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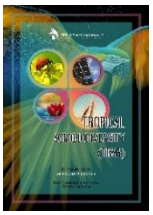

RESEARCH ARTICLE

# EFFECT OF CULTIVATION DATE ON CROP PRODUCTION AND YIELD CHARACTERISTICS ON WHEAT VARIETIES IN THE SOUTHERN PART OF BANGLADESH

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**ABSTRACT**

The study was conducted in Patuakhali throughout October 2017 to April 2017 to study on the outcome sowing date on yield and yield *characteristics* of wheat varieties in the southern part of Bangladesh (AEZ-13).The Significance of this research play vital role for best quality and large amount of Wheat production of southern area of Bangladesh. The research work was studied under the three varieties and the four sowing dates *viz.* The result reveals that the variety BARI Gom-26 ($V_3$) given best performance (83.95 cm) at 15 November ($S_2$) and minimum was observed in BARI Gom-24 (72.18 cm) at 15 December ($S_4$).The number of unattainable tillers hill$^{-1}$ was the maximum in BARI Gom-24 (1.65) at 1$^{st}$ November ($S_1$) at 15 November ($S_2$).The amount of spikelet's spike$^{-1}$ was the highest in BARI Gom-26 (18.92) at 15 November ($S_2$) and the lowest in BARI Gom-26 (16.61) and BARI Gom-24 (16.61) at 15 December ($S_4$). The grains yield was the highest in BARI Gom-26 (5.38 t ha$^{-1}$) at 15 November ($S_2$) and the lowest in BARI Gom-24 (3.24 t ha$^{-1}$) at 15 December ($S_4$). The straw yield was the highest in BARI Gom-26 (8.98 t ha$^{-1}$) at 15 November ($S_2$) and the lowest in BARI Gom-24 (5.98 t ha$^{-1}$) at 15 December ($S_4$). The biological yield was the highest in BARI Gom-26 (14.29 t ha$^{-1}$) at 15 November ($S_2$) and (9.09 t ha$^{-1}$) at 15 December ($S_4$). The highest harvest index was observed in BARI Gom-26 (40.63%) at 15 November ($S_2$) and the minimum harvest index was observed in BARI Gom-24 (30.37%) at 1$^{st}$ November ($S_1$). So, BARI Gom-26 and 15 November would be appropriate variety and optimum sowing date, respectively for obtaining the better growth and higher yield of wheat.

**KEYWORDS**

Yield Attributes, Wheat Varieties, Effective tiller and Patuakhali district.

## 1. INTRODUCTION

Wheat is a largest edible crop in the world but it represent 2nd position in Bangladesh following rice (UNDP and FAO, 1999).In 2010-11 wheat production area was about 3.58 lakh hectares.

The production of wheat in our country has some extent with the production most yielding varieties. The yield is still not up to the mark rather it is low compared to that of the leading to high cultivation in the earth such as China, UK, Italy and Norway where the moderate production was 7.8, 7.7, 6.2 and 4.4 t ha-1, respectively (FAO, 2005).This is because; the country desperately needs to feed the population which is evidently, the most challenging problem that the nation has been facing these days. Most of wheat production in Bangladesh as it is cultivated in winter season, when it is more or less free from different types of hazards and diseases. Wheat production mechanism a considerable extent the food supply and ensure large amount of food security in the country as well. In Our country with in south Asian context wheat is grown during winter season and extends from winter seasons around. The winter season in Bangladesh is humid and moderate soil moisture in this season limits the function of fertilizer.

Among the element that inhabiting the produce poor quality yield (Radford, 1983), poor seed bed layout (Joshi, 1987). Similarly, cultivars matured earlier when planted late, indicating the forced maturity in case of high temperature. In out of seasons the wheat variety should be short time that may escape from high temperature at the grain filling stage (Phadnawis and Saini, 1992). Early cultivation always produces higher yield than off seasons sowing. Therefore this study was planned to examine effect of different sowing dates yield component wheat cultivars. Objectives of the study given below:

To study the influence of sowing date on production of wheat. Observed the optimum sowing time on the yield and yield attributes and to study the suitability of wheat cultivation in the southern part of Bangladesh also this experiment perform the best treatment responsible for the highest yield.

## 2. MATERIALS AND METHODS

The materials and methods of the study are given below-

### 2.1 Site selection and experimental plot

The study area was selected in the coastal belt of Bangladesh Where the salinity aera of surrounded by the mangrove forest zone. Soil

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characteristics of the Research area were silty loams or alluvium. However, the soil of the experimental field was silts clay loam there pH range of 6.8 to 7.8 .

### 2.2 Climate

Usually, Patuakhali zone is suitable for cereal crops production.

### 2.3 Planting inputs and its source of data collection

The seeds of selected three varieties were collected from Breeding Division of BARI, Gazipur.

Characteristics of the experimental varieties used are as follows:

**BARI Gom-24**

Wheat of experimental variety was used as seedling material. This variety attains a height of 95-100 cm and it takes 105-112 days to complete its life cycle and it resistant to fungal infection. The number of tillers plant-1are 3-4 and Its yield is about 3.3-5.10 t ha-1 and 1000 grain weight 50g.

**BARI Gom-25**

BARI Gom 25 Leaves are deep green. Sowing time of this variety is November 15-30 and harvesting time is March- April. Yield is about 3.60 - 5.20 t ha-1.

**BARI Gom-26**

The spices are comparatively shorter in height with 5-6 tillers per plant. Leaves are deep green, broad and recurved. It requires 60-63 days to heading. There is no false spikelet at the base of the spike unlike other varieties and duration of this variety is 104-110 days and yield is about 3.60 - 5.60 t ha-1.

### 2.4 Treatments of the experiment

This experiment have different set consists of three wheat varieties and the 2nd set consisted of 04 different date of sowing. Those treatments sets were presented below:

**A. Variety (3)**

i. BARI Gom-24 (Variety 1)

ii. BARI Gom-25 (Variety 2)

iii. BARI Gom-26 (Variety3 )

**B. Sowing Dates (4)**

i. 1st November (S1)

ii. 15 November (S2)

iii. 30 November (S3)

iv. 15 December (S4)

So, the treatment combinations were as follows

i. 1st November × BARI Gom-24 (S1V1)

ii. 15 November × BARI Gom-24 (S2V1)

iii. 30 November × BARI Gom-24 (S3V1)

iv. 15 December × BARI Gom-24 (S4V1)

v. 1st November × BARI Gom-25 (S1V2)

vi. 15 November × BARI Gom-25 (S2V2)

vii. 30 November × BARI Gom-25 (S3V2)

viii. 15 December × BARI Gom-24 (S4V2)

ix. 1st November × BARI Gom-26 (S1V3)

x. 15 November × BARI Gom-26 (S2V3)

xi. 30 November × BARI Gom-26 (S3V3)

xii. 15 December × BARI Gom-26 (S4V3)

### 2.5 Study plot layout and Land preparation

The experimental plot was laid out in a two factors RCBD design with 03 replications. The size of each plot was 3m × 2m. Four sowing date was also obtained for observing and comparison the growth and yield performance of the studied three varieties.

### 2.6 Manures and fertilizers

Nitrogen, phosphorus and potassium were applied as per treatments.Sulphur and zinc fertilizers were used at 20 and 4 kg ha-1, respectively. All the phosphatic, potassic, sulphur and zinc fertilizers and 1/3rd of urea apply for proper cultivation at 60 days of sowing.

### 2.7 Intercultural operations

#### *2.7.1 Thinning out*

The first thinning out is done after sowing 15 days .The second thinning was done 15 days after first thinning by khupri. However, overcrowded seedlings were removed by hand from the plots in several times.

#### *2.7.2 Gap filling and Weeding*

It should be done for line sowing and Weeding is done for every one week interval

#### *2.7.3 Irrigation and drainage*

The irrigation was made as and when irrigation needed. Three irrigations were required. The first and second weeding was followed by irrigation. Third irrigation was applied at grain filling (GF) stage.

### 2.8 Weight of 1000 grains (g)

One thousand clear dried grains were randomly counted from the seeds gotten from the sample plants and weighed.

## 3. Results and Discussion

The above consequence of the details study we collect different data that was most significance which is discuss below.

### 3.1 Effects of varieties on the basis of wheat Plant height

Plant height is the most important character among the morphological characters of any plant. Besides, plant height act as a key of straw yield and also the increment of the biomass yield the total dry matter. Plant height data was recorded at harvest during the study period. The tallest plants were found in the variety BARI Gom-26 (82.75cm) which was identical with that of BARI Gom-25 (78.40 cm) produced the shortest plants (74.80 cm). The plant height result of genetic makeup as realized under the field condition.

### 3.2 Total tillers hill-1

It found that the total numbers of tillers hill-1 were mostly affected. Highest number of tillers was found in the variety BARI Gom-26 (6.44) followed by BARI Gom-25 (5.71) (Table 1), which was statistically different from BARI Gom-24 (5.00).

### 3.3 Effective tillers hill-1

It was observed that the effective tillers hill-1 was significantly affected by different varieties. The highest number of effective tillers (4.67) was obtained in the variety BARI Gom-26 followed by BARI Gom-25 (4.40).This result was in accordance with that of Alam (2009).

### 3.4 Number of spikelets spike-1 and Number of sterile spikelet's.

**Table 1:** Effects of varieties on plant characters of wheat

| Variety | Plant size (cm) | Amount of total tillers hill$^{-1}$ | Number of effective tillers hill$^{-1}$ | Number of non effective tillers hill$^{-1}$ | Spike length (cm) | Amount spikelet's spike$^{-1}$ | Amount of sterile spikelets spike$^{-1}$ |
|---|---|---|---|---|---|---|---|
| $V_1$ | 74.80ba | 5.00b | 3.88 | 1.12 | 8.95b | 17.27ab | 2.33c |
| $V_2$ | 78.40b | 5.71a | 4.40 | 1.31 | 9.33ab | 17.94a | 1.56d |
| $V_3$ | 82.75c | 6.45a | 4.67 | 1.60 | 9.55ab | 17.54ab | 1.60d |
| Level of sig. | ** | ** | ** | NS | ** | ** | ** |
| CV (%) | 2.32 | 3.43 | 1.76 | 3.12 | 2.52 | 4.24 | 3.52 |

### 3.5 1000 - grain weight

It is evident from Table 4.2 that 1000-amont of seed was weighted by wheat varieties. The heaviest grain (48.08 g) was weighed in the variety (46.94 g) but different from BARI Gam-24 (40.37 g). On the other hand the lightest grain was weighed in the variety BARI Gom-24 (40.37 g).

### 3.6 Grain yield and Straw yield

Because of various species. The highest yield (4.57 t ha-1) was obtained in the variety BARI Gom-26. Statistically different result was found in the variety BARI Gom-25 (4.20 t ha-1), BARI Gom-24 (3.66 t ha-1). Similar result was also observed by Kabir (2009) and Alam (2009).

### 3.7 Harvest index

The largest value (38.93%) was observed in the variety BARI Gom-26 that was statistically identical with the variety BARI Gom-25 (36.39%) and BARI Gom-24 (36.38%).

**Table 2:** Effects of varieties on yield components and yield of wheat

| Variety | Number of grains spike$^{-1}$ | 1000-seed weight (g) | Biological yield (t ha$^{-1}$) | Harvest Index (%) |
|---|---|---|---|---|
| $V_1$ | 33.47b | 40.37 | 10.06d | 36.38a |
| $V_2$ | 34.19ab | 46.94 | 11.54bc | 36.39a |
| $V_3$ | 35.06a | 48.08 | 12.72a | 38.93a |
| Level of sig. | ** | ** | ** | * |
| CV (%) | 2.33 | 3.14 | 4.27 | 4.42 |

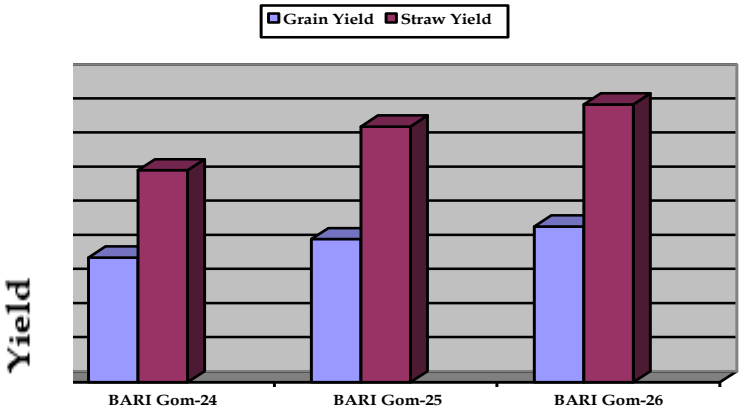


**Figure 1:** Effects of varieties on grain and straw yields of wheat

### 3.8 Effects of sowing date on plant size

Plant height differed significantly owing to variation in different sowing date (Table 4.3).Plant height increased from 1st November to 30th November (Singh and Singh, 1991; Dhuka et al. 1991). The minimum plant height 73.15 was counted in S4. The plant size decreased from 1st December to 15 December.

S1 = 1st November; S2 = 15th November; S3 = 30th November; S4 = 15th December

**Table 3:** Effects of sowing date on plant characters of wheat

| Sowing dates | Crop size (cm) | Amount of total tillers hill$^{-1}$ | Amount of effective tillers hill$^{-1}$ | Amount of non effective tillers hill$^{-1}$ | Spike size (cm) | Amount of spikelets spike$^{-1}$ | Amount of sterile spikelets spike$^{-1}$ |
|---|---|---|---|---|---|---|---|
| $S_1$ | 78.15a | 5.36 | 4.18 | 1.18 | 9.31a | 17.56a | 2.31c |
| $S_2$ | 80.02b | 5.80 | 4.73 | 1.08 | 9.95b | 18.08b | 2.58b |
| $S_3$ | 75.01c | 5.71 | 4.40 | 1.31 | 9.33ab | 17.94a | 2.16d |
| $S_4$ | 73.15d | 5.30 | 3.75 | 1.56 | 8.93cd | 16.56b | 2.09cd |
| Level of sig. | ** | NS | ** | NS | * | * | NS |
| CV (%) | 3.32 | 2.43 | 1.76 | 2.12 | 3.52 | 6.24 | 3.52 |

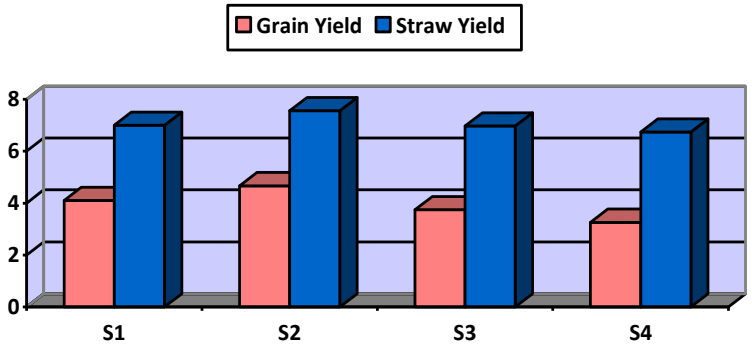


**Figure 2:** Influence of sowing date on grain and straw yields of wheat

**Table 4:** Effects of Interaction between variety (V) and sowing date (S) on characters of wheat

| Interaction (Sowing date ×variety) | Plant height (cm) | Number of total tillers hill$^{-1}$ | Number of effective tillers hill$^{-1}$ | Number of non effective tillers hill$^{-1}$ | Spike length (cm) | Number of spikelets spike$^{-1}$ | Number of sterile spikelets spike$^{-1}$ |
|---|---|---|---|---|---|---|---|
| $S_1V_1$ | 81.46a | 4.76 | 4.11 | 1.65 | 8.44c | 16.64 | 2.76b |
| $S_1V_2$ | 75.50bcd | 5.20 | 3.62 | 1.58 | 8.88bc | 16.79 | 2.77b |
| $S_1V_3$ | 82.91a | 5.22 | 4.11 | 1.11 | 8.92bc | 17.41 | 2.38c |
| $S_2V_1$ | 82.67a | 4.78 | 3.64 | 1.14 | 9.52bc | 17.68 | 2.28c |
| $S_2V_2$ | 76.96bc | 5.92 | 4.58 | 1.15 | 9.14abc | 18.33 | 1.99e |
| $S_2V_3$ | 83.95cd | 6.49 | 5.22 | 1.07 | 10.58bc | 18.92 | 1.14c |
| $S_3V_1$ | 76.14bc | 5.57 | 5.00 | 1.58 | 9.68ab | 17.28 | 1.50d |
| $S_3V_2$ | 77.62b | 5.96 | 4.33 | 1.23 | 9.03bc | 17.27 | 1.69d |
| $S_3V_3$ | 78.28bcd | 4.93 | 3.75 | 1.18 | 8.72bc | 16.78 | 3.05ab |
| $S_4V_1$ | 72.18bcd | 4.67 | 3.27 | 1.36 | 8.04bc | 16.61 | 3.08ab |
| $S_4V_2$ | 77.18b | 4.74 | 3.55 | 1.19 | 8.58a | 17.92 | 3.20a |
| $S_4V_3$ | 75.07d | 4.38 | 3.67 | 1.31 | 8.60bc | 16.61 | 2.33c |
| Level of sig. | * | NS | NS | NS | * | NS | ** |
| CV (%) | 4.32 | 3.43 | 2.76 | 4.12 | 6.52 | 7.24 | 4.52 |

No significant varieties were found due to the system between variety and sowing date in terms of spikelets spike-1 (Table 4.5). It was given by the treatment combination of S2V3 followed by S2V2 (18.33), S4V2 (17.92) S2V1 (17.68) and S1V3 (17.41).

It revealed that the maximum number of grains spike-1 37.27 was recorded in S2V3 followed by S3V1 (36.68), S1V3 (35.00) and S3V3 (33.45). The minimum combination (27.35) was given by the treatment combination of S3V2.

### 3.9 Number of grains spike-1

**Table 5:** Effects of Interaction between variety (V) and sowing date (S) and yield of wheat

| Interaction (Sowing date ×variety) | Number of grains spike$^{-1}$ | 1000-seed weight (g) | Grain yield (t ha$^{-1}$) | Straw yield (t ha$^{-1}$) | Biological yield (t ha$^{-1}$) | Harvest Index (%) |
|---|---|---|---|---|---|---|
| $S_1V_1$ | 30.51g | 40.85 | 3.80bc | 6.30ef | 10.10cd | 33.62abc |
| $S_1V_2$ | 31.98de | 41.82 | 4.14d | 7.15f | 10.29d | 37.80cd |
| $S_1V_3$ | 35.00bc | 40.82 | 4.15b | 7.55def | 111.70c | 38.79ab |
| $S_2V_1$ | 31.94de | 45.92 | 4.86d | 7.27ef | 12.43d | 36.51cd |
| $S_2V_2$ | 31.11a | 48.04 | 5.06a | 8.72a | 13.83a | 36.95abc |
| $S_2V_3$ | 37.27ef | 48.84 | 5.38cd | 8.98f | 14.29d | 40.63bc |
| $S_3V_1$ | 36.68ab | 43.36 | 4.11a | 7.05abc | 13.63a | 37.94a |
| $S_3V_2$ | 27.35cd | 42.79 | 3.58cd | 7.25ab | 11.83b | 36.26d |
| $S_3V_3$ | 33.45g | 40.04 | 4.40bc | 7.26cde | 12.06bc | 35.51cd |
| $S_4V_1$ | 28.53g | 40.31 | 3.24d | 5.98bcd | 10.67c | 30.37d |
| $S_4V_2$ | 32.98cde | 40.85 | 3.48a | 6.55a | 9.03a | 31.07ab |
| $S_4V_3$ | 29.40fg | 41.21 | 3.61d | 6.10ef | 9.51d | 32.75cd |
| Level of sig. | ** | NS | ** | ** | ** | * |
| CV (%) | 4.33 | 5.14 | 3.42 | 7.21 | 5.27 | 4.42 |

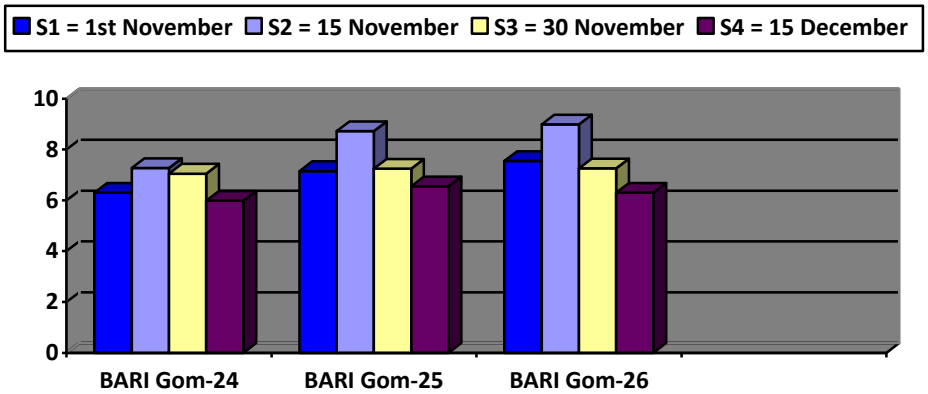


**Figure 3:** Effects of interaction between variety and sowing date on straw yield of wheat

## 4. Summary and Conclusion

Research work consists of 2 sets of application; the first set comprised of variety viz. BARI Gom-24 (V1), BARI Gom-25 (V2) and BARI Gom-26 (V3) and the second set consisted of four levels sowing dates viz. 1st November (S1), 15 November (S2), 30 November (S3) and 15 December (S4). The highest plant height was observed in BARI Gom-26 (83.95 cm) at 15 November (S2) and the lowest plant height was observed in BARI Gom-24 (72.18 cm) at 15 December (S4).The number of tillers was the maximum in BARI Gom-26 (6.49) at 15 November (S2) and the lowest in BARI Gom-24 (4.38) at 15 December (S4).The number of healthy tillers was the highest in BARI Gom-26 (5.22) at 15 November (S2) and the lowest in BARI Gom-24 (3.27) at 15 December (S4). BARI Gom-24 (1.65) was inactive at 1st November (S1) and the lowest in BARI Gom-26 (1.07) at 15 November (S2). The highest 1000 seed weight was observed in BARI Gom-26 (48.84 g) at 15 November (S2) and the lowest 1000 seed weight was observed in BARI Gom-26 (40.04 g) at 30 November (S3).The grains yield was the highest in BARI Gom-26 (5.38 t ha-1) at 15 November (S2) and the lowest in BARI Gom-24 (3.24 t ha-1) at 15 December (S4). The highest harvest index was observed in BARI Gom-26 (40.63%) at 15 November (S2) and the lowest harvest index was observed in BARI Gom-24 (30.37%) at 1st November (S1).Result indicated that the average yield of wheat was decreased due to late sowing. It might be due to the higher temperature at grain filling stage. Grain filling of delayed seeding of wheat can affect more by elevated temperatures and ultimately affect on grain weight resulted smaller grain at maturity of wheat.

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