

ANNUAL REPORT 2018



BANGLADESH TEA RESEARCH INSTITUTE

SRIMANGAL-3210, MOULVIBAZAR

An organ of

BANGLADESH TEA BOARD

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DIRECTOR'S REPORT STAFF

The report of the technical staff shows the position as on 31 December 2018

Director : Dr. Mohammad Ali
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PGD (India), Ph.D

TECHNICAL DIVISIONS

1. DEPARTMENT OF CHEMISTRY

Chief Scientific Officer : **Vacant**

A. SOIL SCIENCE DIVISION

Principal Scientific Officer : **Abdul Qayyum Khan**
B.Sc. (Hons), M.Sc. (DU) MSc
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Scientific Officer : **Kanij Fatema Tuz Zohora**
B.Sc. (Hons), MS. (CU)

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Scientific Officer : **Md. Arifur Rahman Bhuiyan**
BS. (Hons), M.S. (DU)

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B. BIOCHEMISTRY DIVISION

Scientific Officer : **Vacant**

2. DEPARTMENT OF CROP PRODUCTION

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A. BOTANY DIVISION

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B.Sc.Ag(Hons), MS. (BSMRAU)

Scientific Officer : **Ishraath Jahan**
B.Sc. (Hons), MS. (CU)

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B. AGRONOMY DIVISION

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Scientific Officer	: Md. Imran Hossen B.Sc.Ag(Hons), M.S. (SAU)
Scientific Officer	: Sultan Md.MonwarulIslam B.Sc.Ag(Hons), M.S. (BAU)
Farm Supervisor	: Roni Debnath M.Sc.Ag. (Hons), MS (SAU)

3. DEPARTMENT OF PEST MANAGEMENT

Chief Scientific Officer	: Vacant
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A. ENTOMOLOGY DIVISION

Scientific Officer (Deputation)	: Shovon Kumar Paul B.Sc.Ag.(Hons.) (KU), M.S. (BSMRAU)
Scientific Officer	: Md. Jahangir Alam B.Sc.Ag(Hons), M.S. (BAU)
Senior Farm Assistant	: Md. Abul Kalam Azad Dip.-in-Agric. (Dhaka)

B. PLANT PATHOLOGY DIVISION

Senior Scientific Officer	: Mohammed Syeful Islam B.Sc.Ag., MS (BAU)
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TECHNOLOGY DIVISION

Scientific Officer (Deputation in Bandarban)	: Dulal Chandra Dey BSc. Engg Mech. (BUET)
Senior Tea Maker	: Md Amir Ali BSc. (RU)
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STATISTICS & ECONOMICS DIVISION

Senior Scientific Officer	: Dr. Shefali Boonerjee B.Sc. (Hons), M.Sc. (RU) Ph.d (DU)
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Senior Scientific Officer & Officer in-charge	: Ashim Kumar Saha B.Sc. (Hons), M.Sc (DU)
Scientific Officer	: Raihan Mujib Himel B.Sc.Ag (Hons), M.S. (BSMRAU)
Scientific Officer	: Md. Rayhan-Ur- Rahman B.Sc.Ag (Hons), M.S. (BSMRAU)
Senior Farm Assistant	: Ajit Chandra Chowdhury B.A. (NU)

BTRI SUB-STATION, KALITI, KULAURA

Field Assistant : **Aminul Islam Mandal**
Dip.-in-Agric. (Sherpur)

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Senior Scientific Officer & Officer in-charge : **Dr. Mohammad Shameem Al Mamun**
B.Sc.Ag. (Hons.), M.S. (BAU), PGD (India), Ph.D (SUST)

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M. Sc (NU)

Senior Farm Assistant : **Md. Zayed Imam Siddique**
Dip. - In- Agric. (Rangpur)

BILASHCHERRA EXPERIMENTAL FARM

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M.Sc (NU)

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Dip.- in- Agric. (Mymensingh)

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Dip- in- Agric. (Rangpur)

Field & Store Assistant : **Rajib Ahmed**
Dip- in- Agric. (Dhaka)

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M. Sc. (RUD), M.S.S. (NU), LL.B (NU)
PGD in Lib Sc. (Dhaka)

RESEARCH

This report reflects the research and other activities of the institute for the year 2018 starts from 1st January to 31rd December.

During the year under report, a total of 63 experiments on different aspects of tea culture were in progress in different disciplines research divisions. The main features are briefly enumerated below:

Soil Science Division carried out researches on two major fields in respect of fertilizer efficiency and improvement of soil properties. Effect of dolomitic lime on the yield of tea and soil properties has been undertaken. The importance of organic fertilizers and its sources were also encompassed. Experiments on effect of vermicompost on soil properties, growth and yield of mature tea; status of micronutrients in tea soils and its effects on the growth and yield of young and mature tea, performance of bio-char as a soil amendment and its effect on tea soil properties was started during the reporting year. Research on present status of toxic heavy metals (pb, cd, hg, cr) in tea soils, green leaves & made tea and determination of critical values of nutrients in tea soil and plant leaf in sylhet, chattogram and panchagarh region were also initiated during the reported year. Besides, the most useful advisory services on planting, replanting, manuring, soil rehabilitation, extension and other aspects of tea husbandry were rendered to the tea industry through soil analyses. A total of 3301 soil, fertilizer including lime samples were analyzed during 2018.

Plant improvement received top priority as usual amongst the research activities of Botany Division. Several new test clones were under different stages of long term yield and quality trials. Hybridization between clones and agrotypes, collection and preservation of germplasms of tea from home and exotic sources were continued.

Agronomy Division carried out research activities on various cultural practices e.g. Planting, pruning, tipping, plucking and related agro-techniques in tea field and effect of different type of composts on growth and development of tea plant. During the reporting year, a new experiment was initiated on mechanization of tea plucking. Labor crisis is becoming a problem in many of the tea growing area of Bangladesh as well as in many of the tea estates. To cope up the upcoming problem of the tea industry, it may be needed to change the harvesting policy of tea.

The Research of Entomology Division includes cultural and mechanical control of insect pests, bio-control of insect pests, screening of pesticides, host plant resistance and pesticide residue analysis in tea. This Division also rendered all sorts of advisory services to tea estates on problems arising out of pests of tea and analyzed soil and water for nematode count. This Entomology Division also engaged in analyzing made tea samples for the detection of pesticide residue received from different tea estates, companies and organizations.

Plant Pathology Division was mainly concerned with the isolation, culture & identification of major disease causing organisms of tea and ancillary crops, Screening of different fungicides & herbicides, Use of Plant Growth Promoting Rhizospheric (PGPR) Microbes in controlling different tea diseases, Identification of potential source of infection of tea disease for disease development were the new areas of research of the division.

Statistics and Economics division engaged on the economic efficiency of the test clones of BTRI and adoption of BTRI Innovated Technologies and its Extension to Bangladesh Tea Industry. The division also assisted in designing experiments and related statistical analyses of data of other research divisions as and when required.

Normal manufacture of tea in the factory from the green leaves harvested from its Main station and Bilashcherra experimental farm was conducted by Technology Division.

The supply of improved planting materials in the form of fresh as well as rooted cuttings and biclonal seeds were continued from BTRI and sub-stations (including CHT project) during 2018. A total of 34,89,200 fresh cuttings, 65,375 rooted cuttings and 880 kg bi-clonal seeds were distributed to different tea estates in the year 2018. Technology disseminations through seminars, workshops and advisory visits were continued in the Main station and Sub-stations during the year.

TEA TASTING SESSIONS

As a regular annual feature and group exercise, ten general tea tasting sessions were conducted for the tea planters to improve further the manufacturing of quality tea from the tea factories as a whole at BTRI Tea Tasting Room for Sylhet. In addition, Open Day Tea Tasting Sessions were also arranged in each of the four valley circle clubs.

VISITS

Scientific personnel of the institute and sub-stations paid a total of 326 experimental and 135 advisory visits to different tea estates in order to solve various local problems connected with tea culture and experimental purposes during the period under report.

PUBLICATIONS

Annual Report 2017 was published in July 2018 and Circular no. 143 was published in February 2018.

ANNUAL COURSE / SEMINAR/ WORKSHOP

The 53th Annual course (6 day-duration) was held on 'Tea Culture' at the Institute for the covenanted staff of Tea Estates of greater Sylhet. Same courses were held at Chattogram and Panchagarh Sub-stations having two-day duration each. In these courses, Managers, Assistant Managers, Proprietors of different Tea Estates, small tea growers, Scientific Officers of BTRI and Officers of PDU were participated.

MANAGEMENT TRAINING COURSE

Scientists of BTRI conducted a series of Management Training Modules on nursery, young and mature tea management, pruning, pest management, soil management, etc. organized by MTC of Bangladesh Tea Board for the management executives and staffs of different Tea Estates during the period under report.

OFFICIAL CORRESPONDENCE

Total receipts - 3512
Total issues - 2263

LIBRARY

BTRI Library contained 4,936 books and 9,150 Journals, Annual Report, Pamphlets, Circulars, Newsletter, Proceedings and Research highlights, etc.

(Dr. Mohammad Ali)

Director, BTRI.

SOIL SCIENCE DIVISION**Abdul Qayyum Khan**

Principal Scientific Officer

STAFF

Mr. Apu Biswas, Senior Scientific Officer left on deputation for PhD from the division on 13 December 2018. Mrs. Farhana Jahan Chowdhury joined as Scientific Officer on 31 January 2018. There was no other change in the personnel position of the division during the period under report.

RESEARCH

A total of seven experiments were conducted during the year 2018 by Soil Science Division. Progress of the experiments is given below.

SS 1: RESPONSE OF DOLOMITE LIME AND ITS EFFECT ON THE CHANGES OF SOIL PROPERTIES AND YIELD OF MATURE TEA (2016-2019)

To estimate the effect of dolomite lime on the yield of mature tea, a field experiment was conducted at Srigobindpur Tea Estate. The experiment was laid out in a RBD having seven treatments and three replications. Dolomite was applied after a good shower in 1st week of March, 2018. The experiment was laid out in the year 2016 and will be continued upto 2019. Each plot size was 14.00 m². Usual cultural operations and pest control measures were taken as and when needed. Regular weekly harvesting data were recorded during the cropping season. Treatment combinations are as follows:

T ₁ = Control	T ₅ = 2000 kg/ha dolomite
T ₂ = 500 kg/ha dolomite	T ₆ = 2500 kg/ha dolomite
T ₃ = 1000 kg/ha dolomite	T ₇ = 3000 kg/ha dolomite
T ₄ = 1500 kg/ha dolomite	

In every experimental plot basal dose of chemical fertilizers (N₂₂₀, P₄₀, K₁₀₅ & Zn₁₀ kg/ha) were applied. Fertilizer was applied in two split doses. The 1st dose was applied after a good shower of monsoon and the 2nd dose was applied in 1st week of August, 2018.

Table 1. Fertility status of the initial soil of the experimental field

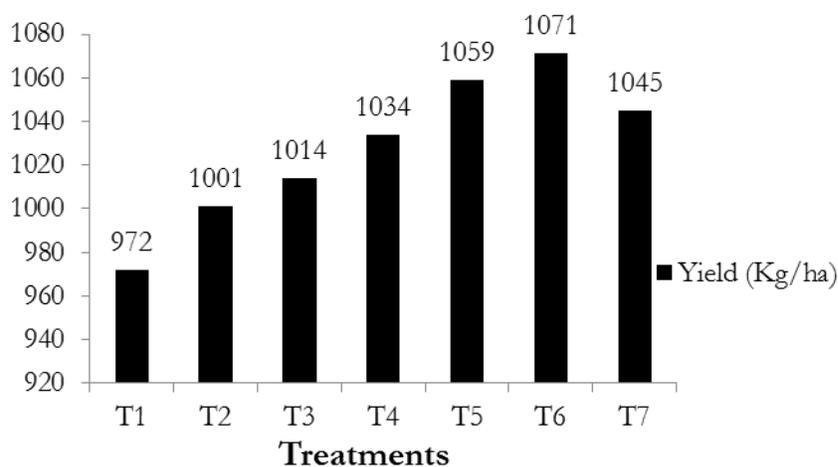
Location	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm	Av. Ca ppm	Av. Mg ppm
Srigobindpur T.E	SCL	4.7 5	1.08	0.125	7.95	51.26	78.61	19.20
Critical value	SL - L	4.5- 5.5	1.0	0.1	10	80	90	25

SCL- Sandy Clay Loam, SL- Sandy Loam L- Loam, O.C-Organic Carbon

Table 2. Soil analytical results at the end of the year 2018

Treatment	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm
T ₁	SCI	4.3	1.04	0.105	5.11	59.09
T ₂	SCI	4.7	1.08	0.109	6.95	66.74
T ₃	SCI	4.8	1.16	0.115	11.18	72.25
T ₄	SCI	4.9	1.18	0.119	12.02	73.98
T ₅	SCI	4.9	1.22	0.124	12.15	76.88
T ₆	SCI	5.1	1.23	0.126	16.91	80.01
T ₇	SCI	5.5	1.16	0.118	6.27	62.49

The result shows that, increase of yield was recorded in every treatment over the control. The highest made tea yield (1071 kg/ha) was recorded in treatment T₆ where 2500 kg/ha dolomite with basal doses of chemical fertilizers were applied (Fig. 1). The rate of increase over the control was 10.19% in case of treatment T₆, and the increase of yield due to different treatment was statistically significant at 1% level ($F = 7.61$).

**Fig 1. Effect of different dolomite lime doses on the yield of tea (Srigobindpur T.E, 2018)**

SS 2: EFFECT OF VERMICOMPOST ON SOIL PROPERTIES, GROWTH AND YIELD OF MATURE TEA (2016-2019)

The long term (2016-2019) experiment has been undertaken to observe the effect of vermicompost on soil properties, growth and yield of mature tea at Bilashcherra Experimental Farm. Evaluation of the dose and efficiency of vermicompost on tea production as well as minimize the use of chemical fertilizer is the prime goal of this experiment. Dolomitic lime and NPK were applied on the soil after a good shower, simultaneously vermicompost was also applied and mixed with the soil by light forking. Usual cultural practices and pest control measures were taken as and when needed. Regular weekly plucking data were recorded during the plucking season of the year 2018. The experiment will be continued upto 2019. There are

eight treatments in a Randomized Block Design with three replications. The unit plot size was 13.40 m². The treatment combinations are presented below.

T ₁ = Control	T ₅ = Vermicompost (6.0 tons/ha)
T ₂ = 100% Recommended fertilizer dose	T ₆ = Vermicompost (1.5tons/ha) + 100% Recommended fertilizer dose
T ₃ = 80% Recommended fertilizer dose	T ₇ = Vermicompost (3.0tons/ha) + 80% Recommended fertilizer dose
T ₄ = 60% Recommended fertilizer dose	T ₈ = Vermicompost (6.0tons/ha) + 60% Recommended fertilizer dose

(Recommended Fertilizer dose: N¹⁰⁰, P³⁰, K⁶⁰ kg/ha)

Table 3. Fertility status of the initial soil of the experimental field

Location	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm	Av. Ca ppm	Av. Mg ppm
BEF	SCI	4.5	1.01	0.120	5.49	48.31	49.26	9.52
Critical value	SL - L	4.5-5.5	1.0	0.1	10	80	90	25

SCL- Sandy Clay Loam, SL- Sandy Loam L- Loam, O.C-Organic Carbon

Table 4. Soil analytical results at the end of the year 2018

Treatment	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm
T ₁	SCI	4.4	1.09	0.112	6.38	51.32
T ₂	SCI	4.8	1.06	0.110	30.55	82.30
T ₃	SCI	4.8	1.09	0.112	25.62	78.25
T ₄	SCI	4.7	1.13	0.117	19.71	73.45
T ₅	SCI	4.7	1.39	0.142	22.28	72.05
T ₆	SCI	4.9	1.22	0.125	36.19	140.52
T ₇	SCI	5.0	1.27	0.131	39.20	98.56
T ₈	SCI	4.9	1.33	0.136	46.18	86.21

The result shows that, increase of yield was recorded in every treatment over the control. The highest made tea (430 kg/ha) was recorded in treatment T₇ where 3.0 tons/ha vermicompost with 80% of the recommended doses of chemical fertilizers were applied (Fig. 2). The rate of increase over the control was 8.59% in case of treatment T₇. The increase of yield due to different treatment was statistically significant at 1% level (F = 4.78).

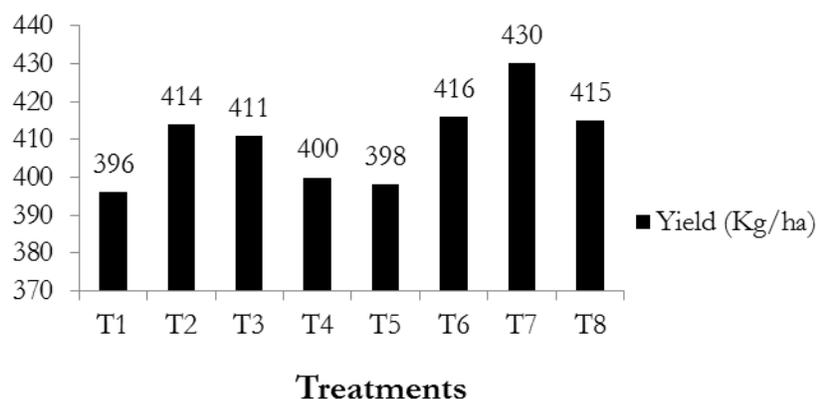


Fig 2. Effect of vermicompost on the yield of tea (BEF, 2018)

SS 3: STATUS OF MICRONUTRIENTS (B, Mo, Zn, Mn, Fe & Cu) IN SOME SELECTED TEA SOILS & ITS EFFECTS ON THE GROWTH AND YIELD OF YOUNG TEA AND MATURE TEA.

Micronutrients are very important for plants to complete their life cycles but need only in a small amount. Micronutrients such as Fe, Mn, Cu, Zn etc function in the enzyme systems in tea plant. They also play an important role in chlorophyll production, oxidation- reduction system, co-enzymatic factor etc. which is ultimately influence on growth, yield and quality of tea. Though very small application of micronutrient may produce dramatic result but the effects of micronutrient deficiency may be severe in term of stunted growth, low yield, dieback and even plant death.

So, it is very important to know the status of micronutrients (B, Mo, Zn, Mn, Fe & Cu) in tea soils of Bangladesh which will helpful for the proper nutrient management.

Methodology: Soil samples were collected randomly from tea sections of BTRI and BEF and analyzed accordingly to estimate the status of micronutrients. The treatments of the experiment will be fix after know the status of micronutrients. Both pot and field experiment will be done.

Duration: 2017-2022

Location: BTRI, BEF and different tea gardens of Sylhet, Chattogram and Panchagarh.

Progress: Micronutrient analysis of the collected 50 (fifty) soil samples of BTRI farm, Bilashcherra Experimental farm and Luskerpore Tea Estate has been done. Zinc, Iron, Manganese and copper analysis of the soil samples has been completed. Minimum content of Zn, Fe and Cu were 0.053, 0.14 and 0.015 ppm respectively. Among 50 soil samples Manganese content of 19 soil samples were in Below Detection Level (BDL). Maximum content of Zn, Fe, Mn and Cu were 1.64, 16.99, 6.54 and 0.47 ppm respectively. In the reporting year, 651 soil samples from 47 tea estates has been collected and analysis is going on.

SS 4: STUDIES ON PHYSICAL PROPERTIES OF SOME SELECTED TEA SOILS OF BANGLADESH AND THEIR INFLUENCE ON CHEMICAL PROPERTIES AND YIELD OF TEA

The life cycle of tea plant is long, yields tend to decline after four or five decades and plant death or stunted growth is a common occurrence in above 40-yr-old tea fields. The decline in yield, as well as the increase in plant mortality or stunted growth under long-term tea cultivation, however, may also reflect degradation of soil health. So this research will help to assess the long-term impact of growing tea on soil physical properties and how it correlates with crop yield.

Methodology:

This research will be conducted by selecting some tea gardens with old, mature and young tea plantation randomly. The following physical properties of soils of those selected gardens will be assessed by using standard methods:

- a) Texture
- b) Structure
- c) Bulk Density
- d) Particle Density
- e) Compaction
- f) Hydraulic Conductivity

Chemical properties will be determined also. All the data will be statistically analyzed by using standard statistical packages.

Location: BTRI, Bilashcherra Experimental Farm and different tea gardens of Bangladesh

Duration: 2017-2022

Progress: Soil sample collection and analysis of physical properties is going on.

SS 5: PRESENT STATUS OF TOXIC HEAVY METALS (Pb, Cd, Hg, Cr) IN TEA SOILS, GREEN LEAVES AND MADE TEA IN BANGLADESH.

Tea is rich in many trace inorganic elements. In addition to many essential elements required for human health, some toxic elements may also be present in tea leaves. This could be due to polluted soil, application of pesticides, fertilizers of industrial activities. There is often little information available about the safety of tea leaves and finished products with respect to heavy metal contamination. Due to the significant amount of tea consumed, it is important to know the toxic metal contents.

Location: BTRI, Bilashcherra Experimental Farm and different tea gardens of Sylhet, Chattogram and Panchagarh.

Duration: 2018-2021

Progress: 61 soil samples, 53 green leaves and 18 made tea samples from different tea estates have been collected and analysis is going on.

SS 6: PERFORMANCE OF BIO-CHAR AS A SOIL AMENDMENT AND IT'S EFFECT ON TEA SOIL PROPERTIES.

Bio char is the porous carbonaceous solid produced by thermochemical conversion of organic materials in an oxygen depleted atmosphere which has physicochemical properties suitable for the safe and long-term storage of carbon in the environment and, potentially, soil improvement. A good portion of the carbon so produced will remain in soils for hundreds and, possibly, thousands of years. Hence, biochar can be an important component of a global response to carbon abatement, though the challenges of achieving such a large-scale utilization of biochar would be considered. Some possible reasons which help to account for the impacts of biochar on soils are: 1) increase in pH of acid soils, 2) increase in water retention, especially sandy and silty soils, 3) provision of nutrients in the ash contained within the biochar, 4) enhancement of the cation exchange capacity (CEC) of the soil, so increasing nutrient use efficiency, 5) enhancement of microbial communities including bacteria, mycorrhizae and fungal hyphae and 6) benefits to soil physical properties. The long term (2018-2021) experiment has been undertaken to observe the effect of bio-char on soil properties, growth and yield of mature tea at BTRI Farm. The experiment was laid out in a RBD having four treatments and three replications. Bio-char was applied in 2nd week of August, 2018. The experiment was laid out in the year 2018 and will be continued upto 2021. Each plot size was 28.43 m². Usual cultural operations and pest control measures were taken as and when needed. Regular weekly harvesting data were recorded during the cropping season.

Treatment combinations are as follows:

T ₁ = Control (Recommended fertilizer dose)	T ₃ = 1.5 t/ha Bio-char + Recommended fertilizer dose
T ₂ = 1.0 t/ha Bio-char + Recommended fertilizer dose	T ₄ = 2.0 t/ha Bio-char + Recommended fertilizer dose

Table 5. Fertility status of the initial soil of the experimental field

Location	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm
BTRI	SCL	4.88	1.25	0.127	29.72	71.43
Critical value	SL - L	4.5-5.5	1.0	0.1	10	80

SCL- Sandy Clay Loam, SL- Sandy Loam L- Loam, O.C-Organic Carbon

Table 6. Soil analytical results at the end of the year 2018

Treatment	Texture	pH	O.C %	Total N %	Av. P ppm	Av. K ppm
T ₁	SCL	4.7	1.21	0.128	34.80	43.23
T ₂	SCL	5.2	1.28	0.130	67.08	45.57
T ₃	SCL	5.0	1.35	0.138	68.64	45.72
T ₄	SCL	5.0	1.42	0.135	71.09	48.03

The result shows that, increase of yield was recorded in every treatment over the control. The highest made tea yield (2726 kg/ha) was recorded in treatment T₃ where 1.5 t/ha bio-char with basal doses of chemical

fertilizers were applied (Fig. 3). The rate of increase over the control was 10.59% in case of treatment T₃, and the increase of yield due to different treatment was statistically insignificant.

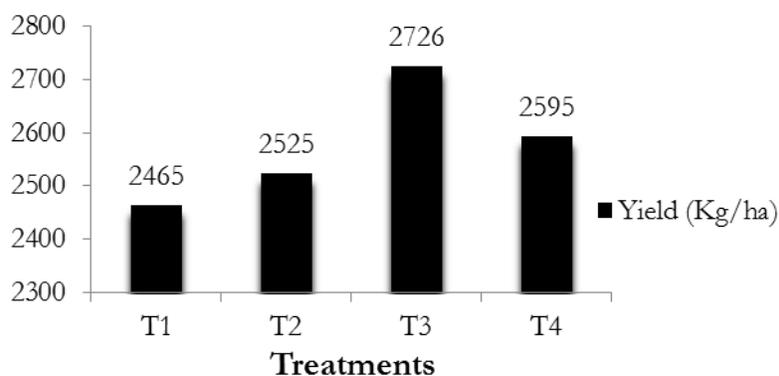


Fig 3. Effect of bio-char on the yield of tea (BTRI, 2018)

SS 7: DETERMINATION OF CRITICAL VALUES OF NUTRIENTS IN TEA SOIL AND PLANT LEAF IN SYLHET, CHATTOGRAM AND PANCHAGARH REGION.

Critical values of nutrients in tea soil and plant leaf are very important for proper fertilizer management. Critical values of some nutrients in tea soils of Bangladesh were optimized earlier. But soil fertility status is changing day by day. So, now it's a crucial time to estimate critical values of essential elements in tea soil as well as tea plant leaves on the basis of present scenario of tea soils of Bangladesh.

Location: different tea gardens of Sylhet, Chattogram and Panchagarh.

Duration: 2018-2021

Progress: Compilation of the last five years soil analytical data of different valley circles as a primary work of the research of 1st year has been completed. 651 soil samples from 47 tea estates have been collected and analysis is going on.

Advisory services

The advisory work is comprised of analysis of soil, water, fertilizer, lime, compost etc. collected or received from different tea estates. Soil samples were analyzed to find out their suitability for proposed new extension, replanting, rehabilitation and also to diagnose the cause of poor growth or failure of existing tea, to recommend appropriate fertilizer requirement and to study the suitability of establishing seed or V.P nursery. During the year under report a total of 3211 soil samples and 90 other samples from 91 tea estates were analyzed for different purposes, the breakup of which is presented in table 6.

Table 7. Number of samples analyzed

Year	Soil	Fertilizer	Lime/Dolomite	Water	Compost	Total (others)	(Soil & others)
2018	3211	60	05	06	19	90	3301

Table 8. List of Tea Estates from where soil and other samples were received or collected and analyzed during the year 2018

Afifanagar	Chundeecherra	Kaiyacherra Dalu	Monipur	sabari
Allynugger	Clevedon	Kaliti	Moomincherra	Sagurnal
Ameenabad	Daragaon	Kapnapahar	Moulvi	Saif
Amo	Dauracherra	Karnafuli	Nalua	Sathgao
Amrail	Deundi	Karotoa	New Samanbagh	Shumshenugger
Amtali	Dildarpur	Khadim	Noyapara	Silloah
Ayeshbagh	Dinarpur	Khan	Nurjahan	Srigobindpur
Bahadurpur	Etah	Kurmah	Ootterbhag & Inanugger	Surma
Baliseria	Fyzabad	Lackatoorah	Parkul	Teliapara
Bidyabeel	Ghazipore	Lalchand	Patharia	Udnacherra
Bijoya	Habibnagar	Lallakhal	Patrakhola	Zareen
Boban	Hafiz	Luskerpore	Phulbari	
Brindaban	Hatimara	Madabpur	Phulcherra	
Chaklapunji	Hooglicherra	Madanmohanpur.	Pooteacherra	
Champarai	Horincherra	Madhupur	Premnagar	
Chandbagh	Hossainabad	Marina	Rahmania	
Chandpore	Imam Bawani	Mathiura	Rajghat	
Chandpur Belgaon	Jagdishpur	Mazdehee	Rampore	
Chatlapore	Jagcherra	Mertinga	Rasidpur	
Chotolekha	Junglebari	Mirzapore	Rema	

OTHER ACTIVITIES

Advisory correspondence

A total of 230 advisory letters to different tea estates on soil, fertilizers, dolomite, compost and other soil related aspects were sent during the year 2018.

Tours

During the year under report officers of the division paid a total 94 visits to different tea estates and other related places for experimental, advisory and official purposes.

Courses on tea culture

Comprehensive lectures on different aspects of soil management were presented by the scientific personnel of the division at the annual course and workshops organized by BTRI for the covenanted staff of tea estate during 2018. Scientists of this division also delivered lectures as resource speakers at the Management Training centre (MTC) for Post Graduate Diploma Course organized by Project Development Unit (PDU) of Bangladesh Tea Board.

BOTANY DIVISION**Md. Ismail Hossain**

Chief Scientific Officer

Dr. Md. Abdul Aziz

Principal Scientific Officer

STAFF

Mr. Abul Kashem, Scientific Officer and Miss. Ishrath Jahan, Scientific Officer both have resigned from the job on June 2018. Mr. Md. Riyadh Arefin, Scientific Officer was transferred to BTRI Fatickcharri substation on July 2018. Mr. Md. Rayhan-Ur-Rahman joined as Scientific Officer on July, 2018. Mr. Md. Rayhan-Ur-Rahman was transferred to CHT project, Bandarban on September 2018. Again, Mr. Md. Rayhan-Ur-Rahman was transferred to BTRI Fatickcharri substation on November 2018. The post of one Senior Scientific Officer and one Field Assistant were vacant. There were no other changes in personnel position of the division during the period under report.

RESEARCH

Thirty two experiments in four programme areas namely –

Prog. Area-1: Preliminary selection of vegetative clones,

Prog. Area-2: Long term yield and quality trial of provisionally selected clones,

Prog. Area-3: Tea breeding & establishment of germplasm bank and

Prog. Area-4: Short term/mid term experiments were carried out by the division.

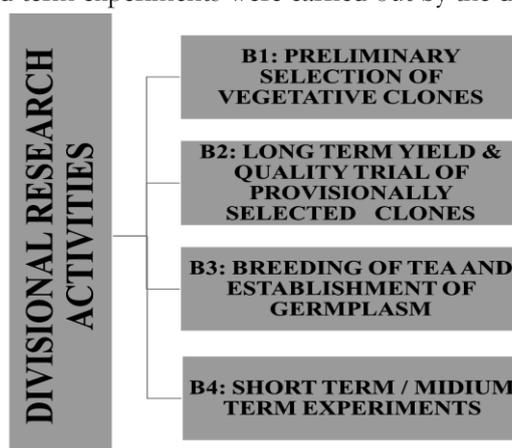


Fig 1. Divisional Activities of Boatny Division (2018)

Results are briefly described below:

B1: PRELIMINARY SELECTION OF VEGETATIVE CLONES (NO. OF EXPERIMENTS-3)

B1-27-7: Selection of Vegetative Clones at Shumshernugger T. E., Section Main Div. Sec. No. 9 (1993-2018).

A total of 2,528 cuttings from 15 selected bushes from Shumshernugger T.E. were collected and put into the rooting trial.

B1-28: Selection of Vegetative Clones at Amo T. E., Section No. 8 (1993-2018)

Twenty one new bushes have been selected during the period under report. The selected bushes have been pruned for collecting cuttings for rooting trial. A total of 2,352 cuttings from 12 bushes of section no. 1 of Amo Tea Estate were collected and planted in the nursery.

B1-31: Selection of Vegetative Clones at Baraoorah T. E., Section No. 8 (2007-2018)

Twenty three new bushes have been selected during the period under report. The selected bushes have been pruned for collecting cuttings for rooting trial. A total of 2,125 cuttings from 12 bushes of section no. 1 of Baraoorah Tea Estate were collected and planted in the nursery.

Progress:

- Preliminary selection of desirable mother bushes is continued at Shumshernugger, Amo and Baraoorah Tea Estates.
- A total of 21, 7 and 23 mother plants from variable seedling population of Amo, Shumshernugger and Baraoorah tea estates respectively have been selected.
- 25 plants are also selected from BTRI C2 area.
- Collection of cutting is going on from the selected plants for rooting trial in nursery in order to find out their rooting ability.

B2: LONG TERM YIELD & QUALITY TRIAL OF PROVISIONALLY SELECTED CLONES (NO. OF EXPERIMENTS-18)**B2-36: Yield and Quality Trial of Test clones Selected from Amo T. E. Test clones A/8/01, A/17/22, A/22/27 and A/22/40 against Control BT1 (BTRI, 1996-2020).**

The plants of this trial were light pruned at 63 cm in 2018. There were 21 plucking rounds in 2018. The yield data were analyzed and presented in Table-1.

Table 1. Yield of green leaves (g/plant)

Clone	A/8/01	A/17/22	A/22/27	A/22/40	BT1
Treatment mean	807.8	762.7	836.24	856.04	754.04

Treatment difference: Significant (LSD value at 5% level of significance= 154.7)

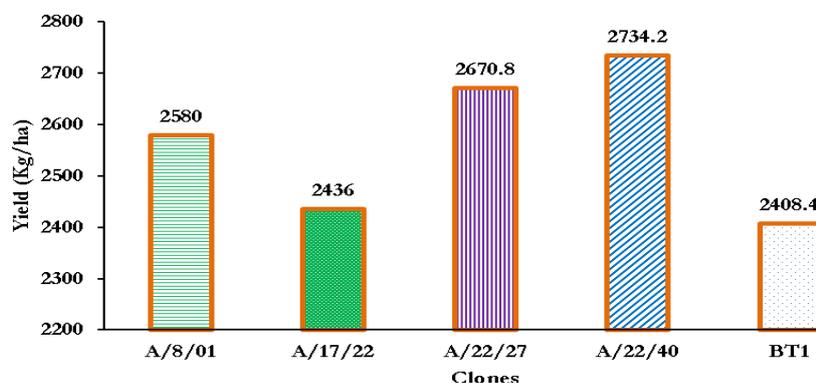


Fig. 2. Comparative yield of clones made tea (kg/ha)

The analytical results revealed that all test clones are comparable in terms of yield. The estimated made tea production in kg/ha is presented in Fig. 2. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 2.

Table 2. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/8/01	7.54	7.59	7.23	7.32	2.35	32.12	AA
A/17/22	7.24	7.25	7.15	7.24	2.49	31.37	A
A/22/27	7.65	7.49	7.39	7.32	2.15	32.43	AA
A/22/40	7.53	7.53	7.45	7.37	2.87	32.75	AA
BT1	7.54	7.71	7.47	7.45	2.91	33.19	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones excepting A/17/22 were comparable with the control BT1 in case of quality, Test clone A/17/22 was inferior in cup than that of control.

B2-38: Yield and Quality Trial of Test clones Selected from Chandpore, Shumshernugger and Amo T. Es.; Test clones C/J1/10, Sh/B/6/59, Sh/B/6/62 and A/8/24 against Control BT2 (BTRI, 1997-2021).

The plants of this trial were light skiffed at 82 cm in 2018. There were 29 plucking rounds in 2018. The yield data were analyzed and presented in Table-3 and the estimated made tea production in kg/ha presented in Fig. 3.

Table 3. Yield of green leaves (g/plant)

Clones	CHA/J1/10	Sh/B/6/59	Sh/B/6/62	A/8/24	BT2
Treatment mean	1034.2	1020.94	833.17	1149.1	866.6

Level of significance: Significant. (LSD value at 5% level of significance= 211.8)

The analytical results revealed that test clones CHA/J1/10, Sh/B/6/59 and A/8/24 significantly showed higher yield against Control BT2, while Sh/B/6/62 showed lower yield against Control BT2. The cup quality of made tea for all the test clones were assessed through organoleptic test and the average scores are presented in Table 4.

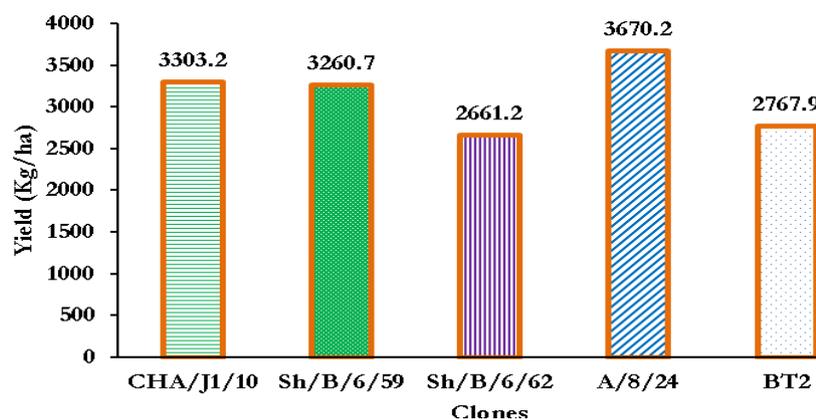


Fig. 3. Comparative yield of clones made tea (kg/ha)

Table 4. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
CHA/J1/10	7.67	7.34	7.38	7.38	2.84	32.42	AA
Sh/B/6/59	7.11	7.19	7.27	7.25	2.47	31.45	A
Sh/B/6/62	7.32	7.32	7.87	7.67	2.84	33.25	AA
A/8/24	7.40	7.30	7.48	7.39	2.68	32.24	AA
BT2	7.49	7.63	7.39	7.24	2.93	32.72	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones excepting Sh/B/6/59 have got comparable cup quality with test clone BT2 excepting the test clone's unique flavoury character. Test clone Sh/B/6/59 was inferior to the control BT2 in case of cup quality.

B2-39: Yield and Quality Trial of Four Test clones Selected from Shumshernugger T.E.; Test clones Sh/B/6/36, Sh/B/6/38, Sh/B/6/55 and Sh/B/6/67 against Standard BT1 (BTRI, 1998-2022).

The plants of this trial were medium skiffed at 78 cm in 2018. There were 18 plucking rounds in 2018. The yield data were analyzed and presented in Table-5. The estimated made tea production in kg/ha is presented in Fig. 4.

Table 5. Yield of green leaves (g/plant)

Clone	Sh/B/6/36	Sh/B/6/38	Sh/B/6/55	Sh/B/6/67	BT1
Treatment mean	502.72	727.22	641.72	594.45	563.53

Treatment difference- Significant. (LSD value at 5% level of significance= 187.8)

The analytical results revealed that test clones Sh/B/6/38, Sh/B/6/55 and Sh/B/6/67 showed significantly higher yield against Standard BT1, while Sh/B/6/36 showed lower yield against Control BT1.

The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 6.

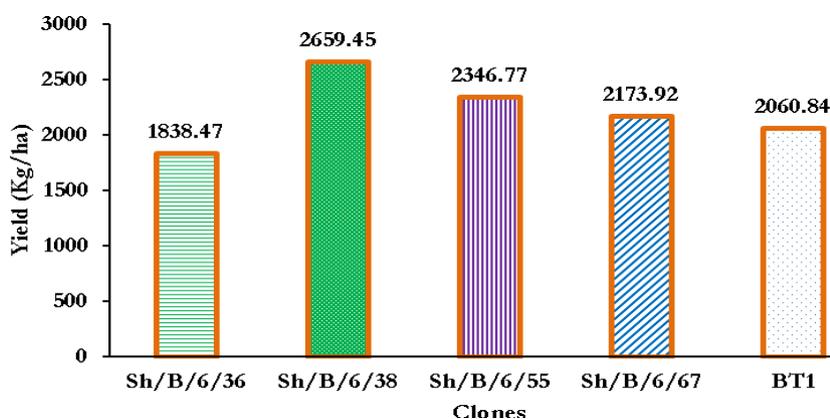


Fig. 4. Comparative yield of clones made tea (kg/ha)

Table 6. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
Sh/B/6/36	7.12	7.30	7.95	7.24	2.90	32.51	AA
Sh/B/6/38	7.36	7.41	7.56	7.25	2.75	32.33	AA
Sh/B/6/55	7.12	7.15	7.04	7.15	2.79	31.24	A
Sh/B/6/67	7.77	7.42	7.15	7.39	2.82	32.55	AA
BT1	7.26	7.42	7.53	7.33	2.96	32.50	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the Test clones excepting Sh/B/6/55 were comparable in cup with the control BT1. Test clone Sh/B/6/55 was inferior to the control BT1 in the case of cup quality.

B2-40: Yield and Quality Trial of Six Test clones – MZ/39, E/4, D/13, B2T1, BR2/97 and SDL/1 against Standard BT2 (BTRI, 2000-2018).

The plants of this trial were light pruned at 65 cm in 2018. There were 23 plucking rounds in 2017. The yield data were analyzed and presented in Table-7.

Table 7. Yield of green leaves (g/plant)

Clone	MZ/39	E/4	D/13	B2T1	BR2/97	SDL/1	BT2
Treatment mean	590.00	574.55	433.01	579.44	418.33	531.43	557.78

Treatment difference- Significant (LSD value at 5% level of significance= 69.581)

The analytical results reveal that yield difference was highly significant (at 5% level of significance) in 2018. Test clones MZ/39, B2T1 and E/4 were comparable in terms of yield with the control BT2 while the test clone, D/13, BR2/97 and SDL/1 performed lower yield than the control. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 8. The estimated made tea production in kg/ha is presented in Fig. 5.

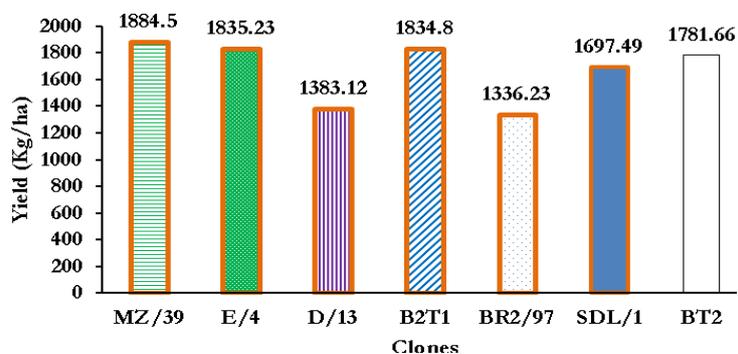


Fig. 5. Comparative yield of clones made tea (kg/ha)

Table 8. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
MZ/39	7.47	7.45	7.54	7.42	2.70	32.58	AA
E/4	7.49	7.69	7.44	7.38	2.61	32.61	AA
D/13	7.62	7.50	7.42	7.45	2.84	33.85	AA
B2T1	7.27	7.37	7.30	7.26	2.61	32.20	AA
BR2/97	7.60	7.38	7.43	7.42	2.73	32.57	AA
SDL/1	7.31	7.51	7.46	7.32	2.58	32.75	AA
BT2	7.42	7.49	7.45	7.34	2.67	32.27	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the Test clones were comparable in cup with the control BT2. However, the unique flavoury character of BT2 was not considered in the case of assessing cup quality.

B2-41: Yield and Quality Trial of Four Test clones Selected from Amo T. E.; Test clones – A/8/37, A/8/55, A/8/62 and A/8/66 against Standard BT2 (BTRI, 2000-2018).

The plants of this trial were light pruned at 65 cm in 2018. There were 24 plucking rounds in 2018. The yield data were analyzed and presented in Table-9.

Table 9. Yield of green leaves

Clone	A/8/37	A/8/55	A/8/62	A/8/66	BT2
Treatment mean	592.69	534.44	506.09	535.38	537.25

Treatment difference- Insignificant.

The analytical results revealed that all test clones are comparable in terms of yield. The estimated made tea production in kg/ha is presented in Fig. 6. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 8.

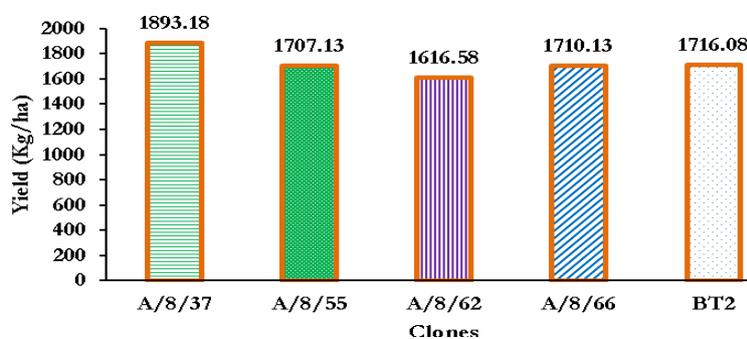


Fig. 6. Comparative yield of clones made tea (kg/ha)

Table 10. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/8/37	7.52	7.37	7.74	7.65	2.81	33.10	AA
A/8/55	7.32	7.36	7.26	7.31	2.25	31.50	A
A/8/62	7.40	7.55	7.63	7.40	2.81	32.60	AA
A/8/66	7.50	7.53	7.36	7.44	2.76	32.62	AA
BT2	7.56	7.75	7.34	7.38	2.67	32.40	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones excepting A/8/55 were comparable in terms of cup quality. The test clone A/8/55 was found inferior to the control. The flavoury character of BT2 was not considered in the case of assessing cup quality.

B2-42: Yield and Quality Trial of Four Test clones Selected from Phulcherra, Amo and Shumshernugger T. Es.; Test clones – A/17/16, Ph/9/1, Ph/9/9 and Sh/B/6/46 against Standard BT1 (BTRI, 2001-2018).

The plants of this trial were light skiffed at 77 cm in 2018. There were 27 plucking rounds in 2018. The yield data were analyzed and presented in Table-11

Table 11. Yield of green leaves (g/plant)

Clone	A/17/16	Ph/9/1	Ph/9/9	Sh/B/6/46	BT1
Treatment mean	873.62	675.81	703.35	880.20	724.41

Level of significance: Insignificant.

The analytical results revealed that all test clones are comparable in terms of yield. The estimated made tea production in kg/ha is presented in Fig. 7. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 12.

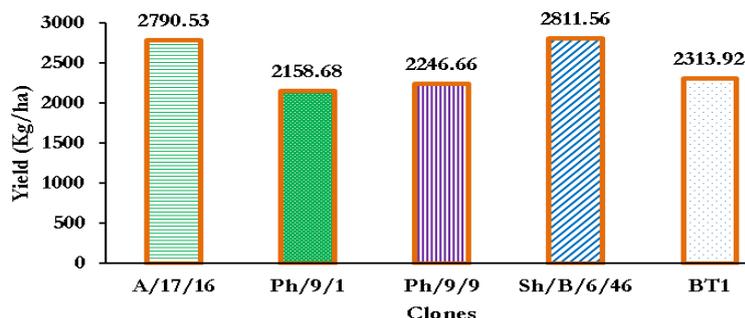


Fig. 7. Comparative yield of clones made tea (kg/ha)

Table 12. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/17/16	7.38	7.39	7.37	7.34	2.90	32.38	AA
Ph/9/1	7.32	7.28	7.28	7.22	2.50	31.60	A
Ph/9/9	7.42	7.56	7.63	7.31	2.57	32.45	AA
Sh/B/6/46	7.46	7.38	7.46	7.26	2.77	32.35	AA
BT1	7.38	7.59	7.73	7.33	2.87	32.90	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones excepting Ph/9/1 were comparable in cup with the control. The Test clone Ph/9/1 was found inferior to the control BT1.

B2-43: Yield and Quality Trial of Four Test clones Selected from Phulcherra and Hybrid Progeny; Test clones– Ph/9/4, Ph/9/25, Ph/9/40 and BS/67 against Standard BT5 (BTRI, 2001-2018).

The plants of this trial were light skiffed at 81 cm in 2018. There were 29 plucking rounds in 2018. The yield data were analyzed and presented in Table-13. The estimated made tea production in kg/ha is presented in Fig. 8.

Table 13. Yield of green leaves (g/plant)

Clone	Ph/9/4	Ph/9/25	Ph/9/40	BS/67	BT5
Treatment mean	944.28	747.21	935.41	1019.79	639.07

Treatment difference- Significant. (LSD value at 5% level of significance= 208.74)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of test clone Ph/9/4, Ph/9/40 and BS/67 were higher than the control BT5. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 14.

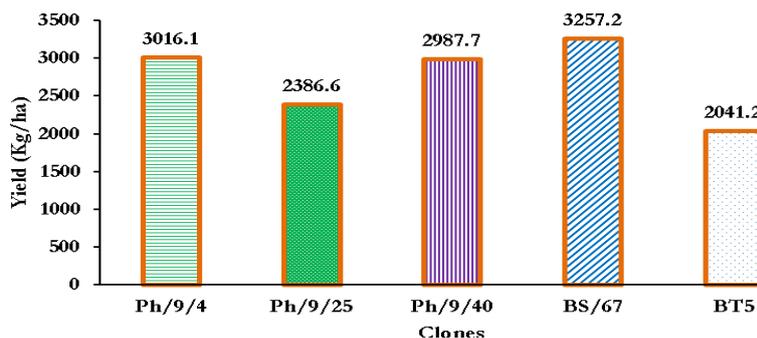


Fig. 8. Comparative yield of clones made tea (kg/ha)

Table 14. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creamin g down	Total	Remarks
	10	10	10	10	10	50	
Ph/9/4	7.14	7.50	7.52	7.36	2.72	32.24	AA
Ph/9/25	7.28	7.56	7.30	7.50	2.46	32.10	AA
Ph/9/40	7.43	7.24	7.17	7.16	2.68	31.60	A
BS/67	7.56	7.58	7.52	7.51	2.78	32.95	AA
BT5	7.66	7.35	7.52	7.46	2.65	32.86	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones were comparable in terms of cup quality with the control BT5 excepting Ph/9/40 which was inferior to the control.

B2-44: Yield and Quality Trial of Three Test clones Selected from Amo and Phulcherra T. Es.; Test clones– A/8B/1, Ph/9B/1, Ph/9/11 and against Standard BT1 (BTRI, 2003-2020).

The plants of this trial were deep skiffed at 61 cm in 2018. There were 26 plucking rounds in 2018. The yield data were analyzed and presented in Table-15.

Table 15. Yield of green leaves (g/plant)

Clone	A/8B/1	Ph/9B/1	Ph/9/11	BT1
Treatment mean	877.25	963.6	1089.2	797.5

Treatment difference- Significant. (LSD value at 5% level of significance= 178.6)

The analytical results revealed that all test clones are significantly produce higher yield against control. The estimated made tea production in kg/ha is presented in Fig. 9. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 14.

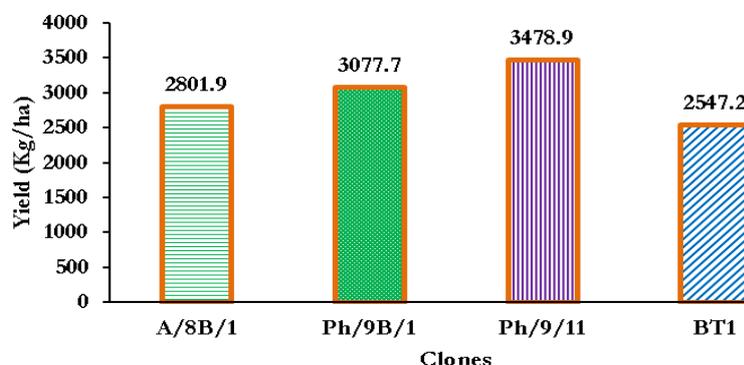


Fig. 9. Comparative yield of clones made tea (kg/ha)

Table 16. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/8B/1	7.10	7.72	7.39	7.15	2.29	31.65	A
Ph/9B/1	7.30	7.32	7.40	7.39	2.84	32.85	AA
Ph/9/11	7.72	7.38	7.11	7.31	2.89	32.41	AA
BT1	7.71	7.63	7.65	7.40	2.85	33.26	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the Test clones were comparable in terms of cup quality with the control BT1 excepting A/8B/1 which performed average cup quality with the control.

B2-45: Yield and Quality Trial of Three Test clones Selected from Amo, Phulcherra and Shumshernugger T. Es.; Test clones- A/8/61, Ph/9/68A, Sh/D/11/18 (retrial from Expt. B2-26) and One Introduced Clone SC/12/28 against Standard BT2 (BTRI, 2005-2022).

The plants of this trial were light skiffed at 78 cm in 2018. There were 29 plucking rounds in 2018. The yield data were analyzed and presented in Table-17.

Table 17. Yield of green leaves (g/plant)

Clone	Ph/9/68A	Sh/D/11/18	A/8/61	SC/12/28	BT2
Treatment mean	1089.57	1214.64	1118.60	1238.41	1037.60

Treatment difference- Significant. (LSD value at 5% level of significance= 208.4)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of test clone A/8/61, Ph/9/68A, Sh/D/11/18 and SC/12/28 were higher than the control BT2. The estimated made tea production in kg/ha is presented in Fig. 10. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 18.

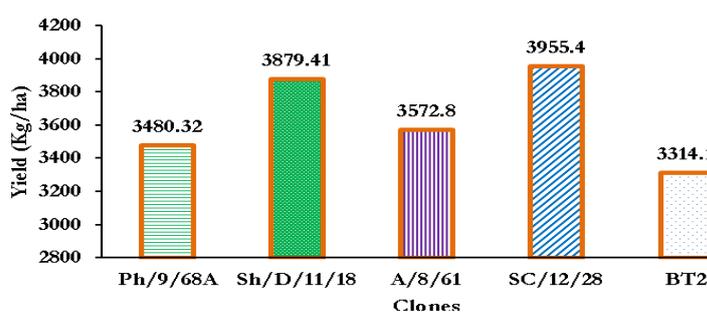


Fig. 10. Comparative yield of clones made tea (kg/ha)

Table 18. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/8/61	7.32	7.32	7.52	7.39	2.85	32.40	AA
Ph/9/68A	7.46	7.38	7.64	7.28	2.58	32.58	AA
Sh/D/11/18	7.21	7.39	7.66	7.27	2.82	32.35	AA
SC/12/28	7.21	7.20	7.35	7.49	3.01	32.26	AA
BT2	7.25	7.46	7.67	7.72	2.70	33.15	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones were comparable in terms of cup quality. However, the flavoury character of BT2 was not considered in the case of assessing cup quality.

B2-46: Yield and Quality Trial of Four Test clones Selected from BTRI Farm (Dulia Section); Test clones – D1/18, D/6, D/10 and D/12 against Standard BT5 (BTRI, 2005-2022).

The plants of this trial were light skiffed at 76 cm in 2018. There were 28 plucking rounds in the reporting year. The yield data were analyzed and presented in Table-19.

Table 19. Yield of green leaves (g/plant)

Clone	D1/18	D/6	D/10	D/12	BT5
Treatment mean	1149.6	1172.3	1043.2	1046.4	959.2

Treatment difference- Significant. (LSD value at 5% level of significance= 245.2)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of test clone D1/18, D/6, D/10 and D/12 were higher than the control BT5. The estimated made tea production in kg/ha is presented in Fig. 11.

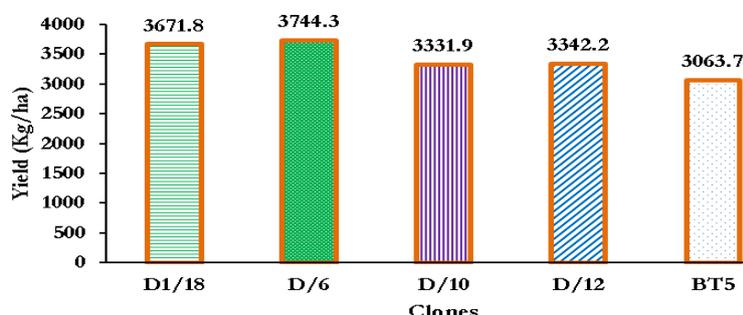


Fig. 11. Comparative yield of clones made tea (kg/ha)

The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 20.

Table 20. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
D1/18	7.71	7.41	7.68	7.56	2.79	33.15	AA
D/6	7.54	7.33	7.65	7.78	2.80	33.10	AA
D/10	7.14	7.56	7.35	7.68	2.65	32.33	AA
D/12	7.23	7.15	7.29	7.26	2.35	31.28	A
BT5	7.16	7.30	7.64	7.43	2.79	32.22	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

Test clones (except D/12) are comparable with the control while D/12 is inferior to the control.

B2-47: Yield and Quality Trial of Four Test clones Selected from Phulcherra T. E. and BTRI Germplasm Bank; Test clones-Ph/9/92, BS/3, Ph/9/108 and G/61/8 against Standard BT15 (BTRI, 2006-2023).

The plants of this trial were medium skiffed at 74 cm in 2018. There were 26 plucking rounds in 2018. The yield data were analyzed and presented in Table-21.

Table 21. Yield of green leaves (g/plant)

Clone	Ph/9/92	BS/3	Ph/9/108	G/61/8	BT15
Treatment mean	1066.66	991.37	940.15	961.67	927.81

Treatment difference- Significant. (LSD value at 5% level of significance = 105.7)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of test clone Ph/9/92, BS/3 and G/61/8 against were higher than the control BT5. The estimated made tea production in kg/ha is presented in Fig. 12. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 22.

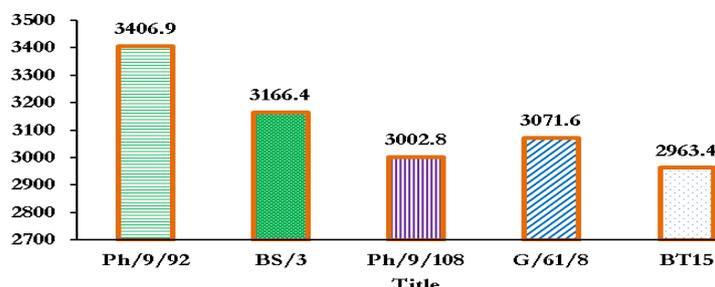


Fig. 12. Comparative yield of clones made tea (kg/ha)

Table 22. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
Ph/9/92	7.60	7.25	7.53	7.37	2.75	32.50	AA
BS/3	7.20	7.40	7.16	7.11	2.27	31.14	A
Ph/9/108	7.47	7.61	7.33	7.47	2.78	32.66	AA
G/61/5	7.46	7.62	7.66	7.68	2.85	33.27	AA
BT15	7.83	7.78	7.85	7.71	3.48	34.65	E

(A: Average, AA: Above Average, E: Excellent cup quality)

The test clones Ph/9/92, Ph/9/108 and G/61/5 gave above average cup quality while the control BT15 gave excellent cup quality. The test clone BS/3 gave average cup quality with the control.

B2-48: Yield and Quality Trial of Four Test clones Selected from Shumshernugger and Amo T. Es. Test clones – A/8/124, Sh/10/2, A/8/125 and A/11/38 against Standard BT2 (BTRI, 2009-2026).

The plants of this trial were light pruned at 56 cm in 2018. There were 18 plucking rounds in 2018. The yield data were analyzed and presented in Table-23.

Table 23. Yield of green leaves (g/plant)

Clone	A/8/124	Sh/10/2	A/8/125	A/11/38	BT2
Treatment mean	588.33	759.73	573.41	603.11	555.28

Treatment difference- Significant. (LSD value at 5% level of significance= 103.8)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of all test clone A/8/124, Sh/10/2, A/8/125 and A/11/38 were higher than the control BT2. The estimated made tea production in kg/ha is presented in Fig. 13. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 24.

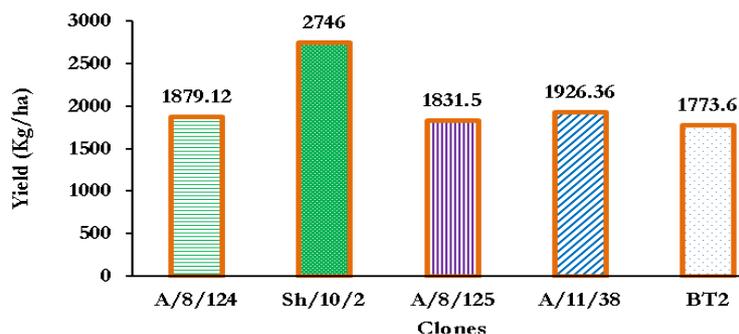


Fig. 13. Comparative yield of clones made tea (kg/ha)

Table 24. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
A/8/124	7.42	7.50	7.35	7.43	2.85	32.55	AA
Sh/10/2	7.34	7.63	7.72	7.34	2.78	32.82	AA
A/8/125	7.57	7.64	7.79	7.37	2.78	33.15	AA
A/11/38	7.51	7.14	7.23	7.52	2.84	32.25	AA
BT2	7.49	7.64	7.38	7.63	2.74	32.88	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones were similar to the control BT2 in respect of cup quality. However, the flavoury character of BT2 was not considered in the case of assessing cup quality.

B2-49: Yield and Quality Trial of Four Test clones Selected from Shumshernugger T.E. (Sh/10/5, Sh/D/13/4 and Amo T. Es. Test clones – A/8/128, BS/91/6, against Standard BT2 (BTRI, 2011-2028).

The plants were light pruned at 56 cm in 2018 and there were 19 plucking round during the cropping period. The yield data were analyzed and presented in Table-25.

Table-25. Yield of green leaves (g/plant)

Clone	Sh/D/13/4	BS/91/6	Sh/10/5	A/8/128	BT2
Treatment mean	760.61	747.40	727.83	773.63	657.47

Treatment difference- Significant (LSD value at 5% level of significance= 185.6)

The analytical results revealed that all test clones are comparable in terms of yield. The estimated made tea production in kg/ha is presented in Fig. 14. The cup quality of made tea for all the test clones were assessed organoleptically and average scores are presented in Table 26.

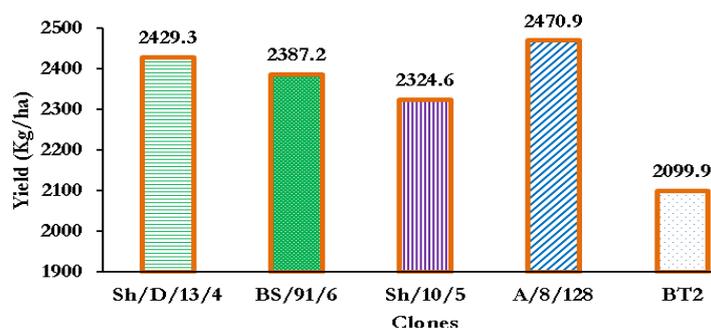


Fig. 14. Comparative yield of clones made tea (kg/ha)

Table 26. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
Sh/D/13/4	7.30	7.34	7.31	7.81	2.67	32.43	AA
BS/91/6	7.32	7.47	7.34	7.30	2.76	32.25	AA
Sh/10/5	7.40	7.70	7.51	7.31	2.73	32.65	AA
A/8/128	7.41	7.42	7.36	7.18	2.76	32.13	AA
BT2	7.47	7.33	7.33	7.40	2.79	32.30	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

All the test clones were similar to the control BT2 in respect of cup quality. However, the flavoury character of BT2 was not considered in the case of assessing cup quality.

B2-50: Yield and Quality Trial of Three Test Clones Selected from Baraoorah T.E. and Shumshernugger T.E. Test Clones – B/8/79, Sh/9/43 and B/8/93 against Standard BT2 and BT17 (BTRI, 2014-2032).

The plants were FFP pruned at 45 cm in 2018 and there were 18 plucking round during the cropping period. The yield data were analyzed and presented in Table 27.

Table 27. Yield of green leaves

Clone	BT17	B/8/79	Sh/9/43	B/8/93	BT2
Treatment mean	460.5	470.8	425.4	465.6	405.9

Treatment difference- Significant (LSD value at 5% level of significance= 65.2)

The analytical results revealed that all the test clones gave significantly higher yield than the control. The estimated made tea production in kg/ha is presented in Fig. 15.

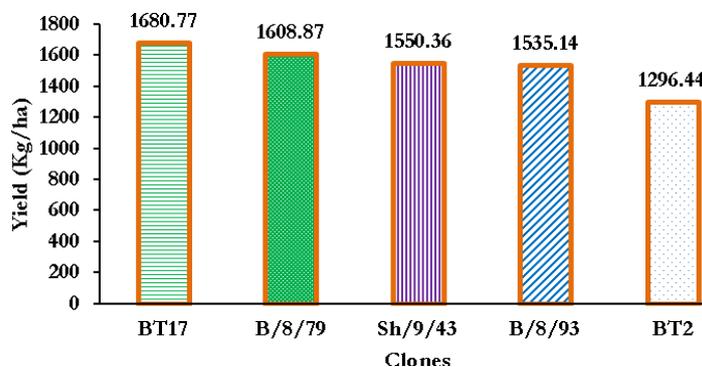


Fig. 15. Comparative yield of clones made tea (kg/ha)

B2-51: Yield and Quality Trial of Two Test Clones Selected from Amo T.E., and Shumshernugger T.E. Test Clones – A/8/194 and Sh/9/65 against Standard BT2, BT17 and BTS1. (BTRI, 2015-2032).

The plants were skiffed at 70 cm in 2018 and there were 18 plucking round during the cropping period. The yield data were analyzed and presented in Table 28.

Table 28. Yield of green leaves

Clone	BTS1	A/8/194	Sh/9/65	BT17	BT2
Treatment mean	391.4	531.2	503.8	402.4	409.4

Treatment difference- Significant (LSD value at 5% level of significance= 102.5)

The analytical results revealed that all test clones are comparable in terms of yield. The estimated made tea production in kg/ha is presented in Fig. 16.

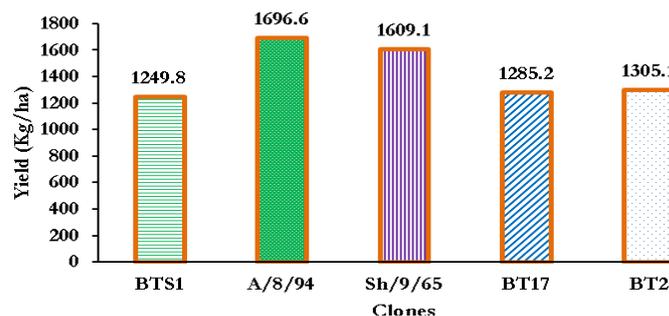


Fig. 16. Comparative yield of clones made tea (kg/ha)

B2-52: Yield and Quality Trial of Four Test Clones Selected from Amo T.E., Baraoorah T.E., and Shumshernugger T.E. Test Clones–T2, T3, T4 and T5 against Standard BT2 (BTRI, 2017-2029).

The experiment was initiated in May 2017 at BTRI farm under Latin Square Design with 105cm x 60cm spacing normal cultural practices were followed.

B2-53: Yield and Quality Trial of Four Test Clones Selected from Amo T.E., Baraoorah T.E., and Shumshernugger T.E. Test Clones–D1, D2, D3 and D4 against Standard BT2 (BTRI, 2017-2029).

The experiment was initiated in May 2017 at BTRI farm under Latin Square Design with 105cm x 60cm spacing normal cultural practices were followed.

B3: BREEDING OF TEA (NO. OF EXPERIMENTS-6)

B3-1.1: Controlled Pollination between Selected Clones/Agrotypes and Selection of Generative Clones for the Establishment of Clonal Seed Reserve (1964-)

Hybridization between the following clone pairs were done in order to identify new biclonal combinations (for hybrid seed production) as well as to select vegetative clones from the progenies.

Hybridization between the following parents was done in 2018:

TV23X BT2, BT2 x TV23, BT12 xTV26, TV26 x BT12, BT10 x TV26, TV26 x BT10, BT4X TV1, TV1 X BT4, BT17 X BT2, BT2 X BT17, BT4 X TV26, TV26 X BT4, BT6 X TV26, TV26 X BT6, BT19 X BT2, BT2 X TV19, TV9 X BT2, BT2 X TV9, TR1 X BT2, BT2 X TR1, US X BT2, BT2 X US

The plants raised from earlier crosses are being preserved in Germplasm Bank. Yield, quality and other performance criteria of the progeny are being recorded.

B3-1.5: Establishment of a Biclonal Seedbarie with Clones TV18 and BT3.

Seedlings from the stock are being observed in the trial plots. Seeds are being collected and distributed to the Tea Estates. Seedbarie (B3-1.5) comprising TV18 and BT3 have been kept under observation. Comparative yield and quality potential of the hybrid progeny (TV18 and BT3) are being assessed against other standard biclonal seeds (B3-1.8 & B3-1.9).

B3-1.8: Comparative Yield and Quality Trial of BTRI Released Biclinal Stock BTS1, Biclinal Stock T18B3, Allynugger Polyclonal Stock (ANPS), Phulbari General Seed Stock (PBS) and Clone BT1 (BTRI, 1999-2018)

The plants of this trial were medium skiffed at 69 cm and there were 26 plucking rounds in 2018. The yield data were analyzed and presented in Table 29. The estimated made tea production in kg/ha is presented in Fig. 17.

Table 29. Yield of green leaves

Clone	BT1	BTS1	PBS	ANPS	T18B3
Treatment mean	794.82	803.81	888.97	844.93	868.72

Treatment difference- Significant (LSD value at 5% level of significance= 255.8)

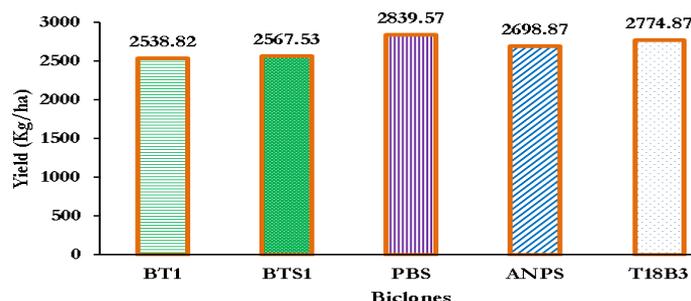


Fig. 17. Comparative yield of clones made tea (kg/ha)

The analytical results reveal that there was no significant yield difference between the biclinal seed stocks. All the biclinal stocks were comparable with the control BT1. The cup quality of made tea for all the treatments was assessed through organoleptic test. The average scores are shown in Table 30.

Table 30. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
BT1	7.38	7.60	7.35	7.62	2.77	32.72	AA
BTS1	7.45	7.51	7.67	7.36	2.88	32.88	AA
PBS	7.15	7.17	7.27	7.32	2.88	31.71	A
ANPS	7.53	7.58	7.27	7.43	2.84	32.65	AA
T18B3	7.65	7.66	7.60	7.57	2.84	33.36	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

The biclinal BTS1 and T18B3 are comparable in cup with the control clone BT1 while PBS was inferior to the control.

B3-1.9: Comparative Trial of 4 Biclinal Seed Stocks (BTS1, BTS3, TV18 × BT3 & TS463) and 3 Parental Clones (BT1, TV1 & TV19) (2002-2018)

The plants of this trial were medium skiffed at 73 cm and there were 28 plucking rounds in 2017. The yield data were analyzed and presented in Table-31.

Table 31. Yield of green leaves (g/plant)

Clone	BTS1	BTS3	TV18 × BT3	TS463	BT1	TV1	TV19
Treatment mean	1232.77	1338.41	1406.51	1299.18	1177.74	1258.4	1356.9

Treatment difference- Significant. (LSD value at 5% level of significance= 203.3)

The statistical results reveal that yield difference was significant (at 5% level of significance) in 2018. The yield performance of all test clone TV18 × BT3 was higher than the control. The cup quality of made tea

for all the treatments was assessed through organoleptic test. The average scores are shown in Table 32. The estimated made tea production in kg/ha is presented in Fig. 18.

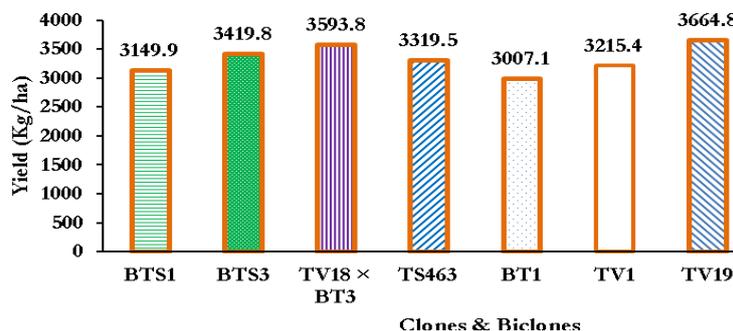


Fig. 18. Comparative yield of clones made tea (kg/ha)

Table 32. Quality scores

Clone	Infusion	Liquor colour	Briskness	Strength	Creaming down	Total	Remarks
	10	10	10	10	10	50	
BTS1	7.31	7.60	7.47	7.61	2.93	32.92	AA
BTS3	7.34	7.15	7.14	7.53	2.69	31.85	A
TV18 x BT3	7.43	7.36	7.15	7.57	2.73	32.25	AA
TS463	7.61	7.36	7.42	7.34	2.76	32.49	AA
BT1	7.32	7.34	7.34	7.49	2.78	32.27	AA
TV1	7.52	7.34	7.56	7.62	2.90	32.94	AA
TV19	7.39	7.34	7.53	7.47	2.81	32.54	AA

(A: Average, AA: Above Average, E: Excellent cup quality)

In all the treatments excepting BTS3 the cup qualities were “Above Average” while BTS3 was just “Average”.

B3-8: Survey and Conservation of Gene Resources of Tea in Bangladesh (BTRI, 1981-)

A total of 516 tea germplasm has been maintained (*ex-situ* conservation) in the Germplasm Bank in order to use in future for varietal improvement.

B3-12: Morphological characterization of BTRI released clones, some test clones and wild genotypes.

A total of 25 accessions (20 BTRI released clones, 4 test clones and 1 wild genotype) were planted in the nursery in October, 2017 to observe their rooting performance and to evaluate their rooting character. Details data will be published after completion of the experiment.

B4: SHORT TERM/MID TERM EXPERIMENTS (NO. OF EXPERIMENTS-4)

B4-2(a). Study on seasonal effect and different clonal effect on recovery percentages of green tea

The experiment was carried out at BTRI Miniature Factory to study recovery percentages of green tea from March 2017 to November 2017. Monthly-wise recovery percentages of green tea was 19.19%.

B4-10: Screening of drought tolerant variety of tea at the nursery and field level.

Cuttings were collected from Shumshernugger and Amo T. E. Overall performance (6 months) are published within next 6 months.

Summary of activities of Botany Division

1. No. of Experimental Visit: 26
2. Advisory Visit/Official Visit: 12
3. Correspondence: 6
4. Delivered lecture hours for postgraduate diploma/ certificate course at MTC:
16 hours
5. Workshop/ Seminar: 13
6. Valley Tea Tasting Session: 6
7. Group Tea Tasting Session: 4
8. Received Tea Sample Taste: 44
9. Quantity of planting material supplied:

Rooted cutting	Bi-clonal seeds
300 nos.	560 kg

AGRONOMY DIVISION

STAFF

Sl. No.	Name	Designation
01	Dr. Toufiq Ahmed	Principal Scientific Officer
02	Dr. Mohammad Masud Rana	Senior Scientific Officer
03	Md. Imran Hossen	Scientific Officer
04	Sultan Md. Monwarul Islam	Scientific Officer
05	Rani Debnath	Farm Supervisor

RESEARCH

During the reporting year, Agronomy division carried out eight experiments under two research program areas such as, (i) standardization of cultural practices; and (ii) development of soil fertility. Results of these experiments on the basis of collected data are briefly discussed below:

Experiment 01: Development of a new pruning cycle for higher and sustainable tea yield in the context of present climate change (BTRI Farm; Long term: 2010-2023)

Treatments: 05

T₁ : LP-DS-MS, T₂ : LP-DS-MS-LS, T₃ : LP-LS-DS-MS, T₄ : LP-LS-DS-MS-DS-LS, T₅ : LP-DS-MS-LS-DS-MS-LS

Planting materials and Design:

BT1, BT2, BT5, BT11, BT12 and BT13 clones were used in the experiment. The experiment was laid out in a Split Plot Design with three replications and total number of plots under the experiment is 90.

Progress:

The plants were pruned according to the schedule of treatments. Yield data were collected at weekly interval. From the analysis result of yield data obtained in 2018, it is observed that significantly highest yield was obtained in the treatment T₅ and lowest in the treatment T₁ (Table 1), and these differences were due to the differences in given pruning operations. From the interaction effect, it was observed that highest yield (3453 kg/ha) was obtained in the treatment combination of T₅ × BT13 and the lowest in the combination of T₁ × BT11 (1480 kg/ha), but statistically the interaction was not significant (Figure 1). From overall analysis (2010-2018) it is observed that longer pruning cycles are providing higher yield of tea. The experiment will be continued till 2023. Final comments will be made thereafter.

Table 1. Made tea yield (kg/ha) of different treatments in 2018

Treatments	Yield (kg/ha)
T ₁ (LP-DS-MS)	1596 ^d
T ₂ (LP-DS-MS-LS)	2189 ^{bc}
T ₃ (LP-LS-DS-MS)	1974 ^c
T ₄ (LP-LS-DS-MS-DS-LS)	2331 ^b
T ₅ (LP-DS-MS-LS-DS-MS-LS)	3067 ^a
LSD (0.05)	252.6
CV (%)	9.40

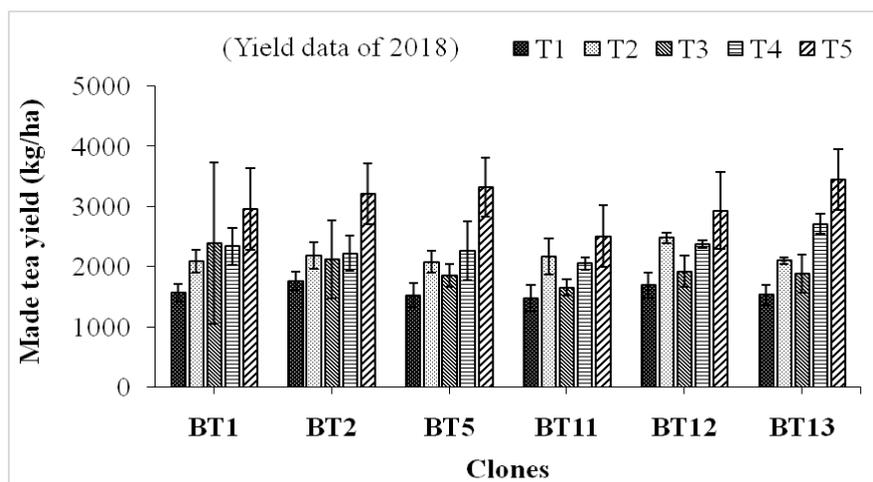


Figure 1. Interaction effect of different clones with different treatments in 2018

Experiment 2. Comparative study on yield and yield related parameters of different clones released from BTRI (BTRI Main Farm; Duration: 2017-2019)

Treatments: 04

BTRI released 4 mature tea clones were considered as treatments e.g. (a) BT2, (b) BT5, (c) BT6 and (d) BT8. Plantation year was 1995.

Parameters studied during the experiment are the harvested yield, casualty percentages at the mature stage of the particular clone and main reason behind the casualty.

Progress:

The experimental area was under MSK pruning in 2018. Yield data were collected regularly. End of the year, collected data were analyzed statistically and it was observed that yield was not significantly different due to treatments. However, among the treatments maximum yield was observed in BT6 (2550 kg/ha) followed by BT2 (2470 kg/ha), BT8 (2305 kg/ha) and the lowest was in BT5 (2005 kg/ha), presented in Figure 2. The experiment will be continued for another year.

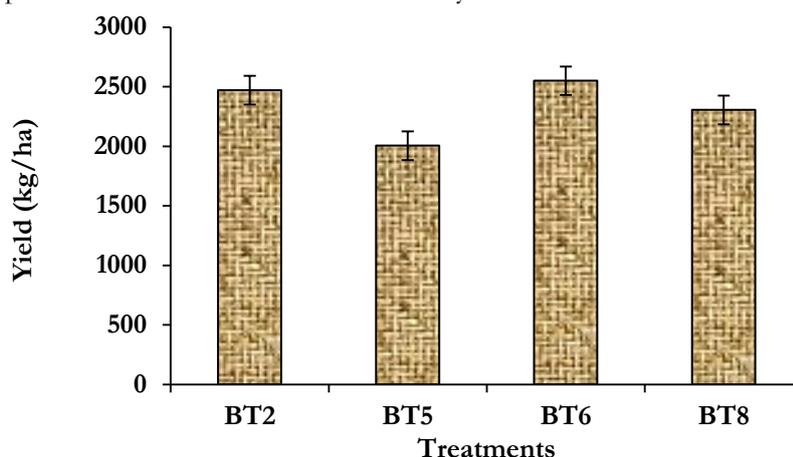


Figure 2. Variation of made tea yield due to treatments

Experiment 03: Development of a tool for easy and effective transplanting of tea saplings in the nursery (BTRI Farm; Short term: 2018-2019)

Treatments: Tools with different shape (three shapes) will be used as different treatments of the experiment (Figure 3). The traditional tool of transplanting will be used as control.

T₁ : Transplanting using traditional tool (Control)

T₂ : Transplanting using Tool 1

T₃ : Transplanting using Tool 2

T₄ : Transplanting using Tool 3

Data collection method:

Transplanting work will be carried out with the tools with different shapes. The following data will be collected-

- Number of transplanted saplings per hour.
- Mortality percentage of the transplanted saplings.
- Growth data of the transplanted saplings.

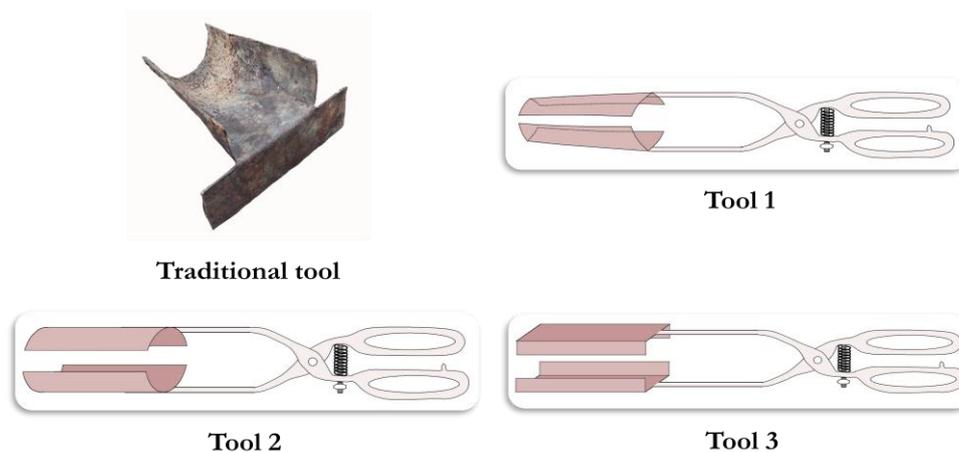


Figure 3. Different transplanting tools that will be used in the study

Progress: According to the design, one of the tools (Tool 2) has been developed in the workshop (Figure 4). The process of preparing other tools has been going on. When all the tools are ready, they will be evaluated experimentally.



Figure 4. Developed Tool 2 according to the design

Experiment 04: Effect of integrated nutrient management for raising clonal tea saplings in polytubes in secondary bed**Treatments: 10**

T₁: Control (Recommended dose of cowdung and chemical fertilizer); T₂: 50 g Cowdung per 1 kg of soil; T₃: 100 g Cowdung per 1 kg of soil; T₄: 150 g Cowdung per 1 kg of soil; T₅: 50 g Poultry Manure per 1 kg of soil; T₆: 100 g Poultry Manure per 1 kg of soil; T₇: 150 g Poultry Manure per 1 kg of soil; T₈: 50 g Vermicompost per 1 kg of soil; T₉: 100 g Vermicompost per 1 kg of soil; and T₁₀: 150 g Vermicompost per 1 kg of soil.

Planting materials and Design: Rooted cutting of BT2 clone. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications.

Progress:

The rooted cuttings were transplanted in polytube (secondary bed) according to the treatments. Growth data including root length, shoot length, base diameter and leaf numbers were collected. During the period from August to December two sets of data were collected. From the analysis result of different growth parameters, it is observed that significantly highest root lengths were found in T₁₀ and T₁, whereas highest shoot length was found in T₁₀. Both root and shoot lengths were found minimum in T₂. Similarly, maximum leaf numbers were found in T₁₀, whereas the lowest numbers were found in T₂. Base diameter and Root-shoot ratio were found statistically non significant. The experiment will be continued till December, 2019 and final comments will be made after the completion of the experiment.

Experiment 05: Effect of different types of pruning on the yield and organoleptic quality of Tea (BTRI Main Farm, Srimangal. Short term: Dec/2016-Dec/2019)

Treatments: Six different types of pruning operations;

T₁: Unprune (UP) (Control), T₂: Light Pruning (LP), T₃: Deep Skiffing (DSK), T₄: Medium Skiffing (MSK), T₅: Light Skiffing (LSK), T₆: Level of skiffing (LOS).

Planting materials and Design: BT2 clone was used in the experiment. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and total number of plots under the experiment is 18.

Progress:

The plants were pruned according to the treatments. Yield data were collected at weekly interval and organoleptic quality data were collected at monthly interval. From the analysis result of yield data obtained in 2018, it is observed that significantly highest average yield was obtained in the treatment T₆ (LOS, 3376.7 kg/ha) and lowest average in the treatment T₂ (LP, 2080 kg/ha) and these differences were due to the differences in given pruning operations (Figure 5). Compare to the control (Unprune), yield gap was maximum in the treatment T₂ (LP, 33.9%) and minimum in T₄ (LSK, 3.71%) (Figure 6). Highest dry weight (g) of 100 shoot (3 leaf and a bud) was found in T₂ (LP- 34.53g) and lowest in T₁ (Unprune- 24.07g). The experiment will be continued till December, 2019 and final comments will be made after the completion of the experiment.

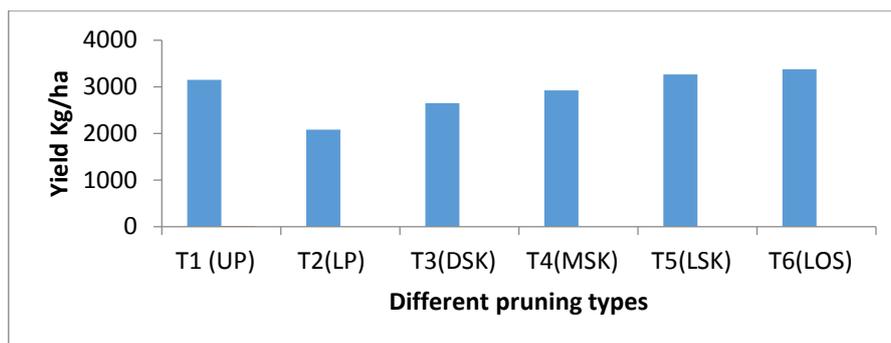


Figure 5. Yield of tea under different types of pruning

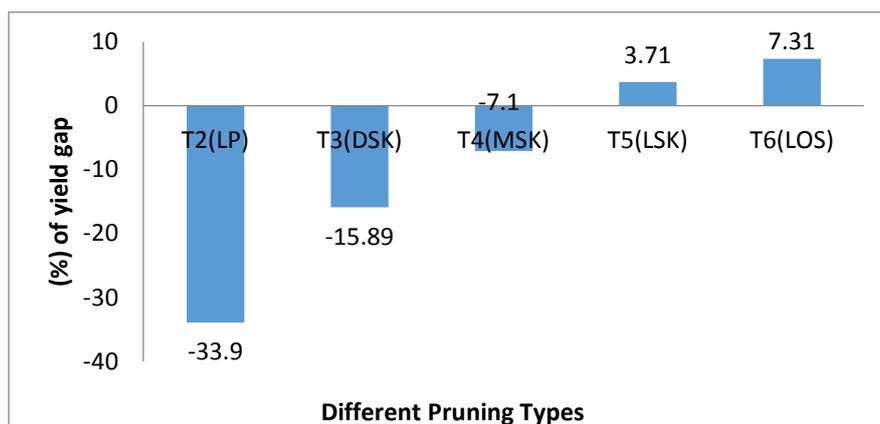


Figure 6. Yield gap (%) in different types of pruning compared to control (Unprune)

Experiment 06: Study on different climatic parameters to observe the impact of climate change in relation to tea production in Bangladesh

Progress:

The experiment was discarded through the decision from Research committee due to lack of available information.

Justification:

This was a survey type experiment through collecting meteorological data from the tea estate of different valley of tea estates. Climatic information data such as temperature, rainfall, relative humidity, sunshine hours and dew point temperature etc. are not available in different tea estates, except the rainfall data. That's why the experiment was discarded through the decision of Research committee.

Experiment 07. Effect of different types of plucking policies on yield and quality of tea (BTRI Main Farm; Duration: 2018-19)

Treatments: 05 (Different plucking method)

T₁: Traditional hand plucking (Control), T₂: Shear plucking, T₃: Plucking with a knife, T₄: Single worker operated machine plucking and T₅: Double worker operated machine plucking.

RCBD was followed as the experimental design with 3 replications *i.e.* there were 15 plots under the experiment.

Progress: Data on the amount of harvested green leaves and time required for harvesting were recorded separately from each plot throughout the year. From the data, the highest green leaf was observed in

Single worker operated machine plucking method (3786 kg/ha) and the lowest was in Shear plucking method (3215 kg/ha) (Figure 7), However, the yield differences were not statistically significant.

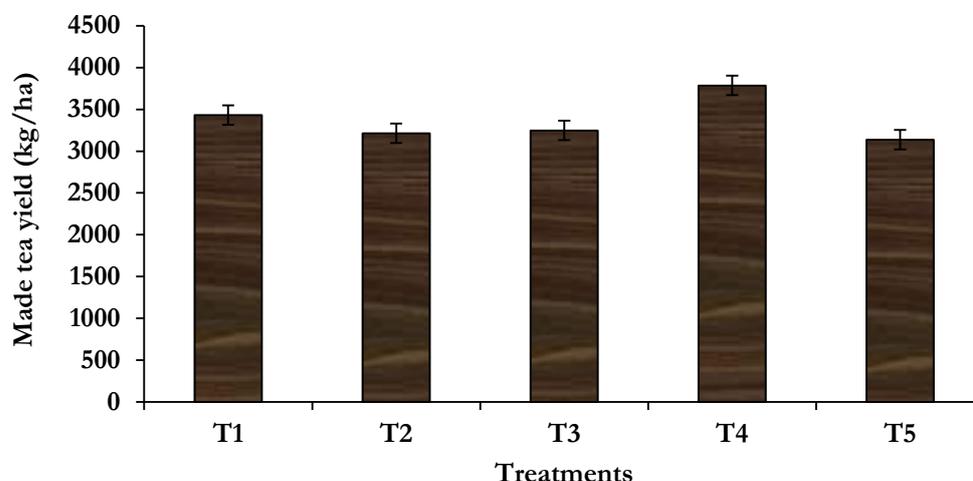


Figure 7. Variation of yield due to different plucking systems

Required time for plucking was maximum in Shear plucking method and minimum was in Double worker operated machine plucking method. To collect 100 kg green leaf, it was observed that the highest time (about 10 hours) is required for Shear plucking method which was followed by traditional hand plucking method (7.5 hours), Plucking with a knife (7 hours), Single worker operated machine plucking method (4.6 hours) and Double worker operated machine plucking method (4.5 hours), presented in Figure 8. To finalize the result, the experiment will be continued for another year.

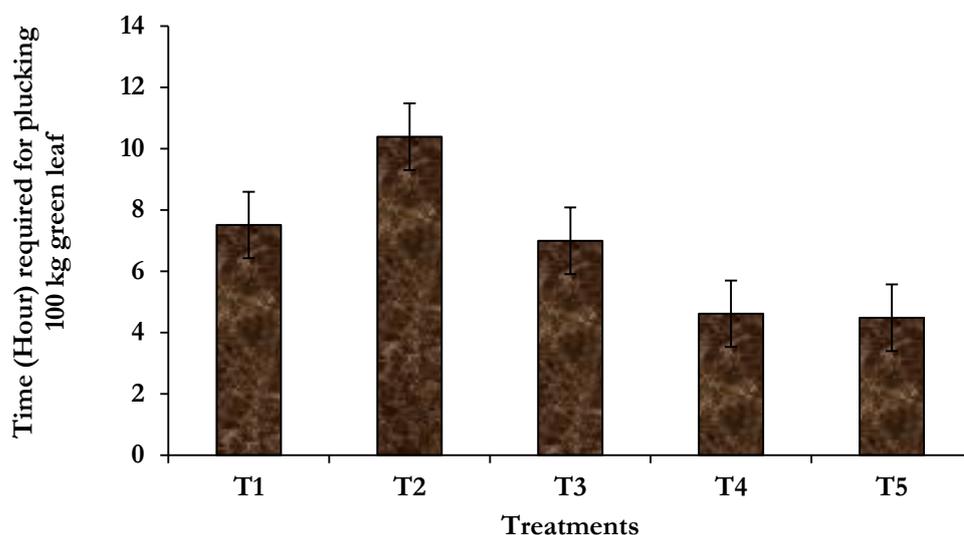


Figure 8. Time required for plucking in different plucking policies

Experiment 08. Effect of different types of compost on growth and development of clonal tea (BTRI Main Farm; Duration: 2017-22)**Treatments: 04**

T₁: Vermi-compost 2 kg per pit including recommended chemical fertilizers; T₂: Farm yard compost 2 kg per pit including recommended chemical fertilizers; T₃ : Decomposed water hyacinth 2 kg per pit including recommended chemical fertilizers; and T₄ : Decomposed cow-dung 2 kg per pit including recommended chemical fertilizers (Control).

Progress:

According to the treatments, the tea saplings were planted in the field by the month of September, 2017. Intercultural practices were done according to BTRI recommendations. During the month of May, 2018 (i.e. 8 months after planting) 1st year pruning of immature tea plants (Decentering/Centre-out) were done and different morphological data were collected e.g. base diameter (mm), fresh weight of the plant (gm) etc. Four months after decentering *i.e.* in September 2018, number of branches/plant were also recorded. From the analysis of data, it was observed that recorded parameters were not significantly different for treatments. Though treatments were not significantly different for parameters but maximum fresh weight was observed in the treatment consisting Vermi-compost (54.3 gm) and minimum observed in Farm yard compost (50.8 gm), presented in Figure 9. Similarly, maximum number of branches were observed in Decomposed water hyacinth consisting treatment and the minimum was in Farm yard compost.

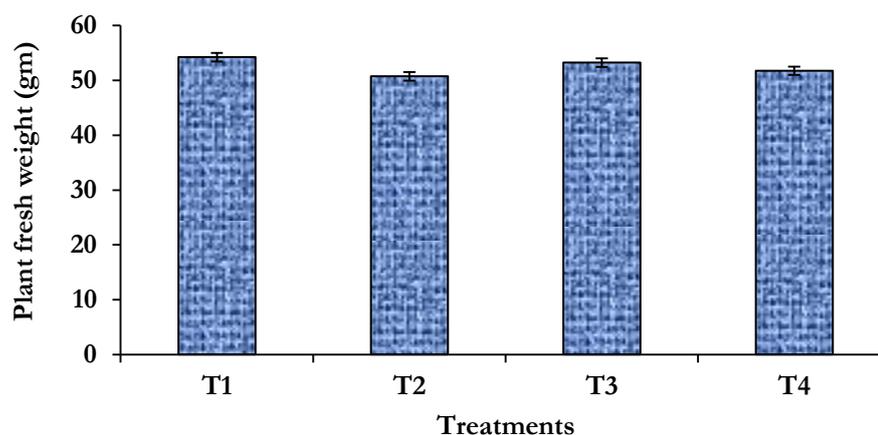


Figure 9. Fresh weight of plant during the time of decentering

OTHER ACTIVITIES**Visits:**

Researchers of the division paid 169 visits to different Tea Estates for experimental, advisory services and other official purposes during the reporting year. Number of visits for the reporting year 2018 is presented in the table below.

Table 2. No. of visit paid by the scientific personnel of the division during the reporting year

Reporting year	No. of experimental visits	No. of advisory visits	No. of other official tours
2018	133	22	14

Workshop / Seminar

Scientific personnel of Agronomy division arranged 16 workshops in different tea estates and BTRI to disseminate updated technologies among planters on plantation, pruning, tipping, plucking, drought management in tea etc.

BTRI Main Farm

Mr. Rani Debnath is the Farm Supervisor of BTRI Main Farm. The institute is spread over an area of 34.90 hectare and breakup of the land is as follows:

Under tea

1) Young clonal tea	: 0.33 ha
2) Mature clonal tea	: 4.64 "
3) Mature seedling tea	: 4.15 "
4) Mother bush, seed bari etc.	: 1.48 "
5) Tea nursery	: 0.62 "

Total : 11.22 ha

Other crops

1) Rehabilitation crops	: 0.16 ha
2) Nursery	: 1.09 "
3) Mixed forest, Orchard, Lemon, Guava etc.	: 5.21 "

Total : 6.46 ha

Other uses

Office, Laboratory, Guest house, Mosque, School,

Factory, Club house, labour line, roads etc. : 17.22 ha

Grand total : 34.90 ha

Improved planting materials supplied

Year of supply	No. of fresh cuttings	No. of rooted cuttings
2018	6,01,200	46,285

Green leaf production and earning from other farm products

Reporting year	Green leaf production in kg	Earning from other farm products in Taka
2018	71,426	7,298

Green Leaf Supplied in kg

Reporting year	Central Factory BTRI	Mini Factory BTRI	Green Tea Factory (New)	Entomology division
2018	68,505	2,867	51	3

Independence and Victory Day

Independence Day and Victory Day were observed with due solemnity during the reporting year.

Meteorological Data for the year 2018

Month	No. rainy days	Rainfall (mm)	Evaporation (mm)	Temperature (°C)		Dew point (°C)	Sunshine hrs.	R.H. (%)
				Max.	Min.			
January	01	34	55.9	23.8	10.7	13.2	5.1	76.4
February	02	19	74.5	28.8	14.1	15.06	5.9	62.2
March	05	49	70.2	32.3	18.1	17.6	7.5	62.9
April	17	173	63.85	32.9	20.7	21.6	5.71	71.9
May	27	635	108.19	31.7	22.14	22.78	4.78	78.77
June	22	383	65.3	33.01	24.93	24.98	4.43	79.08
July	20	173	134	33.7	25.9	25.8	4.6	79.7
August	20	366	146.4	33.8	25.5	25.7	4.44	79.57
September	16	174	121.9	33.48	25.09	26.77	5.17	80.17
October	07	174	96.6	32.35	21.83	23.05	6.37	81.21
November	01	02	102.7	28.95	15.83	17.80	7.53	74.05
December	02	50	89.4	26.52	11.87	14.64	6.61	78.4
Total/Average	140 (Total)	2132 (Total)	1128.99 (Total)	30.94	19.72	20.75	5.7	75.4

ENTOMOLOGY DIVISION**Md. Jahangir Alam**

Scientific Officer

STAFF

Dr. Mohammad Shameem Al Mamun, Senior Scientific Officer was transferred to BTRI Substation, Panchagarh on 8th March 2017. Mr. Shovon Kumar Paul, Scientific Officer is now in deputation at Malaysia for PhD purpose. The posts of Principal Scientific Officer was lying vacant during the period under report. There was no other change in personnel position of the division.

RESEARCH

Five experiments under five programme areas were carried out during the year of 2018. The experiments were - Evaluation of sex pheromone trap and sticky traps against *Helopeltis*, Thrips & Looper caterpillar; Evaluation of some commercial entomopathogens against *Helopeltis*, Red spider mite and Looper Caterpillar in Tea; Screening of tea clones for *Helopeltis*, Red spider mite, Looper caterpillar & Thrips; Screening of pesticides against *Helopeltis*, Red spider mite, Termites, Nematodes and Thrips in tea; Determination of residue level of commonly used pesticides in tea. Details of the experiments together with their findings are furnished below:

ENT 1. CULTURAL AND MECHANICAL CONTROL OF PESTS**ENT 1.1. Evaluation of sex pheromone trap and sticky traps against *Helopeltis*, Thrips & Looper caterpillar (2016-2018)****Progress:**

An experiment was carried out to evaluate the sticky traps as mechanical control measures against thrips in tea at Bangladesh Tea Research Institute (BTRI) main farm, Srimangal and BTRI substation, Panchagarh. The experiment was set up following Randomized Complete Block Design (RCBD) with three replications. Post treatment observations on the attraction of pests were recorded at weekly interval up to 4 weeks.

Result revealed that blue and yellow sticky traps captured greater number of thrips, *S. dorsalis* at different intervals (Fig. 1). However, the traps also captured a large number of non-target insects.

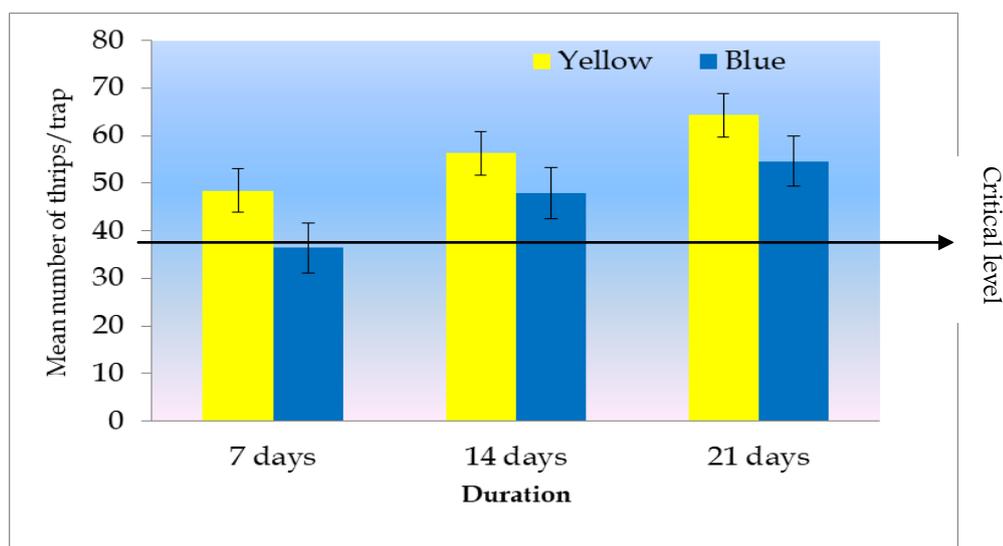


Fig. 1. Performance of sticky traps against thrips in tea

ENT 2. BIO-CONTROL OF PESTS

ENT 2.1. Evaluation of some commercial entomopathogens against *Helopeltis*, Red spider mite and Looper Caterpillar in Tea (2018)

Evaluation of two commercial entomopathogens (microbials) against Red spider mite in Tea

An experiment was carried out to evaluate the potentiality of two microbial pesticides (entomopathogens) viz., *Metarhizium anisopliae* and *Pseudomonas fluorescens* against red spider mite, *Oligonychus coffeae* infesting tea in laboratory and field condition at Entomology Laboratory and BTRI Main Farm, respectively. The Red spider mite was collected from different sections of BTRI main farm and reared in the Entomology Laboratory, BTRI, at 27-30°C temperature and 70-80% relative humidity on a susceptible tea clone, BT2 by following detached leaf culture method of Helle and Sabelis (1985) with slight modifications. The mite pests were reared on tea leaves in rectangular jars (9.5 cm x 7.5 cm x 20 cm).

Technical Name	Commercial Name	Manufacturer/Supplier Name
<i>Metarhizium anisopliae</i>	PEAK MOTI	Peak Chemical Industries Limited
<i>Pseudomonas fluorescens</i>	PEAK MONA	Peak Chemical Industries Limited

The entomopathogens @ 0.5, 1.0 & 1.5 ml/L, concentration, respectively are considered as treatments. Effect of the entomopathogens on mortality of red spider mite was also studied. Data were collected at 24 HAT, 48HAT, 72HAT in the laboratory condition and 7 days interval in field condition.

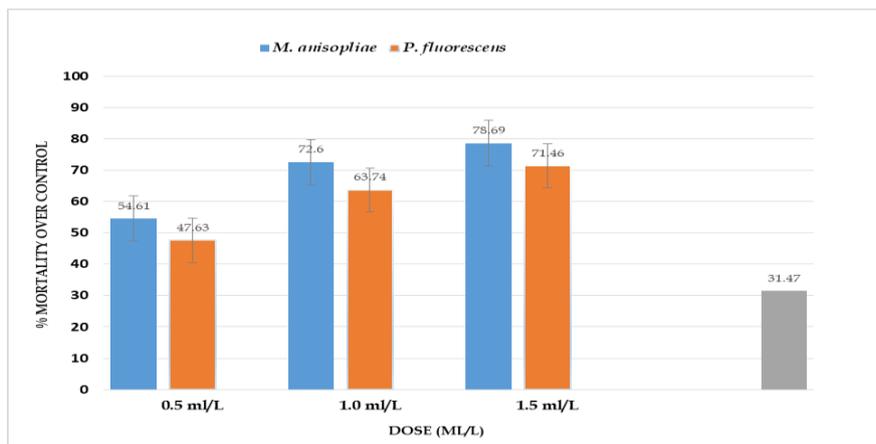


Fig. 2. Percent mortality of red spider mite using entomopathogens at Laboratory condition

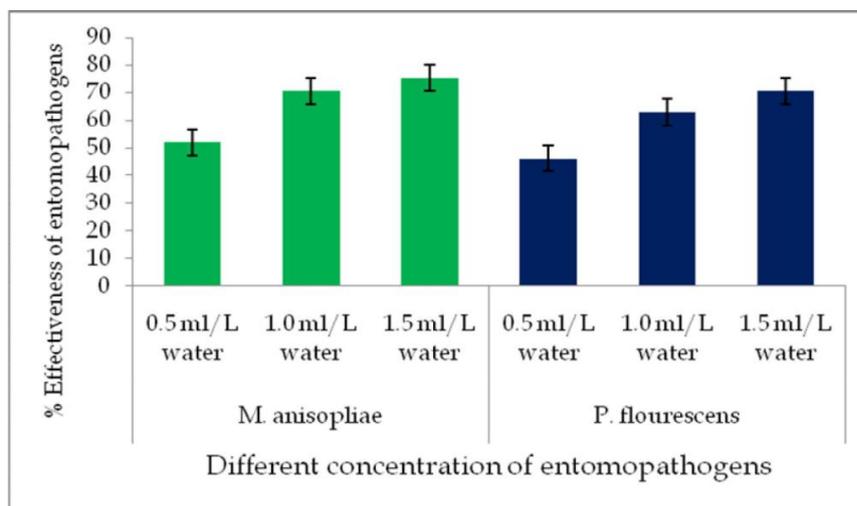


Fig. 3. Effectiveness of two entomopathogens against red spider mite at Field condition

Results revealed that both two entomopathogens showed the toxic effect on red spider mite in tea and significantly reduced mite population. In laboratory condition, the maximum mortality (72.6%) of red spider mites was found in *M. anisopliae* at 1.0 ml/L followed by *P. fluorescens* (63.74%) at 48 HAT (Fig. 2). Similar trend was also found at 72 HAT after spraying of biopesticides. Satisfactory efficacy was also found for control of red spider mite using entomopathogens at field level (Fig. 3)

***Bacillus thuringiensis* against looper caterpillar in tea**

A laboratory experiment was conducted to determine the bioefficacy of *Bacillus thuringiensis* (Antario 32K, Russell IPM Ltd., UK) against looper caterpillar at Pest Management Laboratory, BTRI sub station Panchagarh and the field evaluation was made at BTRI Sub station experimental field during May- July 2018. The dosage of the Antario 32K was 1.0g, 1.5g, 2.0g per litre of water against looper caterpillar. Data were collected at 24 HAT, 48HAT, 72HAT in the laboratory condition

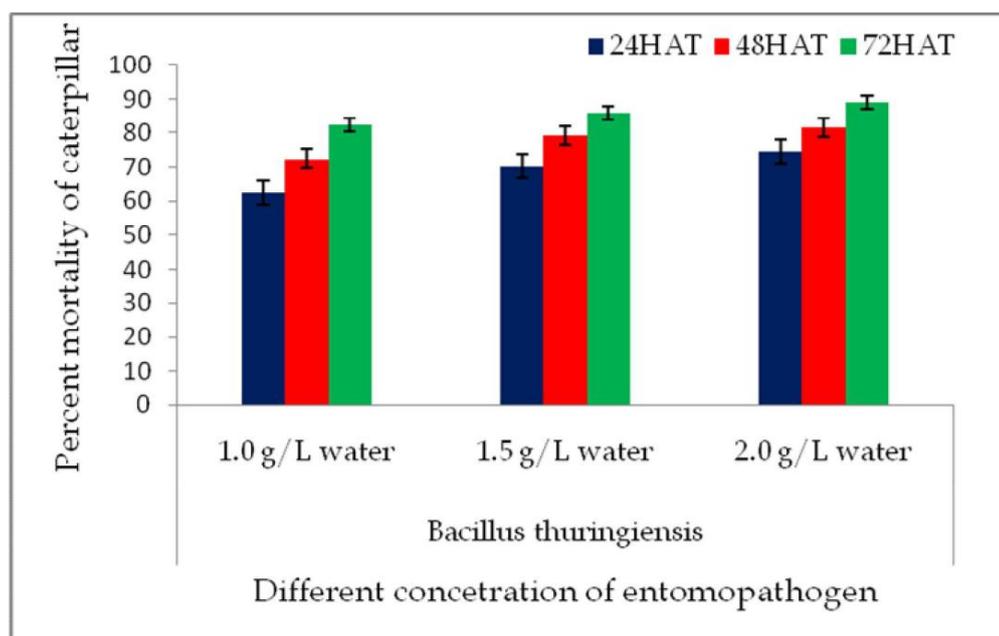


Fig. 4. Percent mortality of looper caterpillar using entomopathogens *Bacillus thuringiensis*

Results revealed that entomopathogen of bacterial formulation of *Bacillus thuringiensis* showed the toxic effect on looper caterpillar in tea and significantly reduced the pest population. In laboratory condition, the maximum mortality (88.96%) of looper caterpillar was found in using *B. thuringiensis* @ 2.0 g/L at 72 HAT (Fig. 4). Similar trend was also found at 24HAT and 48 HAT at other concentrations after spraying of biopesticides. So, *Bacillus thuringiensis* can be used for the control of looper caterpillar infesting tea.

ENT 3. HOST PLANT RESISTANT

ENT 3.1. Screening of tea clones for *Helopeltis*, Red spider mite, Looper caterpillar & Thrips (2017-2018)

Progress: An experiment was carried out to screen the susceptibility of different tea agrotypes and clones to red spider mite infestation at the clonal block of BTRI main farm, Srimangal, Moulvibazar during May 2017 to September 2018. Susceptibility to *Helopeltis*, Red spider mite and Thrips of different tea clones released by BTRI namely, BT1, BT2, BT3, BT4, BT5, BT6, BT7, BT8, BT9, BT10, BT11, BT12, BT13, BT14, BT15, BT16, BT17, BT18, BT19 and BT20 were evaluated against these pests infesting tea. The experiment was laid out in a Randomized Complete Block Design (RCBD) and replicated three times with each plot consisting of 20 plants. From the clonal block of BTRI, the population of different pests was estimated every month by sampling randomly observing and monitoring.

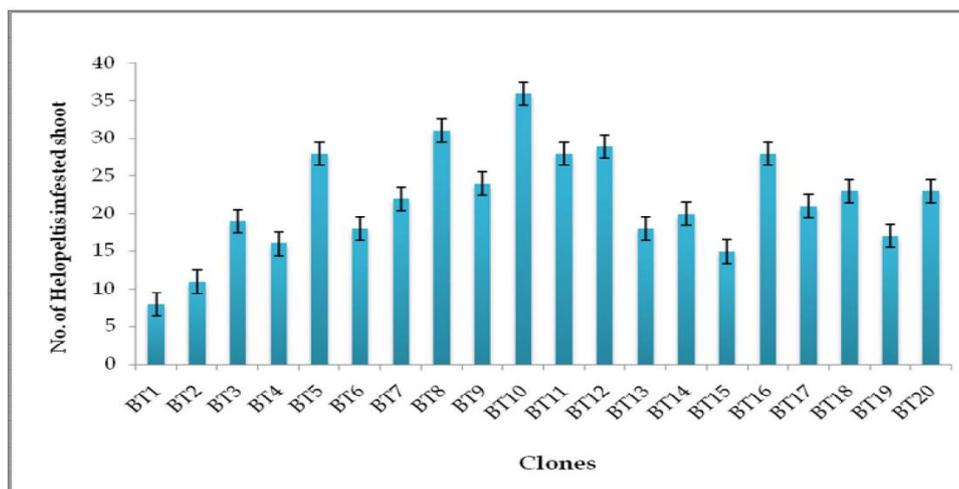


Fig. 5. Clonal susceptibility against Helopeltis

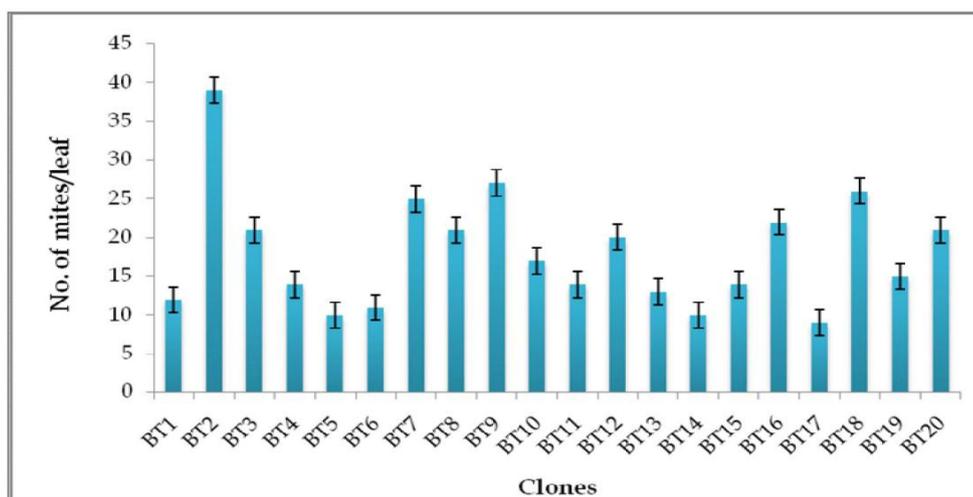


Fig. 6. Clonal susceptibility against Red spider mite

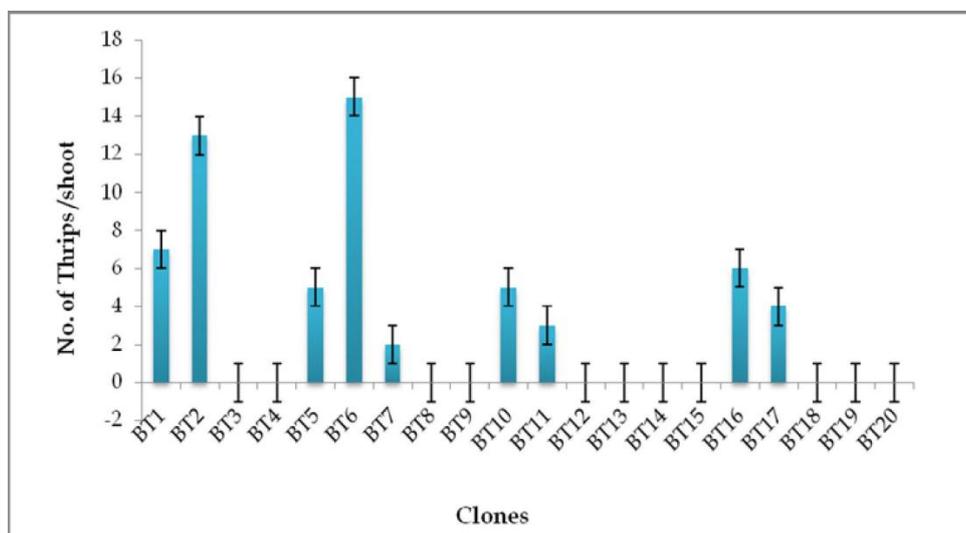


Fig. 7. Clonal susceptibility against Thrips

The maximum pest population of *Helopeltis*, Red spider mite and thrips obtained from all the three replicates of each clone, are presented Fig. 5, 6 and 7. These numbers indicate the relative resistance or susceptibility of the clones to the respective pest infestation.

Observations made on 20 BTRI clones for the susceptibility to *Helopeltis*, red spider mite and thrips infesting tea. Result revealed that BT1, BT2 & BT15 clones were found less attack of *Helopeltis*. BT5, BT6 & BT17 clones were found less attack of Red spider mite. BT3, BT4, BT8, BT9, BT12, BT13, BT14, BT15, BT18, BT19, BT20 were found less attack of thrips. The average pest population varied significantly ($P \leq 0.05$) in the different clones. The significant variability in damage may perhaps be attributed to physical or biological attributes of the agrotypes and clones. Since the light coloured varieties are more affected than the dark leaved varieties.

ENT 4. SCREENING OF PESTICIDES

ENT 4.1. Screening of pesticides against *Helopeltis*, Red spider mites, Termites, Nematodes Aphids and Thrips in tea (2017-2018)

Progress: During 2018, Twenty eight (28) pesticides under different groups were tested against *Helopeltis*, Red spider mite and Aphids in the field and the reports were sent to plant protection wing for their standardization (Fig. 8). The result revealed that all the tested pesticides was found satisfactory (>80% effectiveness).

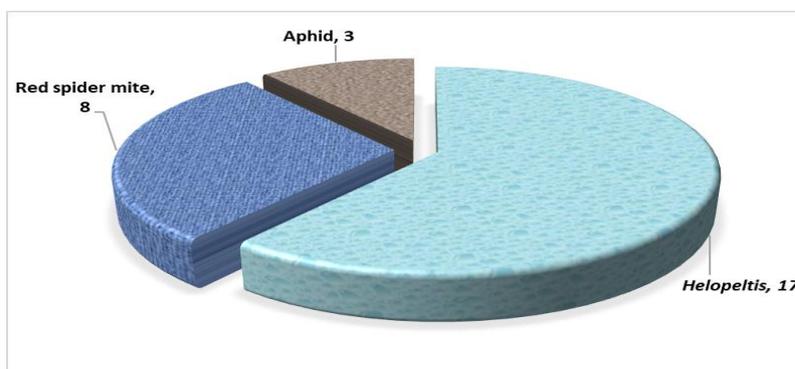


Fig. 8. Number of chemicals trial in the field against different insect pests of tea

ENT 5. PESTICIDE RESIDUE ANALYSIS

ENT 5.1. Determination of residue level of commonly used pesticides in tea (2017-2018)

Progress: An experiment was initiated to know the residue level of pesticides at BTRI main farm. The following group of pesticides namely Chlorpyrifos, Quinalphos, Cypermethrin and Deltamethrin has been applied in experimental plots following BTRI recommended dose and the green leaf samples were collected at 0 (3 hours), 1, 3, 5, 7 & 10 days interval after pesticide application. The leaves samples were manufactured

at Entomology laboratory of BTRI. The green leaf and processed tea were analyzed at Pesticide Analytical Laboratory, BARI (Fig. 9 & 10).

The standard for Chlorpyrifos, Quinalphos, Cypermethrin and Deltamethrin were obtained from Sigma-Aldrich Laborchemikalien, Seelze, Germany via S. F. Scientific Pvt. Ltd. Dhaka, Bangladesh. Standards of these insecticides contained 99.6% purity.

The determination of residue was done by GC-2010 (Shimadzu). For Organophosphorus insecticide (Chlorpyrifos & Quinalphos) FTD (Flame Therm ionized Detector) was used. The capillary column used in FTD was ATTM-1, length 30m, Inner Diameter (ID) 0.25mm and film thickness 0.25 μ m. For detection of pyrethroid (Cypermethrin & Deltamethrin) sample extract was again analyzed with Electron Capture Detector (ECD). The capillary column used in ECD was Optima-1, length 30m, ID 0.25 mm and film thickness 0.25 μ m in case of both detectors. Helium was used as carrier and make up gas in FTD and in case of ECD, it was Nitrogen (99.997% pure).

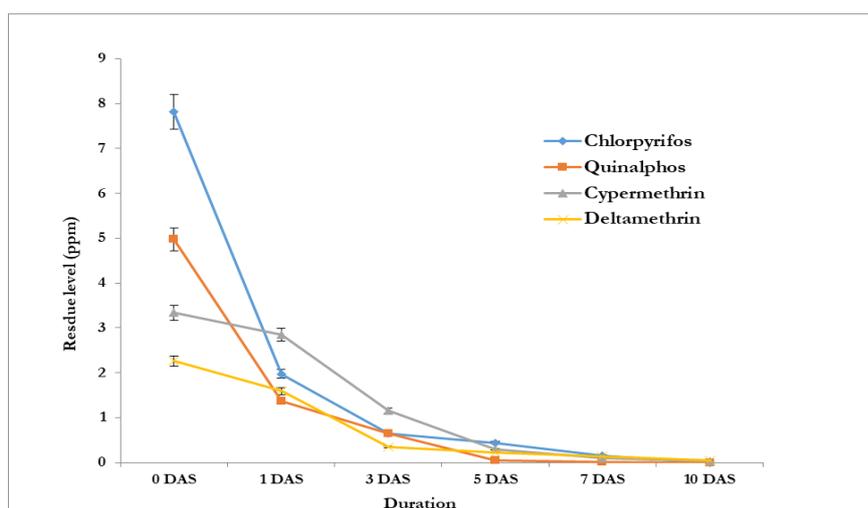


Fig. 9. Residue detection in green leaf sample

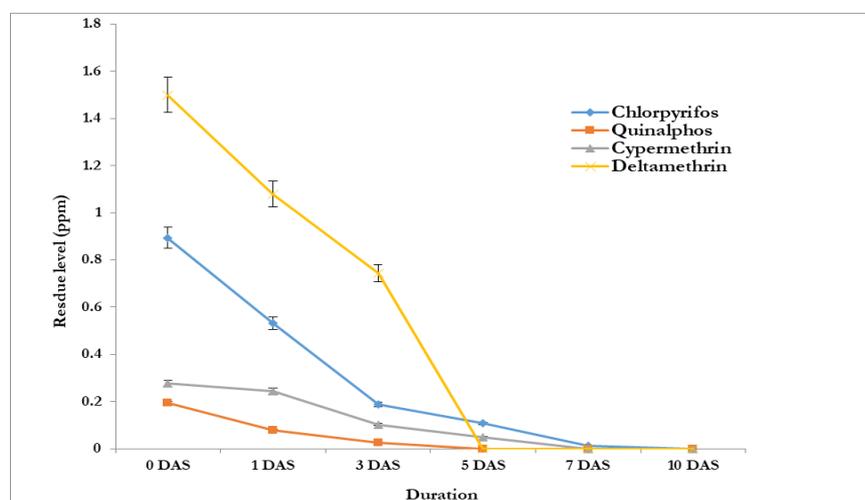


Fig. 10. Residue detection in made tea sample

OTHER ACTIVITIES

Advisory and Experimental visits

A total of Thirty six (36) advisory visits were paid to different tea estates to identify and render advice on specific pest problems and Thirty five (35) advisory letters issued to different tea estates in respect of identification of various pests, their control measures and report on nematode analysis during the reporting year.

Analysis

A total of Ninety one (91) soil samples were analyzed in the Laboratory for nematode count and reported to different tea estates. A total of Twenty eight (28) pesticides including insecticides and miticides were received from plant protection wing, Department of Agricultural Extension, Dhaka for field trial and reports were sent to plant protection wing for standardizations during the year 2018.

Tours/Visits

A total of Eight (08) official visits were paid by the Scientists of the division to different organizations for Official purposes.

Courses on tea culture

The Scientific personnel of the division delivered lectures on tea pest management at Annual Courses held at BTRI Main Station, Srimangal; BTRI Sub-Station, Fatikchari, Chittagong and BTRI Sub-Station, Panchagarh as well as in Post graduation diploma course, MTC, BTB. The resource persons gave comprehensive lectures and practical demonstration on tea pest spectrum, their control options, pesticides and its residue in made tea and spraying techniques.

Workshop/ Seminar

A total of Eleven (11) workshops were conducted at different tea estates under different valley circles on tea pest management during 2018.

PLANT PATHOLOGY DIVISION

Mohammed Syeful Islam

Senior Scientific Officer

Plant Pathology Division

STAFF

Md. Syeful Islam, SSO, Plant Pathology Division was transferred to Bangladesh Tea Board Regional Office, Suyalok, Bandarban on 11 November, 2018. Mr. Raihan Mujib Himel, Scientific officer was transferred to BTRI on 10 December, 2018 from BTRI sub-station, Fatickcherri. The post of Chief Scientific Officer, one Principle Officer and one Field Assistant of the division were remained vacant. There were no other changes in the staff position of this division during this period.

RESEARCH

The division carried out three experiments during the year 2018. The progresses of the experiments are as follows:

PP3: DISEASE MANAGEMENT

PP 3.8: Management of tea diseases with Plant Growth Promoting Rhizospheric microbes (PGPR) (BTRI/BEF: 2016-2020)

Objectives:

1. To isolate potential rhizospheric microbes from tea soil.
2. To evaluate rhizospheric microbes for controlling parasitic and epiphytic red rust in field condition.

Progress: There are four microbes like *Trichoderma*, *Bacillus*, *Pseudomonas* and *Rhizoctonia* were recorded. In case of disease severity scale of parasitic red rust, the lowest severity (44.796) was found with *Trichoderma* followed by *Bacillus*, *Pseudomonas* and *Rhizoctonia* (Table 1). Besides in case of other treatment like fungicides, lowest severity (42.126) was found with Mancozeb + Metalaxyl followed by Mancozeb, Copper Oxychloride and Carbendazim. *Trichoderma* and *Bacillus* shows 42.33% and 33.06% reduction of disease severity over control where *Pseudomonas* and *Rhizoctonia* shows 10.31% and 4.1% reduction of disease severity over control (Table 2). Comparing with the fungicides, *Trichoderma* shows a promising result in case of % reduction of parasitic red rust severity in tea plant.

In case of disease severity scale of epiphytic red rust, the lowest severity (43.372) was found with *Trichoderma* followed by *Bacillus*, *Pseudomonas* and *Rhizoctonia* (Fig:1). And in case of fungicide treatment, lowest severity (42.662) was found with Mancozeb + Metalaxyl followed by copper oxychloride, Mancozeb and Carbendazim. *Trichoderma* and *Bacillus* shows 45.58% and 36.66% reduction of epiphytic red rust over control where *Pseudomonas* and *Rhizoctonia* shows 31.75% and 12.79% reduction of disease severity over control (Fig 2). Unlike parasitic red rust, *Trichoderma* also have a significant effect on % reduction of epiphytic red dust severity.

Table 1: Disease severity scale of parasitic red rust against different treatments with progress of time

Treatment	Afrer 15 days of spray	After 30 days of spray	After 45 days of spray	After 60 days of spray	After 75 days of spray	Mean%
To=Control	78.66	78.66	78.22	76.44	76.44	77.684
T ₁ = <i>Trichoderma</i>	44.88	42.22	45.33	45.33	46.22	44.796
T ₂ = <i>Bacillus</i>	51.99	53.77	52.44	52.88	48.89	51.994
T ₃ = <i>Pseudomonas</i>	68.44	67.10	68.88	67.55	64.88	67.37
T ₄ = <i>Rhizoctonia</i>	75.10	74.66	74.66	74.66	73.33	74.482
T ₅ = Carbendazim	58.66	65.77	60.44	60	58.21	60.616
T ₆ = Copper oxychloride	44.66	46.66	46.22	46.22	43.99	45.55
T ₇ = Mancozeb	43.11	43.10	43.11	43.55	40.66	42.706
T ₈ = Mancozeb+ Metalaxl	41.33	43.55	42.21	42.21	41.33	42.126

Table 2: Reduction of parasitic red rust severity for different treatments over control

Treatment	Disease severity	%changes in severity
To=Control	77.684	00
T ₁ = <i>Trichoderma</i>	44.796	42.33
T ₂ = <i>Bacillus</i>	51.994	33.06
T ₃ = <i>Pseudomonas</i>	67.37	10.31
T ₄ = <i>Rhizoctonia</i>	74.482	4.1
T ₅ = Carbendazim	60.616	21.97
T ₆ = Copper oxychloride	45.55	41.36
T ₇ = Mancozeb	42.706	45.02
T ₈ = Mancozeb+ Metalaxl	42.126	45.77

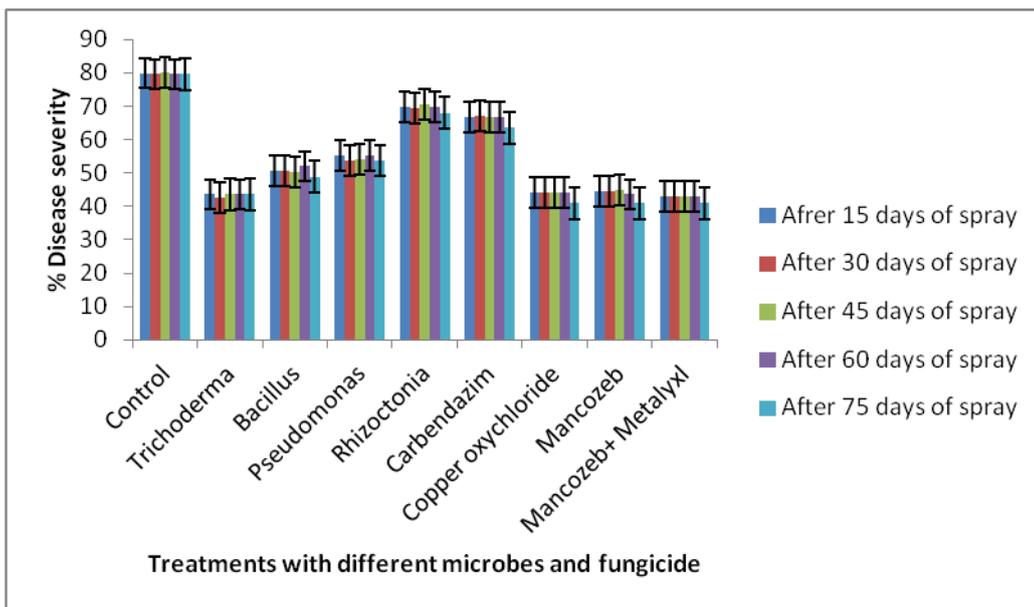


Fig 1: Disease severity scale of epiphytic red rust with different treatments

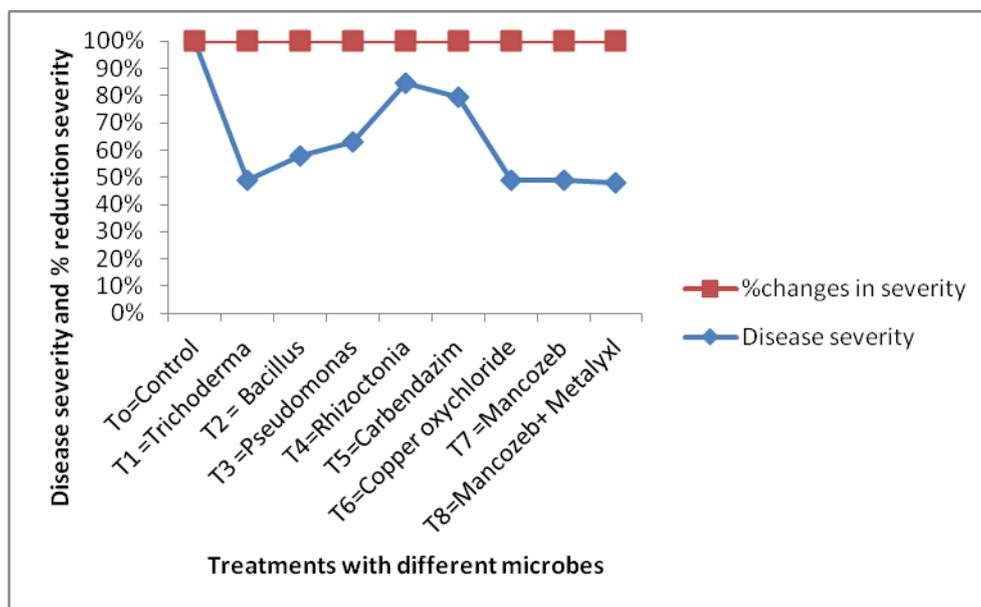


Fig 2: Rate of reduced in epiphytic red rust severity over the control

PP 3.10: Identification of potential source of infection of tea disease for disease development (BTRI/BEF: 2018-2025)

Objectives:

1. To find out the potential source of epiphytic red rust infection in case of bush sanitation after different pruning operation.
2. To develop sustainable measures to control epiphytic red rust effectively.

Progress: In this survey type experiment, there are seven parameters related bush sanitation condition after different pruning operations are considered. It was found that, % severity index of epiphytic red rust in case of LP and DS pruning with clean sanitation was around 51.9% & 68.17% respectively but where unproductive and soil touching mature brunch was not removed during LP and DS, % disease severity index was found around 65.3% & 73.15% respectively. Meanwhile, in case of MS and LS operation % severity index of epiphytic red rust was found around 76.61% & 84.80% respectively. If pruning liter was not fully removed from section after pruning, then % severity index of epiphytic red rust was observed around 90.9%. The experiment will be continued.

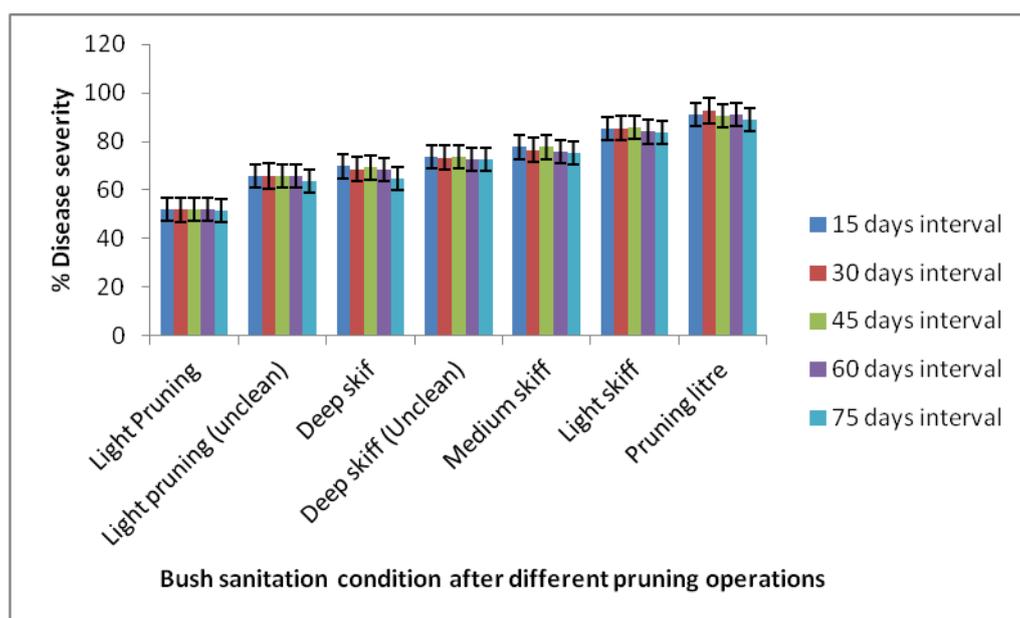


Fig 3: Effect of bush sanitation condition after different pruning operations on percentage of epiphytic red rust severity with progress of time

PP3.3: Screening of new fungicides and herbicides against different diseases and weed in tea (BTRI/BEF/TE(s)).**Progress:**

A total of ten fungicides and nine herbicides of different groups were tested against respective diseases and weeds. Tested chemicals were found >80% effective against the respective pests. Reports were sent to PTASC for further necessary action.

OTHER ACTIVITIES**Advisory and Experimental visits**

A total of twenty two (22) advisory visits were paid to different tea estates to identify and render advice on specific disease and weeds problem and twenty two (22) correspondences issued to different tea estates in respect of identification of various diseases and their control measures during the reporting year. Thirty (30) experimental visits were made with particular preference to experimental data collection in tea estates.

Official visit/tours

A total of seventeen (17) official visits were paid by the scientists of the division to different organizations for official purposes.

Courses on tea culture

The scientific personnel of the division delivered lectures on tea disease and weeds management at annual courses held at BTRI main station, Srimangal; BTRI sub-station, Fatickchari, Chattogram and Panchagarh.

Workshop/Seminar

A total of eleven (11) workshops on tea disease and weed management were carried out in different tea valleys during the year. One (01) scientific paper was also published in journal during the period under report.

STATISTICS & ECONOMICS DIVISION**Dr. Shefali Boonerjee**

Senior Scientific Officer

STAFF

Mrs. Shefali Boonerjee, Senior Scientific Officer joined on 23rd June 2015 in this Division. The posts of Principal Scientific Officer (PSO), and Statistical Assistant were lying vacant during the period under report. There was no other change in personnel position of the division.

RESEARCH

There were three experiments running in this division regarding economic efficiency of tea production, evaluation of technology and economic efficiency of tea factories. The present situation of these experiments is summarized below.

SE 1: ECONOMIC EFFICIENCY OF TEA PRODUCTION

SE1.1. Economic efficiency of the test clones of BTRI. This experiment has undertaken to evaluate the economic efficiency of the test clones from which commercial clone (s) will be released. The economic performance is also needed to be understood before commercial release of a clone. With this view of importance the experiment has currently been started in November, 2018. Initially 2 experiment plots of BTRI Farm has been selected for data collection which are named as Bt 42 and Bt 43. Data from both the plots regarding green leaf production, expenditure for the workers' wages and other cultural operations are being collecting. The secondary data collection of production and approximate expenditure of last 10 years is also on going

SE 2: EVALUATION OF TECHNOLOGIES.

SE 2.1. Adoption of BTRI Innovated Technologies and its Extension to Bangladesh Tea Industry.

The study conducted to examine the overall feature of implementation and its efficiency of the BTRI technologies to the tea estates. BTRI has innovated a number of technologies and made a great impact on the tea industry providing these technologies. Bangladesh tea has increased its productivity remarkably from the last few decades. One of the reasons behind such improvement is the utilization of scientific technologies like superior planting materials, authentic control measures of pest and disease management, proper agronomic practices, increase of soil fertility and pH control etc. BTRI has so far released 21 outstanding clones and developed many other successful technologies which are effectively been used in the tea industry. But there is no information about the percentage of application of the technologies and its efficiency in implementation. So, the current data regarding the disseminated technologies to the estate required to be up-to-dated. This database will be helpful to find out the adoption efficiency in the field and to find out the limitations of dissemination of the BTRI technologies.

In the present experiment, the adoption percentages of both BT and TV clones in the tea estates of different valleys are explored. The collected data of total 144 gardens were summarized according to valley wise and management wise (Table1) adoption of clonal plantation. From the result it was explored that about 41.64% land of total tea area of the 7 valleys is occupied by clone plantation with the average production of 1607.48 kg/ha. The use of BT and TV clones are 45.05% and 40.20% with the average production of 1591 and 1667 kg/ha respectively. Among the valleys, the highest BTRI released clones were adopted by Chittagong valley which is 74.62% of their clone area. Among the rest of the valleys, BT

clones were planted in their clone area 68.31% in Luskerpur, 51.79% in North Sylhet, 51.28% in Lungla, 48.78% in Monu-Doloi and 47.69% in Juri valley. The Balisera valley has the lowest (35.63%) clone planted area of which only 21.82% is occupied by BT clones. Data on using of cultural practices like pruning cycle, plant to plant spacing, pests and disease control measures are also collected in the same time through the questionnaire from the estates and the results are being under analyzing.

Table 1. The utilization of clones (%) in the different Management.

Management	No. of TEs	Seedling % of total tea are		Clone area (%) of total tea area				
		Area (%)	Av. yield (kg/h)	Total clone area (%)	BT %	Av. Yield of BT area (kg/h)	TV %	Av. Yield of TV area (kg/h)
Finlays	7	63.76	1425	35.3	8.35	1500	72.2	1900
NTC	11	47.43	886	50.48	61.95	1416	32.9	1417
BTB	3	56.00	864	41.41	57.00	1386	42.81	1291
Duncun	16	61.22	1338.5	33.64	30.22	1695	41.93	1950
Deundi Tea Co. Ltd.	4	53.60	1215	46.40	60.55	1533	40.00	1500
The New Sylhet Co.	1	14.90	1200	85.09	65.55	1800	26.75	1700

STATISTICS

Table 2. Tea Production, Internal Consumption, Export and Import of Bangladesh

Year	Production (mkg)	Internal Consumption (mkg)	Export (mkg)	Import (mkg)
2001	53.15	36.95	12.92	-
2002	53.62	41.50	13.65	-
2003	58.30	37.44	12.18	-
2004	56.00	43.33	13.11	-
2005	60.14	43.30	9.01	-
2006	53.41	40.51	4.79	-
2007	58.19	46.27	10.56	-
2008	58.66	52.12	8.39	-
2009	59.99	53.74	3.15	4.5
2010	60.04	57.63	0.91	6.0
2011	59.13	58.50	1.47	7.0
2012	62.52	61.19	1.50	8.5
2013	66.26	64.00	0.54	11.6
2014	63.88	67.17	2.66	6.9
2015	67.38	77.57	0.54	10.68
2016	85.05	81.64	0.62	8.83
2017	78.95	85.93	2.56	6.29
2018	82.134	90.45	0.64	7.45

Source: BTB Monthly Bulletin, 2018

Table 3. Month wise tea Crop Production (mkg) of Bangladesh

Month	2016		2017		2018	
	Production (mkg)	Cumulative Production (mkg)	Production (mkg)	Cumulative Production (mkg)	Production (mkg)	Cumulative Production (mkg)
January	0.093	0.093	0.157	0.157	0.331	0.331
February	0.013	0.106	0.016	0.173	0.038	0.369
March	2.506	2.612	1.152	1.325	1.556	1.952
April	5.096	7.708	4.382	5.707	3.505	5.430
May	6.445	14.153	5.934	11.641	6.334	11.764
June	11.227	25.380	8.584	20.225	7.634	19.398
July	11.395	36.775	11.206	31.431	10.985	30.383
August	11.182	47.957	10.648	42.079	12.477	42.860
September	12.716	60.673	9.784	51.863	12.008	54.868
October	10.907	71.580	11.464	63.327	11.863	66.731
November	9.00	80.580	9.075	72.402	9.147	75.878
December	4.47	85.050	6.547	78.949	6.256	82.134

Source: BTB Monthly Bulletin, 2016, 2017 and 2018

OTHER ACTIVITIES

Annual Returns of BTB and BCS

Annual returns of BTRI farms including Bilashcherra Experimental farm on land use, tea seeds, plants and tea waste and also on employment and employment cost (BTB return Form No. 1 & 3) were prepared for the period of 2018 and sent to BTB. Annual statistical return of manpower and labor welfare and on tea garden land (BCS form No. 2 & 3) of BTRI farms for 2018 also had sent to BCS office, Dhaka.

BILASHCHERRA EXPERIMENTAL FARM

BTRI, SREEMANGAL

STAFF

A.K.M Ashraful Haq took over the charges of Bilascherra Experimental Farm on 26 August, 2018. There was no other change in the staff position during the 2019.

FARM**Table 1.** Land Distribution

Sl. No.	Description	Area (ha)
	Under Tea	110.64
	I. Plucking Area	
	1. Immature Tea (under 5 years)	6.18
	2. Tea bushes 6 to 10 years	4.18
(a)	3. Tea bushes 11 to 40 years	33.36
	4. Tea bushes 41 to 60 years	60.10
	II. Seed Bari	6.00
	II. Seed Nursery	0.50
	III. Clone Nursery	0.50
	Under Subsidiary Crops	19.76
(b)	I. Fruit Tree	5.15
	II. Soft and Hard Wood Timber Garden	10.56
	III. Agar	4.05
(c)	Office/Bungalow/Godown, Staff Quarter, Labour Line, School, Hospital, Graveyard, Masjid/Mandir/Church and Roads	29.60
(d)	Cultivable, Fallow and Waste Land	68.36
	Total Area of the Farm	228.36

Table 2. Crop Production

Description	Quantity
a. Green Leaf	5,16,936 (kg)
b. Made Tea	1, 14,594(kg)
c. Average Production	1,036(kg/ha)

Table 3. Green leaf Production of the Farm in the Year 2019

Name of the Month	Month-wise crop production in 2019 (kg)
January	-
February	-
March	3,124
April	11,417
May	5,968
June	67,173
July	38,468
August	1,59,561
September	76,037
October	72,562
November	62,684
December	19,942
Total	5,16,936 kg

Table 4. Production of Improved Bi-clonal Seed, Planting Materials and Sales of Farm Products

Bi-Clonal Seed production(kg)	Institutional use (kg)	Sales of Bi-Clonal Seed (kg)	Sale amount (Tk)	Sales of Different Fruit (Tk)
110	110			23,000

Extension and Development

3.81 ha of land was newly planted in 2018. It has a nursery with the average capacity of 50,000 plants. Water supply, labor houses, roads and bridges were regularly maintained. Four thousand tea saplings were infilled in different sections in the year 2019. Experiments of different divisions had been facilitated at the period.

Miscellaneous

The Victory Day as well as the Independence Day were celebrated with due solemnity during the year. Prizes for sports and sweets were distributed among the labors of the farm and their children on both the occasions. Blankets were distributed among the labors as incentive of the year.

BTRI Fatickchari Sub-station Chattogram

Personnel

Mr. Ashim Kumar Saha, Senior Scientific Officer (Soil Science) took over the charges of BTRI Sub-station from Mr. Raihan Mujib Himel, Scientific Officer (Plant Pathology) on 12 March 2017 and continued to 30 June 2018. Dr. Md. Masud Rana, Senior Scientific officer (Agronomy) was transferred from BTRI, Srimangal to BTRI Fatickchari Sub-station and took over the charges of the Sub-station from Mr. Saha on 1 July 2018, and continued to 6 October 2018; and again handed over the charges to Mr. Saha on 7 October 2018. Mr. Md. Riyadh Arefin, Scientific officer (Botany) and Mr. Md. Kamal Hossen, Upper Divisional Assistant were transferred from from BTRI, Srimangal to the Sub-station and also Mr. Md. Rayhan-Ur-Rahaman, Scientific Officer, Botany division, arrived in here from CTH Project, Bandarban during the reporting year. Mr. Ajit Chandra Chowdhury is performing his duties as before as a Senior Farm Assistant consecutively.

Production of green leaves

During the reporting year, about 63,180 Kg of green leaves were plucked from the existing tea plantation and sold to Kaiyacherra Dolu Tea Estate @ Tk. 26 per Kg of green leaves.

Distribution of improved planting materials

About 26, 68,000 Nos. of fresh cuttings were collected from the mother bush area and 320 Kg of bi-clonal tea seeds were also harvested from the Seed Bari at the sub-station were distributed to the different tea gardens in Chattogram and Chattogram Hill Tract project, Bandarban.

Infilling and Extension programme

About 11.25 acres of cultivable area of the sub-station was brought under tea cultivation extension program during the reporting year.

Development

A modern 'Soil Analytical Laboratory' for determining physical and chemical properties of soils of the tea gardens and small tea growers was under development during the period. A vermi-compost unit was also established during the reporting year.

Seminars/Workshops

Two workshops were conducted at two tea estate viz. at Neptune Tea Estate and Rangapani Tea Estate, Chattogram on "Nursery Maintenance and Soil Management" Estate and "Plucking Technique", respectively during this reporting.

KALITI SUB-STATION**Kulaura, Moulvibazar****STAFF**

There was no change in the personnel position of the Sub-station during the reporting year.

PRODUCTION

Green leaves produced during 2018 and total number of fresh cuttings distributed to different tea estates is given below:

Year	Production of green leaf (Kg)	Sale price @ 27.00 (Tk)	Fresh cutting supplied (nos.)	Sale price @ 0.30 (Tk)	Roted cutting supplied at BEF (nos.)	Sale price
2018	27,676	7,47,252	2,20,000	66,000	3,440	-

BTRI SUB-STATION**Bandarban****STAFF**

Mr. Mohammed Syeful Islam, Senior Scientific Officer, Bangladesh Tea Research Institute, Srimongal Joined on 14 November 2018. Mr. Md. Raihanur Rahman, Scientific Officer, Bangladesh Tea Research Institute Joined on 23 September 2018 and was again Transferred to BTRI Substation, Fatickchari, Chattogram on 13 November 2018. There were no other changes in the personnel position of the Sub-station during the reporting year.

Extension Progress

There was a total no. of small grower under registration 291, No. of small grower under tea cultivation 106, total land under tea cultivation 474 Acre in the year 2018. Provided technical support all over the year to small holding tea growers. Co-ordinated sales of green leaves all over the year.

Works under the Project

1. Given newly registration small tea grower 157 N0s.
2. Tea sapling raised 10 lac.
3. Land lease for tea sapling production 1.53 Acre.
4. Training of different topics such as tea plantation, land preparation, pruning, plucking, disease and pest management, Total no. of farmer 265 under 11 batches.
5. Necessary repairing of the office building has been done in the reporting year.
6. Proper maintenance of mother bush plot around the year.
7. Necessary steps are performed to establish CTC tea processing factory in 2018.

BTB REGIONAL STATION, PANCHAGARH**Dr. Mohammad Shameem Al Mamun**Senior Scientific Officer
&
Project Director, Northern Bangladesh Project**STAFF**

Mr. Md. Abul Kashem, Scientific Officer (Botany) was resigned from Northern Bangladesh Project, Nilfamarai on 28 June 2018. Mr. Mohammad Sayadul Huq was transferred from Bilashcherra Experimental Farm, BTRI to BTB Regional Station, Panchagarh and joined on 04 November 2018. Mr. Zayed Imam Siddiqi, Senior Farm Assistant and Mr. Mohammad Saiful Kadir, Account Assistant were transferred from BTB Regional Station, Panchagarh to Northern Bangladesh Project, Nilfamari and BTRI Main Station, Srimangal, respectively on 08 July 2018. There was no other change in the personnel position of the substation during the period under report.

Research Project

A sub-project entitled “Integrated Pest Management (IPM) Approaches to Major Pests of Tea for Sustainable Tea Production” under Competitive Research Grant (CRG) of NATP Phase 2 of PIU; BARC funded by USAID & GoB was implemented at BTRI main station & BTRI Substation, Panchagarh since May 2017. The objective of the project is to minimize the load of synthetic pesticides through a sustainable management practice along with consumers’ safety by adopting IPM practices. The experiments on different control options of IPM such as cultural control viz., plucking, pruning cycle, field sanitation, mechanical viz., solar light trap, yellow, blue sticky trap, resistant agrotypes, indigenous plant extracts, commercial biopesticides, Parasitoids and entomopathogens against major pests of tea were carried out at BTRI Substation and different farmers’ field at Panchagarh during the study period. A pest management laboratory with sophisticated equipments and an IPM field laboratory was established at the substation under this project. The project was ended in September 2018. The project completion report (PCR) has been sent to BARC, Dhaka.

Development Project

A development project entitled “Extension of Small Holding Tea Cultivation in Northern Bangladesh” under Bangladesh Tea Board; Ministry of Commerce funded by Overseas Development Assistance (ODA) Revolving Fund was implemented at BTB Regional Station, Panchagarh since September 2015. The objective of the project is to extend tea cultivation in 500 hectares of land (300 ha. in Panchagarh, 150 ha. in Thakurgaon, 25 ha. in Dinajpur & 25 ha. in Nilfamari) by organizing and motivating the farmers in the project areas and to supply the planting materials (Fresh cuttings) & 10 lacs tea saplings of appropriate clone/variety at the cheapest rate to the tea growers of that locality each year. About 346 hectare of lands was extended and 687 small tea growers were registered under this project. One Consultant and one Field Assistant were recruited under this project during the period under report. About 5.0 lac tea saplings have been distributed to the registered small grower at the subsidized rate @ Tk. 2.00/Saplings upto December 2018. The project will be completed in June 2021.

VP Nursery

15,350 saplings raised under BTRI VP nursery were distributed to the registered small growers @ 4.5/saplings and earned Tk. 69,075/= during 2018.

Advisory visit

A total of One hundred seventy four (174) advisory visits were paid to different tea gardens and small tea growers' gardens in northern Bangladesh (Panchagarh, Thakurgaon, Nilfamari & Dinajpur) and rendered advice on tea cultivation in scientific way during 2018. Twenty five (25) samples of tea plants/plant parts were received from different small tea growers in respect of identification of various pests, diseases, other nutrient deficiencies, and suggested their remedies during the reporting year.

Official visit

A total of Nineteen (19) official visits were paid to different organizations including Tea Expo, BARC, Bangladesh Tea Board, Chattagram, IMED, a2i, and Ministry of Commerce, Dhaka.

Monitoring visit

Seven (7) monitoring visits were paid to Korotoa T.E., Sallyllun T.E. M.M. T.E, Haque T.E., Dahuk T.E., Kazi & Kazi T.E., and Greenfield T.E. and collected information on development activities of the garden in a prescribed format and sent to PDU for necessary action during 2018.

Training/Workshop

One (01) training workshop were conducted by BTRI for small tea growers at Atoari, Panchagarh on different aspects of tea culture during 2018 and Twenty one (21) training/seminar/rally/motivation workshops were conducted for small tea growers at different upazilla under Northern Bangladesh Project during 2018.

Miscellaneous

Participated in the Digital Innovation Fair 2018 along with Mobile apps "Duti Pata Ekti Kuri" organized by Deputy Commissioner's Office, Panchagarh during 12-14 February 2018. Two days' long Annual Course 2018 was held on 7-8 May 2018 at BTB Regional Station, Panchagarh. Visit of respected Chairman, Bangladesh Tea Board Major General Md. Shafeenul Islam, ndc, psc and Major General Md. Jahangir Al Mustahidur Rahman, psc on 9 January 2018 and 16 July 2018, respectively.

Other activities of the divisions during 2018

Sl.	Item	Soil Science	Bio chemistry	Botany	Agronomy	Entomology	Plant Pathology	St. & Eco.	Technology
01	No. of experiments	07	-	32	08	07	06	03	-
02	No. of experimental visits	52	-	26	133	35	30	-	-
03	No. of advisory visits	22	-	12	22	36	22	-	-
04	No. of advisory correspondence	230	-	06	6	35	22	-	-
05	No. of official visits	20	-	-	14	08	17	-	-
06	No. of soil, fertilizer & dolomite samples analyzed	3301	-	-	-	-	-	-	-
07	No. of nursery soil, water & cowdung samples analyzed for nematodes	-	-	-	-	91	-	-	-
08	No. of pesticide residue analysis (commercial)	-	-	-	-	-	-	-	-
09	No. of pesticide residue analysis (Experimental)	-	-	-	-	03	-	-	-
10	Physical test of pesticides in Lab.	-	-	-	-	-	-	-	-
11	No. of pesticides tested in tea fields	-	-	-	-	28	19	-	-
12	No. of circulars/pamphlets/leaflets issued to T. E.	-	-	01	-	02	-	-	-
13	No. of workshop/seminar conducted	01	-	13	16	11	11	-	-
14	MTC module conducted (Hours/year)	18 hrs.	-	16 hrs.	20.5 hrs.	3 hrs.	12 hrs.	-	-
15	Attended national seminar, conference, symposium & workshop	01	-	05	-	01	01	-	-
16	Attended international seminar, conference & symposium	-	-	-	-	-	-	-	-
17	Attended Training/Course	02	-	01	01	-	-	-	-
18	No. of research paper published	01	-	01	01	-	02	01	-
19	No. of Fresh cutting supplied	-	-	-	6,01,200	-	-	-	-
20	No. of Rotted cutting supplied	-	-	300	46,285	-	-	-	-
21	Biclonal seed supply to T. E.	-	-	560 kg	-	-	-	-	-
22	Tea tasting	-	-	10	-	-	-	-	-