Project ID -791

## Competitive Research Grant

# Sub-Project Completion Report

## on

# Effect of variety and fertilizer on cotton yield, fiber quality and seed oil content

**Project Duration**

**July 2017 to 30 September 2018**

**Cotton Development Board**

**Submitted to**
**Project Implementation Unit-BARC, NATP 2**
**Bangladesh Agricultural Research Council**
**Farmgate, Dhaka-1215**

**September 2018**

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## Acronyms

| | | |
|---|---|---|
| CDB | - | Cotton Development Board |
| CRC | - | Cotton Research Center |
| CRG | - | Competitive Research Grant |
| GOT | - | Ginning Out Turn |
| HCRC | - | Hill Cotton Research Center |
| HVI | - | High volume Instrument |
| NATP | - | National Agriculture Technology Project |
| SRDI | - | Soil Resource Development Institute |

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## Executive Summary

Cotton is an important cash crop in Bangladesh grown over 37 districts in Bangladesh. Cotton Development Board, an organization of the Bangladesh Government, is responsible for both cotton research and extension. During 2017-18 season, cotton was cultivated in 43050 ha of land and the lint production was 165479 bales that met only 3% of our national demand. Thus, Bangladesh has an urgent need to increase domestic cotton production. The cotton production of Bangladesh would be increased by the combination of increasing per hectare yield as well as expanding the cotton growing areas in Bangladesh. For a healthy growth and better yield cotton crop needs continuous supply of essential nutrient elements. Deficiency or toxicity of any one nutrient results in reduction of plant growth and ultimately yield. It is established fact that optimum nutritional requirement of cotton are of primary importance to boost up its production. Experiments to determine the response of cotton to various rates and fertilizers have always been an important part of research in Pakistan and a balanced supply of nutrients is essential to rise per hectare yields.

To determine the optimum rates of NPK fertilizer for cotton varieties CB-14 and CB-15, field experiments were conducted at 5 Cotton Research Center located at Sreepur, Gazipur; Jagadishpur, Jessore; Sadarpur, Dinajpur; Mahigonj, Rangpur and Balaghata, Bandarban in 2017-2018. At each location six field experiments were set up. To know the effect of 7 different rates of N on CB-14 and CB-15, two experiments were set up in RCBD with 3 replications at each location. To know the effect of 6 different rates of P on CB-14 and CB-15, two experiments were set up in RCBD with 3 replications at each location. To know the effect of 6 different rates of K on CB-14 and CB-15, two experiments were set up in RCBD with 3 replications at each location. Cotton growth data were collected from 10 randomly selected plants at each plot. Average boll weight was calculated by dividing the ten bolls. Seed cotton was harvested from three middle rows to determine the plot yield.

In cotton research center Gazipur, the results revealed that the optimum doses of NPK are 200, 100 and 200 kg/ha for cotton variety CB-14 and for CB-15 variety doses are 160, 80 and 120 kg/ha respectively. In case of Cotton Research Center, Jagadishpur, Jashore the optimum doses of NPK for cotton variety CB-14 are 240, 80 and 200 kg/ha and for CB-15 are 200, 80 and 200 kg/ha In case of Cotton Research Center, Sadarpur, Dinajpur the optimum doses of NPK for cotton variety CB-14 are 200, 60 and 200 kg/ha and for CB-15 are200, 80 and 200 kg/ha respectively. In case of Cotton Research Center, Mahigonj, Rangpur the optimum doses of NPK for cotton variety CB-14 are 240, 60 and 200 kg/ha and for CB-15 are 240, 80 and 200 kg/ha respectively. In case of Hill Cotton Research Center, Balaghata, Bandarban the optimum doses of NPK for cotton variety CB-14 are 200,80 and 200 kg/ha and for CB-15 are 100,80 and 200 kg/ha respectively. N has positive correlation with length, uniformity index, strength, elongation, micronaire while it has negative correlation with reflectance and yellowness. For CB-14, P has positive correlation with length, uniformity index, strength and elongation while it has negative correlation with micronaire, reflectance and yellowness. For CB-15, P has positive correlation with length, uniformity index, strength, elongation, micronaire and yellowness while it has negative correlation with reflectance. For CB-14 and CB-15, K has positive correlation with length, uniformity index, strength, elongation, reflectance and yellowness. However, for CB-14, K has negative correlation with micronaire while for CB-15, K has positive correlation. Farmers can increase income and decrease production cost by using optimum fertilizer rates generated through this project. In addition to that generated technologies will be helpful for planning of resource allocation for cotton production in Bangladesh.

**CRG Sub-Project Completion Report (PCR)**

## A. Sub-project Description

1. Title of the CRG sub-project: **Effect of variety and fertilizer on cotton yield, fiber quality and seed oil content**
2. Implementing organization: **Cotton Development Board**
3. Name and full address with phone, cell and E-mail of PI/Co-PI (s):


a). Principal Investigator :
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4. Sub-project budget (Tk):

4.1 Total: 3500000

4.2 Revised (if any): N. A.

5. Duration of the sub-project: July 2017 to September 2018

5.1 Start date: 13 July 2017

5.2 End date: 30 September 2018

**6. Justification of undertaking the sub-project:**

Cotton (*Gossypium hirsutum* L.) is considered as king among the various fiber crops; also called white gold is one of the most important cash crop worldwide and plays an important role in economy of many countries (Patil *et al.,* 2011*).* Millions of people in the world are directly or indirectly associated with Cotton business, i.e. production, transport, ginning textile and other allied industries thus it is livelihood to the millions of people. Cotton fiber, occupies a pivotal position in the international economy (Arshad*et al*., 2005). World population is increasing at alarming rate, the sustainability and improvement of cotton yield will be the prime objective of cotton scientist.

Cotton is the leading fiber crop and important source of edible oil and protein meals. Cottonseed oil contains high antioxidant (Khan *et al.,* 1995). In Bangladesh, cottonseed is used for edible oil production and the cottonseed meal is used for poultry, animal and fish feed. Cotton seed is a major source of oil, and ranks second among the five major oil seed cropes i.e., soybean, cotton, sunflower, peanut and rapeseed. Competition with other seed sources in the oil and the developing prospect of using cottonseed as a food, have increased the awareness of the potential importance of cottonseed to food reserves of the world. In Pakistan, cottonseed (*Gossypium hirsutum* L.) is the major source of edible oil and has been reported to contribute 72% of the total edible-oil production (Khan *et al.,* 1995), while the protein is fed to livestock animals in the form of seed cake. Hence, cottonseed is an important source of providing nutrients. Since upland cotton is grown mainly for fibre production, breeders have conducted studies to exploit the potential of plant with a higher cottonseed yield and improved fibre characteristics. Thus due to a unidirectional breeding approach, increase in oil and protein contents has never been taken into consideration. The supply of nitrogen throughout the growing season is one of the key environmental factors for a high yield, but nitrogen supply to the commercial cotton fields varies considerably due to various fertilization rates, soils nutrient composition and variation in rainfall (Peter, 2000).

Information is also available on the effect of nitrogen on the oil and protein contents, which indicated that nitrogen fertilization tends to increase the protein content of seed at the expense of oil (Scott *et al.,* 1973; Nuttal *et al*., 1989; Boquet *et al*., 1993). However, there is no available information on the combining ability for oil and protein contents in different nitrogen regimes. This is partly due to a lack of understanding of the genetics of the traits involved. Till to date, cotton research conducted by the Cotton Development Board targeted to improve the quantity and quality of cotton fiber. As such research for the identification of the factors affecting the on cottonseed protein and oil content is necessary. During the course of seed development nitrogen is the building block of protein structure and also plays the most important role in oil synthesis. Cotton seed oil and protein concentration in cotton is controlled by multiple genes and is strongly influenced by the environment. Moreover. Numerous studies indicated significant negative correlation between oil and protein content in cottonseed. CB-14 and CB-15 are important cotton varieties released by Cotton Development Board those are presently grown over 37 districts. These project activities are designed to identify the factors affecting the cottonseed oil and protein content of these three varieties for contributing in the value addition of cotton crop as well to increase the farm income.

The objective of the present study was to determine the Influence of variety, and NPK fertilizer rates on cotton yield, fiber quality and seed oil content (*Gossypium hirsutum* L.).

**7. Sub-project goal:**

Increasing cotton yields in Bangladesh that will contribute in farmer's additional income from cotton cultivation.

**8. Sub-project objectives:**

a. To determine the NPK requirements of cotton variety CB 14
b. To determine the NPK requirements of cotton variety CB 15
c. To know the effect of various rates of NPK on cotton fiber quality and seed oil content.

**9. Implementing locations:**

a. Cotton Research Center (CRC), Sreepur, Gazipur
b. Cotton Research Center (CRC), Jagadishpur, Jashore
c. Cotton Research Center (CRC), Sadarpur, Dinajpur
d. Cotton Research Center (CRC), Mahigonj, Rangpur
e. Hill Cotton Research Center (HCRC), Balaghata, Bandarban

**10. Methodology in brief:**

To determine the effect of variety and fertilizer on cotton yield and fiber quality, field experiments were conducted at 5 Cotton Research Center located at Sreepur, Gazipur; Jagadishpur, Jessore; Sadarpur, Dinajpur; Mahigonj, Rangpur and Balaghata, Bandarban in 2017-2018. The effect of yield and yield contributing characters of two cotton varieties, CB-14 and CB-15 by the various rates of NPK fertilizer were evaluated by six experiments conducted at each location. The initial soil samples were collected from the experiment sites and were analyzed at Soil Resource Development Institute (SRDI) laboratory. The initial soil characteristics of experimental sites are given in Table 1.

**Table1. Initial soil status of Experimental sites**

| Location | Nutrient Elements | $p^H$ | OM (%) | N (%) | K meq/100 g soil | P µg/g soil | S µg/g soil | Mg meq/ 100 g soil | Zn µg/g soil | B µg/g soil | Soil Texture |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CRC Sreepur Gazipur | N | 5.60 | 1.68 | 0.084 | 0.12 | 6.87 | 0.004 | 0.82 | 1.33 | 0.43 | Clay loam |
| | P | 6.10 | 1.58 | 0.18 | 0.42 | 5.68 | 0.001 | 1.31 | 1.34 | 0.60 | Clay loam |
| | K | 5.90 | 1.68 | 0.085 | 0.24 | 7.61 | 0.001 | 1.47 | 1.85 | 0.25 | Clay loam |
| CRC Jagadishpur Jashore | N | 7.20 | 0.20 | 0.010 | 0.12 | 2.41 | 0.002 | 0.79 | 0.92 | 0.13 | Sandy loam |
| | P | 7.70 | 0.27 | 0.014 | 0.14 | 3.28 | 1.05 | 0.48 | 0.88 | 0.20 | Sandy loam |
| | K | 7.60 | 0.40 | 0.020 | 0.14 | 3.11 | 2.61 | 0.45 | 0.79 | 0.08 | Sandy loam |
| CRC Sadarpur Dinajpur | N | 6.73 | 1.03 | 0.05 | 0.38 | 5.50 | 4.50 | 1.20 | 1.12 | 0.18 | Sandy loam |
| | P | 6.70 | 0.90 | 0.04 | 0.17 | 9.90 | 6.40 | 1.76 | 3.11 | 0.12 | Sandy loam |
| | K | 6.85 | 0.80 | 0.06 | 0.20 | 5.10 | 9.59 | 0.71 | 1.33 | 0.59 | Sandy loam |
| CRC Mahigonj Rangpur | N | 6.53 | 1.13 | 0.07 | 0.28 | 7.50 | 5.58 | 1.90 | 1.12 | 0.28 | Sandy loam |
| | P | 6.25 | 1.10 | 0.04 | 0.15 | 5.90 | 9.49 | 1.56 | 2.21 | 0.30 | loam |
| | K | 6.50 | 0.90 | 0.08 | 0.45 | 5.20 | 12.69 | 0.71 | 1.30 | 0.50 | loam |
| HCRC Balaghata Bandarban | N | 6.50 | 1.28 | 0.064 | 0.18 | 3.29 | 11.52 | 0.54 | 3.46 | 0.35 | Clay loam |
| | P | 6.40 | 1.14 | 0.057 | 0.22 | 8.35 | 1.08 | 0.62 | 4.90 | 0.48 | clay Loam |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| K | 6.30 | 1.21 | 0.061 | 0.23 | 6.16 | 0.002 | 0.63 | 4.60 | 0.76 | clayLoam |

The brief descriptions of six experiments conducted at each location are given below:

Experiment 1: Effect of nitrogen on yield, fiber quality and seed oil content on cotton variety CB-14

Treatment:
$T_0$ = 0 (Control)
$T_1$ = 40 kg N/ha
$T_2$ = 80 kg N/ha
$T_3$ = 120 kg N/ha
$T_4$= 160 kg N/ha
$T_5$ = 200 kg N/ha
$T_6$ = 240 kg N/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: N fertilizer was applied as per treatment and PKS were applied as per recommended dose (60-175-30 kg/ha P-K-S respectively).
Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields
Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed

Experiment 2: Effect of nitrogen on yield, fiber quality and seed oil content on cotton variety CB-15
Treatment:
$T_0$ = 0 (Control)
$T_1$ = 40 kg N/ha
$T_2$ = 80 kg N/ha
$T_3$ = 120 kg N/ha
$T_4$= 160 kg N/ha
$T_5$ = 200 kg N/ha
$T_6$ = 240 kg N/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: N fertilizer was applied as per treatment and PKS were applied as per recommended dose (60-175-30 kg/ha P-K-S respectively).

Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields
Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed
Experiment 3: Effect of phosphorus on yield, fiber quality and seed oil content of cotton variety CB-14
Treatment:
$T_0$ = 0 (Control)
$T_1$ = 20 kg P/ha
$T_2$ = 40 kg P/ha
$T_3$ = 60 kg P/ha
$T_4$= 80 kg P/ha
$T_5$ = 100 kg P/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: P fertilizer was applied as per treatment and NKS were applied as per recommended dose (150-175-30 kg/ha P-K-S respectively).
Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields
Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed

Experiment 4: Effect of phosphorus on yield, fiber quality and seed oil content of cotton variety CB-15
Treatment:
$T_0$ = 0 (Control)
$T_1$ = 20 kg P/ha
$T_2$ = 40 kg P/ha
$T_3$ = 60 kg P/ha
$T_4$= 80 kg P/ha
$T_5$ = 100 kg P/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: P fertilizer was applied as per treatment and NKS were applied as per recommended dose (150-175-30 kg/ha P-K-S respectively).
Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields

Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed

Experiment 5: Effect of potassium on yield, fiber quality and seed oil content of cotton variety CB-14
Treatment:
$T_0$ = 0 (Control)
$T_1$ = 50 kg P/ha
$T_2$ = 100 kg P/ha
$T_3$ = 150 kg P/ha
$T_4$= 200 kg P/ha
$T_5$ = 250 kg P/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: K fertilizer was applied as per treatment and NPS were applied as per recommended dose (150-60-30 kg/ha P-K-S respectively).
Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields
Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed

Experiment 6: Effect of potassium on yield, fiber quality and seed oil content of cotton variety CB-15
Treatment:
$T_0$ = 0 (Control)
$T_1$ = 50 kg P/ha
$T_2$ = 100 kg P/ha
$T_3$ = 150 kg P/ha
$T_4$= 200 kg P/ha
$T_5$ = 250 kg P/ha

Design: RCBD
Replication: 3
Plot Size : 5.4m × 4.5 m
Spacing : 90 × 45 cm
Season : 2017-2018
Fertilizer dose: K fertilizer was applied as per treatment and NPS were applied as per recommended dose (150-60-30 kg/ha P-K-S respectively).
Cultural Practices: All crop management practices including thinning, weeding, earthing-up etc. were done uniformly for all fields
Pest Management: Eco-friendly pest management was followed.
Irrigation Management: Irrigation was applied as needed

Data collection:
Cotton growth data were collected from 10 randomly selected plants at each plot. Average boll weight was calculated by dividing the ten bolls. Seed cotton was harvested from three middle rows to determine the plot yield. Ginning out turn (GOT) was computed by using the following formula given by Singh (2004).

$$GOT\ \% = \frac{\text{Weight of lint}}{\text{Weight of seed cotton}} \times 100$$

Fiber characters like strength, fineness, uniformity and elongation of each plant were measured using by high volume instrument (HVI-900). Mean genotypic values of these characters were calculated.

Statistical analysis:
Data collected on different parameters were analyzed statistically by using CropStat 7.2 developed by International Rice Research Institute.

**11. Results and discussion:**

11. 1. Effect of nitrogen on CB 14:

11.1.1. Location Effect on CB-14:
Location effect of N fertilizers on yield and yield contributing characters of CB-14 are given in Table 2.The maximum plant height (156.30cm) was produced from Rangpur Farm and the minimum plant height (104.00 cm) was recorded at CRC, Sreepur, Gazipur. The lowest monopodial branch/plant (1.0) was recorded at HCRC, Bandarban and the highest monopodial branch/plant (2.8) was recorded from CRC, Dinajpur. The lowest number of sympodial branch/plant (14.6) was found at HCRC, Bandarban and the greater number of sympodial branch/plant (20.00) was found at CRC, Rangpur. Highest number of boll/plant (28.30) was recorded from the CRC, Rangpur and the lowest number of boll/plant (21.60) was recorded from the HCRC, Bandarban. The lowest single boll weight (4.88 g) was recorded from CRC, Jashore and the highest single boll weight (5.25 g) was recorded from CRC, Rangpur. The highest seed cotton yield (2685 kg/ha) was recorded from CRC, Rangpur and lowest seed cotton yield (2181 kg/ha) was recorded from the HCRC, Bandarban.

Table 2. Effect of Location of N on CB-14 yield and yield contributing characters

| Location | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| CRC, Gazipur | 104.0 | 1.2 | 16.4 | 22.2 | 4.97 | 2402 |
| CRC, Jashore | 128.2 | 2.5 | 17.0 | 23.8 | 4.88 | 2369 |
| CRC, Dinajpur | 128.0 | 2.8 | 15.4 | 22.2 | 5.23 | 2231 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CRC, Rangpur | 156.3 | 2.0 | 20.0 | 28.3 | 5.25 | 2685 |
| CRC, Bandarban | 122.2 | 1.0 | 14.6 | 21.6 | 5.11 | 2181 |
| 5% LSD | 5.475 | 0.383 | 0.888 | 1.431 | 0.15 | 126 |
| CV% | 7.0 | 32.6 | 8.6 | 9.8 | 4.8 | 8.7 |

**11.1.2 Nitrogen effect:**

The effect of various levels of N fertilizers on yield and yield contributing characters of CB-14 are given in Table 3. The lowest plant height (86.8 cm) was recorded from control treatment and the highest plant height (151.6 cm) was recorded from the treatment of 200 kg N/ha. Increased plant height with the increasing level of nitrogen was also reported by Narayana and Aparna (2011). The highest monopodial branch/plant (2.1) was produced from the treatment of 160 kg N/ha and the lowest monopodial branch/plant (1.3) was recorded from the control treatment. The lowest sympodial branch/plant (11.0) was recorded from control treatment and the highest sympodial branch/plant (19.6) was recorded from the treatment of 160 kg N/ha. The maximum boll/plant (32.00) was recorded from treatment of 160 kg N/ha and the minimum boll/plant (9.90) was recorded from the control treatment. The lowest single boll weight (3.99 g) was recorded from control treatment and the highest single boll weight (5.70 g) was recorded from the treatment of 160 kg N/ha. Sawan *et al.* (2006); reported that boll weight increased with increasing N rate from 95 to 143 kg/ha. Maximum seed cotton yield (3310 kg) was obtained from applying N at the rate 160 kg/ha. The lowest seed cotton yield (1016 kg/ha) was recorded from control treatment. Saleem *et. al.* (2010) indicated that nitrogen had significant effect on the seed cotton yield per hectare.

Table 3. Effect of various levels of N fertilizers on yield and yield contributing characters of CB-14

| Treatment | Doses of N/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 86.8 | 1.3 | 11.0 | 9.9 | 3.99 | 1016 |
| $T_1$ | 40 | 106.7 | 2.0 | 13.7 | 16.8 | 4.38 | 1688 |
| $T_2$ | 80 | 120.9 | 1.9 | 16.3 | 20.5 | 4.94 | 2193 |
| $T_3$ | 120 | 131.6 | 2.0 | 18.0 | 25.0 | 5.33 | 2472 |
| $T_4$ | 160 | 148.1 | 2.1 | 19.6 | 32.0 | 5.70 | 3310 |
| $T_5$ | 200 | 151.6 | 2.0 | 19.6 | 30.1 | 5.66 | 3009 |
| $T_6$ | 240 | 148.4 | 2.1 | 18.7 | 31.1 | 5.62 | 2926 |
| 5% LSD | | 6.5 | 0.5 | 1.1 | 1.7 | 0.18 | 150 |
| CV% | | 7.0 | 32.6 | 8.6 | 9.8 | 4.8 | 8.7 |

11.1.3. Interaction Effect

The interaction effect of location × treatment on yield and yield contributing characters of CB-14 are given in Table 4.

Table 4. Location × treatment interaction effect on CB-14

| Location | Treatment | Doses of N/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| CRC Sreepur Gazipur | $T_0$ | 0 | 61.6 | 0.3 | 10.4 | 8.7 | 4.08 | 767 |
| | $T_1$ | 40 | 86.8 | 0.7 | 13.9 | 15.0 | 4.53 | 1685 |
| | $T_2$ | 80 | 103.8 | 1.4 | 16.5 | 18.1 | 4.63 | 2350 |
| | $T_3$ | 120 | 110.8 | 1.3 | 17.6 | 22.6 | 5.15 | 2559 |
| | $T_4$ | 160 | 125.6 | 1.8 | 19.4 | 31.3 | 5.59 | 3344 |
| | $T_5$ | 200 | 118.3 | 1.4 | 18.4 | 28.5 | 5.45 | 3093 |
| | $T_6$ | 240 | 120.9 | 1.5 | 18.6 | 30.9 | 5.34 | 3012 |
| CRC Jagadishpur Jashore | $T_0$ | 0 | 90.7 | 2.1 | 10.5 | 9.3 | 3.77 | 1018 |
| | $T_1$ | 40 | 109.0 | 2.3 | 12.5 | 14.6 | 3.89 | 1525 |
| | $T_2$ | 80 | 123.0 | 2.5 | 17.5 | 19.5 | 4.47 | 2106 |
| | $T_3$ | 120 | 134.1 | 2.5 | 19.1 | 26.7 | 4.98 | 2334 |
| | $T_4$ | 160 | 139.7 | 2.8 | 20.5 | 34.8 | 5.78 | 3597 |
| | $T_5$ | 200 | 145.2 | 2.8 | 20.0 | 31.9 | 5.78 | 3044 |
| | $T_6$ | 240 | 155.9 | 2.7 | 19.1 | 30.1 | 5.48 | 2960 |
| CRC Sadarpur Dinajpur | $T_0$ | 0 | 86.8 | 3.0 | 9.9 | 9.8 | 3.97 | 986 |
| | $T_1$ | 40 | 106.5 | 3.5 | 12.1 | 13.2 | 4.47 | 1383 |
| | $T_2$ | 80 | 119.6 | 2.9 | 14.2 | 18.8 | 5.27 | 2181 |
| | $T_3$ | 120 | 129.2 | 2.8 | 15.0 | 24.9 | 5.53 | 2374 |
| | $T_4$ | 160 | 144.4 | 2.9 | 19.7 | 29.0 | 5.67 | 3162 |
| | $T_5$ | 200 | 163.4 | 2.6 | 19.6 | 29.0 | 5.87 | 2764 |
| | $T_6$ | 240 | 146.0 | 2.2 | 17.1 | 30.6 | 5.87 | 2765 |
| CRC Mahigong Rangpur | $T_0$ | 0 | 112.3 | 0.4 | 14.6 | 12.7 | 4.31 | 1401 |
| | $T_1$ | 40 | 126.1 | 2.0 | 15.4 | 22.6 | 4.57 | 2105 |
| | $T_2$ | 80 | 140.1 | 2.2 | 18.9 | 23.4 | 5.07 | 2335 |
| | $T_3$ | 120 | 147.1 | 2.2 | 22.1 | 27.8 | 5.64 | 2716 |
| | $T_4$ | 160 | 194.0 | 2.2 | 22.9 | 38.5 | 5.83 | 3561 |
| | $T_5$ | 200 | 189.2 | 2.4 | 24.0 | 35.4 | 5.57 | 3393 |
| | $T_6$ | 240 | 185.6 | 2.4 | 22.3 | 37.7 | 5.73 | 3287 |
| CRC Balaghata Bandarban | $T_0$ | 0 | 82.7 | 0.5 | 9.4 | 9.2 | 3.83 | 906 |
| | $T_1$ | 40 | 105.2 | 1.6 | 14.5 | 18.4 | 4.47 | 1740 |
| | $T_2$ | 80 | 118.2 | 0.6 | 14.3 | 22.8 | 5.27 | 1993 |
| | $T_3$ | 120 | 136.8 | 1.2 | 16.3 | 23.1 | 5.33 | 2377 |
| | $T_4$ | 160 | 136.9 | 0.8 | 15.7 | 26.4 | 5.60 | 2888 |
| | $T_5$ | 200 | 141.9 | 0.6 | 15.9 | 25.5 | 5.60 | 2752 |
| | $T_6$ | 240 | 133.6 | 1.5 | 16.1 | 26.0 | 5.70 | 2608 |
| 5% LSD | | | 14.5 | 1.0 | 2.3 | 3.8 | 0.40 | 334 |
| CV% | | | 7.0 | 32.6 | 8.6 | 9.8 | 4.8 | 8.7 |

11.1.4. Regression analysis:

CB-14 yield response to N fertilizer at CRC, Sreepur, Gazipur is presented in Figure 1. The estimated equation for CB-14 yield in relation to N is $y = -0.064x^2 + 24.45x + 770.3$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 2) showed that the maximum yield (3180) of CB-14 can be obtained by applying 200 kg N/ha.

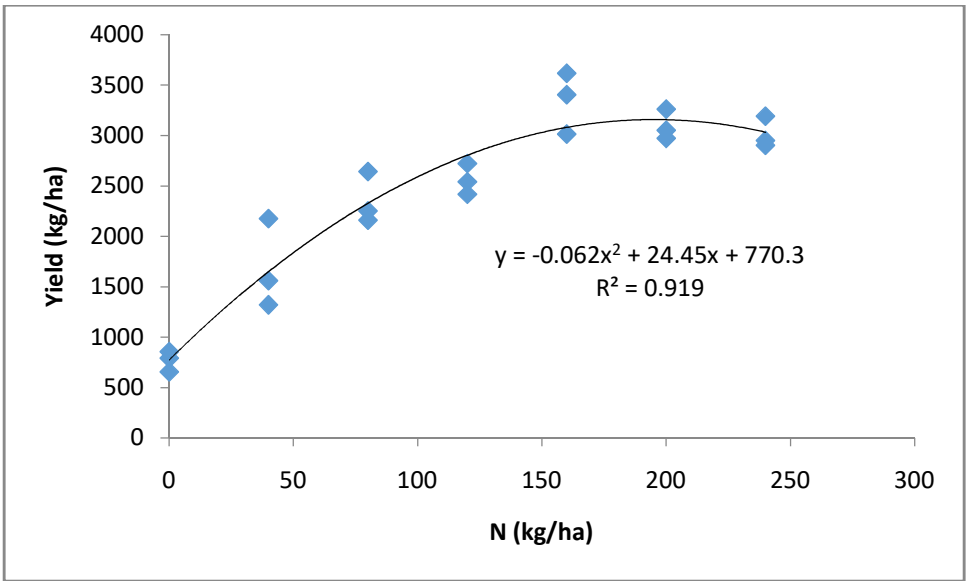



Fig. 1. CB-14 yield in response to N fertilizer at Cotton Research Center, Sreepur, Gazipur

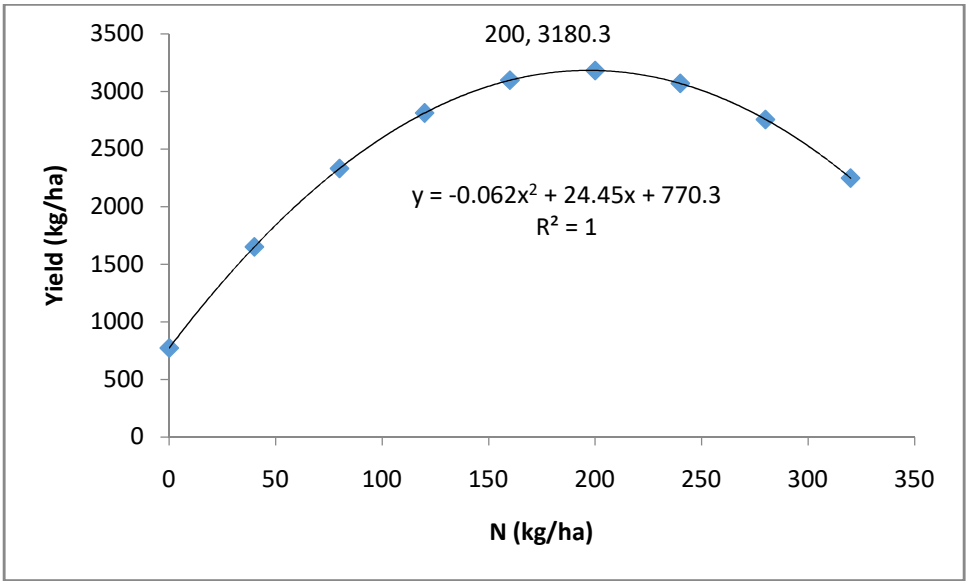


Fig. 2. Projected yield of CB-14 in response to N fertilizer at Cotton Research Center, Sreepur, Gazipur

CB-14 yield response to N fertilizer at CRC, Jagadishpur, Jashore is presented in Figure 3. The estimated equation for CB-14 yield in relation to N is $y = -0.048x^2 + 20.95x + 869.8$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 4) showed that the maximum yield (3133) of CB-14 can be obtained by applying 240 kg N/ha

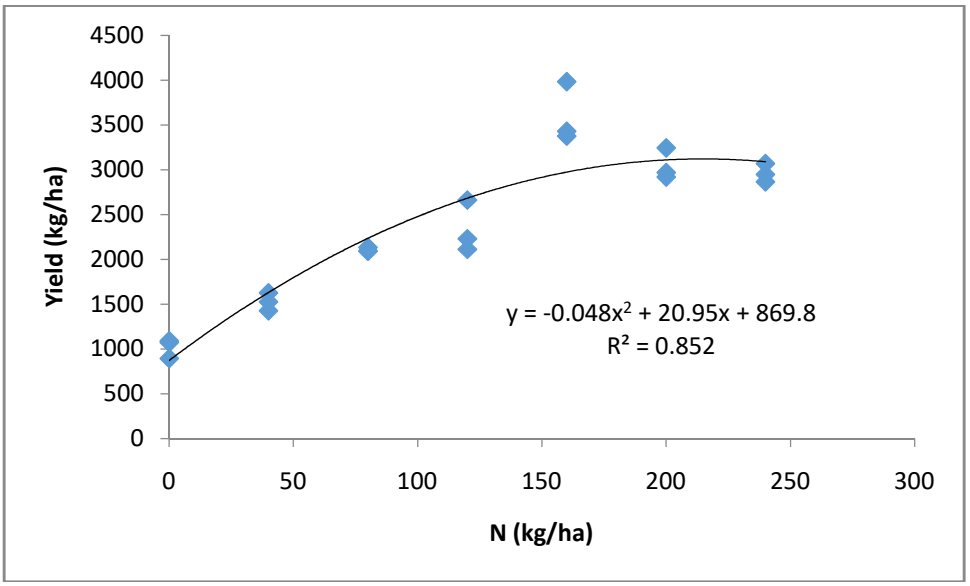



Fig. 3. CB-14 yield in response to N fertilizer at Cotton Research Center, Jagadishpur, Jashore

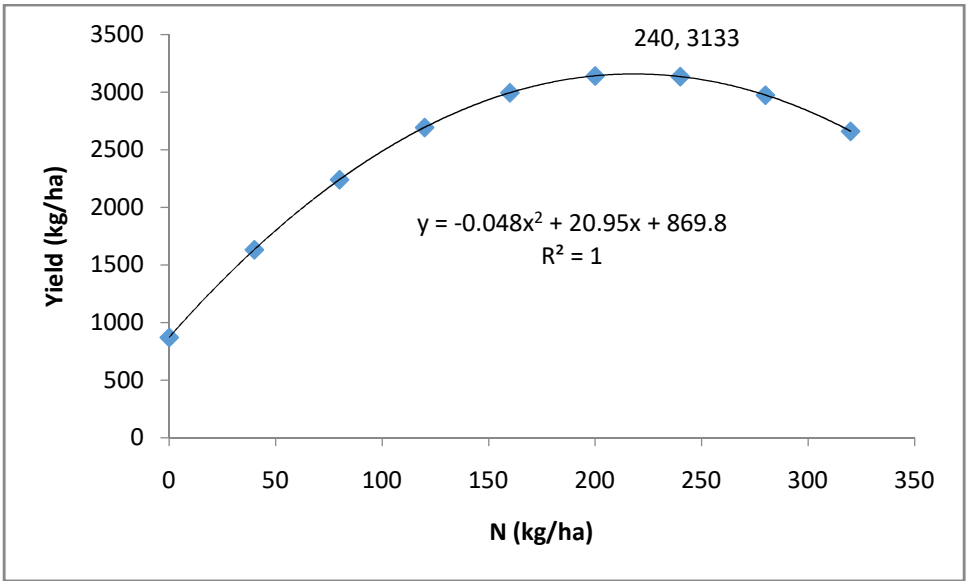


Fig. 4. Projected yield of CB-14 in response to N fertilizer at Cotton Research Center, Jagadishpur, Jashore

CB-14 yield response to N fertilizer at CRC, Sadarpur, Dinajpur is presented in Figure 5. The estimated equation for CB-14 yield in relation to N is $y = -0.050x^2 + 20.19x + 854.4$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 6) showed that the maximum yield (2892) of CB-14 can be obtained by applying 200 kg N/ha

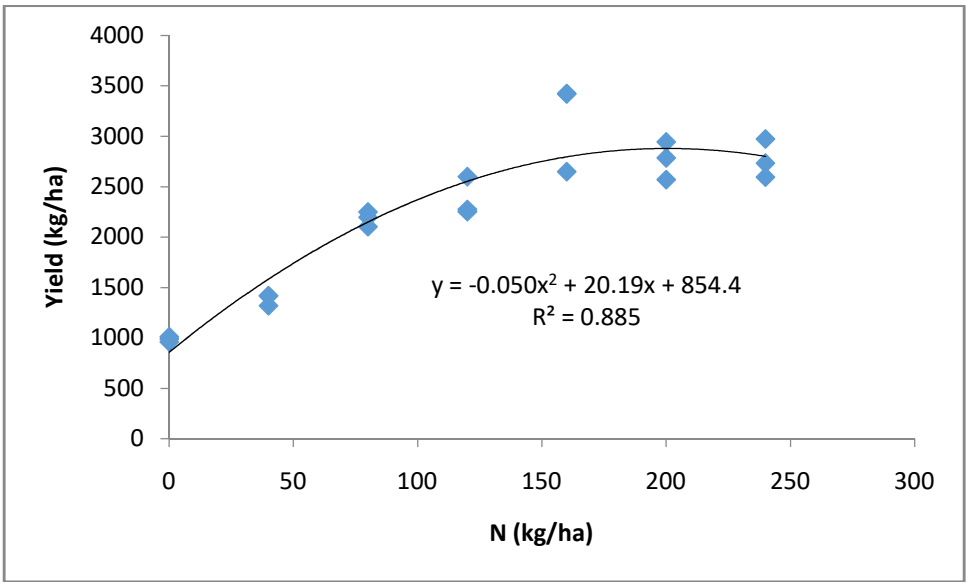



Fig. 5. CB-14 yield in response to N fertilizer at Cotton Research Center, Sadarpur, Dinajpur

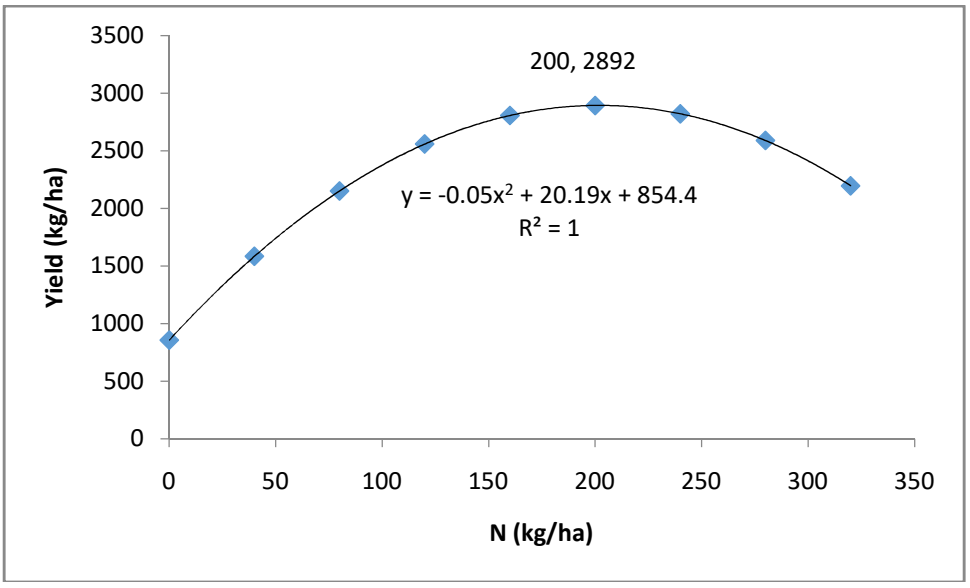



Fig. 6. Projected yield of CB-14 in response to N fertilizer at Cotton Research Center Sadarpur, Dinajpur

CB-14 yield response to N fertilizer at CRC, Mahigonj is presented in Figure 7. The estimated equation for CB-14 yield in relation to N is $y = -0.038x^2 + 17.57x + 1367$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 8) showed that the maximum yield (3395 kg/ha) of CB-14 can be obtained by applying 240 kg N/ha.

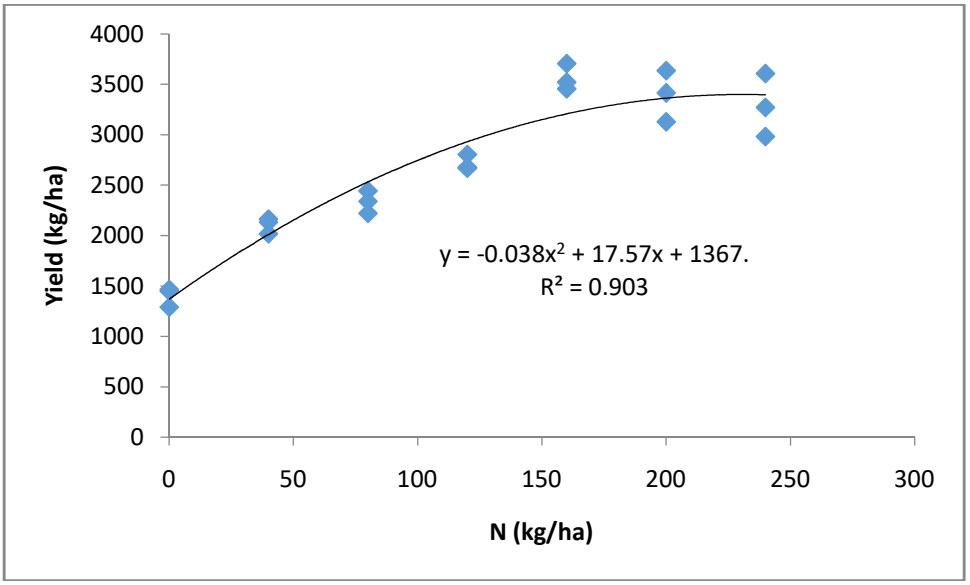



Fig. 7. CB-14 yield in response to N fertilizer at Cotton Research Center, Mahigang, Rangpur

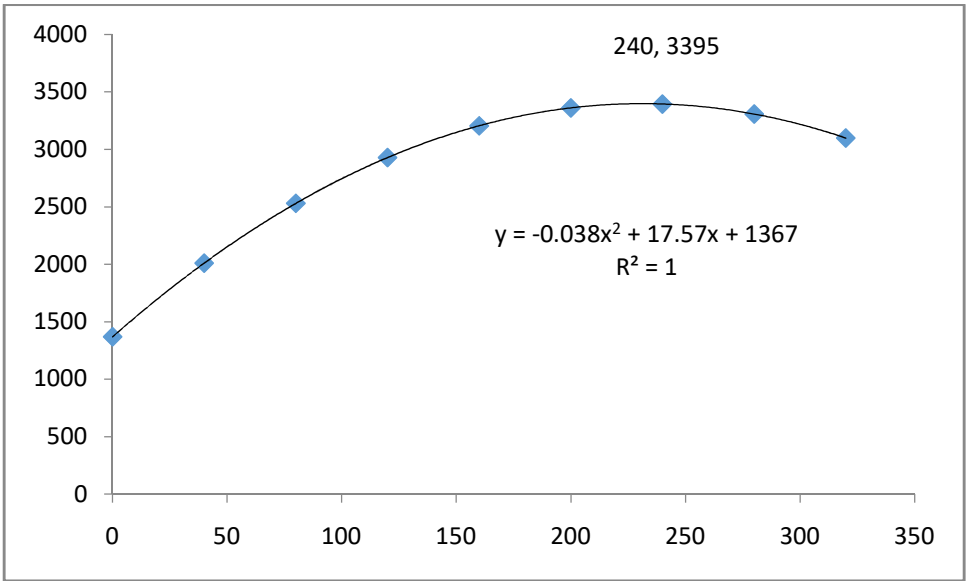



Fig. 8. Projected yield CB-14 yield in response to N fertilizer at Cotton Research Center, Mahigang, Rangpur.

CB-14 yield response to N fertilizer is presented in Figure 9 at Balaghata Farm. The estimated equation for CB-14 yield in relation to N is $y = -0.49x^2 + 18.91x + 929.1$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 10) showed that the maximum yield (2751 kg/ha) of CB-14 can be obtained by applying 200 kg N/ha

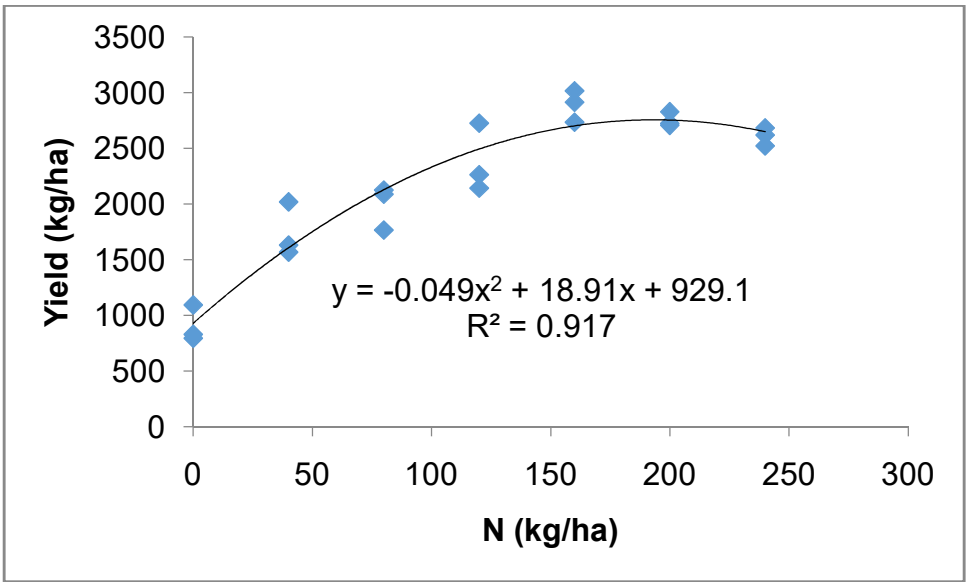



Fig. 9. CB-14 yield in response to N fertilizer at Cotton Research Center, Balaghata, Bandarban

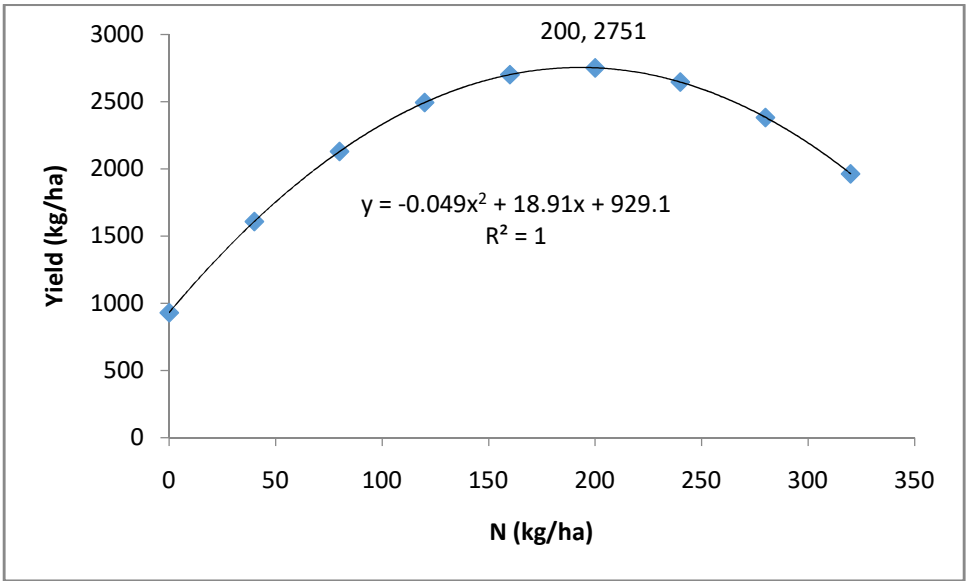



Fig. 10. Projected yield CB-14 yield in response to N fertilizer at Cotton Research Center, Balaghata, Bandarban.

11. 2. Effect of nitrogen on CB 15

11.2.1. Location Effect on CB-15

Location effect of N fertilizers on yield and yield contributing characters of CB-15 are given in Table 5. The maximum plant height (129.60cm) was produced from Rangpur Farm and the minimum plant height (101.70 cm) was recorded from the Sreepur,Gazipur Farm.The lowest monopodial branch/plant (1.0) was recorded from Bandarban Farm and the highest monopodial branch/plant (2.9) was recorded from Dinajpur Farm. The greater number of sympodial branch/plant (17.3) was found in Rangpur Farm and the lower number of sympodial branch/plant (14.30) was found Bandarban Farm.Highest number of boll/plant (31.60) was produced Rangpur and the lowest number of boll/plant (21.30) was recorded from the Bandarban. The lowest single boll weight (4.99 g) was recorded from Jashore and the highest single boll weight (5.30 g) was recorded from Gazipur. The maximum seed cotton yield (2799 kg/ha) was recorded from Rangpur Farm and minimum seed cotton yield (2131 kg/ha) was recorded from the Bandarban Farm.

Table 5. Effect of Location on CB-15 yield and yield contributing characters

| Location | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| CRC Sreepur Gazipur | 101.7 | 1.2 | 16.3 | 24.0 | 5.30 | 2403 |
| CRC Jagadishpur Jashore | 128.0 | 1.9 | 16.7 | 24.0 | 4.99 | 2249 |
| CRC Sadarpur Dinajpur | 118.6 | 2.9 | 15.1 | 21.2 | 5.18 | 2195 |
| CRC Mahigong Rangpur | 129.6 | 1.8 | 17.3 | 31.6 | 5.07 | 2799 |
| CRC Balaghata Bandarban | 123.8 | 1.0 | 14.3 | 21.3 | 5.05 | 2131 |
| 5% LSD | 6.01 | 0.37 | 0.93 | 1.56 | 0.15 | 185 |
| CV% | 8.1 | 34.2 | 9.4 | 10.4 | 4.7 | 12.8 |

11.2.2 Nitrogen effect

The effect of various levels of N fertilizers on yield and yield contributing characters of CB-15 are given in Table 6.The minimum plant height (83.00 cm) was recorded from control treatment and the maximum plant height (140.7 cm) was recorded from the treatment of 160 kg N/ha. The greater monopodial branch/plant (2.3) was recorded from $T_7$ treatment and the lower number of monopodial branch/plant (1.5) was recorded from the control treatment.The lowest sympodial branch/plant (10.0) was found in control treatment and the highest sympodial branch/plant (17.1) was found in of 120 kg N/ha.The lowest boll/plant (10.1) was recorded from control treatment and the highest boll/plant (33.30) was recorded from the treatment of 160 kg N/ha. Gangaiah *et.al*.2013reported that application of 180 kgN/ha produced mean boll number of 54/plant which was 40% greater over no nitrogen fertilizer application.

The lowest single boll weight (4.02 g) was recorded from control treatment and the highest single boll weight (5.83 g) was recorded from the treatment of 200 kg N/ha. The minimum seed cotton yield (942 kg/ha) was recorded from control treatment and the maximum seed cotton yield (3062 kg/ha) was recorded from the treatment of 160 kg N/ha.

Table 6. Effect of various levels of N fertilizers on yield and yield contributing characters of CB-15

| Treatment | Doses of N/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 83.0 | 1.5 | 10.0 | 10.1 | 4.02 | 942 |
| $T_1$ | 40 | 102.1 | 1.6 | 13.6 | 18.0 | 4.42 | 1763 |
| $T_2$ | 80 | 113.9 | 1.8 | 15.8 | 21.4 | 4.88 | 2258 |
| $T_3$ | 120 | 124.0 | 1.6 | 17.1 | 24.3 | 5.27 | 2594 |
| $T_4$ | 160 | 140.7 | 1.7 | 18.5 | 33.3 | 5.78 | 3062 |
| $T_5$ | 200 | 138.2 | 1.8 | 18.3 | 32.8 | 5.83 | 2945 |
| $T_6$ | 240 | 140.4 | 2.3 | 18.3 | 30.9 | 5.63 | 2926 |
| 5% LSD | | 7.11 | 0.44 | 1.10 | 1.85 | 0.17 | 219 |
| CV% | | 8.1 | 34.2 | 9.4 | 10.4 | 4.7 | 12.8 |

11.2.3. Interaction Effect

Interaction effect of Location and Treatment of N fertilizers on yield and yield contributing characters of CB-15 are given in Table 7.

Table 7. Location × treatment interaction effect on CB-15

| Location | Treatment | Doses of N/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| Sreepur Gazipur | $T_0$ | 0 | 58.6 | 0.3 | 9.9 | 11.3 | 4.24 | 730 |
| | $T_1$ | 40 | 70.5 | 0.7 | 13.9 | 16.8 | 4.72 | 1717 |
| | $T_2$ | 80 | 103.8 | 1.2 | 16.5 | 22.3 | 5.13 | 2338 |
| | $T_3$ | 120 | 110.8 | 1.3 | 17.6 | 24.1 | 5.42 | 2870 |
| | $T_4$ | 160 | 121.4 | 1.2 | 18.6 | 31.6 | 5.92 | 3187 |
| | $T_5$ | 200 | 120.9 | 1.7 | 18.4 | 31.8 | 5.99 | 3123 |
| | $T_6$ | 240 | 125.6 | 1.8 | 19.4 | 30.3 | 5.69 | 2858 |
| Jagadishpur Jashore | $T_0$ | 0 | 84.5 | 1.1 | 9.8 | 10.7 | 3.90 | 975 |
| | $T_1$ | 40 | 109.1 | 2.1 | 13.6 | 17.6 | 3.95 | 1450 |
| | $T_2$ | 80 | 119.6 | 2.0 | 15.8 | 20.5 | 4.53 | 2212 |
| | $T_3$ | 120 | 134.1 | 2.1 | 18.0 | 23.7 | 4.96 | 2396 |
| | $T_4$ | 160 | 147.5 | 2.0 | 20.3 | 32.9 | 5.93 | 2862 |
| | $T_5$ | 200 | 150.8 | 2.0 | 19.6 | 32.2 | 5.90 | 2963 |
| | $T_6$ | 240 | 150.4 | 2.1 | 19.5 | 30.3 | 5.75 | 2883 |
| Sadarpur Dinajpur | $T_0$ | 0 | 77.7 | 2.9 | 9.9 | 9.1 | 3.93 | 1004 |
| | $T_1$ | 40 | 104.9 | 2.3 | 13.3 | 14.0 | 4.43 | 1662 |
| | $T_2$ | 80 | 113.7 | 3.1 | 15.0 | 15.2 | 4.97 | 2158 |
| | $T_3$ | 120 | 115.4 | 2.7 | 16.8 | 18.7 | 5.53 | 2420 |
| | $T_4$ | 160 | 143.0 | 2.7 | 17.7 | 32.4 | 5.77 | 2736 |
| | $T_5$ | 200 | 136.9 | 2.4 | 16.7 | 29.9 | 6.07 | 2722 |
| | $T_6$ | 240 | 138.8 | 4.1 | 16.0 | 28.9 | 5.57 | 2664 |
| Mahigong Rangpur | $T_0$ | 0 | 101.6 | 1.0 | 10.5 | 10.7 | 4.07 | 1116 |
| | $T_1$ | 40 | 115.5 | 1.8 | 14.1 | 23.9 | 4.50 | 2332 |
| | $T_2$ | 80 | 121.3 | 2.1 | 17.0 | 27.4 | 4.69 | 2488 |
| | $T_3$ | 120 | 128.2 | 1.6 | 17.9 | 32.1 | 5.18 | 2838 |
| | $T_4$ | 160 | 145.7 | 1.9 | 19.8 | 43.6 | 5.68 | 3841 |
| | $T_5$ | 200 | 147.0 | 1.5 | 21.1 | 44.7 | 5.67 | 3265 |
| | $T_6$ | 240 | 147.8 | 2.7 | 21.0 | 38.5 | 5.70 | 3716 |
| Balaghata Bandarban | $T_0$ | 0 | 92.7 | 1.9 | 10.0 | 8.5 | 3.97 | 884 |
| | $T_1$ | 40 | 110.7 | 0.9 | 13.0 | 17.8 | 4.50 | 1652 |
| | $T_2$ | 80 | 111.1 | 0.4 | 14.5 | 21.5 | 5.10 | 2096 |
| | $T_3$ | 120 | 131.5 | 0.6 | 15.4 | 23.1 | 5.27 | 2446 |
| | $T_4$ | 160 | 145.8 | 0.9 | 16.2 | 26.1 | 5.60 | 2685 |
| | $T_5$ | 200 | 135.2 | 1.8 | 15.6 | 25.5 | 5.50 | 2649 |
| | $T_6$ | 240 | 139.4 | 0.8 | 15.6 | 26.3 | 5.43 | 2507 |
| 5% LSD | | | 15.90 | 0.98 | 2.45 | 4.14 | 0.39 | 491 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CV% | 8.1 | 34.2 | 9.4 | 10.4 | 4.7 | 12.8 |

11.2.4. Regression analysis

CB-15 yield response to N fertilizer is presented in Figure 11 at Sreepur Farm. The estimated equation for CB-15 yield in relation to N is $y = -0.075x^2 + 27.03x + 725.1$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 12) showed that the maximum yield (3130 kg/ha) of CB-15 can be obtained by applying 160 kg N/ha

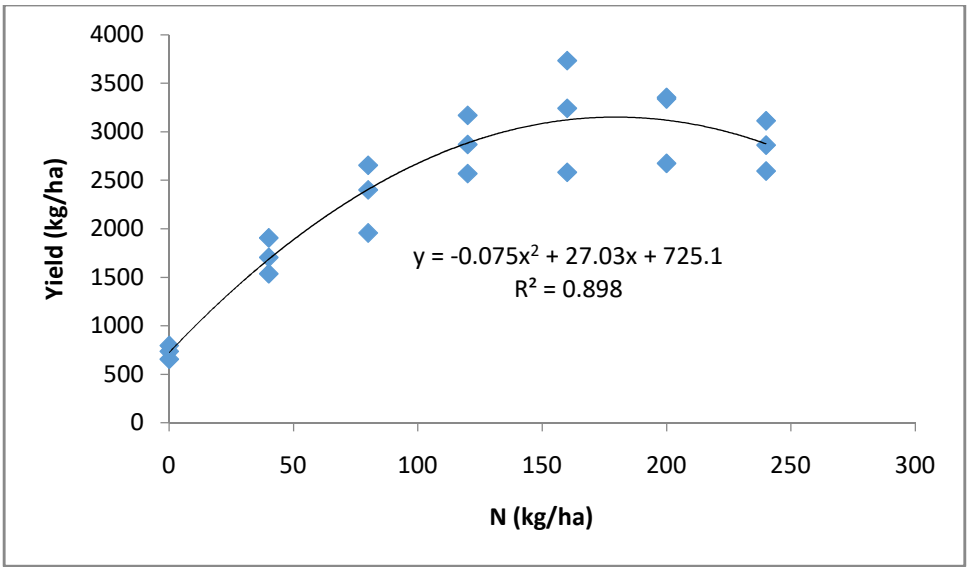



Fig. 11. CB-15 yield in response to N fertilizer at Cotton Research Center, Sreepur, Gazipur

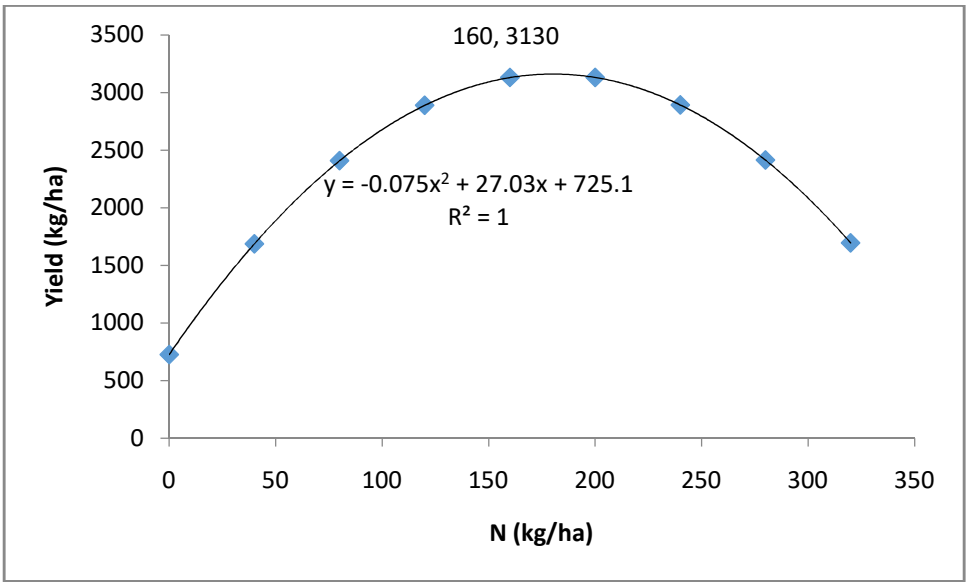



Fig. 12. Projected yield CB-15 yield in response to N fertilizer at Cotton Research Center, Sreepur, Gazipur

CB-15 yield response to N fertilizer is presented in Figure 13 at Jagadishpur Farm. The estimated equation for CB-15 yield in relation to N is $y = -0.041x^2 + 18.24x + 913.1$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 14) showed that the maximum yield (2921 kg/ha) of CB-15 can be obtained by applying 200 kg N/ha

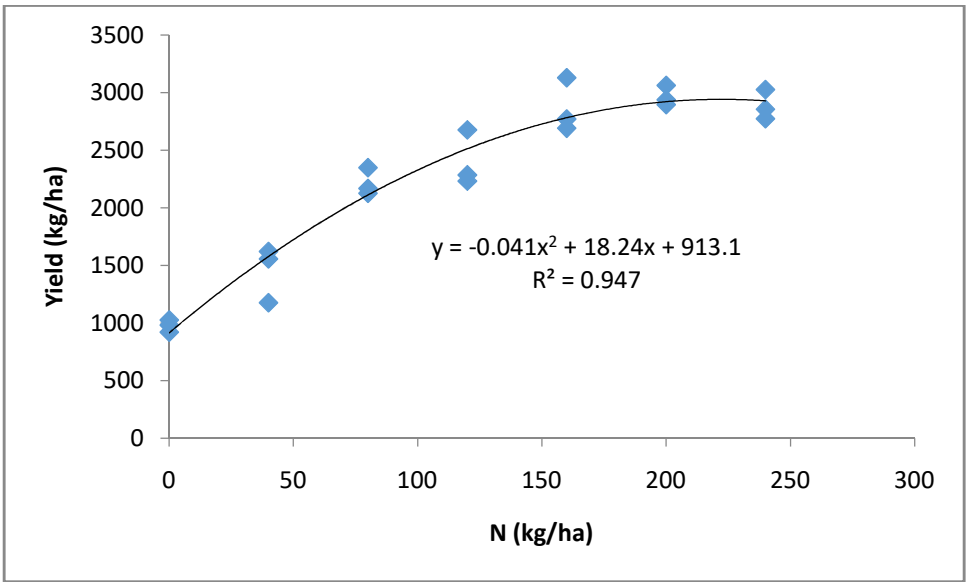



Fig. 13. CB-15 yield in response to N fertilizer at Cotton Research Center, Jagadishpur, Jashore

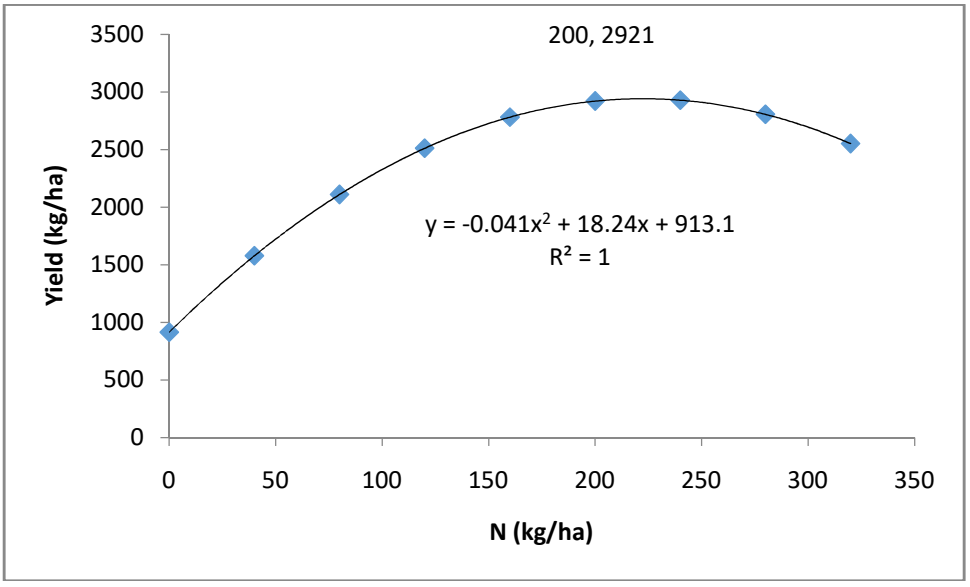



Fig. 14. Projected yield CB-15 yield in response to N fertilizer at Cotton Research Center, Jagadishpur, Jashore

CB-15 yield response to N fertilizer is presented in Figure 15 at Sadarpur Farm. The estimated equation for CB-15 yield in relation to N is $y = -0.044x^2 + 17.61x + 1013$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 16) showed that the maximum yield (2775kg/ha) of CB-15 can be obtained by applying 200 kg N/ha

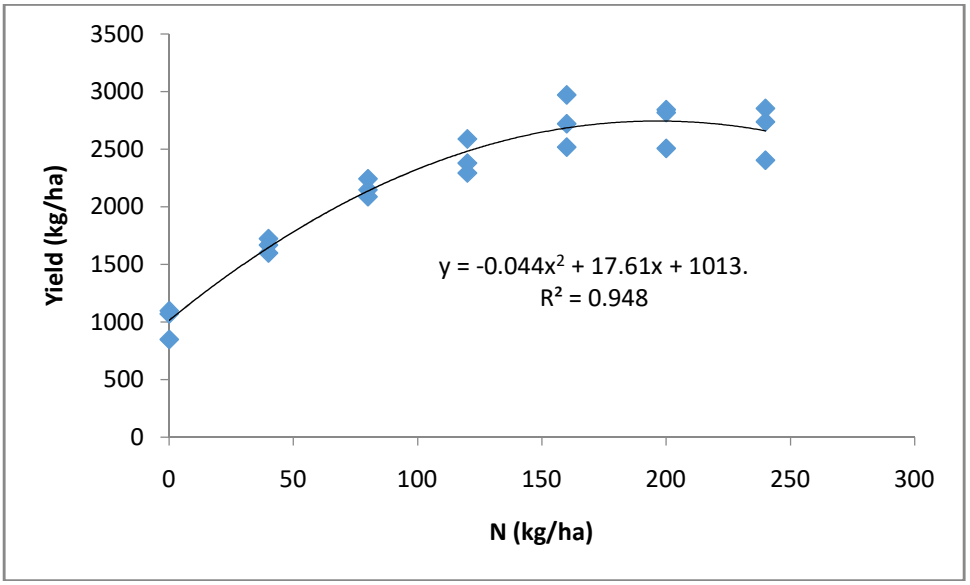



Fig. 15. CB-15 yield in response to N fertilizer at Cotton Research Center, Sadarpur, Dinajpur

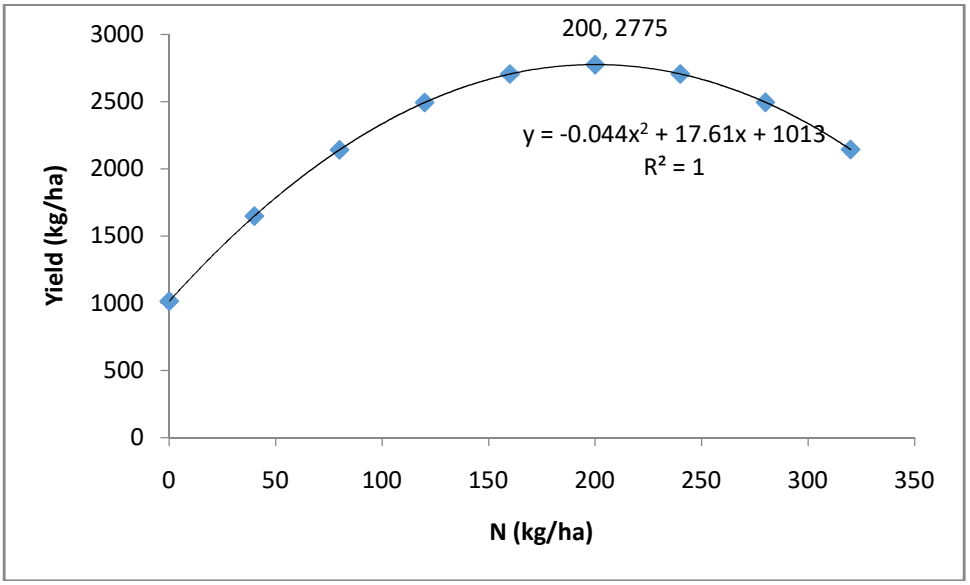



Fig. 16. Projected yield CB-15 yield in response to N fertilizer at Cotton Research Center, Sadarpur, Dinajpur

CB-15 yield response to N fertilizer is presented in Figure 17 at Mahigang Farm. The estimated equation for CB-15 yield in relation to N is $y = -0.045x^2 + 20.86x + 1251$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 18) showed that the maximum yield (3665 kg/ha) of CB-15 can be obtained by applying 240 kg N/ha

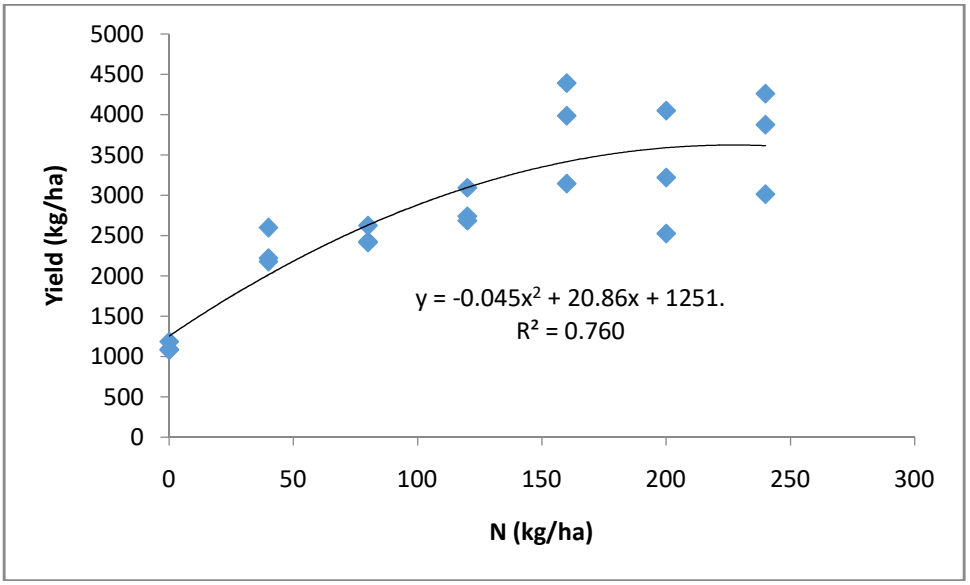



Fig. 17. CB-15 yield in response to N fertilizer at Cotton Research Center, Mahigang, Rangpur

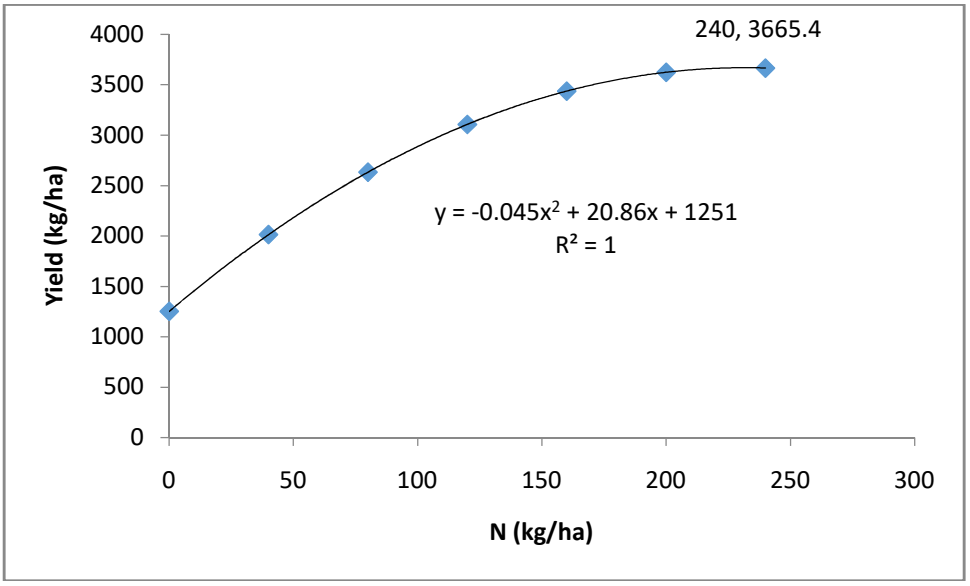



Fig. 18. Projected yield CB-15 yield in response to N fertilizer at Cotton Research Center, Mahigang, Rangpur

CB-15 yield response to N fertilizer is presented in Figure 19 at Balaghata Farm. The estimated equation for CB-15 yield in relation to N is $y = -0.053x^2 + 19.46x + 905.6$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 20) showed that the maximum yield (2678kg/ha) of CB-15 can be obtained by applying 200 kg N/ha

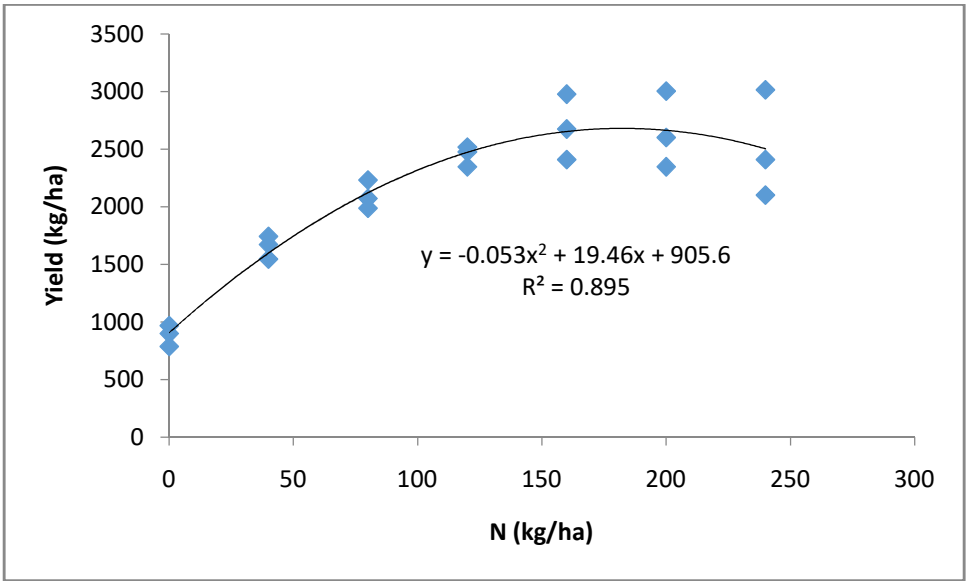



Fig. 19. CB-15 yield in response to N fertilizer at Cotton Research Center, Balaghata, Bandarban

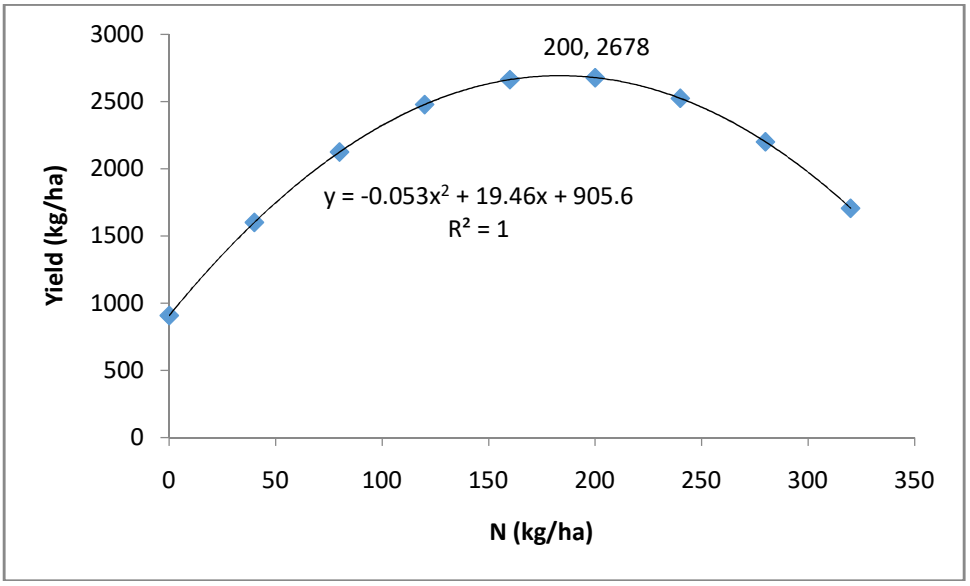



Fig. 20. Projected yield CB-15 yield in response to N fertilizer at Cotton Research Center, Balaghata,Bandarban

11. 3. Effect of phosphorus on CB- 14

11.3.1. Location Effect on yield and yield parameters of CB-14

Location effect of P fertilizers on yield and yield contributing characters of CB-14 are given in Table 8.The maximum plant height (130.20cm) was produced from Jashore Farm and the minimum plant height (113.60 cm) was recorded from the Sreepur, Gazipur Farm. The lowest monopodial branch/plant (1.2) was recorded from Gazipur and Bandarban Farm and the highest number of monopodial branch/plant (3.1) was recorded from Dinajpur Farm. The lowest number of sympodial branch/plant (14.0) was found in Dinajpur Farm and the greater number of sympodial branch/plant (18.30) was found Gazipur Farm. The highest number of boll/plant (29.50) was recorded Sreepur, Gazipur and the lowest number of boll/plant (20.90) was recorded from the Sadarpur, Dinajpur. The lowest single boll weight (4.80 g) was recorded from control at Sreepur and the highest single boll weight (5.20 g) was recorded from Dinajpur. The highest seed cotton yield (2379 kg/ha) was recorded from Jashore Farm and lowest seed cotton yield (2196 kg/ha) was recorded from the Dinajpur Farm.

Table 8. Effect of Location of P on CB-14 yield and yield contributing characters

| Location | Plant height(cm) | Monopodia/ plant | Sympodia/ plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| Sreepur, Gazipur | 113.6 | 1.2 | 18.3 | 29.5 | 4.8 | 2309 |
| Jagadishpur, Jashore | 130.2 | 2.0 | 16.8 | 24.3 | 5.0 | 2379 |
| Sadarpur, Dinajpur | 115.0 | 3.1 | 14.0 | 20.9 | 5.2 | 2196 |
| Mahigong, Rangpur | 116.7 | 1.2 | 17.1 | 25.9 | 5.0 | 2209 |
| Balaghata, Bandarban | 124.4 | 1.2 | 15.2 | 23.3 | 5.0 | 2219 |
| 5% LSD | 4.61 | 0.33 | 0.98 | 2.05 | 0.16 | 151.16 |
| CV% | 5.8 | 28.6 | 9 | 12.4 | 4.9 | 10 |

11.3.2 Treatment effect

The effect of various levels of P fertilizers on yield and yield contributing characters of CB-14 are given in Table 9. The lowest plant height (87.90 cm) was produced from control treatment and the highest plant height (129.80 cm) was produced from the treatment of 60 kg P/ha. The maximum monopodial branch/plant (1.40) was found in control treatment and the highest monopodial branch/plant (2.00) was found in treatment 100 kg P/ha.The greater number of sympodial branch/plant (18.70) was observed in 80 kg P/ha and the lowest sympodial branch/plant (10.10) was recorded from the control treatment.The lowest boll/plant (9.90) was produced from control treatment and the highest boll/plant (30.80) was produced from the treatment of 60 kg P/ha. The minimum single boll weight (4.00 g) was found in control treatment and the maximum single boll weight (5.70 g) was found in treatment $T_5$ (80 kg P/ha) Maqshoof *et. at*.2009 reported thatboll weight increased to the highest value of 3.66 g with P application of 34 kg $ha^{-1}$.The lowest seed cotton yield (939 kg/ha) was recorded from control treatment and the highest seed cotton yield (2776 kg/ha) was recorded from the treatment of 80 kg P/ha which was followed by the treatment $T_4$(60 kg P/ha).A significant increase in seed cotton yield in soils having phosphorus < 12 mg kg-1 of soil in the Punjab province has been reported (Gill et al. 2000, Makhdum et al. 2001).

Table 9. Effect of various levels of P fertilizers on yield and yield contributing characters of CB-14

| Treatment | Doses of P/ha | Plant height(cm) | Monopodia / plant | sympodia/ plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 87.9 | 1.4 | 10.1 | 9.9 | 4.0 | 939 |
| $T_2$ | 20 | 117.0 | 1.6 | 15.4 | 23.3 | 4.6 | 2096 |
| $T_3$ | 40 | 124.5 | 1.8 | 17.1 | 26.0 | 5.0 | 2367 |
| $T_4$ | 60 | 129.8 | 1.7 | 18.4 | 30.8 | 5.3 | 2754 |
| $T_5$ | 80 | 129.5 | 1.8 | 18.7 | 30.3 | 5.7 | 2776 |
| $T_6$ | 100 | 131.1 | 2.0 | 17.9 | 28.5 | 5.5 | 2641 |
| 5% LSD | | 5.06 | 0.36 | 1.08 | 2.25 | 0.18 | 165.59 |
| CV% | | 5.8 | 28.6 | 9 | 12.4 | 4.9 | 10 |

### 11.3.3. Interaction Effect

Interaction effect of Location and Treatment P fertilizers on yield and yield contributing characters of CB-14 are given in Table 10.

Table 10. Location × treatment interaction effect on CB-14

| Location | Treatment | Doses of P/ha | Plant height (cm) | Monopodia/ plant | sympodia/ plant | No.boll / plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| Sreepur Gazipur | $T_0$ | 0 | 69.4 | 0.2 | 11.0 | 10.6 | 4.12 | 1059 |
| | $T_1$ | 20 | 118.3 | 1.5 | 19.1 | 32.1 | 4.54 | 1865 |
| | $T_2$ | 40 | 126.1 | 1.2 | 19.1 | 32.5 | 4.63 | 2402 |
| | $T_3$ | 60 | 125.3 | 1.2 | 20.6 | 35.5 | 4.98 | 2746 |
| | $T_4$ | 80 | 125.2 | 1.7 | 20.5 | 34.6 | 5.47 | 3087 |
| | $T_5$ | 100 | 117.5 | 1.2 | 19.4 | 31.8 | 5.07 | 2697 |
| Jagadishpur Jessore | $T_0$ | 0 | 91.2 | 1.5 | 9.6 | 10.1 | 3.93 | 883 |
| | $T_1$ | 20 | 128.7 | 1.9 | 15.6 | 19.8 | 4.33 | 2047 |
| | $T_2$ | 40 | 135.1 | 2.2 | 16.7 | 23.8 | 4.57 | 2473 |
| | $T_3$ | 60 | 142.6 | 2.0 | 19.4 | 32.5 | 5.42 | 3070 |
| | $T_4$ | 80 | 143.1 | 2.1 | 20.3 | 30.2 | 5.97 | 2902 |
| | $T_5$ | 100 | 140.6 | 2.1 | 19.5 | 29.6 | 5.90 | 2898 |
| Sadarpur Dinajpur | $T_0$ | 0 | 86.4 | 2.8 | 10.9 | 9.5 | 3.93 | 883 |
| | $T_1$ | 20 | 112.3 | 2.4 | 13.5 | 19.8 | 4.67 | 2421 |
| | $T_2$ | 40 | 116.4 | 3.4 | 14.7 | 21.0 | 5.27 | 2227 |
| | $T_3$ | 60 | 125.8 | 3.3 | 15.5 | 27.2 | 5.73 | 2536 |
| | $T_4$ | 80 | 119.9 | 3.2 | 14.4 | 24.2 | 5.77 | 2631 |
| | $T_5$ | 100 | 129.0 | 3.6 | 14.9 | 23.8 | 5.60 | 2476 |
| Mahigang Rangpur | $T_0$ | 0 | 102.4 | 1.1 | 9.8 | 10.0 | 3.96 | 987 |
| | $T_1$ | 20 | 110.0 | 0.9 | 15.4 | 23.1 | 4.87 | 2100 |
| | $T_2$ | 40 | 119.4 | 1.2 | 18.6 | 28.0 | 5.30 | 2404 |
| | $T_3$ | 60 | 118.6 | 1.4 | 19.6 | 31.6 | 5.20 | 2703 |
| | $T_4$ | 80 | 126.1 | 1.5 | 19.7 | 32.5 | 5.67 | 2601 |
| | $T_5$ | 100 | 123.4 | 1.3 | 19.4 | 29.8 | 5.10 | 2457 |
| Balaghata Bandarban | $T_0$ | 0 | 89.8 | 1.4 | 9.1 | 9.2 | 3.83 | 885 |
| | $T_1$ | 20 | 115.6 | 1.3 | 13.5 | 21.5 | 4.40 | 2049 |
| | $T_2$ | 40 | 125.8 | 1.1 | 16.5 | 24.9 | 5.03 | 2327 |
| | $T_3$ | 60 | 136.7 | 0.6 | 16.9 | 27.1 | 5.27 | 2714 |
| | $T_4$ | 80 | 133.4 | 0.7 | 18.7 | 29.7 | 5.60 | 2660 |
| | $T_5$ | 100 | 145.1 | 1.9 | 16.2 | 27.5 | 5.80 | 2679 |
| 5% LSD | | | 11.30 | 0.81 | 2.40 | 5.03 | 0.40 | 370.27 |
| CV% | | | 5.8 | 28.6 | 9 | 12.4 | 4.9 | 10 |

11.3.4. Regression analysis

CB-14 yield response to P fertilizer at Sreepur Farm is presented in Figure21. The estimated equation for CB-14 yield in relation to P is $y = -0.302x^2 + 47.63x + 1034$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 22) showed that the maximum yield (2912 kg/ha) of CB-14 can be obtained by applying 80 kg P/ha.

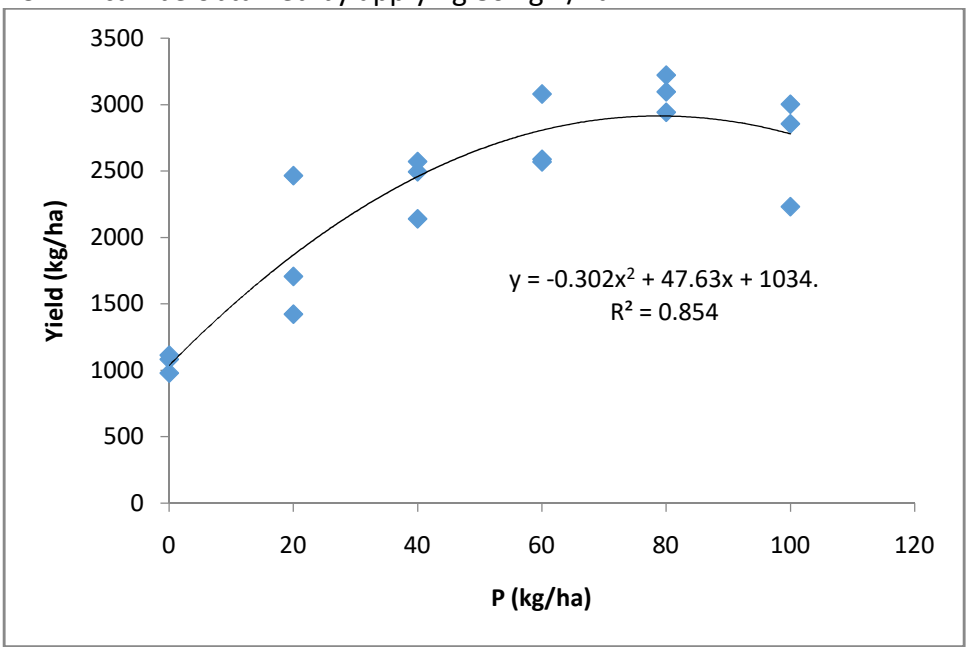



Fig. 21. CB-14 yield in response to P fertilizer at Cotton Research Center, Sreepur, Gazipur

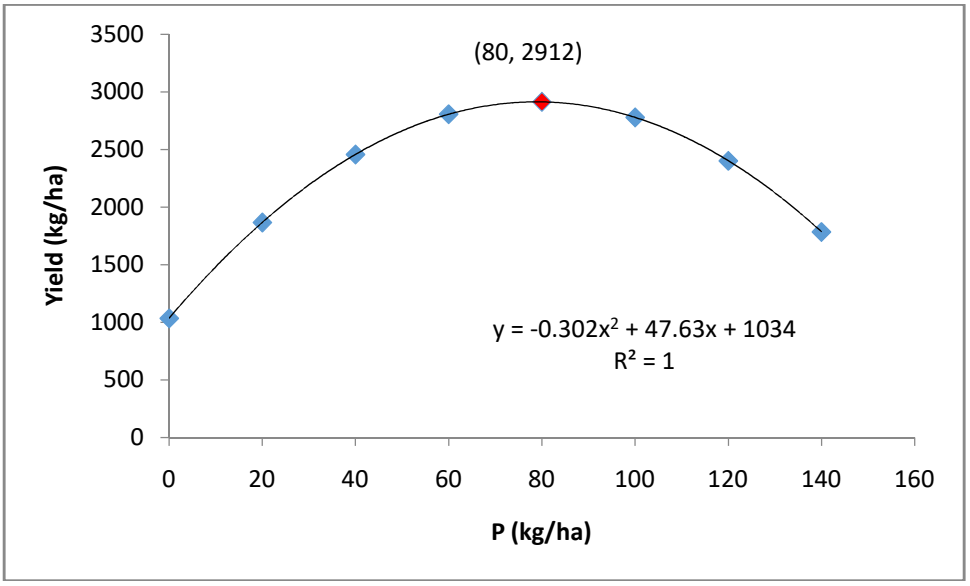



Fig. 22. Projected yield of CB-14 in response to P fertilizer at Cotton Research Center, Sreepur, Gazipur

CB-14 yield response to P fertilizer at Jagadishpur Farm is presented in Figure 23. The estimated equation for CB-14 yield in relation to P is $y = -0.366 x^2 + 55.58.x + 944.4$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 24) showed that the maximum yield (3048 kg/ha) of CB-14 can be obtained by applying 80 kg P/ha.

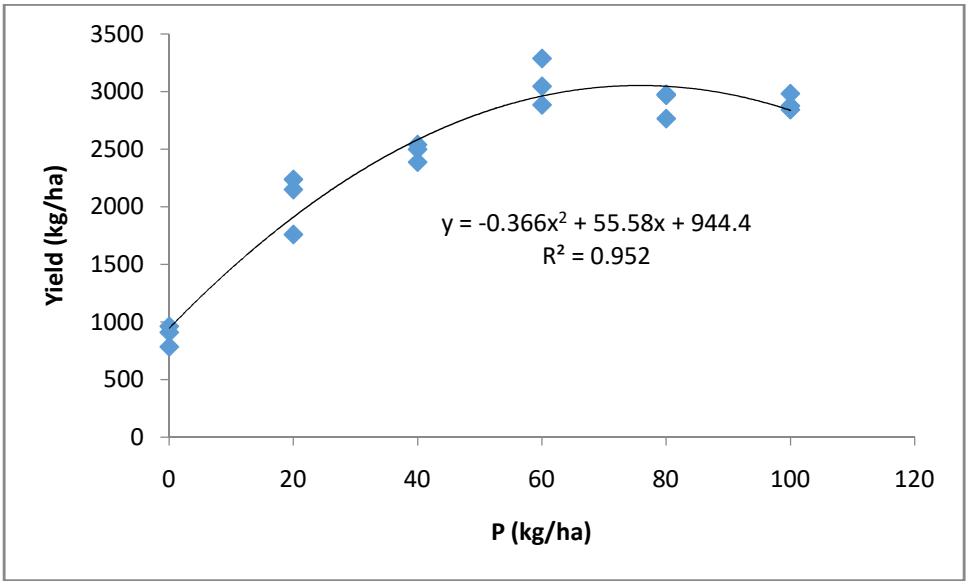



Fig. 23. CB-14 yield in response to P fertilizer at Cotton Research Center, Jagadishpur, Jashore

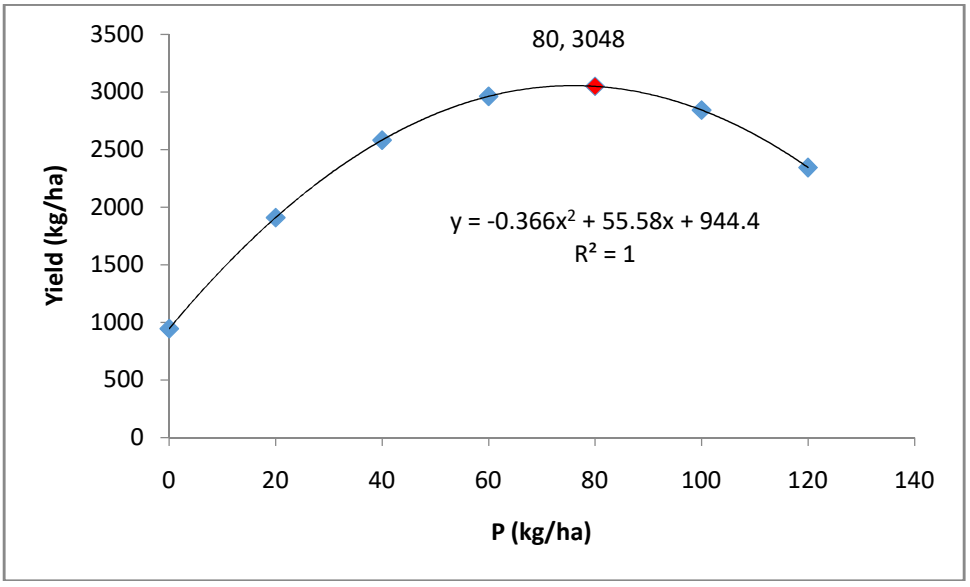



Fig. 24. Projected yield of CB-14 in response to P fertilizer at Cotton Research Center, Jagadishpur, Jashore.

CB-14 yield response to P fertilizer at Sadarpur Farm is presented in Figure 25. The estimated equation for CB-14 yield in relation to P is $y = -0.326x^2 + 45.35x + 1124$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 26) showed that the maximum yield (2671 kg/ha) of CB-14 can be obtained by applying 60 kg P/ha.

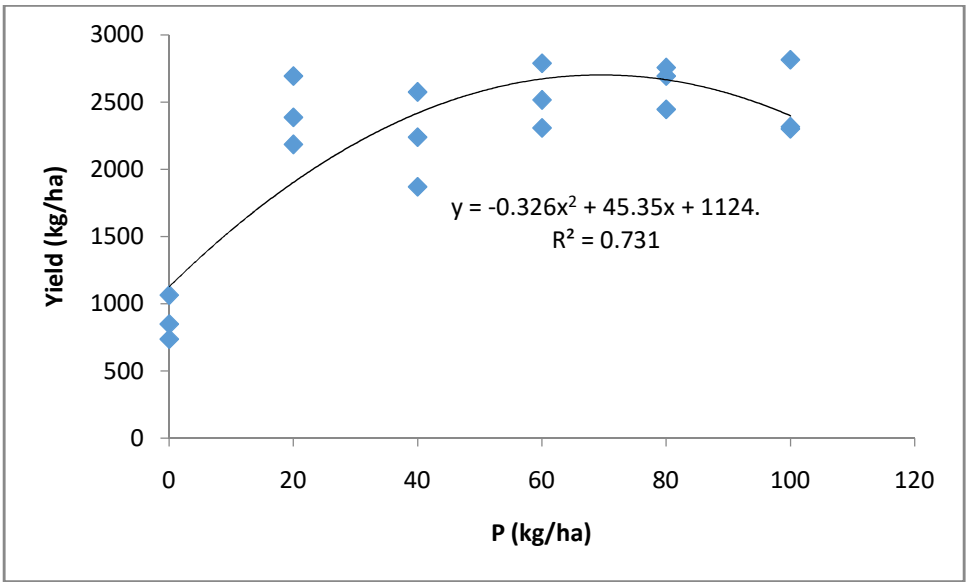



Fig. 25. CB-14 yield in response to P fertilizer at Cotton Research Center, Sadarpur, Dinajpur

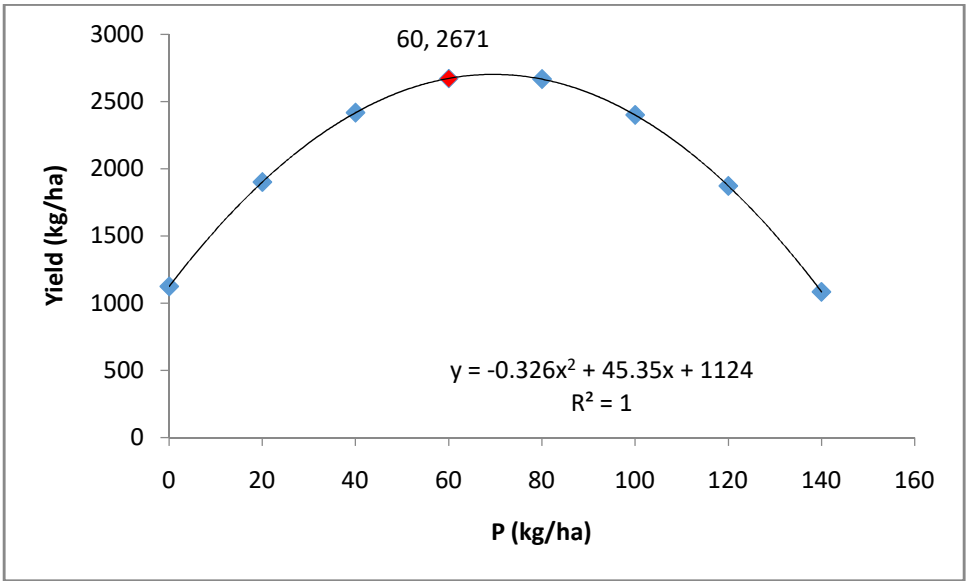



Fig. 26. Projected yield of CB-14 in response to P fertilizer at Cotton Research Center, Sadarpur, Dinajpur

CB-14 yield response to P fertilizer at Mahiganj Farm is presented in Figure 27. The estimated equation for CB-14 yield in relation to P is $y = -0.353x^2 + 48.41x + 1083$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 28) showed that the maximum yield (2717 kg/ha) of CB-14 can be obtained by applying 60 kg P/ha.

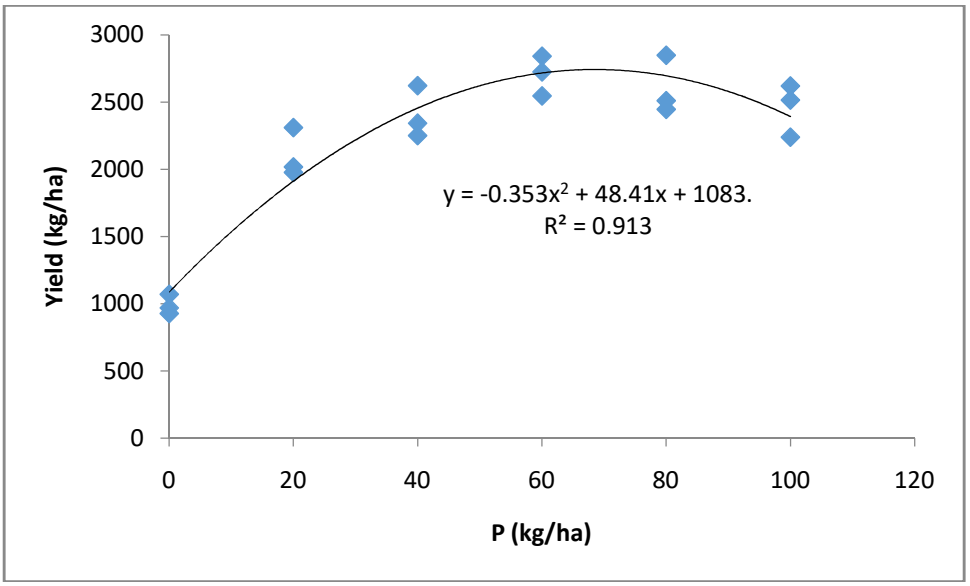



Fig. 27. CB-14 yield in response to P fertilizer at Cotton Research Center, Mahigonj, Rangpur

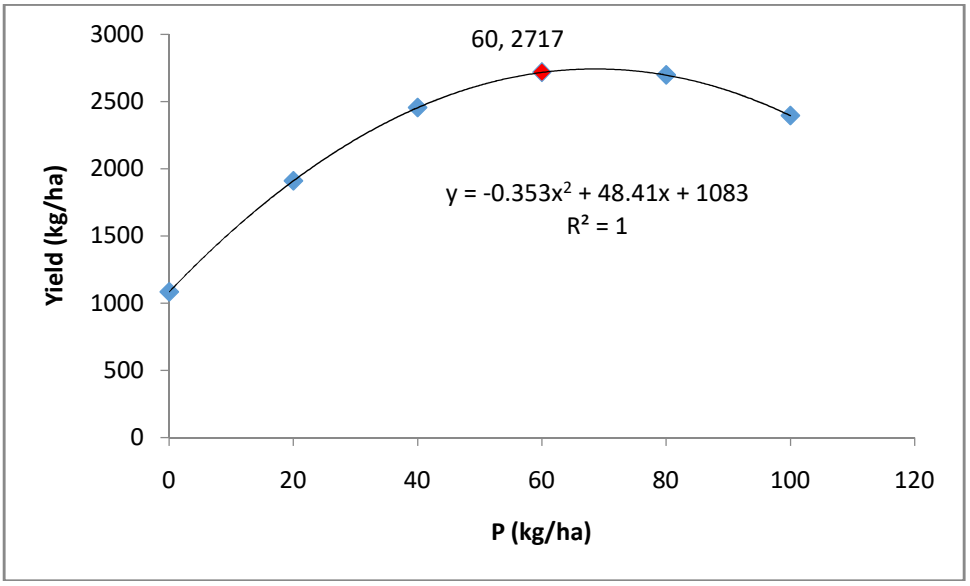



Fig. 28. Projected yield of CB-14 in response to P fertilizer at Cotton Research Center, Mahigonj, Rangpur

CB-14 yield response to P fertilizer at Balaghata Farm is presented in Figure 29. The estimated equation for CB-14 yield in relation to P is $y = -0.314x^2 + 47.47x + 999.9$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 30) showed that the maximum yield (2788 kg/ha) of CB-14 can be obtained by applying 80 kg P/ha.

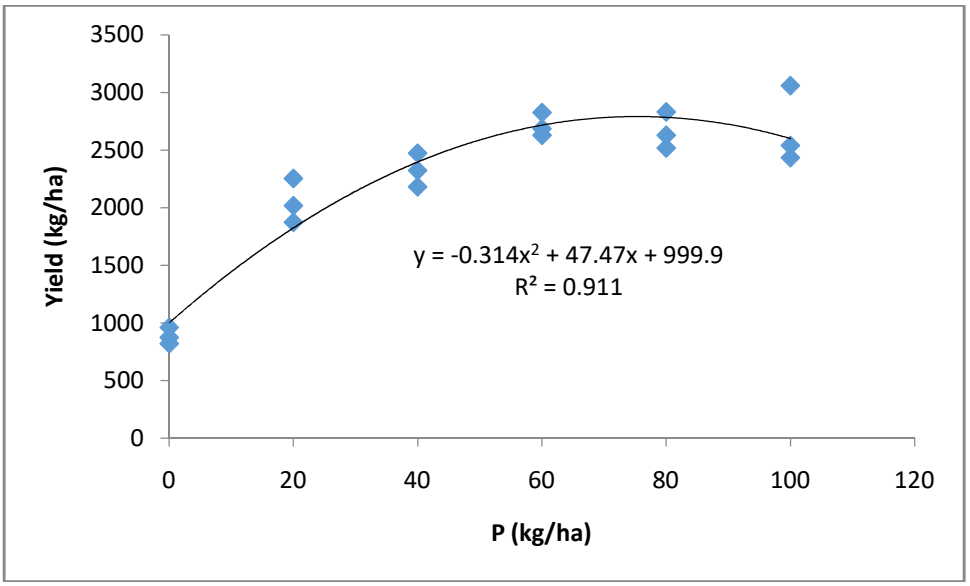



Fig. 29. CB-14 yield in response to P fertilizer at Cotton Research Center, Balaghata, Bandarban

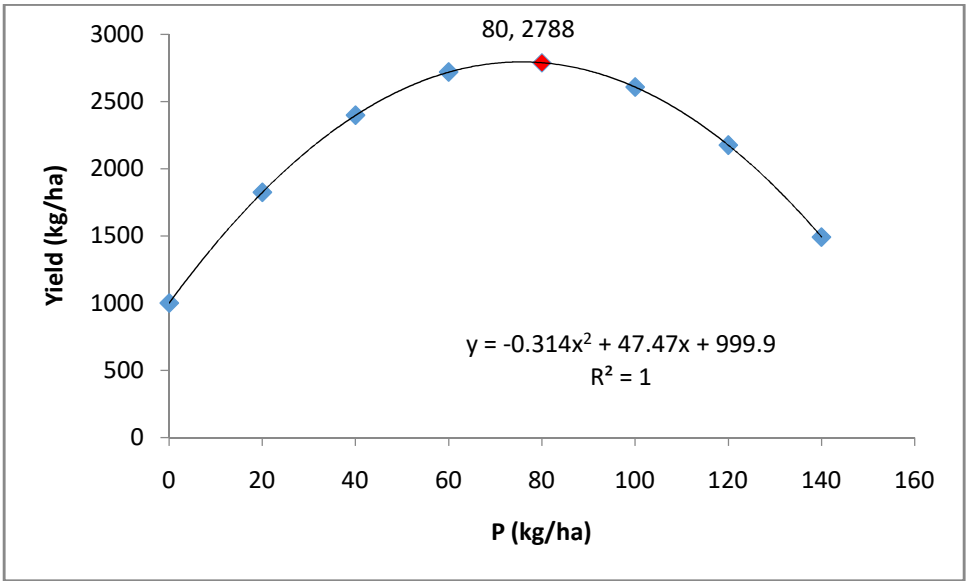



Fig. 30. Projected yield of CB-14 in response to P fertilizer at Cotton Research Center, Balaghata, Bandarban

11. 4. Effect of phosphorus on CB 15

11.4.1. Location Effect on yield and yield parameters of CB-15

Location effect of P fertilizers on yield and yield contributing characters of CB-15 are given in Table 11.The lowest plant height (90.9cm) was observed from Gazipur Farm and the highest plant height was (127.90 cm) was recorded from the Jashore Farm.The minimum number of monopodial branch/plant (0.80) was found in Gazipur and maximum monopodial branch/plant (2.70) was found in Dinajpur Farm.The greater number of sympodial branch/plant (16.30) was recorded from Jashore and Rangpur Farm and the loweast sympodial branch/plant (13.60) was found in Dinajpur Farm. Highest number of boll/plant (25.60) was found in Rangpur and the lowest number of boll/plant (23.00) was found in Bandarban. The lowest single boll weight (4.98 g) was recorded from Jashore and the highest single boll weight (5.22 g) was recorded from Dinajpur. The maximum seed cotton yield (2675 kg/ha) was recorded from Rangpur Farm and minimum seed cotton yield (2018 kg/ha) was found in Bandarban Farm.

Table 11. Effect of Location on CB-15 yield and yield contributing characters

| Location | Plant height (cm) | Monopodia / plant (No.) | Sympodia/ plant (No.) | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| Sreepur, Gazipur | 90.9 | 0.8 | 15.1 | 23.4 | 5.05 | 2325 |
| Jagadishpur, Jashore | 127.9 | 1.8 | 16.3 | 23.8 | 4.98 | 2449 |
| Sadarpur, Dinajpur | 107.0 | 2.7 | 13.6 | 23.4 | 5.22 | 2452 |
| Mahigong, Rangpur | 109.0 | 1.2 | 16.3 | 25.6 | 5.20 | 2675 |
| Balaghata, Bandarban | 122.8 | 0.9 | 14.2 | 23.0 | 5.01 | 2018 |
| 5% LSD | 5.73 | 0.31 | 0.62 | 1.73 | 0.16 | 141 |
| CV% | 5.73 | 0.31 | 0.62 | 1.73 | 0.16 | 141 |

11.4.2 Phosphorus effect

The effect of various levels of P fertilizers on yield and yield contributing characters of CB-15 are given in Table 12. The greater plant height (87.90 cm) was recorded from control treatment and the highest plant height (129.80 cm) was recorded from the treatment of 60 kg P/ha. The lowest monopodial branch/plant (1.40) was recorded from control treatment and the highest monopodial branch/plant (2.00) was recorded from the treatment of 100 kg P/ha.The maximum sympodial branch/plant (17.0) was found in treatment $T_5$ and $T_6$ and minimum sympodial branch/plant (10.20) was found in control treatment which was followed by the treatment $T_4$ (60kg P/ha). The lowest boll/plant (9.90) was recorded from control treatment and the greater number of boll/plant (30.90) was collected from the treatment of 80 kg P/ha. The lowest single boll weight (3.97 g) was recorded from control treatment and the highest single boll weight (5.75 g) was recorded from the treatment of 80 kg P/ha.Maqshoof *et. at*.2009 reported that boll weight increased to the highest value of 3.66 g with P application of 34 kg $ha^{-1}$.The maximum seed cotton yield (3093kg/ha) was found in$T_5$ treatment and minimum seed cotton yield (971 kg/ha) was recorded from the control treatment. A significant increase in seed cotton yield in soils having phosphorus < 12 mg kg-1 of soil in the Punjab province has been reported (Gill et al. 2000, Makhdum et al. 2001).

Table 12 Effect of various levels of P fertilizers on yield and yield contributing characters ofCB-15

| Treatment | Doses of P/ha | Plant height (cm) | Monopodia / plant | sympodia/ plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 83.4 | 1.3 | 10.2 | 9.9 | 3.97 | 971 |
| $T_1$ | 20 | 110.4 | 1.3 | 14.4 | 19.3 | 4.62 | 1900 |
| $T_2$ | 40 | 115.0 | 1.5 | 15.4 | 24.6 | 5.09 | 2392 |
| $T_3$ | 60 | 119.0 | 1.4 | 17.0 | 29.2 | 5.52 | 2978 |
| $T_4$ | 80 | 120.1 | 1.6 | 17.0 | 30.9 | 5.75 | 3093 |
| $T_5$ | 100 | 121.3 | 1.7 | 16.6 | 29.2 | 5.60 | 2969 |
| 5% LSD | | 6.28 | 0.34 | 0.68 | 1.90 | 0.17 | 155 |
| CV% | | 7.7 | 31.3 | 6.1 | 10.9 | 4.7 | 8.9 |

11.4.3. Interaction Effect

Interaction effect of Location and Treatment of P fertilizers on yield and yield contributing characters of CB-15 are given in Table13

Table 13. Location × treatment interaction effect on CB-15

| Location | Treatment | Doses of P/ha | Plant height (cm) | Monopodia/ plant | sympodia / plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| Sreepur Gazipur | $T_0$ | 0 | 57.7 | 0.0 | 10.7 | 10.2 | 4.06 | 973 |
| | $T_1$ | 20 | 93.1 | 0.8 | 14.4 | 21.9 | 5.01 | 1605 |
| | $T_2$ | 40 | 97.6 | 0.9 | 15.7 | 23.5 | 5.20 | 2042 |
| | $T_3$ | 60 | 98.1 | 1.0 | 17.0 | 28.4 | 5.35 | 3275 |
| | $T_4$ | 80 | 97.3 | 1.0 | 16.4 | 29.0 | 5.37 | 3034 |
| | $T_5$ | 100 | 101.6 | 1.0 | 16.7 | 27.1 | 5.32 | 3024 |
| Jagadishpur Jessore | $T_0$ | 0 | 94.0 | 1.5 | 10.1 | 9.4 | 3.83 | 937 |
| | $T_1$ | 20 | 122.0 | 2.0 | 14.9 | 19.5 | 4.40 | 2132 |
| | $T_2$ | 40 | 131.7 | 1.5 | 16.0 | 22.1 | 4.57 | 2601 |
| | $T_3$ | 60 | 139.2 | 2.0 | 19.0 | 30.7 | 5.27 | 2964 |
| | $T_4$ | 80 | 140.1 | 2.1 | 18.6 | 29.7 | 5.93 | 3019 |
| | $T_5$ | 100 | 140.0 | 1.9 | 18.8 | 31.1 | 5.90 | 3041 |
| Sadarpur Dinajpur | $T_0$ | 0 | 73.2 | 2.8 | 10.0 | 10.5 | 4.03 | 986 |
| | $T_1$ | 20 | 111.3 | 2.2 | 13.8 | 19.9 | 4.53 | 2313 |
| | $T_2$ | 40 | 107.3 | 3.2 | 13.5 | 24.2 | 5.27 | 2548 |
| | $T_3$ | 60 | 116.5 | 1.7 | 15.4 | 26.3 | 5.80 | 2745 |
| | $T_4$ | 80 | 114.2 | 2.6 | 14.7 | 30.5 | 5.93 | 3227 |
| | $T_5$ | 100 | 119.7 | 3.7 | 14.4 | 29.2 | 5.73 | 2896 |
| Mahigang Rangpur | $T_0$ | 0 | 98.1 | 1.2 | 10.7 | 9.4 | 4.10 | 1040 |
| | $T_1$ | 20 | 109.6 | 0.9 | 15.5 | 20.2 | 4.71 | 1980 |
| | $T_2$ | 40 | 107.6 | 1.4 | 16.8 | 27.9 | 5.37 | 2825 |
| | $T_3$ | 60 | 111.9 | 1.2 | 18.0 | 33.0 | 5.77 | 3398 |
| | $T_4$ | 80 | 116.7 | 1.3 | 18.5 | 31.4 | 5.73 | 3467 |
| | $T_5$ | 100 | 110.2 | 1.3 | 18.0 | 31.8 | 5.50 | 3337 |
| Balaghata Bandarban | $T_0$ | 0 | 94.1 | 1.0 | 9.5 | 10.1 | 3.80 | 921 |
| | $T_1$ | 20 | 116.0 | 0.7 | 13.6 | 15.1 | 4.43 | 1468 |
| | $T_2$ | 40 | 130.6 | 0.6 | 15.1 | 25.1 | 5.07 | 1944 |
| | $T_3$ | 60 | 129.3 | 1.2 | 15.5 | 27.6 | 5.40 | 2507 |
| | $T_4$ | 80 | 132.1 | 0.8 | 16.5 | 33.7 | 5.77 | 2719 |
| | $T_5$ | 100 | 135.0 | 0.8 | 15.3 | 26.5 | 5.57 | 2548 |
| 5% LSD | | | 14.0 | 0.8 | 1.5 | 4.2 | 0.39 | 346 |
| CV% | | | 7.7 | 31.3 | 6.1 | 10.9 | 4.7 | 8.9 |

11.4.4. Regression analysis

CB-15 yield response to P fertilizer at Sreepur Farm is presented in Figure 31. The estimated equation for CB-15 yield in relation to P is $y = -0.264x^2 + 48.96x + 846.30$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 32) showed that the maximum yield (3102 kg/ha) of CB-15 can be obtained by applying 100 kg P/ha.

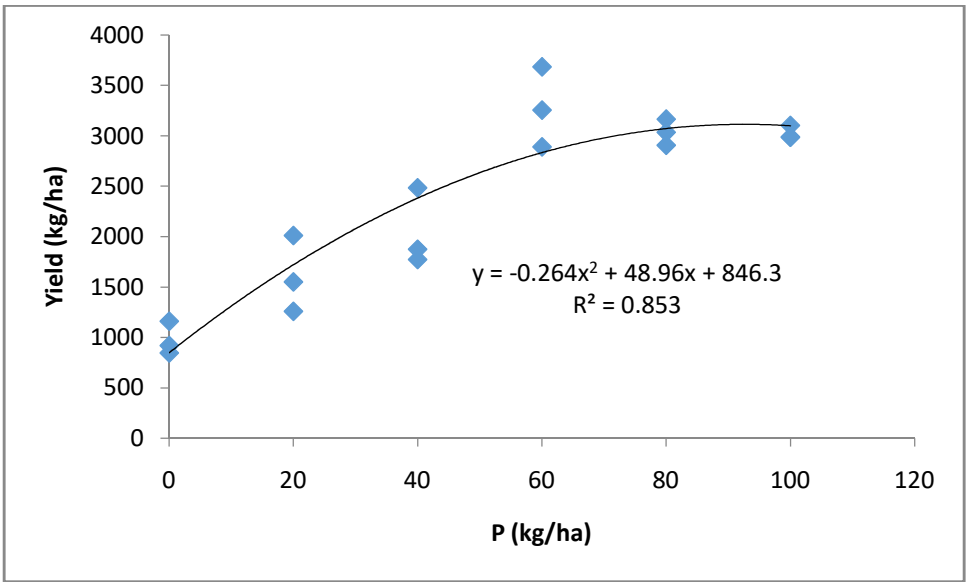



Fig. 31. CB-15 yield in response to P fertilizer at Cotton Research Center, Sreepur, Gazipur

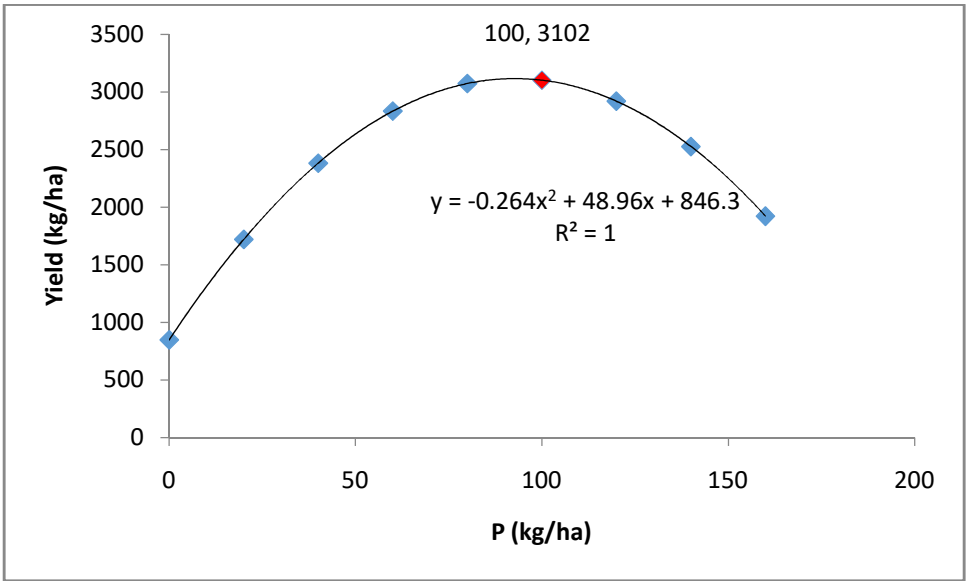



Fig. 32. Projected yield of CB-15 in response to P fertilizer at Cotton Research Center, Sreepur, Gazipur

CB-15 yield response to P fertilizer at Jagadishpur Farm is presented in Figure 33. The estimated equation for CB-15 yield in relation to P is $y = -0.335\ x^2 + 52.93.x + 1033$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 34) showed that the maximum yield (3123 kg/ha) of CB-15 can be obtained by applying 80 kg P/ha.

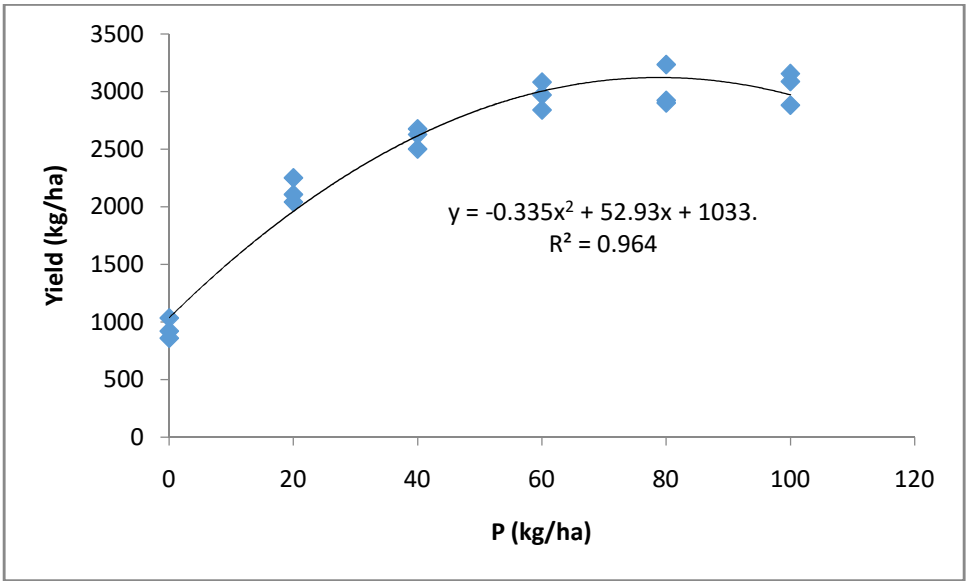



Fig. 33. CB-15 yield in response to P fertilizer at Cotton Research Center, Jagadishpur, Jashore

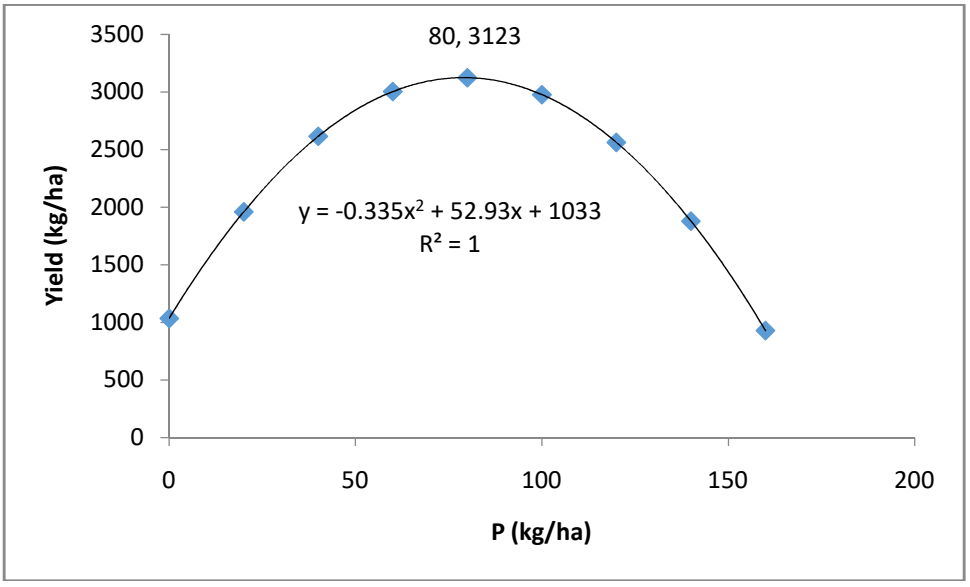



Fig. 34. Projected yield of CB-15 in response to P fertilizer at Cotton Research Center, Jagadishpur, Jashore

CB-15 yield response to P fertilizer at Sadarpur Farm is presented in Figure 35. The estimated equation for CB-15 yield in relation to P is $y = -0.326x^2 + 50.44x + 1125$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 36) showed that the maximum yield (3074 kg/ha) of CB-15 can be obtained by applying 80 kg P/ha

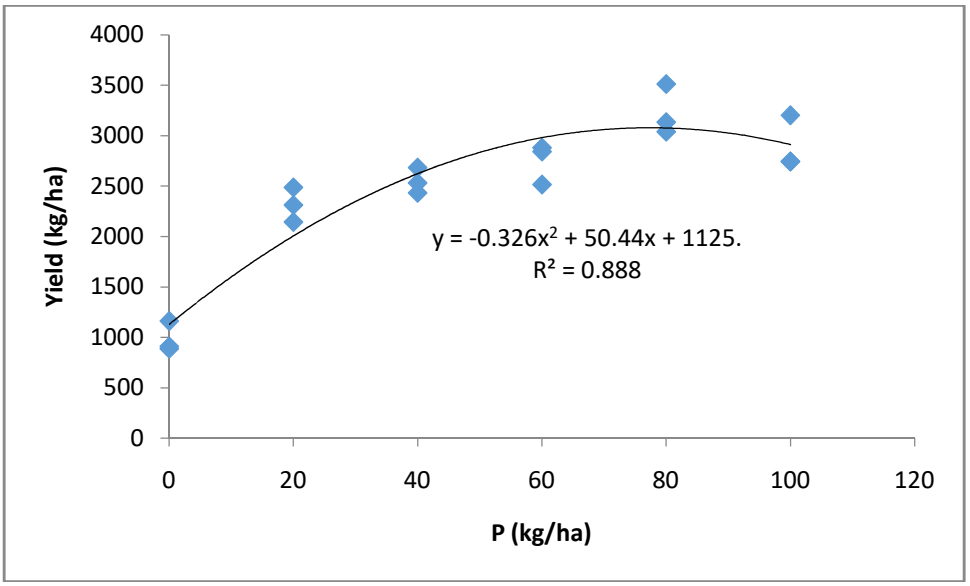



Fig.35. CB-15 yield in response to P fertilizer at Cotton Research Center, Sadarpur, Dinajpur

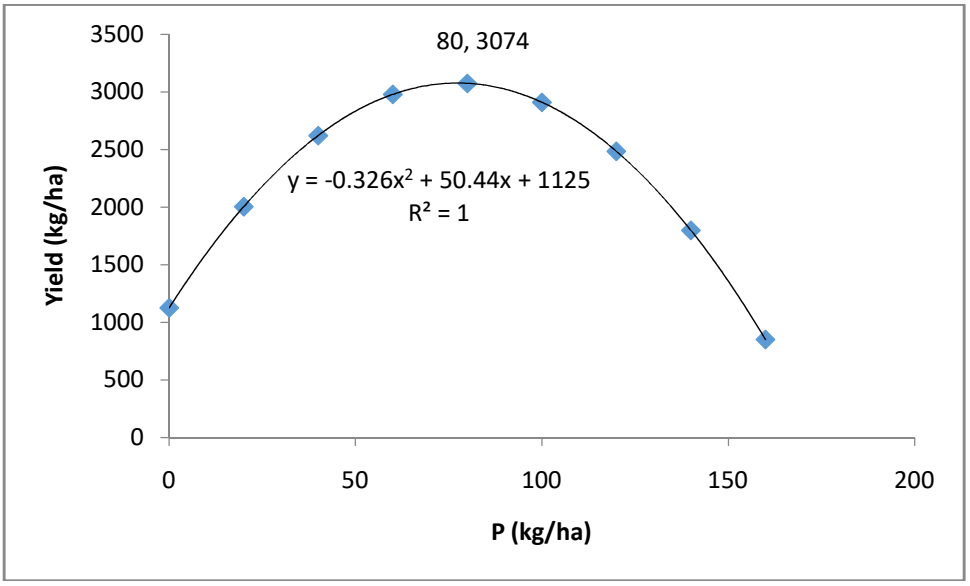



Fig. 36. Projected yield of CB-15 in response to P fertilizer at Cotton Research Center, Sadarpur, Dinajpur

CB-15 yield response to P fertilizer at Mahigonj Farm is presented in Figure 37. The estimated equation for CB-15 yield in relation to P is $y = -0.377x^2 + 61.32x + 991.6$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 38) showed that the maximum yield (3484 kg/ha) of CB-15 can be obtained by applying 80 kg P/ha.

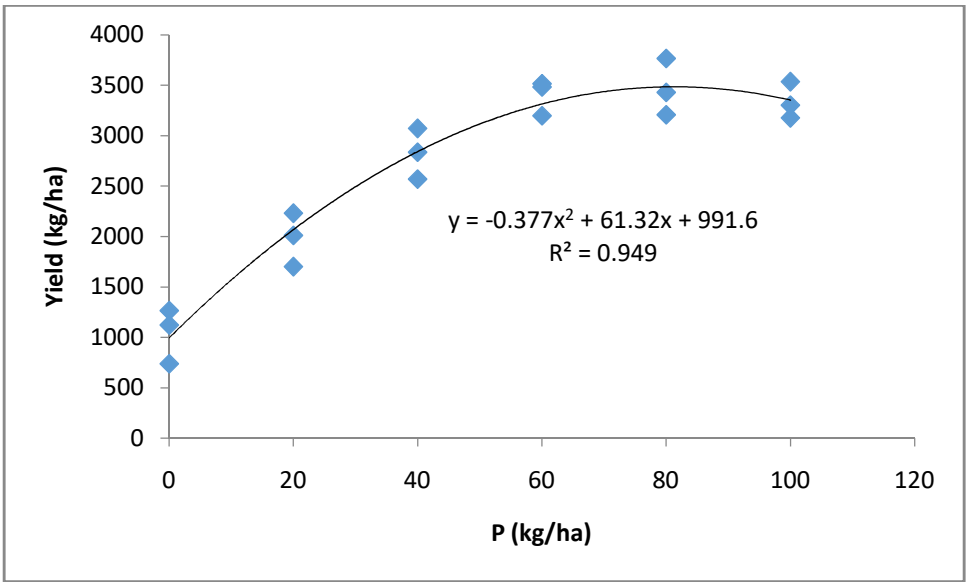



Fig. 37. CB-15 yield in response to P fertilizer at Cotton Research Center, Mahigonj, Rangpur

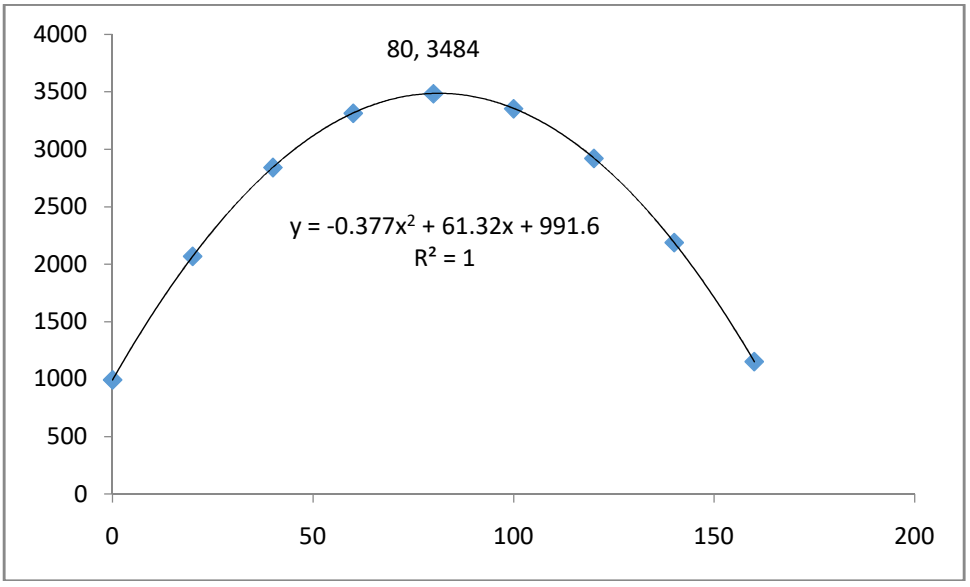



Fig. 38. Projected yield of CB-15 in response to P fertilizer at Cotton Research Center, Mahigonj, Rangpur

CB-15 yield response to P fertilizer at Balaghata Farm is presented in Figure 39. The estimated equation for CB-15 yield in relation to P is $y = -0.207x^2 + 38.52x + 851.7$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 40) showed that the maximum yield (2634 kg/ha) of CB-15 can be obtained by applying 100 kg P/ha.

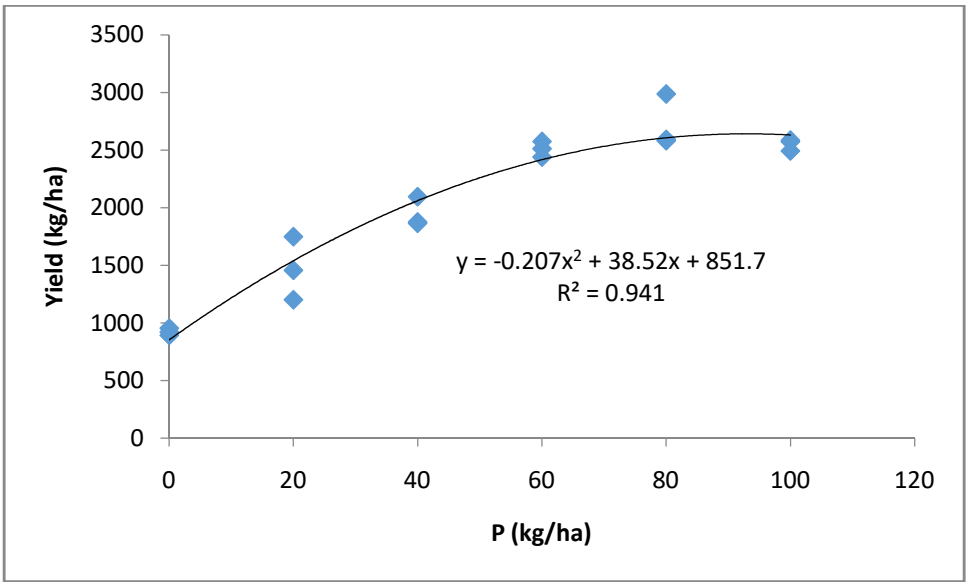



Fig. 39. CB-15 yield in response to P fertilizer at Cotton Research Center, Balaghata, Bandarban

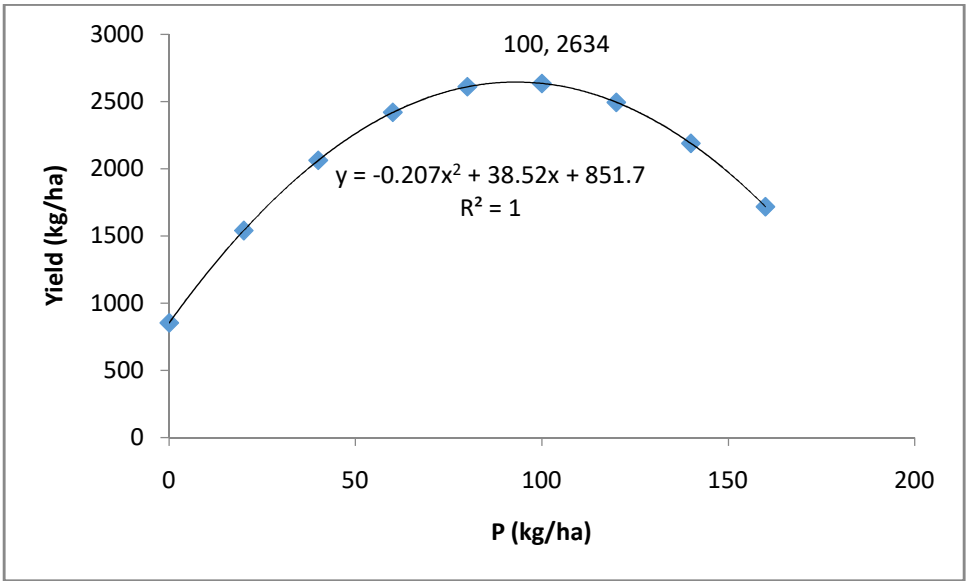



Fig.40. Projected yield of CB-15 in response to P fertilizer at Cotton Research Center, Balaghata, Bandarban

11. 5. Effect of potassium on CB 14

11.5.1. Location Effect on yield and yield parameters

Location effect of K fertilizers on yield and yield contributing characters of CB-14 are given in Table 14. The lowest plant height (105.80cm) was observed in Gazipur Farm and the highest plant height (131.00 cm) was observed in Jashore Farm. The minimum number of monopodial branch/plant (1.20) was found in Gazipur and maximum monopodial branch/plant (2.40) was found in Dinajpur Farm. The greater number of sympodial branch/plant (21.90) was recorded from Jashore Farm and the lowest sympodial branch/plant (14.70) was found in Bandarban Farm. The highest number of boll/plant (27.90) was found in Rangpur and the lowest number of boll/plant (24.10) was found in Bandarban.The lowest single boll weight (5.01 g) was recorded from Dinajpur and the highest single boll weight (5.34 g) was recorded from Bandarban. The maximum seed cotton yield (2700 kg/ha) was recorded from Rangpur Farm and minimum seed cotton yield (2230 kg/ha) was found in Gazipur Farm which was followed by the (2604 kg/ha) Jashore Farm.

Table 14. Effect of Location on CB-14 yield and yield contributing characters

| Location | Plant height(cm) | Monopodia/ plant | sympodia/ plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| Sreepur Gazipur | 105.80 | 1.20 | 16.30 | 24.10 | 5.04 | 2230 |
| Jagadishpur Jashore | 131.30 | 2.20 | 21.90 | 26.70 | 5.25 | 2604 |
| Sadarpur Dinajpur | 114.60 | 2.40 | 15.00 | 23.10 | 5.01 | 2251 |
| Mahigang Rangpur | 120.80 | 2.20 | 16.90 | 27.90 | 5.08 | 2700 |
| Balaghata Bandarban | 127.50 | 1.50 | 14.70 | 24.50 | 5.34 | 2307 |
| 5% LSD | 6.33 | 0.36 | 0.86 | 1.76 | 0.15 | 177.24 |
| CV% | 7.9 | 28.2 | 7.6 | 10.4 | 4.4 | 11.0 |

11.5.2 Potassium effect

The effect of various levels of K fertilizers on yield and yield contributing characters of CB-14 are given in Table 15. The minimum plant height (85.70 cm) was produced from control treatment and the highest plant height (134.10 cm) was produced from the treatment of 150 kg K/ha.The lowest monopodial branch/plant (1.5) was recorded from control treatment and the highest monopodial branch/plant (2.2) was recorded from the treatment of 150 kg K/ha. The greater number of sympodial branch/plant (19.6) was recorded from $T_6$ (250 kg K/ha) treatment and the lowest sympodial branch/plant (10.1) was recorded from the control treatment. The lowest boll/plant (10.1) was recorded from control treatment and the highest boll/plant (33.10) was recorded from the treatment of 200 kg K/ha. The lowest single boll weight (3.98 g) was recorded from control treatment and the highest single boll weight (5.81 g) was recorded from the treatment of 200 kg K/ha. The minimum seed cotton yield (940 kg/ha) was recorded from control treatment and the highest seed cotton yield (3190 kg/ha) was recorded from the treatment of 200 kg K/ha. Application of potassium, a significant improvement was reported in cotton seed yields and this improvement was reported maximum in the plots treated with 150 to 200 kg K ha-1 as compared to the control Gormus et al. (2016).

Table 15. Effect of various levels of K fertilizers on yield and yield contributing characters of CB-14

| Treatment | Doses of K/ha | Plant height(cm) | Monopodia/ plant | sympodia/ plant | No.boll/ plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 85.7 | 1.5 | 10.1 | 10.1 | 3.98 | 940 |
| $T_1$ | 50 | 113.8 | 2.1 | 15.8 | 20.1 | 4.58 | 2014 |
| $T_2$ | 100 | 123.8 | 1.9 | 17.7 | 25.4 | 5.26 | 2480 |
| $T_3$ | 150 | 134.1 | 2.2 | 19.3 | 30.8 | 5.54 | 2942 |
| $T_4$ | 200 | 131.3 | 1.8 | 19.2 | 33.1 | 5.81 | 3190 |
| $T_5$ | 250 | 131.3 | 1.9 | 19.6 | 32.1 | 5.70 | 2945 |
| 5% LSD | | 6.94 | 0.39 | 0.94 | 1.92 | 0.17 | 194.15 |
| CV% | | 7.9 | 28.2 | 7.6 | 10.4 | 4.4 | 11.0 |

11.5.3. Interaction Effect

Interaction effect of Location and Treatment of K fertilizers on yield and yield contributing characters of CB-14 are given in Table16

Table 16. Location × treatment interaction effect on CB-14

| Location | Treatment | Doses of K/ha | Plant height (cm) | Monopodia / plant | sympodia / plant | No.boll / plant | Boll Wt(g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| Sreepur Gazipur | $T_0$ | 0 | 72.4 | 0.4 | 10.4 | 10.5 | 4.08 | 940 |
| | $T_1$ | 50 | 104.1 | 1.2 | 14.8 | 18.7 | 4.57 | 1571 |
| | $T_2$ | 100 | 112.3 | 1.4 | 17.0 | 25.6 | 4.96 | 2292 |
| | $T_3$ | 150 | 110.9 | 0.9 | 17.9 | 28.3 | 5.18 | 2845 |
| | $T_4$ | 200 | 115.1 | 1.7 | 18.3 | 33.0 | 5.80 | 3247 |
| | $T_5$ | 250 | 120.3 | 1.5 | 19.0 | 31.1 | 5.66 | 2948 |
| Jagadishpur Jessore | $T_0$ | 0 | 88.6 | 1.7 | 11.0 | 10.1 | 3.83 | 963 |
| | $T_1$ | 50 | 124.4 | 2.3 | 19.6 | 20.5 | 4.53 | 2327 |
| | $T_2$ | 100 | 134.1 | 2.5 | 25.0 | 25.5 | 5.23 | 2553 |
| | $T_3$ | 150 | 146.9 | 2.2 | 25.4 | 33.1 | 5.73 | 3025 |
| | $T_4$ | 200 | 145.8 | 2.2 | 24.7 | 37.1 | 5.97 | 3523 |
| | $T_5$ | 250 | 148.0 | 2.4 | 25.7 | 33.8 | 6.20 | 3235 |
| Sadarpur Dinajpur | $T_0$ | 0 | 74.9 | 2.0 | 9.8 | 9.5 | 3.93 | 954 |
| | $T_1$ | 50 | 107.2 | 2.5 | 14.5 | 22.9 | 4.47 | 2198 |
| | $T_2$ | 100 | 122.4 | 2.4 | 15.0 | 23.7 | 5.13 | 2307 |
| | $T_3$ | 150 | 136.3 | 2.9 | 16.8 | 26.3 | 5.63 | 2668 |
| | $T_4$ | 200 | 127.6 | 2.0 | 17.1 | 29.0 | 5.63 | 2726 |
| | $T_5$ | 250 | 119.3 | 2.3 | 16.9 | 27.3 | 5.27 | 2650 |
| Mahigang Rangpur | $T_0$ | 0 | 99.7 | 2.0 | 10.2 | 10.1 | 4.03 | 965 |
| | $T_1$ | 50 | 114.2 | 2.6 | 15.5 | 21.4 | 4.53 | 2160 |
| | $T_2$ | 100 | 119.9 | 1.6 | 16.4 | 26.4 | 5.27 | 3141 |
| | $T_3$ | 150 | 131.1 | 2.8 | 19.1 | 35.3 | 5.57 | 3409 |
| | $T_4$ | 200 | 131.1 | 2.0 | 19.9 | 35.6 | 5.60 | 3397 |
| | $T_5$ | 250 | 129.0 | 2.1 | 20.2 | 38.5 | 5.50 | 3126 |
| Balaghata Bandarban | $T_0$ | 0 | 93.1 | 1.6 | 9.1 | 10.1 | 4.00 | 880 |
| | $T_1$ | 50 | 119.2 | 1.7 | 14.5 | 17.0 | 4.80 | 1812 |
| | $T_2$ | 100 | 130.4 | 1.5 | 14.9 | 25.7 | 5.70 | 2105 |
| | $T_3$ | 150 | 145.2 | 1.7 | 17.3 | 31.2 | 5.60 | 2764 |
| | $T_4$ | 200 | 136.8 | 1.3 | 16.0 | 30.8 | 6.07 | 3056 |
| | $T_5$ | 250 | 140.0 | 1.3 | 16.3 | 29.8 | 5.87 | 2765 |
| 5% LSD | | | 15.51 | 0.87 | 2.11 | 4.30 | 0.37 | 434.14 |
| CV% | | | 7.9 | 28.2 | 7.6 | 10.4 | 4.4 | 11.0 |

11.5.4. Regression analysis

CB-14 yield response to K fertilizer at Sreepur Farm is presented in Figure 41. The estimated equation for CB-14 yield in relation to K is $y = -0.0423x^2 + 19.509x + 838.75$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 42) showed that the maximum yield (3059 kg/ha) of CB-15 can be obtained by applying 200 kg K/ha.

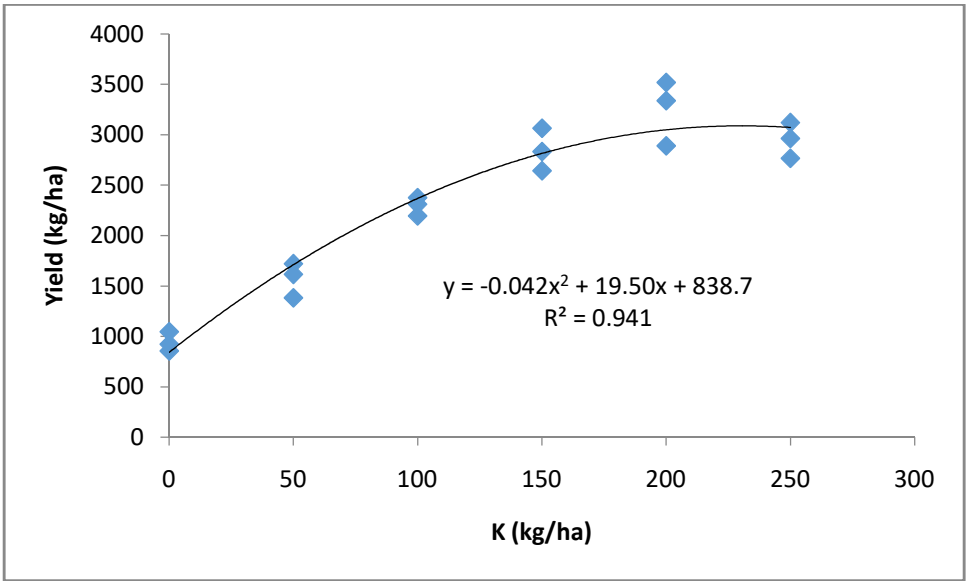



Fig. 41. CB-14 yield in response to K fertilizer at Cotton Research Center, Sreepur, Gazipur

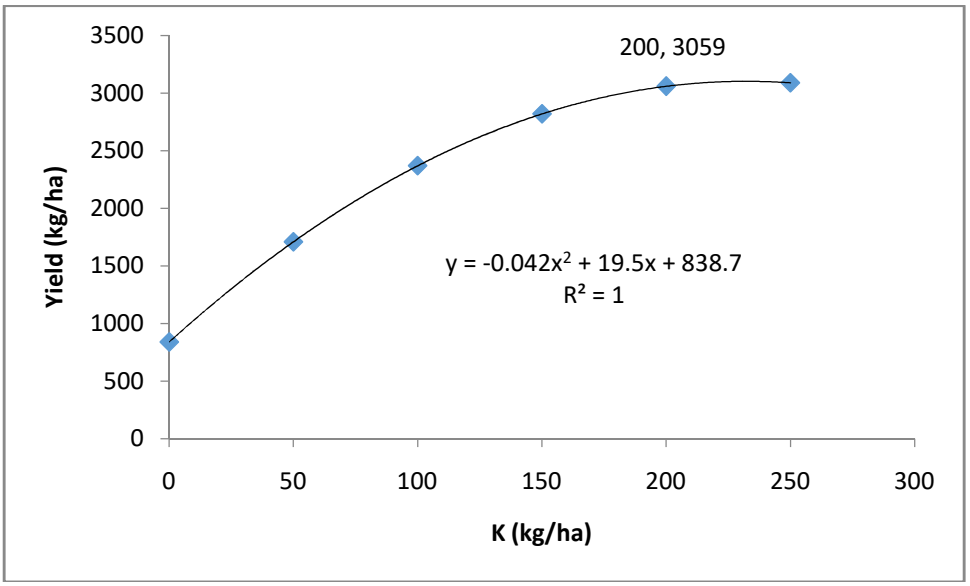



Fig. 42. Projected yield of CB-14 in response to K fertilizer at Cotton Research Center, Sreepur, Gazipur

CB-14 yield response to K fertilizer at Jagadishpur Farm is presented in Figure 43. The estimated equation for CB-14 yield in relation to K is $y = -0.051x^2 + 21.624x + 1075.8$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 44) showed that the maximum yield (3359 kg/ha) of CB-14 can be obtained by applying 200 kg K/ha.

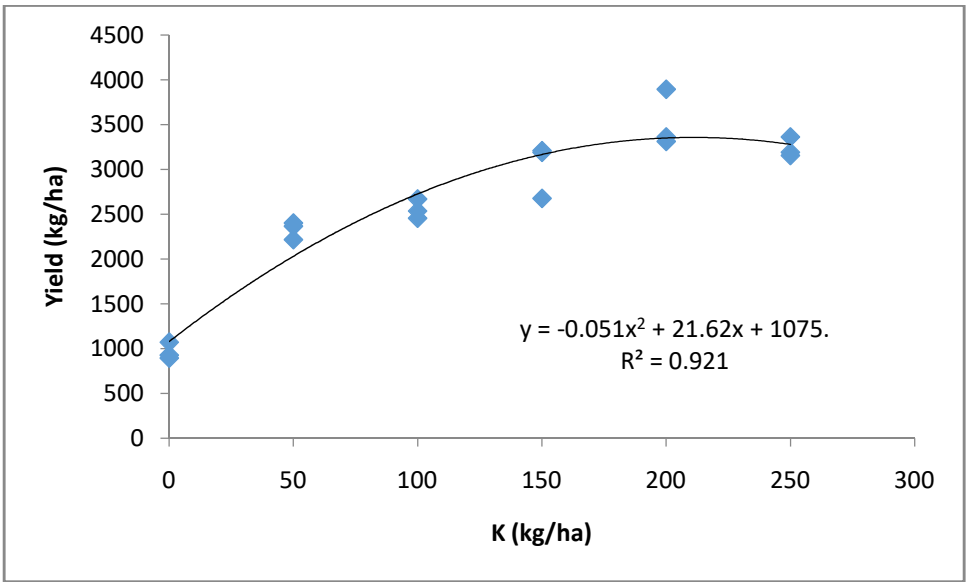



Fig. 43. CB-14 yield in response to K fertilizer at Cotton Research Center, Jagadishpur, Jashore

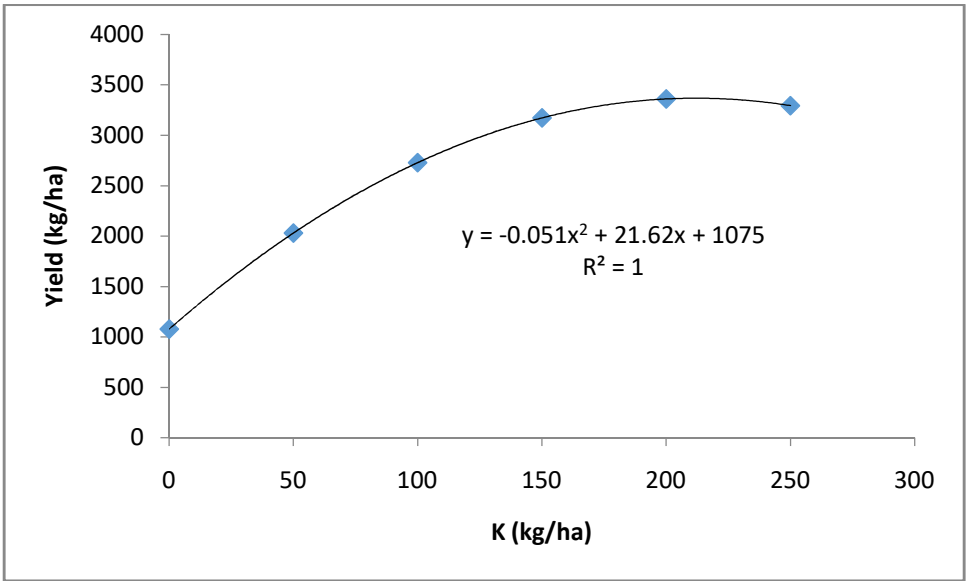



Fig. 44. Projected yield of CB-14 in response to K fertilizer at Cotton Research Center, Jagadishpur, Jashore

CB-14 yield response to K fertilizer at Sadarpur Farm is presented in Figure 45. The estimated equation for CB-14 yield in relation to K is $y = -0.0486x^2 + 18.1114x + 1100.7$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 46) showed that the maximum yield (2802 kg/ha) of CB-14 can be obtained by applying 200 kg K/ha.

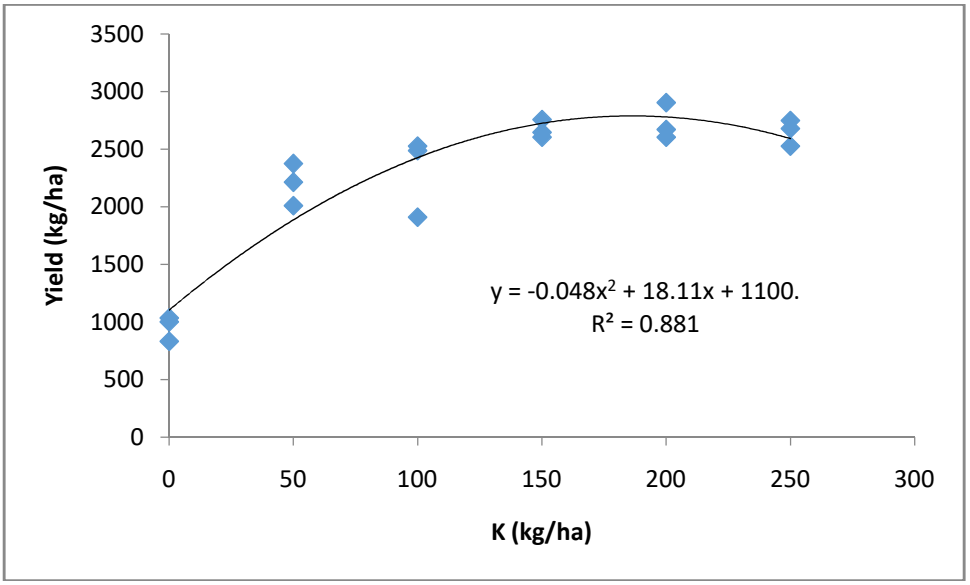



Fig. 45. CB-14 yield in response to K fertilizer at Cotton Research Center, Sadarpur, Dinajpur

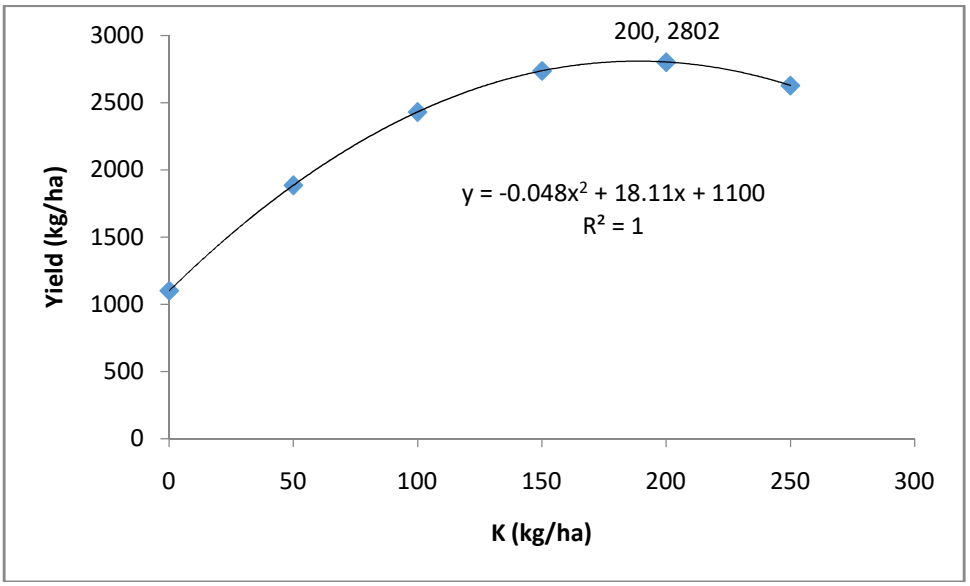



Fig. 46. Projected yield of CB-14 in response to K fertilizer at Cotton Research Center, Sadarpur, Dinajpur

CB-14 yield response to K fertilizer at Mahigonj Farm is presented in Figure 47. The estimated equation for CB-14 yield in relation to K is $y = -0.0807x^2 + 28.624x + 971.33$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 48) showed that the maximum yield (3495 kg/ha) of CB-14 can be obtained by applying 200 kg K/ha.

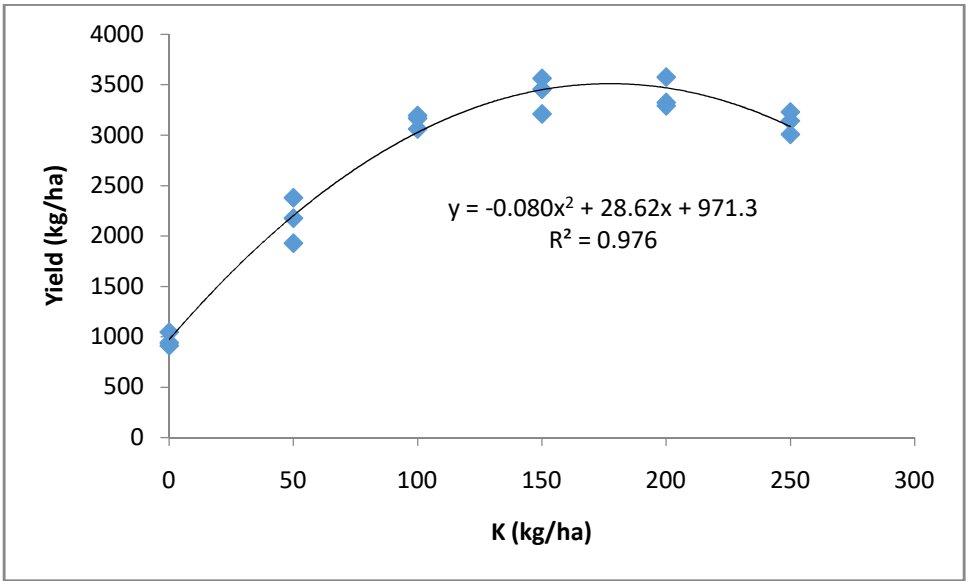



Fig. 47. CB-14 yield in response to K fertilizer at Cotton Research Center, Mahigang, Rangpur

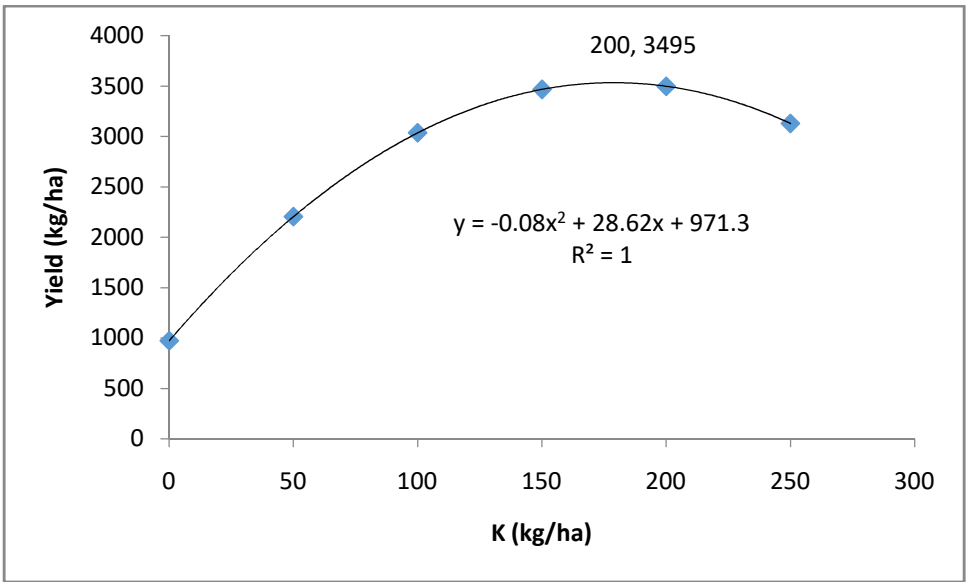


Fig. 48. Projected yield of CB-14 in response to K fertilizer at Cotton Research Center Mahigang, Rangpur

CB-14 yield response to K fertilizer at Balaghata Farm is presented in Figure 49. The estimated equation for CB-14 yield in relation to K is $y = -0.0437x^2 + 18.817x + 879.33$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-14 (Figure 50) showed that the maximum yield (2921 kg/ha) of CB-14 can be obtained by applying 200 kg K/ha.

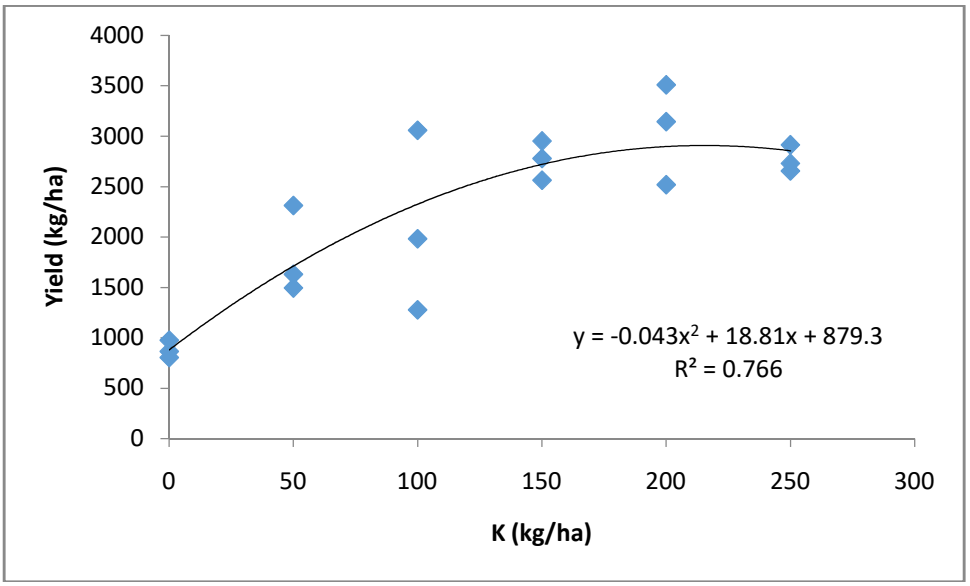



Fig. 49. CB-14 yield in response to K fertilizer at Cotton Research Center, Balaghata, Bandarpur

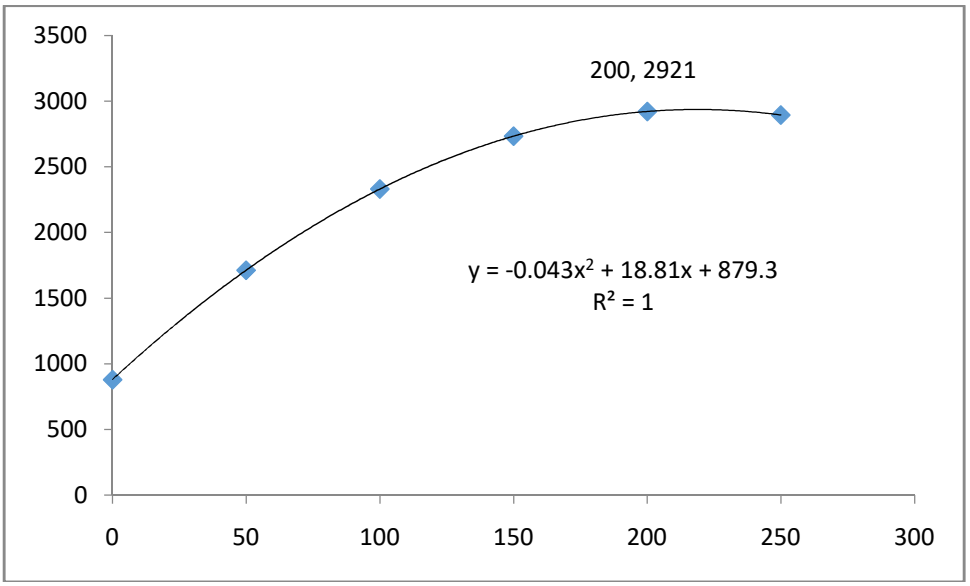



Fig. 50. Projected yield of CB-14 in response to K fertilizer at Cotton Research Center Balaghata, Bandarban

11. 6. Effect of potassium on CB 15

11.6.1. Location Effect on yield and yield parameters of CB-15

Location effect of K fertilizers on yield and yield contributing characters of CB-15 are given in Table 17. The minimum plant height (98.11cm) was found in Bandarban Farm and the maximum plant height (135.00 cm) was found in Jashore Farm. The lowest number of monopodial branch/plant (0.60) was observed in Bandarban and greater number of monopodial branch/plant (2.89) was found in Dinajpur Farm. The highest number of sympodial branch/plant (20.13) was recorded from Jashore Farm and the lowest sympodial branch/plant (11.50) was found in Bandarban Farm. Higher number of boll/plant (29.88) was found in Rangpur and the lower number of boll/plant (18.64) was found in Bandarban. The lowest single boll weight (4.78 g) was produced from Bandarban and the highest single boll weight (5.28 g) was recorded from Jashore. The maximum seed cotton yield (2616 kg/ha) was recorded from Jashore Farm and minimum seed cotton yield (2230 kg/ha) was found in Gazipur Farm which was followed by the (2050 kg/ha) Gazipur Farm.

Table 17. Effect of Location on CB-15 yield and yield contributing characters

| Location | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|
| Sreepur Gazipur | 98.49 | 0.62 | 15.19 | 22.44 | 4.96 | 2050 |
| Jagadishpur Jashore | 135.00 | 1.98 | 20.13 | 26.81 | 5.28 | 2616 |
| Sadarpur Dinajpur | 106.67 | 2.89 | 13.77 | 24.10 | 5.08 | 2413 |
| Mahigong Rangpur | 120.35 | 1.98 | 16.61 | 29.88 | 5.20 | 2552 |
| Balaghata Bandarban | 98.11 | 0.60 | 11.50 | 18.64 | 4.78 | 2027 |
| 5% LSD | 5.65 | 0.31 | 0.93 | 1.86 | 0.15 | 201.44 |
| CV% | 7.58 | 28.82 | 9.12 | 11.48 | 4.57 | 12.94 |

11.6.2 Potassium effect

The effect of various levels of K fertilizers on yield and yield contributing characters of CB-15 are given in Table 18. The minimum plant height (81.85 cm) was produced from control treatment and the maximum plant height (124.29 cm) was produced from the treatment of 200 kg K/ha. The lowest monopodial branch/plant (1.37) was recorded from control treatment and the highest monopodial branch/plant (1.74) was recorded from the treatment of 150 kg K/ha. The greater number of sympodial branch/plant (17.61) was recorded from $T_5$ (200 kg K/ha) treatment and the lowest sympodial branch/plant (10.05) was recorded from the control treatment. The lowest boll/plant (9.68) was recorded from control treatment and the highest boll/plant (31.80) was recorded from the treatment of 200 kg K/ha. The lowest single boll weight (3.89 g) was recorded from control treatment and the highest single boll weight (5.75 g) was recorded from the treatment of 200 kg K/ha. The minimum seed cotton yield (891 kg/ha) was recorded from control treatment and the maximum seed cotton yield (3039 kg/ha) was recorded from the treatment of 200 kg K/ha. Application of potassium, a significant improvement was reported in cotton seed yields and this improvement was reported maximum in the plots treated with 150 to 200 kg K ha-1 as compared to the control Gormus *et al.* (2016).

Table 18. Effect of various levels of K fertilizers on yield and yield contributing characters of CB-15

| Treatment | Doses of K/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|
| $T_0$ | 0 | 81.85 | 1.37 | 10.05 | 9.68 | 3.89 | 891.60 |
| $T_1$ | 50 | 104.14 | 1.73 | 14.35 | 20.10 | 4.53 | 2066.30 |
| $T_2$ | 100 | 116.65 | 1.65 | 16.34 | 23.89 | 4.99 | 2384.80 |
| $T_3$ | 150 | 120.50 | 1.74 | 16.99 | 30.14 | 5.47 | 2760.80 |
| $T_4$ | 200 | 124.29 | 1.46 | 17.61 | 31.80 | 5.75 | 3039.50 |
| $T_5$ | 250 | 122.91 | 1.73 | 17.32 | 30.66 | 5.74 | 2850.30 |
| 5% LSD | | 6.19 | 0.34 | 1.02 | 2.04 | 0.16 | 220.67 |
| CV% | | 7.58 | 28.82 | 9.12 | 11.48 | 4.57 | 12.94 |

11.6.3. Interaction Effect

Interaction effect of Location and Treatment of K fertilizers on yield and yield contributing characters of CB-15 are given in Table19.

Table 19. Location × treatment interaction effect on CB-15

| Location | Treatment | Doses of K/ha | Plant Height (cm) | Monopodial branch/ plant | Sympodial branch/ plant | Boll/ plant | Boll weight (g) | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|
| Sreepur Gazipur | $T_0$ | 0 | 53.57 | 0.10 | 10.43 | 10.33 | 4.05 | 701.00 |
| | $T_1$ | 50 | 89.37 | 0.08 | 14.50 | 19.83 | 4.66 | 1745.50 |
| | $T_2$ | 100 | 102.12 | 0.60 | 15.56 | 23.90 | 4.92 | 1854.00 |
| | $T_3$ | 150 | 109.57 | 0.76 | 15.80 | 25.63 | 4.88 | 2327.20 |
| | $T_4$ | 200 | 118.77 | 0.70 | 17.83 | 28.36 | 5.77 | 2818.60 |
| | $T_5$ | 250 | 117.55 | 0.76 | 17.03 | 26.60 | 5.40 | 2718.20 |
| Jagadishpur Jessore | $T_0$ | 0 | 100.00 | 1.56 | 9.66 | 9.40 | 3.83 | 893.90 |
| | $T_1$ | 50 | 123.67 | 2.16 | 18.56 | 19.46 | 4.60 | 2187.90 |
| | $T_2$ | 100 | 139.57 | 2.03 | 23.13 | 25.46 | 5.26 | 2654.80 |
| | $T_3$ | 150 | 147.10 | 2.16 | 22.70 | 33.40 | 5.70 | 3177.90 |
| | $T_4$ | 200 | 151.07 | 1.96 | 23.66 | 38.40 | 6.00 | 3581.70 |
| | $T_5$ | 250 | 148.60 | 2.00 | 23.10 | 34.76 | 6.33 | 3204.70 |
| Sadarpur Dinajpur | $T_0$ | 0 | 80.17 | 2.26 | 9.56 | 10.33 | 3.93 | 908.50 |
| | $T_1$ | 50 | 100.43 | 3.00 | 12.20 | 21.30 | 4.33 | 2251.00 |
| | $T_2$ | 100 | 114.87 | 3.16 | 14.80 | 24.13 | 5.03 | 2456.00 |
| | $T_3$ | 150 | 112.97 | 3.33 | 14.93 | 29.66 | 5.75 | 2909.20 |
| | $T_4$ | 200 | 113.37 | 2.33 | 15.56 | 30.13 | 5.83 | 3096.50 |
| | $T_5$ | 250 | 117.55 | 3.26 | 15.56 | 29.06 | 5.60 | 2861.60 |
| Mahigang Rangpur | $T_0$ | 0 | 97.97 | 2.06 | 9.26 | 9.83 | 3.96 | 1001.30 |
| | $T_1$ | 50 | 109.23 | 2.20 | 15.30 | 23.50 | 4.63 | 2348.20 |
| | $T_2$ | 100 | 123.70 | 2.10 | 16.30 | 33.40 | 5.20 | 2931.40 |
| | $T_3$ | 150 | 126.60 | 2.03 | 19.46 | 38.86 | 5.80 | 2952.50 |
| | $T_4$ | 200 | 132.80 | 1.86 | 18.23 | 40.93 | 5.93 | 3090.50 |
| | $T_5$ | 250 | 126.60 | 1.63 | 19.06 | 38.60 | 5.66 | 2909.20 |
| Balaghata Bandarban | $T_0$ | 0 | 77.53 | 0.86 | 9.26 | 8.50 | 3.66 | 953.50 |
| | $T_1$ | 50 | 98.00 | 0.50 | 11.20 | 16.40 | 4.43 | 1798.80 |
| | $T_2$ | 100 | 103.00 | 0.36 | 11.90 | 18.36 | 4.53 | 2027.80 |
| | $T_3$ | 150 | 100.07 | 0.40 | 12.06 | 23.13 | 5.23 | 2396.30 |
| | $T_4$ | 200 | 111.67 | 0.46 | 12.76 | 24.56 | 5.50 | 2748.00 |
| | $T_5$ | 250 | 98.40 | 1.00 | 11.83 | 20.90 | 5.36 | 2376.90 |
| 5% LSD | | | 13.85 | 0.76 | 2.30 | 4.57 | 0.37 | 493.43 |
| CV% | | | 7.58 | 28.82 | 9.12 | 11.48 | 4.57 | 12.94 |

11.6.4. Regression analysis

CB-15 yield response to K fertilizer at Sreepur Farm is presented in Figure 51. The estimated equation for CB-15 yield in relation to K is $y = -0.037x^2 + 15.36x + 793.6$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 52) showed that the maximum yield (2759 kg/ha) of CB-15 can be obtained by applying 250 kg K/ha.

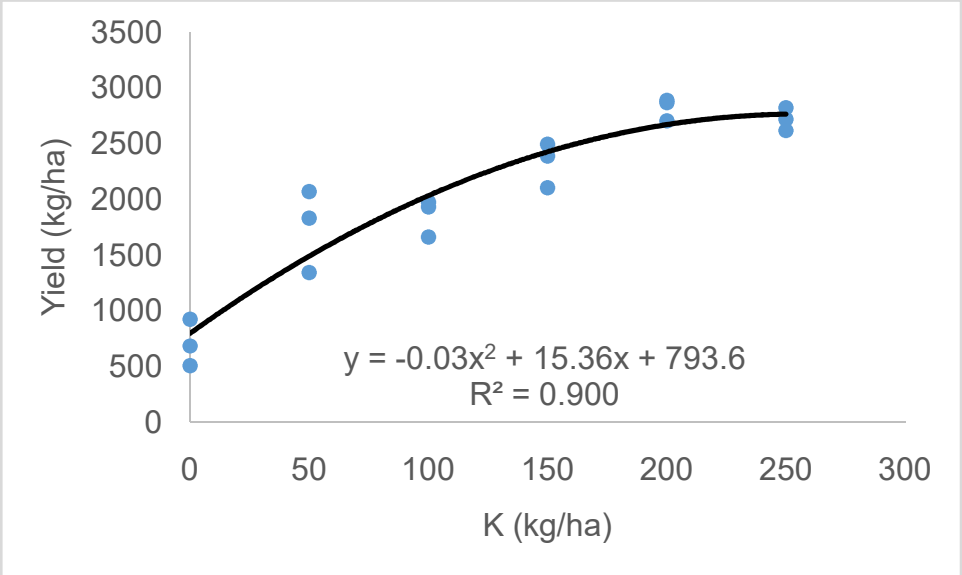



Fig. 51. CB-15 yield in response to K fertilizer at Cotton Research Center, Sreepur, Gazipur

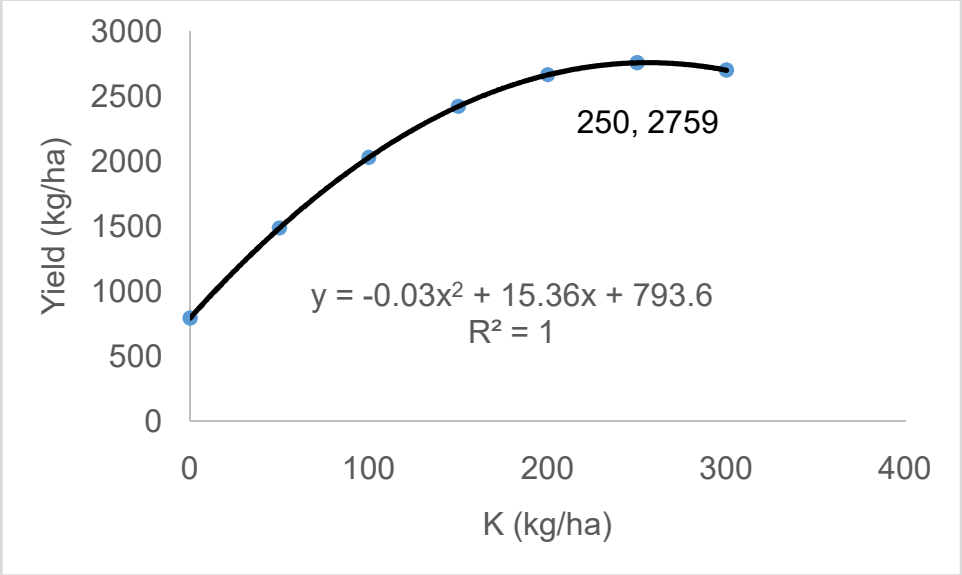



Fig. 52. Projected yield of CB-15 in response to K fertilizer at Cotton Research Center Sreepur, Gazipur

CB-15 yield response to K fertilizer at Jagadishpur Farm is presented in Figure 53. The estimated equation for CB-15 yield in relation to K is $y = -0.061x^2 + 24.66x + 943.1$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 54) showed that the maximum yield (3415 kg/ha) of CB-15 can be obtained by applying 200 kg K/ha.

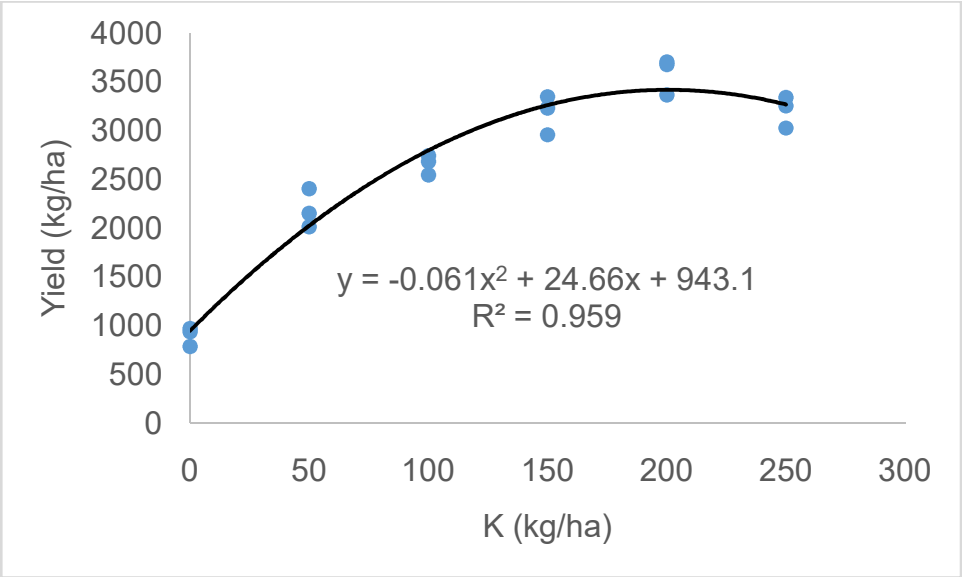



Fig. 53. CB-15 yield in response to K fertilizer at Cotton Research Center, Jagadishpur, Jashore

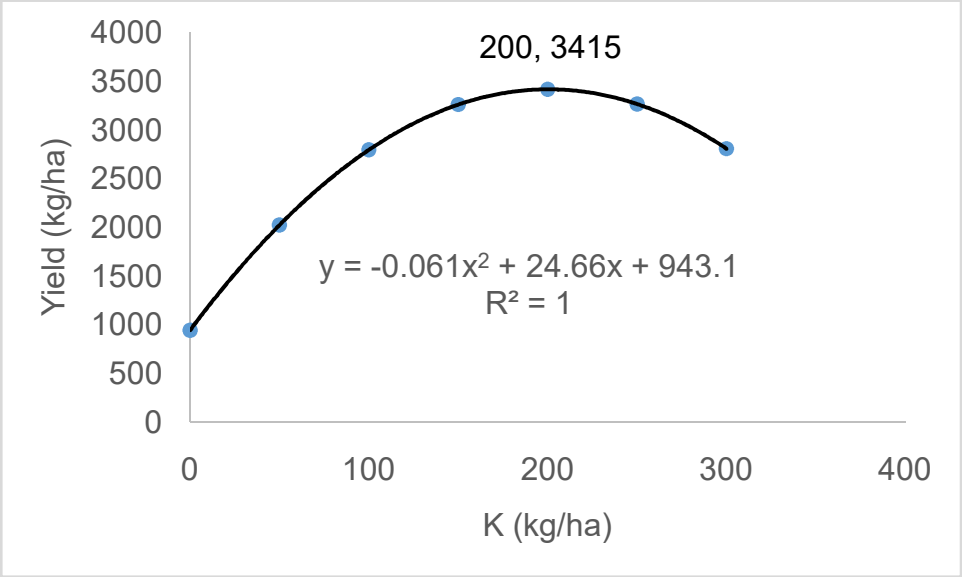



Fig. 54. Projected yield of CB-15 in response to K fertilizer at Cotton Research Center Jagadishpur, Jashore

CB-15 yield response to K fertilizer at Sadarpur Farm is presented in Figure 55. The estimated equation for CB-15 yield in relation to K is $y = -0.056x^2 + 21.49x + 1029$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 56) showed that the maximum yield (3057 kg/ha) of CB-15 can be obtained by applying 200 kg K/ha.

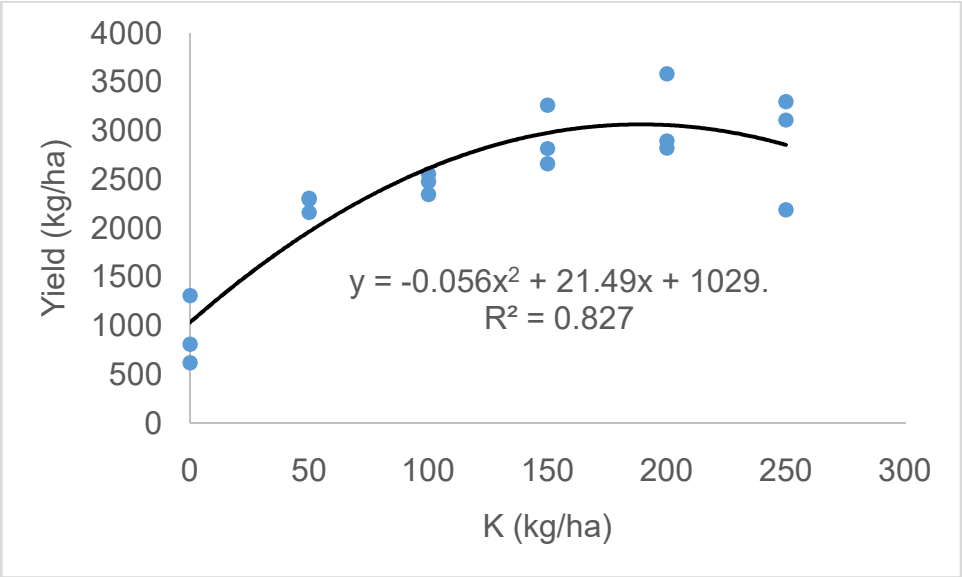



Fig. 55. CB-15 yield in response to K fertilizer at Cotton Research Center, Sadarpur, Dinajpur

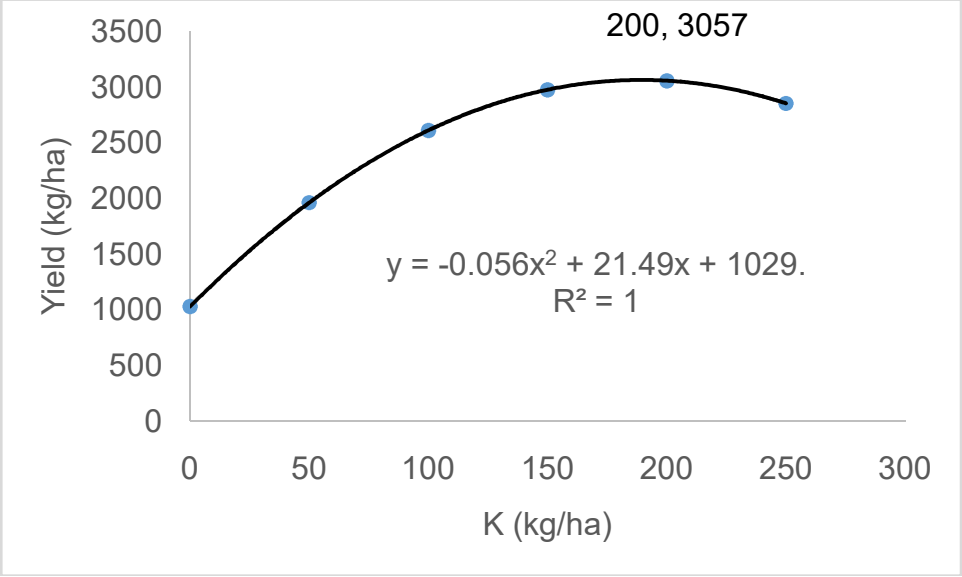



Fig. 56. Projected yield of CB-15 in response to K fertilizer at Cotton Research Center Sadarpur, Dinajpur

CB-15 yield response to K fertilizer at Mahigonj Farm is presented in Figure 57. The estimated equation for CB-15 yield in relation to K is $y = -0.061x^2 + 22.29x + 1164$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 58) showed that the maximum yield (3184 kg/ha) of CB-15 can be obtained by applying 200 kg K/ha.

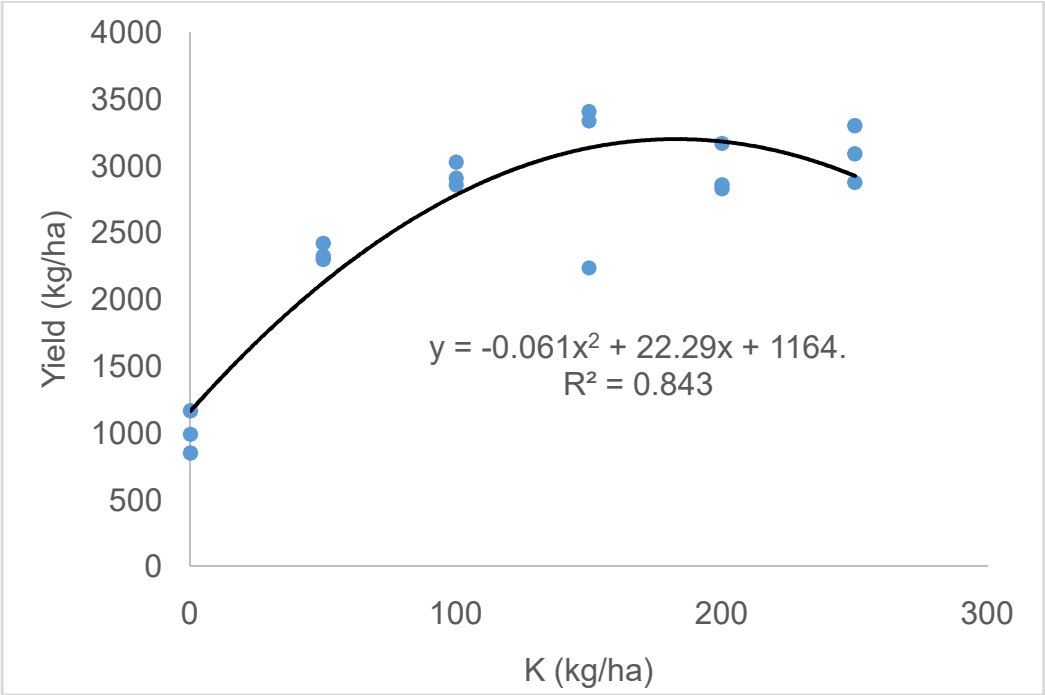



Fig. 57. CB-15 yield in response to K fertilizer at Cotton Research Center, Mahigang, Rangpur

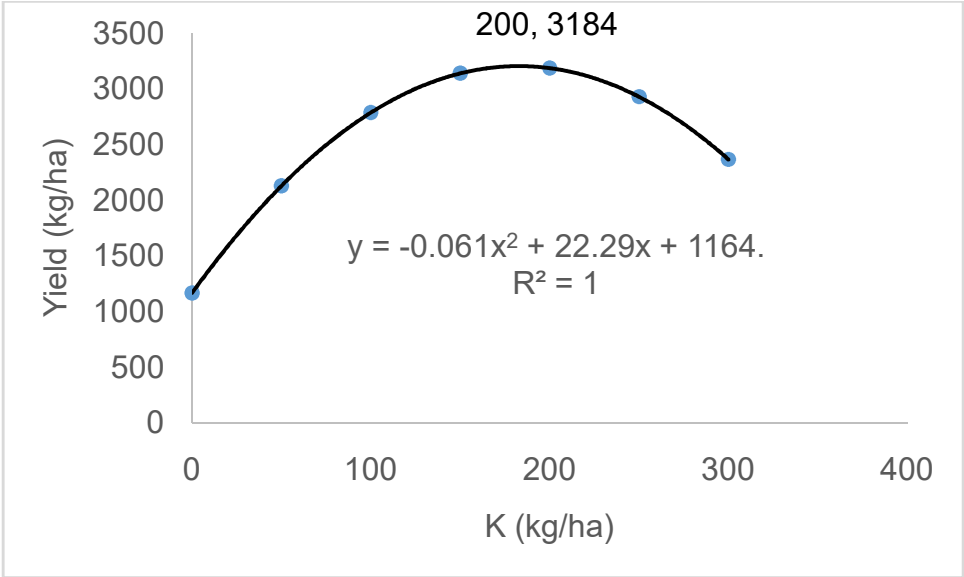



Fig. 58. Projected yield of CB-15 in response to K fertilizer at Cotton Research Center Mahigang, Rangpur

CB-15 yield response to K fertilizer at Balaghata Farm is presented in Figure 59. The estimated equation for CB-15 yield in relation to K is $y = -0.039x^2 + 15.88x + 979.3$. The higher value of R-square revealed that the yield is predictable. The projected yield of CB-15 (Figure 60) showed that the maximum yield (2561 kg/ha) of CB-15 can be obtained by applying 200 kg K/ha.

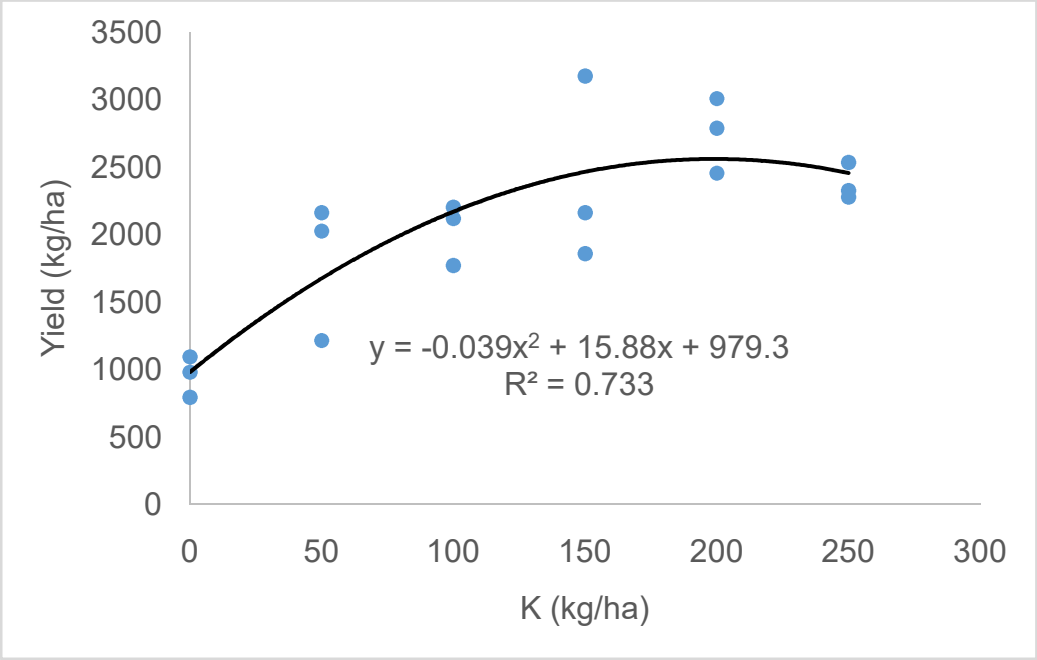



Fig. 59. CB-15 yield in response to K fertilizer at Cotton Research Center, Balaghata, Bandarban

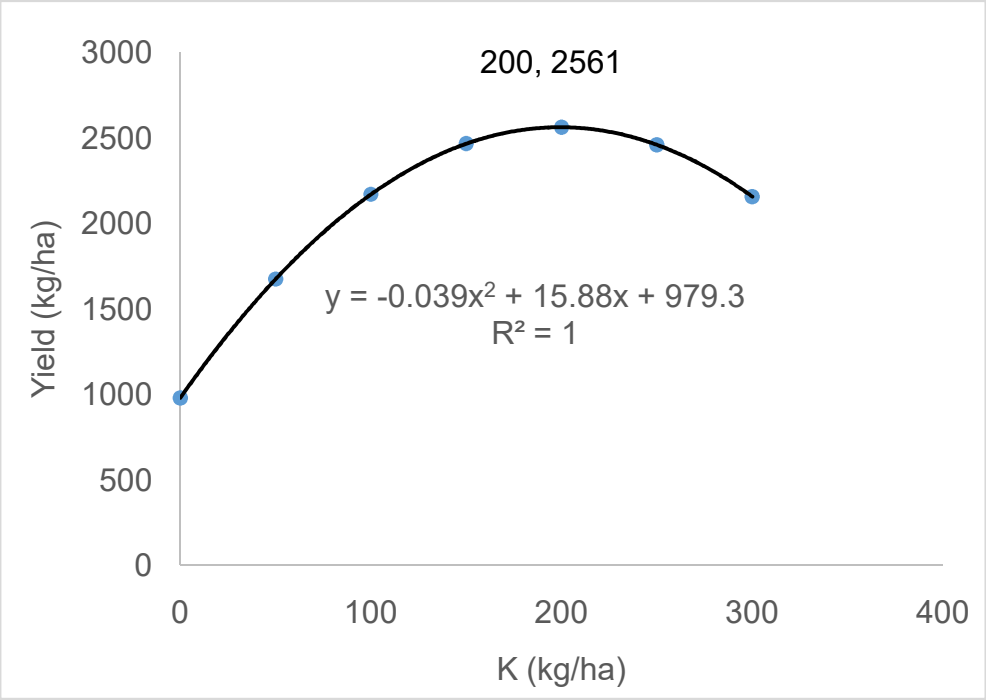


Fig. 60. Projected yield of CB-15 in response to K fertilizer at Cotton Research Center Balaghata, Bandarban

11.7. Fiber Quality Related Parameters:

Cotton fiber quality has been defined as the quality of cotton fibers needed for textile production. Particular cotton fiber quality attributes defined by the USDA-AMS (2005) are: length, uniformity index, strength, elongation, micronaire, color as reflectance and yellowness. There are several factors influencing fiber quality, of which cultivar is of the greatest importance followed by management practices including fertilizer application. The present study indicated that nitrogen application rates affected the fiber quality of CB-14 and CB-15.

The correlations among N and fiber quality of CB-14 and CB-15 are given in Table 7. The results showed that N has positive correlation with length, uniformity index, strength, elongation, micronair while it has negative correlation with reflectance and yellowness.

Table 20. Correlation among N and fiber properties

| | Fiber length | Uniformity Index | Fiber strength | Elongation | Micronaire | Reflectance | Yellowness |
|---|---|---|---|---|---|---|---|
| CB-14 | 0.626203 | 0.720093 | 0.023345 | 0.66904 | 0.585094 | -0.06934 | -0.02957 |
| CB-15 | 0.326496 | 0.413092 | 0.776222 | 0.184779 | 0.385092 | -0.42875 | -0.51179 |

The correlations among P and fiber quality of CB-14 and CB-15 are given in Table 8. The results showed that in case of CB-14, P has positive correlation with length, uniformity index, strength and elongation while it has negative correlation with micronaire, reflectance and yellowness. In case of CB-15, P has positive correlation with length, uniformity index, strength, elongation, micronaireand yellowness while it has negative correlation with reflectance.

Table 21. Correlation among P and fiber properties

| | Fiber length | Uniformity Index | Fiber strength | Elongation | Micronaire | Reflectance | Yellowness |
|---|---|---|---|---|---|---|---|
| CB-14 | 0.732998 | 0.682267 | 0.623805 | 0.612547 | -0.59905 | -0.62106 | -0.47468 |
| CB-15 | 0.788706 | 0.765574 | 0.923093 | 0.912334 | 0.548412 | -0.67579 | 0.623834 |

The correlations among K and fiber quality of CB-14 and CB-15 are given in Table 8. The results showed that in case of CB-14, K has positive correlation with length, uniformity index, strength, elongation, reflectance and yellowness while it has negative correlation with micronaire. In case of CB-15, K has positive correlation with length, uniformity index, strength, elongation, micronaire, yellowness and reflectance.

Table **22. Correlation among K and fiber properties**

| | Fiber length | Uniformity Index | Fiber strength | Elongation | Micronaire | Reflectance | Yellowness |
|---|---|---|---|---|---|---|---|
| CB-14 | 0.610938 | 0.498244 | 0.68913 | 0.157457 | -0.09729 | 0.594879 | 0.425525 |
| CB-15 | 0.774575 | 0.669605 | 0.813542 | 0.983131 | 0.818766 | 0.575478 | 0.37915 |

**12. Research highlight/findings (Bullet point – max 10 nos.):**

- In case of Research Center, Sreepur, Gazipur the optimum doses of NPK for cotton variety CB-14 are 200,100 and 200 kg/ha and for CB-15 are160,80 and 250 respectively.
- In case of Research Center, Jagadishpur, Jashore the optimum doses of NPK for cotton variety CB-14 are 240,80 and 200 kg/ha and for CB-15 are200,80 and 200 respectively.
- In case of Research Center, Sadarpur, Dinajpur the optimum doses of NPK for cotton variety CB-14 are 200,60 and 200 kg/ha and for CB-15 are200,80 and 200 respectively.
- In case of Research Center, Mahigonj, Rangpur the optimum doses of NPK for cotton variety CB-14 are 240,60 and 200 kg/ha and for CB-15 are 240,80 and 200 respectively.
- In case of Research Center, Balaghata, Bandarban the optimum doses of NPK for cotton variety CB-14 are 200,80 and 200 kg/ha and for CB-15 are 100,80 and 200 respectively.
- N has positive correlation with length, uniformity index, strength, elongation, micronaire while it has negative correlation with reflectance and yellowness.
- For CB-14, P has positive correlation with length, uniformity index, strength and elongation while it has negative correlation with micronaire, reflectance and yellowness
- For CB-15, P has positive correlation with length, uniformity index, strength, elongation, micronaire and yellowness while it has negative correlation with reflectance.
- For CB-14, K has positive correlation with length, uniformity index, strength, elongation, reflectance and yellowness while it has negative correlation with micronaire
- For CB-15, K has positive correlation with length, uniformity index, strength, elongation, micronaire, yellowness and reflectance.



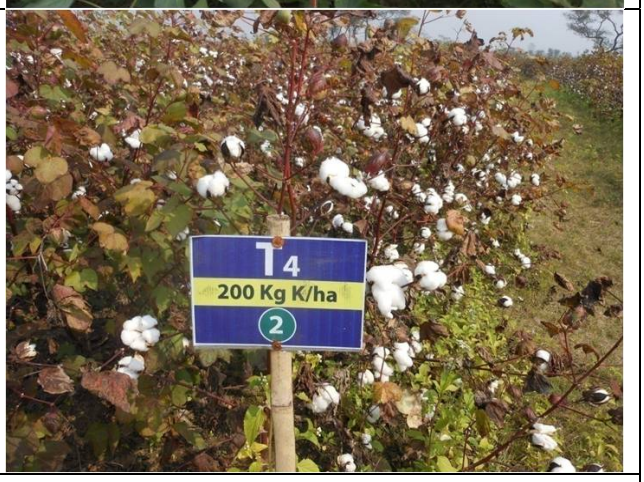

Layout, Seed sowing and fertilizer application






Field experiments at five locations




Experimental plots at different stage




Seed cotton drying and ginning


Fiber quality testing and weighting of seed

**B. Implementation Position**

**1. Procurement:**

| Description of equipment and capital items | PP Target | | Achievement | | Remarks |
|---|---|---|---|---|---|
| | Phy (#) | Fin (Tk) | Phy (#) | Fin (Tk) | |
| **(a) Office equipment** | | | | | |
| - Laptop with accessories | 2 | 1,20,000 | 2 | 1,20,000 | |
| - Desktop Computer | 1 | 60,000 | 1 | 60,000 | |
| - UPS | 1 | 20,000 | 1 | 20,000 | |
| - Laser Printer | 1 | 10,000 | 1 | 10,000 | |
| - Scanner | 1 | 10,000 | 1 | 9,950 | |
| -Digital Camera | 1 | 25,000 | 1 | 25,000 | |
| - File Cabinet | 1 | 20,000 | 1 | 20,000 | |
| - Computer Table | 1 | 5,000 | 1 | 5,000 | |
| - Computer Chair | 1 | 3,920 | 1 | 3,900 | |
| **(b) Lab &field equipment** | | | | | |
| - Laboratory Manual Oil Press & Filter Unit Set | 1 | 3,00,000 | - | - | Laboratory Manual Oil Press & Filter is not available in Bangladesh |
| - Soil pH and moisture meter | 5 | 1,00,000 | 5 | 99,500 | |
| - Digital Balance | 5 | 75,000 | 5 | 75,000 | |
| **(c) Other capital items** | | | | | |

**2. Establishment/renovation facilities: N/A**

| Description of facilities | Newly established | | Upgraded/refurbished | | Remarks |
|---|---|---|---|---|---|
| | PP Target | Achievement | PP Target | Achievement | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**3. Training/study tour/ seminar/workshop/conference organized: N/A**

| Description | Number of participant | | | Duration (Days/weeks/ months) | Remarks |
|---|---|---|---|---|---|
| | Male | Female | Total | | |
| (a) Training | | | | | |
| (b) Workshop | | | | | |

**C. Financial and physical progress**

**Fig in Tk**

| Items of expenditure/activities | Total approved budget | Fund received | Actual expenditure | Balance/ unspent | Physical progress (%) | Reasons for deviation |
|---|---|---|---|---|---|---|
| A. Contractual staff salary | 703787 | 703787 | 703786 | 1 | 100.00 | |
| B. Field research/lab expenses and supplies | 1927754 | 1828990 | 1566617 | 262373 | 85.65 | |
| C. Operating expenses | 133009 | 132744 | 126159 | 6585 | 95.04 | |
| D. Vehicle hire and fuel, oil & maintenance | 111700 | 108700 | 100200 | 8500 | 92.18 | |
| E. Training/workshop/seminar etc. | 0 | 0 | 0 | 0 | 0.00 | |
| F. Publications and printing | 150000 | 124500 | 0 | 124500 | 0.00 | |
| G. Miscellaneous | 25400 | 25122 | 23732 | 1390 | 94.47 | |
| H. Capital expenses | 448350 | 448350 | 448350 | 0 | 100.00 | |
| **Total** | **3500000** | **3372193** | **2968844** | **403349** | **88.04** | |

**D. Achievement of Sub-project by objectives: (Tangible form)**

| **Specific objectives of the sub-project** | **Major technical activities performed in respect of the set objectives** | **Output(i.e. product obtained, visible, measurable)** | **Outcome(short term effect of the research)** |
|---|---|---|---|
| a. To determine the NPK requirements of cotton variety CB 14 | 15 Field experiments were completed successfully | Effects of various rates of NPK on cotton variety CB 14 were determined | Location specific optimum rates of NPK for maximize CB 14 yields were determined |
| b. To determine the NPK requirements of cotton variety CB 15 | 15 Field experiments were completed successfully | Effects of various rates of NPK on cotton variety CB 15 were determined | Location specific optimum rates of NPK for maximize CB 14 yields were determined |
| c. To know the effect of various rates of NPK on cotton fiber quality | 114 samples were analyzed with HVI | Effects of various rates of NPK on cotton fiber quality were known | Quality fiber can be obtained by optimum fertilizer rates |

**E. Materials Development/Publication made under the Sub-project:**

| Publication | Number of publication | | Remarks (e.g. paper title, name of journal, conference name, etc.) |
|---|---|---|---|
| | Under preparation | Completed and published | |
| Technology bulletin/ booklet/leaflet/flyer etc. | | - | |
| Journal publication | | **Under process** | |
| Information development | | | |
| Other publications, if any | | | |

**F. Technology/Knowledge generation/Policy Support (as applied):**

**i. Generation of technology (Commodity & Non-commodity)**

Location wise optimum doses of NPK fertilizer r for cotton variety CB-14 and CB-15 was generated through this sub-project..

ii. **Generation of new knowledge that help in developing more technology in future**

Variety wise fertilizer doses will be used for further assessment of fertilizer doses for new cotton varieties.

**iii. Technology transferred that help increased agricultural productivity and farmers' income**

The requirements of NPK fertilizers for cotton variety CB-14 and CB-15 were known. Farmers can increase income and decrease production cost by using optimum fertilizer rates.

**iv. Policy Support**

Optimum fertilizer rates, generated through this project, will be helpful for planning of resource allocation for cotton production in Bangladesh.

**G. Information regarding Desk and Field Monitoring**

**i) Desk Monitoring [description & output of consultation meeting, monitoring workshops/seminars etc.):**

Inception Workshop: August, 2017
Six month report- workshop
Annual report - workshop

**ii) Field Monitoring (time& No. of visit, Team visit and output):**

| Monitoring team | Date(s) of visit | Total visit till date (No.) | Remarks |
|---|---|---|---|
| **Technical Division/ Unit, BARC** | **03.02.2018** | **1** | |
| **PIU-BARC, NATP-2** | **-** | **-** | |
| **Internal Monitoring** | **19.09.2017** | **1** | |
| **Others Visitors (if any)** | **01.02.2018**<br>**15.02.2018**<br>**20.04.2018** | **1**<br>**1**<br>**1** | |

**I. Lesson Learned/Challenges (if any)**

i) NPK fertilizer rates varied with varieties and locations
ii) NPK has different effect on fiber quality
iii) Optimum rates of fertilizer maximize cotton yield

**J. Challenges (if any)**

To motivate farmers using variable NPK rates of NPK fertilizer as per variety and locations.

Signature of the Principal Investigator
Date …….

Seal

Counter signature of the Head of the organization/authorized representative
Date ……..
Seal

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