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Effect of Sowing Dates on the Yield and Yield Contributing Characters of Wheat

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Abstract: The effect of sowing dates on some wheat cultivars was studied at BAU farm. There were two boron treatments (0 and 1 kg B/ ha), three wheat cultivars (Prodip, Shatabdi and Sourav) and four sowing dates (18 November, 28 November, 08 December and 18 December, 2006). The soil was silt loam having 6.74 pH, 1.97% organic matter and 0.19 µg/g available boron content. Although not significant, Sourav produced considerably higher yield over the other two varieties. The 28 November sowing gave the highest yield (3330 kg ha^{-1}) followed by 18 November (3009 kg ha^{-1}), 08 December (2281 kg ha^{-1}) and 18 December sowing (1879 kg ha^{-1}). The grain yield was positively correlated with the number of grains $spike^{-1}$ and 1000-grain weight. Results indicate that sowing of Sourav variety may be recommended to sow in the Old Brahmaputra Floodplain agro ecological region (AEZ 9).

Key words: Wheat yield, variety and sowing date.

Introduction

Wheat, next to rice, is the most important cereal crop in Bangladesh. In Bangladesh about 0.84 million hectares of land is covered by wheat producing 0.976 million metric tons with an average yield of 2.16 t ha^{-1} during the year 2002-2003, (BBS, 2004). Scarcity of food has become a chronic problem of this country. So, the cereal crop production like wheat should be increased to meet the demand of the increasing population, where an individual requires 454g-cereal food (BARI, 2004). The wheat yield in this country is low (2.16 t ha^{-1}). Late sowing coupled with boron deficiency might be the principal reason for low productivity of wheat in Bangladesh (Razzaque and Hossain, 1991, Jahiruddin *et al*., 1992, Hossain *et al*, 1994 and Saifuzzaman, 1996). The farmers of this country use only about 102 kg nutrients ha^{-1} (70 kg N, 24 kg P_2O_5, 6 kg K_2O, 2 kg S+Zn) annualy, while the crop removal is nearly 200 kg ha^{-1} (Islam *et al*., 1999). The majority farmers in this country usually grow wheat in the same land after T. aman rice harvest and thus, sowing of wheat is often delayed. Due to late sowing, the wheat crop experiences high temperature during flowering stage, which results in grain sterility. Despite the constraint that winter in Bangladesh is short and moreover, mild compared to the traditional wheat growing countries in the world, the crops has nicely adapted to this climate. Therefore, the present study is well justified to find out the optimum sowing dates for wheat cultivation under a typical agro- climatic situation of Mymensingh, Bangladesh (AEZ-9).

Materials and methods

The experiment was conducted in the Field laboratory of the Department of Soil Science at Bangladesh Agricultural university (BAU) farm, Mymensingh.during the period from November 2006 to April 2007. The experimental field is located at $24^0$54' N latitude and 90^o 50' E longitude at a height of 18 m above the mean sea level. It belongs to the AEZ 9, Old Brahamaputra Foodplain (UNDP and FAO, 1988). Characteristically, the soil was silt loam having pH 6.74, organic matter 1.97%, total N 0.078%, available P 9.92 ppm, available K 0.087 c mol kg^{-1}, available S 12.35 ppm, available Zn 0.70 ppm and available B 0.19 ppm. The test crop was wheat (*Triticum aestivum*). The treatment consisted of (i) Boron level- 0 kg B ha^{-1}, 1 kg B ha^{-1} (BARC, 2005) (ii) Sowing dates- November 18, November 28, December 08 and December 18, 2006 and (iii) Variety- prodip, shatabdi and sourav. Seeds were sown in four dates at 10-day intervals with a seed rate of 125 kg ha^{-1}. The experiment was laid out in a split-split plot design with a distribution of sowing dates to the main plots, varieties to the sub-plots and boron treatment to the sub-sub-plots. The area of each unit plot was 12 m^2 (3m×4m). The data of following crop parameters were collected at harvest such as plant height (cm), tillers $plant^{-1}$, spike length (cm), spikelets $spike^{-1}$, grains $spike^{-1}$, thousand grain weight (g), grain yield (kg ha^{-1}) and straw yield (kg ha^{-1}).

Results and Discussion

Plant height did not respond significantly to the sowing dates but it differed among the varieties. Shatabdi had the tallest (80.94 cm) plants, which was significantly different from Sourav (78.75 and Prodip (78.58 cm). Although there was no significant effect of sowing date, in value the sowing on 28 November showed the highest plant height (79.75 cm) and December 18 had the lowest (78.88 cm) (Table 1). There was no significant effect of variety on tillering of the crop, but it varied due to varying sowing dates. Among the three varieties Sourav gave the highest number of tillers $plant^{-1}$ (3.89) and the lowest number of tillers $plant^{-1}$ was recorded for Prodip variety (3.76). Tillering tended to decrease generally as the sowing date was delayed. However, the maximum tillering was found in the 2^{nd} sowing (28 November) and minimum in the 4^{th} sowing (18 December). The highest number of tillers $plant^{-1}$ (4.26) was observed at 28 November sowing and the lowest tillers $plant^{-1}$ (3.52) at 18 December was sowing (Table 1). Variety and sowing dates produced significant effect on spike

length. Prodip variety produced longer spike than the other two varieties did. The longest spike was found in variety Prodip (10.88 cm) and the smallest in Shatabdi (8.76 cm). The longest spike was recorded from 28 November sowing (10.45 cm) and the lowest was found on 18 December sowing (9.28 cm) (Table 1).Variety had a significant influence on the number of spikelets spike^{-1} and the effect of sowing date was also significant on this parameter. The highest number of spikelets spike^{-1} was recorded with Prodip variety (18.31) and the lowest number of spikelets spike^{-1} with Shatabdi variety (16.20). In respect of sowing dates, the second sowing (28 November) produced the highest number of spikelets spike^{-1} (18.93) and the last sowing (18 December) had the lowest number of spikelets spike^{-1} (16.13) (Table 1). Variety and sowing dates had a significant influence on the number of grains spike^{-1}. The highest number of grains spike^{-1} was recorded for Sourav variety (29.83) and the lowest number of grains spike^{-1} was recorded for Shatabdi variety (26.88). The number of grains spike^{-1} tended to decline as the date of sowing was delayed. Dhaka *et al.* (2006) reported that the number of grains spike^{-1} gradually declined as the sowing date was delayed from 20 November to 25 December. The 28 November sowing gave the highest number of grains spike^{-1} (31.81) and the 18 December sowing did the lowest number of grains spike^{-1} (23.18) (Table 1). The 1000-grain weight varied with the varieties, which might be the varietal characteristics. The 1000-grain weight for Prodip was 42.45g, Shatabdi was 41.25g and Sourav was 41.00g. The highest 1000-grain weight was recorded in the 18 November sowing (48.45 g) and the lowest 1000-grain weight was recorded in the 18 December sowing (36.75 g) (Table 1). The 1000-grain weight decreased significantly with delay in sowing dates (Patil *et al.*, 2003). The grain yield also varied with varieties. Sourav produced the highest yield (2694 kg ha^{-1}) and Shatabdi did the lowest (2510 kg ha^{-1}). No significant difference in yield among the three varieties was noticed. The 28 November sowing had the highest yield (3330 kg ha^{-1}). The yield recorded from the last sowing (18 December) was remarkably low (1879 kg ha^{-1}). Shirpurkar *et al.* (2006) found that grain yield decreased as the date of sowing was delayed, particularly after 26th November. The straw yield of wheat was significantly affected by crop variety and time of sowing. Shatabdi variety demonstrated the highest straw yield (4355 kg ha^{-1}) and the other two varieties viz. Prodip and Sourav showed an identical yield. The straw yield was recorded maximum for the 28 November sowing (4712 kg ha^{-1}) and minimum for the 18 December sowing (3456 kg ha^{-1}) (Table 1). The variation in straw yield due to different varieties and sowing dates as observed in the present experiment is in agreement with Hossain *et al.* (1994).

Interaction effect of sowing dates and variety on the yield and yield contributing characters of wheat are presented in table 2.There was no significant interaction between sowing dates and variety in terms of plant height. The insignificant effect of sowing dates on plant height of wheat was also reported by Mandal and Das (1988). There was no significant interaction between sowing dates and variety in terms tillers plant^{-1} (Table 2). There was no significant interaction between sowing dates and variety in terms of spike length. There was no significant interaction between sowing dates and variety on spikelets spike^{-1} (Table 2). Grains spike^{-1} was influenced significantly due to interaction of sowing dates and variety. The highest grains spike^{-1} was obtained (33.57) from Sourav variety with 18 November sowing (V_3S_1) and the lowest grains spike^{-1} was obtained (22.35) from Shatabdi variety with 18 December sowing (V_2S_4) (Table 2). The interaction between variety and sowing date was not significant in respect of 1000-grain weight, which shows that the effect of variety and sowing date was not dependent on each other. The interaction effect of variety with sowing date was significant on grain yield. The highest grain yield was obtained (2506 kg ha^{-1}) from Shatabdi variety with 28 November sowing (V_2S_2) and the lowest grain yield was obtained (1228 kg ha^{-1}) from Prodip variety with 18 December sowing (V_1S_4). Interaction effect of sowing dates and variety was not significant in respect of straw yield of wheat (Table 2). The reduction of grain yield for 18 November sowing was probably due to higher soil temperature during sowing to germination and that for 08 December sowing was due to shorter period at vegetative stage and rise in temperature at grain filling stage that caused the highest number of sterile tillers plant^{-1} and the number of sterile spikelets.

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Table 1. Effects of variety and sowing dates on the yield and yield contributing characters of wheat

Variety	Plant height (cm)	Tillers plant^{-1} (no)	Spike length (cm)	Spikelets spike^{-1} (no)	Grains spike^{-1} (no)	1000-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Prodip	78.58	3.76	10.88	18.31	28.02	42.45	2663	3555
Shatabdi	80.94	3.80	8.76	16.20	26.88	41.25	2510	4355
Sourav	78.75	3.89	9.44	17.94	29.83	41.00	2694	3775
LSD (P=0.05)	0.22	0.163	0.77	0.17	0.47	0.77	86	132
Sowing Dates								
S_1 (Nov 18)	79.24	4.07	9.33	16.54	30.14	48.45	3009	4408
S_2 (Nov 28)	79.95	4.26	10.33	18.93	31.81	44.80	3330	4712
S_3 (Dec 08)	79.61	3.46	9.70	18.34	27.85	39.36	2281	3831
S_4 (Dec 18)	78.88	3.52	9.28	16.13	23.18	36.75	1879	3456
LSD (P=0.05)	0.62	0.082	0.17	0.31	0.49	0.71	38	92

Table 2. Interaction effects of sowing date and variety on the yield and yield components of wheat

Interaction		Plant height (cm)	Tillers plant^{-1} (no.)	Spike length (cm)	Spikelets spike^{-1} (no.)	Grains spike^{-1} (no.)	1000-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Sowing date × Variety									
Nov. 18	Prodip	78.13	3.91	10.24	17.08	29.57	55.98	2222	3501
	Shatabdi	83.13	4.17	8.77	15.65	27.28	50.55	1888	5556
	Sourav	76.47	4.13	8.98	16.87	33.57	47.42	2389	4167
Nov. 28	Prodip	78.40	4.30	12.86	19.45	30.87	45.83	2380	4445
	Shatabdi	80.48	4.27	8.47	18.42	31.82	44.88	2506	5222
	Sourav	77.75	4.20	10.00	18.90	32.75	41.02	2338	4467
Dec. 08	Prodip	80.13	3.47	10.51	19.30	28.35	45.27	1855	4039
	Shatabdi	79.67	3.27	9.10	16.00	26.07	38.20	1391	4917
	Sourav	80.05	3.63	9.51	19.72	29.11	33.26	1689	3855
Dec. 18	Prodip	77.65	3.37	9.90	17.38	23.28	41.22	1228	2233
	Shatabdi	80.47	3.47	8.68	14.73	22.35	37.06	1444	2522
	Sourav	80.72	3.70	9.26	16.27	23.88	31.69	1366	2611
LSD (P=0.05)		NS	NS	NS	NS	3.25	NS	19.00	NS

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