Jute exports rise record 31% in FY21. The Business Standard. 29 August 2021. Available online: https://www.tbsnews.net/economy/jute-exports-rise-record-31-fy21- 291742 (Accessed 11th February, 2022)
Jute growers expect good yield. The Daily Star. 28 June 2021. Available online: https://www.thedailystar.net/business/economy/news/jute-growers-expect-good-yield-2119577 (Accessed on February 20, 2023)
Karimi, S., P. M. Tahir, A. Karimi, A. Dufresne, and A. Abdul Khani. 2014. Kenaf bast cellulosic fibers hierarchy: A comprehensive approach from micro to nano. Carbohydrate polymers 101:878–85. doi:10.1016/j.carbpol.2013.09. 106.
Kiani, M.J., M.K. Abbasi and N. Rahim, 2005. Use of organic manure with mineral N fertilizer increases wheat yield at Rawalakot Azad Jammu and Kashmir. Arch. Agron. Soil Sci., 51: 299-309.
M. A. Mottaleb et al.: Economic Analysis of Alternative Cropping Patterns for Coastal Agricultural Production in Bangladesh, Journal of Coastal Research, Volume 78, 2017, Pages 129-133
M. K. Hasan et al.: Effect of watermelon and jute cultivation on soil fertility and economic return in coastal saline soils, Journal of Soil Science and Environmental Management, Volume 7, Issue 11, 2016, Pages 186-193.
M. R. Islam et al.: Evaluation of a Farmer's Alternative Cropping Pattern (FACP) in a Coastal Area of Bangladesh", International Journal of Agricultural Research, Innovation and Technology, Volume 5, Issue 2, 2015, Pages 35-41.
Mahmud AA, Alam MJ, Islam MA, Molla MSH, Ali MA 2020: Millet-Jute-T. Aman Cropping Pattern for Increasing System Productivity in the Active Brahmaputra-Jamuna Floodplain Chars. The Agriculturists 18(1)129-136.
Mamun, M. A., Saha, C. K., Mostofa, M. G., Miah, A. and Hossain, M. Z. 2017. Identification of suitable varieties for seed production of jute in non-traditional areas of Bangladesh. BD. J. Pl. Breed. 30(1): 33-37.
Mandal, R. and M. P. Bezbaruah. 2013. Diversification of cropping pattern: its determinants and role in flood affected agriculture of Assam Plains. Indian J. Agric. Econ. 68 (2): 169-181.
MEF, 2004. India's Initial National Communication to the United Nations Framework Convention on Climate Change. New Delhi: Ministry of Environment and Forests (MEF), India.
Mendelsohn, R., Nordhaus, W.D., Shaw, D., 1994. The impact of global warming on agriculture: a Ricardian analysis. Am. Econ. Rev. 84, 753–771.
Mohd Rifaat, A. H. 2008. Kenaf ganti tembakau, Berita Harian, online: http://www.mtib.gov.my/repository/stayinform/ kenaf-ganti-tembakau.pdf, accessed on 15th August 2012.
Mohiuddin, M. and Choudhury, R. M. 1997. Species diversity in homestead agroforestry

system of Chittagong district, an explanatory study, Bangladesh J. Forest Sci., 26(1): 18-24.

Molla, M.M.U.; Sabur S.A.; Akhtar, S. Current Scenario of Jute Sector in Bangladesh: Domestic and World Perspective. Int. J. Bus. Soc. Sci. Res. 2014, 2(2), 136-144. http://www.ijbssr.com/currentissueview/14013066

Mondol MEA, Rahman H, Rashid MH, Hossain MA, Islam MM (2013). Screening of mungbean germplasm for resistance to Mung bean Yellow Mosaic Virus. *International Journal of Sustainable Crop Production, 8(1), 11-15*.

Mostofa, M. G. 2012. Genetic divergence combining ability, heterosis and gene action for yield characters in Kenaf (H.cannabinus) Ph. D. Thesis, Dept. Genet. & Pl. Breed., Bangladesh Agril. Univ., Mymensingh, Bangladesh.

Nair, P. K. R. 1990. An introduction to agroforestry Kluwer Academic publishers, ICRAF.

Nishino, T., Hirao, K., Kotera, M., Nakamea, K. and Inagaki, H. 2003. Kenaf reinforced biodegradable Composite. Composite Science and Technology. 63(9): 1281-1286.

Nishino, T., K. Hirao, M. Kotera, K. Nakamae and H. Inagaki. 2003. Kenaf reinforced biodegradable composite. Composites Science and Technology. 63(9): 1281- 1286.

Parrotta, J.A., Dey, De., Pryck, J. and Darko, O. B. 2015. The Historical, Environmental and Socio-Economic Context of Forests and Tree-Based Systems for Food Security and Nutrition. In: Forests, Trees and Landscapes for Food Security and Nutrition. A Global Assessment Report. https://www.researchgate.net/publication/276950253

Paul, P.L.C., Roy, D., Mahmud, M.N.H., Hossain, M.B., Yesmin, M.S., Kundu, P.K. and Islam, M.T. (2021b). Rice-based cropping system intensification in the coastal saline area of Bangladesh: problems and prospects. *Bangladesh Rice Journal* **25(2)**: 31-43. https://doi.org/10.3329/brj.v25i2.62705.

Rahman, M. M. and Bala, B. K., 2009. Ecological and Environmental Sustainability of jute production in Bangladesh: Life Cycle Assessment. SAARC J. Agri., 7(2): 51-56.Ricardo, D., 1817. On the Principles of Political Economy and Taxation. John Murray,London.

Rising demand, price of jute entice farmers. The Daily Star. 13 September 2022. Available online: https://www.thedailystar.net/business/economy/news/rising-demand-price-jute-entice-farmers-3117766 (Accessed on February 20, 2023).

Sarkar, S., Gaydon, D.S., Brahmachari, K., Poulton, P.L., Chaki, A.K., Ray, K., Ghosh, A., Nanda, M.K., Mainuddin, M. (2022). Testing APSIM in a complex saline coastal cropping environment. *Environmental Modelling Software* **147**: 105239. https://doi.org/10.1016/j.envsoft.2021.105239.

Sattar, S.A. and M.N. Islam. 2010. Char lands of Bangladesh: their extent, management practices and future research needs. Presented in the Workshop on Soil Fertility, fertilizer Management and Future research Strategy, held at BARC, during 18-19 January, 2010.

Sattar, S.A. and M.N. Islam. 2010. Char lands of Bangladesh: their extent, management practices and future research needs. Presented in the Workshop on Soil Fertility, fertilizer Management and Future research Strategy, held at BARC, during 18-19 January, 2010.

Senanayake., L., D.P., Knievel, S. E. Stevena, 1987. Nodulation and symbiotic nitrogen fixation of cowpea (Vigna unguiculata L.). Plant Soil 99: 435-439.Singh, A.K., Barman, D., Kundu, D.K., 2017. Impact of rainfall and temperature change on productivity of jute, rice and wheat under long term fertilizer experiment. Paper presented at the National Seminar on Nutrients and pollutants in soil-plant-animal-human continuum for sustaining soil, food and nutritional security - way forward, Bidhan Chandra Krishi Viswavidyalaya, 9–10 June 2017, Kalyani, West Bengal, India.

Sinha, B. and Day, D. 2008. Industrial Crops and Product Research. 29(1): pp. 16-26.
Skidar, M. F. S.; Banerjee, B. N. Jute Cultivation in India and Bangladesh: A Comparative Study, Mital Publication, New Delhi, India, 1990. pp 25.
Sultana, J., Ahmed, M. B., & Ali, M. Y. (2020). Adoption of climate resilient cropping patterns in southern coastal region of Bangladesh: Farmer's perception. SAARC Journal of Agriculture, 18(2), 207-217
Tejaswini, K., Reddy, P. B. H., Lakshmi, T., & Reddy, P. M. (2023). Profile of the farmers cultivating groundnut in the coastal sandy soils of SPSR Nellore district of Andhra Pradesh. Andhra Pradesh Journal of Agricultural Sciences, 9(2), 95-99
The Business Post 2022. Southern region sees growth in jute production. https://businesspostbd.com/nation/southern-region-sees-growth-in-jute-production-2022-07-22 (Accessed on 06 February, 2024).
Troy, T.J., Kipgen, C., Pal, I., 2015. The impact of climate extremes and irrigation on US crop yields. Environ. Res. Lett. 10 (5), 054013.
Tumuhairwe J. B., Rwakaikara-Silver, M. C., Muwanga, S., Natigo, S. 2007. Screening legume green manure for climatic adaptability and farmer accepance in the semi-arid agro-ecological zone of Uganda. In: Bationo A, Waswa B, Kihara J, Kimetu J (eds). Advances in integrated soil fertility management in Sub-Saharan Africa: Challenges and opportunities, Springer, The Netherlands, pp. 255-259.
Ulaş A., Aydin A., Ulaş F., Yetişir H., Miano T. F. 2020: Cucurbita Rootstocks Improve Salt Tolerance of Melon Scions by Inducing Physiological, Biochemical and Nutritional Responses. Horticulturae vol.6, no.4.
Wood, I. M. 1981. Plant Fibre crops, The new Rural Industries (A hand book for farmers and livestock's). University press: pp. 66-76.
Zahan, T., Islam, Md. M., Khan, Md. S. I., Anik, Md. F. A., Akhter, S., Ali, M. A., Chaki, A. K., Anwar, Md. M., Hasan, G. N., Haque, Md. E., & Bell, R. W. (2024). Productivity Improvement in Coastal Region of Bangladesh through Improving Rice-based Cropping Patterns and Optimizing Nutrient Management. *Journal of the Indian Society of Coastal Agricultural Research*, *42*(1). https://doi.org/10.54894/JISCAR.42.1.2024.144707

G. GENOME RESEARCH CENTER
ANNUAL RESEARCH PROGRAMME 2025-2026
PROGRAMME AREA: GENETIC AND VARIETAL IMPROVEMENT OF JUTE AND ALLIED FIBER CROPS
PROJECT 1: DEVELOPMENT OF SHORTER LIFE SPAN JUTE GENOTYPE

1.1 Title of the experiment: Screening and Selection of Short-Life Span Transgenic Tossa Jute Lines for Generation Advancement and Homozygosity

Background:

Jute is Bangladesh's most important cash crop, but it takes 120-130 days to grow (April to August). This long growing season makes it impossible to plant food crops like paddy or mung bean in the same field right after, forcing farmers to leave land unused for months. This reduces their income and wastes valuable farmland. To solve this problem, we developed a new quick-growing transgenic Tossa jute line using genetic modification. Since the plants were transformed via *in planta* transformation method, it takes time to ensure stable genetics.

Objective:

To get the transgenic homozygous jute seed containing inserted genes.

To produce genetically stable, homozygous transgenic jute seeds containing the desired inserted genes while maintaining standard plant height.

Location: Genome research center

Investigator (s): Md. Ruhul Amin, M. A. Sadat, Md. Wali Ullah, Afsana Mimi, Md. Zablul Tareq, and S. M. Mahbub Ali

Methodology:

Experimental details:

1. Seed Sterilization & Selection:

- Sterilize jute seeds using mercury chloride ($HgCl_2$).
- Place seeds on a selective growth medium (¼ strength MS + hygromycin 5mg/L) to identify transgenic plants.
- Keep in an incubator for 3 days.

2. Root Development & Acclimatization:

- Select healthy seedlings with long roots and transfer them to bottles containing ¼ MS rooting medium.
- After 10-15 days, move plants with strong roots to small soil pots. Cover with polythene bags to maintain humidity and keep in the tissue culture lab.

3. Hardening & Field Transfer:

- Once roots and shoots develop (after ~2 weeks), transfer plants to larger pots outdoors.
- After 1 month, transplant mature plants to the field.

4. Seed Collection:

Collect mature T_4 generation seeds 5-6 months after transplantation

5. Molecular screening

- **DNA isolation and PCR:** Genomic DNA is isolated from plants of upcoming generation and PCR is done for molecular confirmation of the desired ~~construct~~ gene.

Expected output: Transgenic plants of the T_5 generation, as well as seeds from the T_4 generation of O-9897, the T_1 generation of Robi-1, and the T_1 generation of Komola will be obtained.

Records to be Preserved:

1. All screening records, PCR results, and associated data will be properly documented and preserved.

Estimated cost: 150000.00 BDT

PROJECT 2: HOST-INDUCED GENE SILENCING TO PROTECT JUTE FROM STEM ROT DISEASE

2.1 Title of the experiment: Molecular validation of gene insertion (*MpChs7*) from the transgenic jute seed (T_4) through PCR

Background and objectives: Seed of transgenic jute plant with inserted gene along with Hygromycin resistance gene produce long root. However, long root from the seeds of non-integrated gene can also be produced due to the uneven distribution of hygromycin in the supplemented MS media. So, gene insertion need to be confirmed through the PCR with the DNA of the transgenic jute leaf. Finally, produced seeds from the molecular validated transgenic plant is required for the next year experiment.

Objectives:

1. To confirm the gene insertion (*Chs7*) of the transgenic jute plants.
2. To collected the seeds from the transgenic plants having *Chs7* inserted gene.

Expected output: Jute plants having *Chs7* gene will be confirmed and Bio- assay/ disease assay will be conducted with the positive jute plants.

Duration of the study: March, 2025 to January, 2026.

Name of the Investigators: Md. Abu Sadat, Borhan Ahmed and *S. M. Mahbub Ali*

Location: Genome Research Center, BJRI, Dhaka-1207

Experimental Details:

a. Materials: Leaf sampl's of T_4 trangenic plants.

b. Methodology:

1. DNA will be extracted from the leaf of the positive jute seedling/s through standard protocol developed by Genome Research Center (GRC).
2. Gene insertion will be confirmed through PCR run. In this experiment inserted *M. phaseolina* specific *Chs7* primer will be used.

Records to be Preserved:

1. Gel electrophoresis picture of PCR product.

Estimated cost: 150000.00 BDT

Reference:

Islam, M. S., M. S. Haque, M. M. Islam, E. M. Emdad, A. Halim, Q. M. M. Hossen *et al*., 2012. Tools to kill: genome of one of the most destructive plant pathogenic fungi *Macrophomina phaseolina*. *BMC Genomics*. 13: 493.

Islam, M S., J. A. Saito, E. M. Emdad, B. Ahmed, M. M. Islam, A. Halim *et al.,* 2017. Comparative genomics of two jute species and insight into fiber biogenesis. *Nature Plants*. 3: 16223.

Karimi, H. Z. and Innes, R. W. 2022. Molecular mechanism underlying host-induced gene silencing. *The Plant Cell.* 34: 3183-3199.

PROJECT 3: DEVELOPMENT OF STEM ROT RESISTANT/ TOLERANT JUTE GENOTYPE THROUGH DEFENSIN ENCODING GENE OF DESHI JUTE

3.1 Title of the experiment: *In silico* analysis of defensin encoding genes from deshi jute and selecting potential candidates for construct preparation

Background and objectives: Crop yield and quality are highly dependent on the normal growth and development of plant. Along with other, biotic and abiotic factors also influence plant growth in nature. Biotic factors like pathogen alone can cause 100% yield loss during epidemic diseases occurrence. During pathogenic attack, plant produces a complex of multiple peptides which has been shown to play a vital role against pathogenic attack as their natural defense system. Till now, more than 500 antimicrobial peptides (AMPs) have been identified

from different plant species. Plant defensins are small, basic and heat stable peptides having some special characteristics. Plant defensins was shown to play significant role against different plant pathogenic fungi in both *in vitro* and *in vivo*.

Objectives:

1. To identify defensin encoding genes from the deshi jute (*Corchorus capsularis*).
2. To select potential genes for the development of stem rot resistant/ tolerant variety.

Expected output: The features of defensin gene will be unlocked and their behavior under disease condition will be understood.

Duration of the study: March, 2025 to January, 2026.

Name of the Investigators: Md. Abu Sadat, Md. Ruhul Amin, Md. Wali Ullah, Borhan Ahmed and *S. M. Mahbub Ali*

Location: Genome Research Center, BJRI, Dhaka-1207

Experimental Details:

a. Materials: High configured computers and bioinformatic tools/ software's.

b. Methodology:

Identification of defensin genes in *C. capsularis*

Defensin genes/ or defensin proteins were searched and identified through a pipeline. In brief, Defensin protein sequences of Arabidopsis and grapevine were used as queries in this study and protein BLAST (BLASTP) was used against local database of two jute species with the E-value threshold was selected at 10^{-3} to get the entire possible defensin candidates.

Determination of defensin genes structures

For determining the gene structure (exon and intron), we have collected the GFF (General feature format) data of both jute species (*C. capsularis* and *C. olitorius*) from the NCBI website (https://www.ncbi.nlm.nih.gov/). And then we analyzed those data with the help of online software named Gene Structure Display Server 2.0 (http://gsds.cbi.pku.edu.cn/). Domain structures were generated by online software 'Simple Modular Architecture Research Tool (SMART)' (http://smart.embl.de/).

Phylogenetic analysis of defensin genes

The full length protein sequences of defensin genes of jute plants and published defensin proteins from different plant organisms were collected from the online database (https://www.ncbi.nlm.nih.gov/). For constructing phylogenetic tree, the multiple sequence alignment was constructed with the received sequence of different defensins using ClustalW2 program with default parameter. Then a phylogenetic tree was constructed through MEGA 6.0 using neighbor-joining method with the 1000 bootstrap replicates.

Defensin gene RNA seq analysis

Transcriptome data of four different jute developmental stages of two species (*C. capsularis* and *C. olitorius*) was downloaded from the NCBI database (https://www.ncbi.nlm.nih.gov/).

Expression pattern analysis of defensin genes

Deshi jute seedlings will be inoculated with the stem rot pathogen *Macrophomina phaseolina* at seedlings will be collected at 0, 1, 3, 5 days, respectively in control environment. Then RNA will be isolated and expression pattern will be determining through Quantative Real Time PCR (q-RT PCR).

Records to be Preserved:

1. Records of identified defensin gene will be preserved
2. Data of qRT-PCR under disease condition will be recorded and preserved.

Estimated cost: 150000.00 BDT

Reference:

Islam, M. S., M. S. Haque, M. M. Islam, E. M. Emdad, A. Halim, Q. M. M. Hossen *et al*., 2012.

Tools to kill: genome of one of the most destructive plant pathogenic fungi *Macrophomina phaseolina*. *BMC Genomics*. 13: 493.
Islam, M S., J. A. Saito, E. M. Emdad, B. Ahmed, M. M. Islam, A. Halim *et al.,* 2017. Comparative genomics of two jute species and insight into fiber biogenesis. *Nature Plants*. 3: 16223.
Jha, S., and Chattoo, B. B. 2010. Expression of a plant defensin in rice confers resistance to fungal phytopathogens. *Transgenic Res*. 19: 373-384.
Lacerda, A. F., E. A. R. Vasconcelos, P. B. Piligrini, and de Sa M. F. G. 2014. Antifungal defensins and their role in plant defense. Frontiers in *Microbiol*. 5: 116.

PROJECT 4: DEVELOPMENT OF *Bt*-TRANSFORMED JUTE FOR ENHANCED INSECT RESISTANCE

4.1 Title of the experiment: Screening of tossa transgenic *Bt* jute upgradation of their generations as well as homozygosity

Background and objectives: Jute hairy caterpillar (*Spilosoma obliqua*) is most devastation insect pest of jute that causes significant yield loss. To control this insect, continuous application of chemical pesticides not only bring about environmental and health hazards but also encourage pest resurgence. Therefore, bio-pesticides are the best alternative to chemical one. *Bacillus thuringiensis* (*Bt*) has been effectively used in natural pest management as it is characterized by the production of insecticidal crystal (Cry) proteins (δ-endotoxin) that control several insects of Lepidoptera, Diptera and Coleoptera orders. Recently, *Cry* gene has been inserted into many crops, such as maize, wheat, cotton, canola, soybean, and potato. We have developed transgenic *Bt* jute plants through *Agrobacterium*-mediated transformation of a synthetic *Cry1Ab/Ac* gene into tosa jute

Objective

To obtain homozygous transgenic *Bt* jute lines over-expressing the synthetic *Cry1Ab/Ac* gene

Expected output: Generation of Bt toxin-expressing transgenic jute lines.

Duration of the study: March, 2025 to January, 2028.

Name of the Investigators: Md. Wali Ullah, Md. Abu Sadat and Borhan Ahmed

Location: Genome Research Center, BJRI, Dhaka-1207

Experimental Details:

1. Seed Sterilization & Selection:

- Sterilize jute seeds using mercury chloride ($HgCl_2$).
- Place seeds on a selective growth medium (¼ strength MS + hygromycin 5mg/L) to identify transgenic plants.
- Keep in an incubator for 3 days.

2. Root Development & Acclimatization:

- Select healthy seedlings with long roots and transfer them to bottles containing ¼ MS rooting medium.
- After 10-15 days, move plants with strong roots to small soil pots. Cover with polythene bags to maintain humidity and keep in the tissue culture lab.

3. Hardening & Field Transfer:

- Once roots and shoots develop (after ~2 weeks), transfer plants to larger pots outdoors.
- After 1 month, transplant mature plants to the field.

4. Genomic DNA will be extracted from Bt transgenic plants, followed by PCR analysis to confirm Bt gene introgression.

5. Insect bioassays were performed on excised leaf sections using the protocol described by Majumder et al. (2018).

Records to be Preserved:

2. All screening records, PCR results, and associated data will be properly documented and preserved.

Estimated cost: 150000.00 BDT

Reference

Majumder, S., Sarkar, C., Saha, P., Gotyal, B. S., Satpathy, S., Datta, K. and Datta, S. K. (2018). *Bt* jute expressing fused δ-endotoxin *Cry1Ab/Ac* for resistance to Lepidopteran pests. *Frontiers in plant science*, 8: 2188.

PROJECT 5: DEVELOPMENT OF LOW-LIGNIN JUTE GENOTYPES

EXPERIMENT 5.1 Generation Upgradation and Selection of Low-Lignin Transgenic Jute

Background and objectives: Jute fiber has become more popular in recent years due to its renewability, biodegradability, low manufacturing costs, and wide range of uses. One of the major components of fiber is lignin, which impairs the fiber quality and as a result, makes jute fiber unsuitable for use in the textile industry and biofuel production. The main aim of this study was to reduce lignin content jute advance line by down regulation one of the key genes (4-O-methyltransferase, COMT) in associate with lignin biosynthesis to reduce lignin polymerization.

Objective

To obtain homozygous transgenic *Bt* jute lines over-expressing the synthetic *Cry1Ab/Ac* gene

Expected output: Generation of Bt toxin-expressing transgenic jute lines.

Duration of the study: March, 2025 to January, 2028.

Name of the Investigators: Md. Wali Ullah, Md. Abu Sadat, Borhan Ahmed and *S. M. Mahbub Ali*

Location: Genome Research Center, BJRI, Dhaka-1207

Experimental Details:

1. Seed Sterilization & Selection:

- Sterilize jute seeds using mercury chloride ($HgCl_2$).
- Place seeds on a selective growth medium (¼ strength MS + hygromycin 5mg/L) to identify transgenic plants.
- Keep in an incubator for 3 days.

2. Root Development & Acclimatization:

- Select healthy seedlings with long roots and transfer them to bottles containing ¼ MS rooting medium.
- After 10-15 days, move plants with strong roots to small soil pots. Cover with polythene bags to maintain humidity and keep in the tissue culture lab.

3. Hardening & Field Transfer:

- Once roots and shoots develop (after ~2 weeks), transfer plants to larger pots outdoors.
- After 1 month, transplant mature plants to the field.

4. Genomic DNA will be extracted from Bt transgenic plants, followed by PCR analysis to confirm targeted lignin gene gene introgression.

Records to be Preserved:

3. All screening records, PCR results, and associated data will be properly documented and preserved.

Estimated cost: 150000.00 BDT

PROJECT 6: DEVELOPMENT OF A SIMPLE AND INEXPENSIVE TECHNIQUE FOR PRESERVING FUNGAL CULTURES FROM JUTE

6.1 Title of the experiment: Optimization of an effective long-term preservation technique for *Fusarium oxysporum*, a newly identified jute pathogen

Background and objectives: Fungal cultures are essential resources in various fields such as agriculture, medicine, and biotechnology. The World Data Centre for Microorganisms (WDCM) reports that there are approximately 846 culture collections registered in 79 different countries and regions. Among these collections are fungi that have been identified as much as 587236 species (https://www.wdcm.org/). Preserving these cultures effectively is crucial for maintaining their viability and genetic integrity over extended periods. Traditional methods for fungal culture preservation include cryopreservation, lyophilization, and storage in glycerol, but these techniques often require specialized equipment and can be costly. There is a need for simpler, more cost-effective methods that can be easily implemented in resource-limited settings. The proposed research aims to address a critical need in mycology and related fields by providing a cost-effective and accessible method for preserving fungal cultures. This method will be particularly valuable for laboratories in resource-limited settings, enabling them to maintain important fungal collections without the need for expensive equipment and materials. Additionally, the method's simplicity and low cost could facilitate broader research and applications in agriculture, medicine, and biotechnology, where preserved fungal cultures play a vital role. By ensuring the long-term viability and genetic stability of these cultures, the new preservation method will support ongoing research and development efforts, contributing to advancements in fungal biology and its applications. Therefore, the specific objectives of this experiment are:

1. **Develop the dry filter paper preservation protocol**: Standardize the method for different phytopathogenic fungi.
2. **Evaluate the viability and pathogenicity of preserved cultures**: Ensure preserved cultures retain their viability and pathogenic characteristics over time.

Expected output: A Simple and Inexpensive protocol will be developed for Preserving Phytopathogenic Fungal Cultures

Duration of the study: March, 2025 to February, 2026.

Name of the Investigators: Md. Wali Ullah, Md. Abu Sadat, Borhan Ahmed and *S. M. Mahbub Ali*

Location: Genome Research Center (GRC), BJRI

Experimental Details:

Materials and Method:

The following research methodology will be employed to achieve the stated objectives:

1. Selection of Fungal Strains

Fungal Strain Selection: Select phytopathogenic fungal strains representing a diverse range of species and pathogenicity levels. Strains should be well-characterized and maintained on appropriate growth media.

2. Preparation of Fungal Inoculum

Cultivation: Inoculate selected fungal strains onto appropriate agar media and incubate under optimal growth conditions until sporulation or mycelial growth is observed.

Biomass Harvesting: Harvest fungal biomass from actively growing cultures using sterile techniques. Adjust biomass concentration to achieve uniform inoculation on filter paper.

3. Inoculation and Desiccation on Filter Paper

Inoculation: Apply fungal biomass evenly onto pre-cut filter paper discs using sterile techniques. Control the amount of biomass to ensure consistent coverage without oversaturation.

Desiccation: Air-dry inoculated filter paper discs in a sterile environment until complete desiccation is achieved. Monitor desiccation rate and environmental conditions to prevent contamination.

4. **Storage and Viability Testing**

Storage Conditions: Store desiccated filter paper discs in airtight containers at predetermined temperatures and humidity levels. Designate storage conditions based on preliminary optimization experiments.

Viability Testing: Periodically assess the viability of preserved fungal cultures by rehydrating filter paper discs and inoculating onto fresh agar media. Monitor growth and observe for signs of contamination or loss of viability.

Records to be Preserved:

- Fungal growth period
- Desiccation time of fungus on filter paper
- Different parameter of the developed technique will be recorded.

Estimated cost: 150000.00 BDT

PROJECT 7: DEVELOPMENT OF INTERNAL TRANSCRIBED SPACER (ITS) GENE LIBRARY FOR THE JUTE PATHOGEN

7.1 Title of the experiment: Construction of an ITS gene library for molecular identification of *Fusarium oxysporum*, a newly identified pathogen of jute

Background and Objectives:

Jute, known as the "golden fiber," is a vital cash crop in Bangladesh. However, its productivity is severely affected by various pathogens, with *Fusarium oxysporum* being a primary cause of vascular wilt disease. Accurate identification and characterization of *F. oxysporum* strains are crucial for understanding their pathogenicity, epidemiology, and developing effective control strategies. The Internal Transcribed Spacer (ITS) region of fungal ribosomal DNA serves as a reliable molecular marker for fungal pathogen identification and classification, making it an ideal target for developing a comprehensive gene library.

Objectives

- To amplify and clone the ITS gene into a TA vector
- To sequence the target region and validate its accuracy
- To preserve the constructed plasmid clones at –80°C

Expected output:

- A comprehensive ITS gene library for *Fusarium oxysporum* strains affecting jute.
- A better understanding of the genetic diversity of *Fusarium oxysporum* populations.

Duration of the study: March, 2025 to February, 2026.

Name of the Investigators: Md. Wali Ullah, Md. Abu Sadat, Borhan Ahmed and *S. M. Mahbub Ali*

Location: Genome Research Center (GRC), BJRI

Experimental Details:

Materials and Method:

The following research methodology will be employed to achieve the stated objectives:

1. DNA isolation from pure cultures: Extract fungal DNA from pure cultures using a standard fungal DNA extraction kit.
2. PCR using ITS gene primer: Use universal ITS primers (e.g., ITS1 and ITS4) to amplify the ITS region via PCR.
3. Cloning of ITS gene into TA vector
4. Sequencing of interest: Purify PCR products and sequence them using Sanger sequencing.

5. Preservation (-80ºC) of constructed Cloning Plasmid

Records to be Preserved:

- Constructed plasmid clones will be preserved at –80°C.
- Sequence data will be stored at GRC repository

Estimated Cost: 50000.00 BDT

PROJECT 8: PRECISION GENOME EDITING FOR THE IMPROVEMENT OF JUTE CULTIVARS

8.1 Title of the experiment: Development of low lignin containing Jute variety through CRISPR/Cas genome editing

Background and Objectives:

Jute, is a fiber yielding plant of genus *Corchorus,* family Malvaceae and provides the second most important bast fiber after cotton. The number of handy products made from jute fibers are numerous for example, jute ropes, bags, cups, clothing, holders, hessian clothes etc. □iodegradable properties of jute can extensively replace plastic materials from the industry reducing environmental pressure. Systematically reducing the lignin content in jute fibers aids in increasing its aesthetic quality as well as reducing processing hassle. The complex biosynthesis of lignin in jute is complex. We propose to perform an *in-silico* analysis unraveling the members of *lignin biosynthesis related* gene in jute with a view to, knocking down functions of some of these genes to produce a novel genotype of local jute cultivar yielding low lignin. By employing genome editing through CRISPR-Cas9 technology, designing high performance sgRNAs targeting the *potential lignin biosynthersis related* genes, constructing an expression vector with the guides using modular cloning and developing mutant plants through *Agrobacterium*-mediated transformation, we intent to generate this novel mutant significant to our economy and environment.

Expected output: Engineer a jute genotype capable of producing fibers with significantly reduced lignin content.

Duration of the study: August, 2025 to August, 2029.

Name of the Investigators: Borhan Ahmed, Md. Wali Ullah, and *S. M. Mahbub Ali*

Location: Genome Research Center (GRC), BJRI

Experimental Details:

Materials and Methods

i. ***Reconstruction of lignin biosynthesis pathway and selection of target genes.***
ii. Analysis of the expression of all the identified lignin biosynthesis genes using publicly available database at various developmental stages and tissues.
iii. Expression Profiling of Key Lignin-Related Genes in Jute Through qRT-PCR Analysis.
iv. Final selection of candidate gene(s) and associated promoter regions for guide RNA design and subsequent CRISPR/Cas9 vector assembly.
v. The CRISPR-Cas9 construct will be introduced into jute (Corchorus spp.) via in planta transformation methodology.

Records to be Preserved:

i. Records of identified lignin biosynthesis related gene will be preserved
ii. Data of qRT-PCR in different tissue will be recorded and preserved.
iii. *Supporting research records generated during the experiment will be maintained.*

Estimated Cost: 500000.00 BDT

PROJECT 9: FIELD ASSESSMENT OF ADVANCED LINES IN JUTE AND ALLIED FIBERS

9.1. Title of the experiment: Comparative study on yield and yield attributes of year-round cultivable advanced line of tossa jute with existing popular varieties

Background & objective: Jute is economically important natural fiber crop just after cotton. The agricultural climate of Bangladesh is very much suitable for quality fiber production (Islam and Uddin, 2019). It is a rapid growing renewable biomass and photo-reactive crop with only 120 days harvesting period (Dempsey, 1975). Jute is photo-sensitive and short-day crop. It produces flower if day length is below 12.5hrs. It is grown in summer for its fiber production. If it is possible to grow less photo-sensitive jute line then it can be cultivated longer period of time compared to existing varieties. Considering above facts, an experiment was designed to find out photo-sensitivity and yield potentiality of different tossa jute genotypes.
Expected output: To develop year-round cultivable tossa jute variety
Duration of the study: February, 2025 to February, 2026.
Location: Manikganj, Rangpur, Faridpur and Jashore

Name of investigators: Md. Zablul Tareq, Wali Ulla, Md. Abu Sadat, Md. Ruhul Amin, Borhan Ahmed, S. M. Mahbub Ali

Date of initiation and duration: February-Decembe/2025

Experimental details:
Treatments:
Variety/Genotype:
V_1: Robi-2 (year-round cultivable advanced line)
V_2: BJRI Tossa pat 8 (Robi-1)
V_3: BJRI Tossa pat 9 (Sobuj Sona)
V_4: JRO-524
Date of sowing:
S_1: 23.02.2025
S_2: 10.03.2025
S_3: 25.03.2025
S_4: 13.04.2025
S_5: 15.07.2025
S_6: 15.08.2025
S_7: 15.09.2025
S_8: 30.09.2025
S_9: 15.10.2025
S_{10}: 15.11.2025
Plot size: 2.1m x 3.0m
Design: Factorial design with 3 replications
Records to be kept:

- Plant population/plot
- Plant height (10plants)
- Base diameter (10plants)
- Number of nodes
- Dry fiber weight
- Dry stick weight
- Days to flowering
- Weather data

PROGRAMME AREA: OPTIMIZATION AND ENHANCEMENT OF MICROBIAL COSORTIA FOR JUTE AND ALLIED FIBRE CROPS RETTING

PROJECT: 10 DESIGN AND OPTIMIZATION OF BACTERIAL CONSORTIA FOR ENHANCED JUTE RETTING EFFICIENCY

10.1 Title of the experiment: Performance of jute retting potentiality using bacterial consortia within carrier material

Background and objective: Jute is an internationally recognized natural fiber crop, second only to cotton. It is a bast fiber composed primarily of cellulose, hemicellulose, and lignin, with pectin acting as the binding agent. The fiber is traditionally separated through a retting process, which involves the microbial breakdown of pectin and other gummy substances by jute-retting bacteria. To accelerate this process, bacterial cultures can be introduced, significantly reducing the retting period to 7–10 days compared to the conventional method (Hasan et al., 2020). However, maintaining bacterial cultures in liquid media poses challenges, including limited shelf life, bulkiness, and handling difficulties. To address these issues, this experiment aims to evaluate the retting efficiency of bacterial consortia when incorporated into carrier materials.

Expected outcome: To find out suitable dose of bacterial inocula within carrier material for eco-friendly and rapid jute retting

Status of program: New program

Date of initiation and duration: March-August/2025

Name of the Investigator: Md. Zablul Tareq, Md. Wali Ulla, Md. Abu Sadat, Md. Ruhul Amin, Borhan Ahmed and S. M. Mahbub Ali

Location: Genome Research Centre, BJRI, Dhaka

Experimental details

Methodology

Carrier material: Rice bran + Talk (1:1)
Jute ribbon=10kg
Pond water=50L
Inocula: Six bacterial consortia
Inocula concentration: $1x10^{10}$ CFU/ml
Inocula: Carrier material=1:5
Plant age: 110-120 days

Treatments:

- T_1=Control (No inocula pellet: No Carrier Material:: 0ml: 0 g)
- T_2= (Fresh inocula pellet: Carrier Material::100ml :500g)
- T_3= (Fresh inocula pellet: Carrier Material::50ml:250g)
- T_4= (Fresh inocula pellet: Carrier Material:: 25ml:125g
- T_5= (Fresh inocula pellet: Carrier Material:: 12.5ml:63g)

Replication: 2

Records to be kept

- Environmental temperature
- Water temperature in jak
- Bacterial survivability
- Days to retting

PROGRAM AREA: ADVANCEMENT OF GENOMICS AND BIOINFORMATICS APPLICATION IN JUTE AND ALLIED FIBER CROPS

PROJECT 11. SYSTEMATIC ANALYSIS AND CURATION OF GENES ACROSS THE GENOME

11.1 Title of the experiment: Genome wide identification of chitinase encoding genes from *Macrophomina phasiolina* genome

Background

Chitinase-encoding genes play a crucial role in plant improvement due to their ability to enhance resistance against fungal pathogens. Chitinases are hydrolytic enzymes that break down chitin, a major structural component of fungal cell walls, thereby inhibiting fungal growth and spread. By introducing or upregulating chitinase genes in plants through genetic engineering or selective breeding, researchers can develop crops with increased tolerance to fungal infections, reducing the need for chemical fungicides and promoting sustainable agriculture. Additionally, chitinases can contribute to plant defense signaling pathways, bolstering the overall immune response and improving plant health and productivity under biotic stress conditions.

Objective:

- Identification and characterization of candidate gene for chitinase synthesis genes
- Updating genomic data of *Macrophomina phasiolina* genome

Expected output: We will get Chitinase-encoding genes with their important charateristic for crop improvement

Duration of the study: March, 2025 to February, 2026.

Name of the Investigators: Md. Ruhul Amin, M. A. Sadat, Md. Wali Ullah, Afsana Mimi, Md. Zablul Tareq, and S. M. Mahbub Ali

Location: Genome Research Center (GRC), BJRI

Experimental Details:

The comprehensive in silico approach provides valuable insights into gene function, structure, and evolutionary significance, aiding in targeted gene manipulation and plant improvement strategies.

- Sequence Retrieval
- Sequence Quality Check and Translation
- Functional Annotation
- Physicochemical Property Analysis
- Subcellular Localization Prediction
- Secondary and Tertiary Structure Prediction
- Phylogenetic Analysis
- Gene Ontology (GO) and Pathway Analysis
- Promoter and Regulatory Element Analysis

Records to be Preserved:

1. Records of identified genes will be preserved.
2. All data related to genomic analysis of identified genes will be recorded.

Estimated Cost: 150000 BDT

11.2 Title of the experiment: Potassium Transporter Genes in Jute Species: Genome-Wide Identification and Abiotic Stress Responses

Background and objectives: Potassium (K^+) is an important inorganic macronutrient playing roles in enhancement of growth and development, flower formation, fruit quality and yield of plant. In particular, K^+ also contributes to many physiological and metabolic process that further improve plant tolerance to various abiotic stresses including salt, drought and cold. It

contributes 5-10% of the total dry weight and is abundantly present in the cytosol. The plant cell utilizes K^+ for different fundamental process, i.e. osmoregulation, stomata movement, cell elongation, electrical neutralization of anionic groups and control of membrane polarization. Potassium ion is also involved in the maintenance of pH in the cytosol, which crucial for enzyme functioning. K^+ is also accumulated in mitochondria and certain other organelles like vacuoles, nucleus, and chloroplasts. Storage of K^+ in vacuole is very helpful in maintaining the concentration of potassium ion in cytosol through its exchange between these two compartments. Despite its importance and abundance in the cell, an optimum cellular concentration of K^+ must be maintained for proper cellular functioning. Maintenance of K^+ concentration in the cytoplasm is correlated with plant tolerance to salinity and drought stress. Moreover, it is also important for neutralization of anions involved in the maintenance and modulation of membrane potential. A complex transport system consisting of various transporters and channels is involved in homeostasis of K^+ in the cytosol. This system mediates the absorption and translocation of K^+ from soil to different parts of the plant. The K^+ transport systems are multifunctional protein encoded by a large family found in most plant tissue to contribute different physiological and biochemical processes. The transport of potassium ion is accomplished by a variety of transporter proteins which have categorized into the five major K^+ transporter families comprising three transporter and two voltage-gated K^+ channels families. The K^+ transporter family includes (1) the HAK/KT/KUP family of high-affinity transporters, (2) the HKT family of high-affinity transporters, and (3) the KEA family of efflux antiporters while two major types of voltage-gated K^+ channels are (i) voltage-gated K+ channels, (ii) non-voltage-gated (tandem-pore) K^+ (TPK) channels**.**

Expected output: Molecular characterization of K^+ transport systems revealing species-specific stress response networks in Corchorus species.

Duration of the study: March, 2025 to February, 2026.

Name of the Investigators: Borhan Ahmed, Wali Ullah, Abu Sadat and S. M. Mahbub Ali

Location: Genome Research Center (GRC), BJRI

Experimental Details:

1. Potassium transporter family Genes Identification

- Database Development**:** Curate a potassium transporter gene family database through literature mining and integration of existing repositories.
- Homology-Based Gene Discovery**:** Perform BLASTp (e-value $\leq 1e^{-10}$) against *C. olitorius* and *C. capsularis* genomes.

2. Structural and Functional Characterization

- Domain & Motif Analysis: Predict domains using InterProScan (signature databases: Pfam, SMART).
- Identify motifs via MEME Suite (E-value $<1e^{-10}$)
- Gene Properties**:** Compute physicochemical properties (ExPASy ProtParam).
- Subcellular localization : Prediction through mPLoc server3. Evolutionary and Genomic Analysis
- Phylogenetic Classification**:** Construct ML trees (MEGA-X, 1000 bootstraps); classify clades with known potassium transporter gene families.
- Synteny & Collinearity: Confirm syntenic blocks by reciprocal BLAST and visual inspection (Circos plots).
- Determination of the promoter region-binding motif using PLANTCARE database.

3. Functional & Regulatory Validation

- Expression Profiling**:** Transcriptome data analysis of identified genes among different tissues and stresses using publicly available raw RNA Seq data.

- Quantitative PCR (qPCR) validation: Select high-priority candidate genes from *Corchorus olitorius* and *C. capsularis* for expression profiling under controlled abiotic stress conditions

Records to be Preserved:

3. Records of identified genes will be preserved.
4. All data related to genomic analysis of identified genes will be recorded.

Estimated Cost: 150000 BDT