

EVALUATION OF SOME WHEAT VARIETIES AGAINST LEAF BLIGHT (*Bipolaris sorokiniana*)

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ABSTRACT

A net house experiment was carried out in the field of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to evaluate ten wheat varieties against leaf blight (*Bipolaris sorokiniana*). The wheat seeds of varieties Sonalika, Kanchan, Barkat, Shatabdi, Aghrani, Pavon-76, Akbar, Gourab, Sourav and Protiva were collected from Bangladesh Agricultural Research Institute (BARI), Gazipur. At ear initiation stage, flowering stage, milking stage and hard dough stage minimum disease severity was recorded in the variety Shatabdi and maximum in the variety Sonalika. The highest number of grains/ear (36.95) and number of healthy grains/ear (36.43) were recorded in the variety Shatabdi. The highest 1000-seed weight (43.10g) were recorded in the variety Gourab and lowest in the variety Protiva. The highest grain yield/pot (5.97g) was recorded in the variety Gourab and lowest yield/pot (4.40g) in the variety Pavon-76. The highest straw yield /pot (14.13g) was recorded in the variety Barkat and lowest (9.10g) in the variety Shatabdi.

Keywords: leaf blight, *Bipolaris sorokiniana*, varietal reaction, wheat

INTRODUCTION

About two third of the total world's population consume wheat as staple food (Majumder, 1991). Dubin and Ginkel (1991) reported that the largest area of wheat cultivation in the warmer climates exists in the South-East Asia including Bangladesh, India and Nepal. Wheat suffers from as many as 26 seed-borne pathogens causing 14 seed-borne diseases (Fakir, 1999). Among them leaf spot and black point caused by *Bipolaris sorokiniana* has become a serious concern in the recent years in Bangladesh (Fakir, 1992). Though the average yield of wheat have been increasing dramatically during the last decade, the wheat yield in Bangladesh is too low (2.20 t/ha) in comparison to the developed countries of the world like Japan, France, Germany and UK producing 3.76, 7.12, 7.28, and 8.00 t/ha, respectively (FAO, 2000). At present about 373.70 thousand hectares of land in Bangladesh is covered by wheat cultivation with the annual production of 972.09 thousand metric tons (BBS, 2011). Various factors responsible for the yield of wheat in the country. Among the factors disease plays a vital role. In the farmer's field, the yield loss in wheat due to leaf blight / spot disease in the country have been reported to be 14.97 % (Alam *et al.*, 1995). In case of severe attack, it may result 100% yield loss (Hossain and Azad, 1994). Considering 10% production loss of wheat caused by this disease, approximately 175000 tons of wheat worth more than Tk.1400 million is lost annually in Bangladesh (Fakir, 2000). The yield loss in wheat due to leaf blight / leaf blotch disease in the country has been reported to be 20% in variety Sonalika, where 14% and 8% in Akbar and Kanchan, respectively (Razzaque and Hossain, 1991). The most acceptable method for controlling the disease is cultivation of resistant variety. But none of the wheat varieties in the country is found resistant against this disease (Hossain and Azad, 1992). Farmer's of the country are still not aware of their seed health. Efforts for controlling the disease through different measures have been made by many workers (Wildermuth *et al.*, 1992; Pidoplichko and Andreeva, 1980; BARI, 1984; Meisner *et al.*, 1994; Hossain and Azad, 1992). The most expectable method for controlling the disease is cultivation of resistant variety, but not a single wheat cultivar in the country is found to be resistant or free from the disease (Hossain and

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Azad, 1992). Thus, the present piece of research work was carried out to evaluate the wheat varieties against leaf blight (*Bipolaris sorokiniana*).

MATERIALS AND METHODS

The experiment was carried out in the net house of Sher-e-Bangla Agricultural University. After drying and cleaning the soil, decomposed cowdung was mixed with collected soil (1:1) and earthen pots of 30 cm diameter were filled two third portions with the mixture. Chemical fertilizers were not used in the pot soil. The wheat seeds were sown in pot in the month of December. Total numbers of 50 seeds were sown in each pot. Germination of seedlings was counted and germination percentage was calculated at 7 DAS, 14 DAS and 21 DAS. Finally three seedlings per pot were allowed to grow for subsequent data recording on leaf blight severity and yield attributes. The data were recorded for disease reaction in four growth stages of the plant namely panicle initiation stage, flowering stage, milking stage and hard dough stage. Plants for each pot were selected for collection of data on percent Leaf area diseased (% LAD). LAD of flag leaf, second leaf (2nd from the top) and 3rd leaf (3rd from the top) were counted. The grading of the leaves were done followed 0-5 rating scale as used by Hossain and Azad (1992) and the CIMMYT method (Gilchrist, 1984).

RESULTS AND DISCUSSION

Germination of seed

Percentage seed germination varied significantly among the wheat varieties tested (Table 1). Among the varieties Shatabdi attained maximum germination (88.67%) after 21 DAS. The minimum germination (75.33%) was recorded in the variety Gourab. More or less similar trend of germination percentages were observed among wheat varieties at both 7 and 14 days

Table 1. Germination of different wheat varieties in pot

Variety	Germination (%)		
	7 Days after sowing	14 days after sowing	21 days after sowing
Sonalika	37.33 f	62.67 b	80.00 cd
Shatabdi	48.00 a	68.67 a	88.67 a
Akbar	46.67 b	60.67 c	79.33 d
Gourab	35.33 g	57.33 d	75.33 e
Sourav	43.33 cd	63.33 b	79.33 cd
Pavon-76	37.33 f	60.00 c	78.33 cd
Kanchan	44.67 c	58.33 d	81.33 c
Protiva	40.67 e	60.00 c	84.00 b
Aghrani	42.67 d	58.67 d	77.00 de
Barkat	44.67 c	61.33 b	79.00 cd
LSD _(0.05)	2.025	1.895	2.152

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Disease severity at panicle initiation stage, flowering stage, milking stage and hard dough stage

Disease severity at panicle initiation stage recorded on flag leaf, 2nd and 3rd leaf of different wheat variety were used in this trail and found to differ statistically (Table 2). In case of flag leaf, maximum disease severity was recorded in the variety Akbar (0.28) which was closely followed by the variety Sonalika (0.22) and no infection was recorded in the variety Shatabdi, Sourav, Pavan-76, Kanchan, Protiva and Barkat. In case of 2nd leaf, maximum disease severity (1.00) was recorded in the variety Sonalika and minimum in the variety Shatabdi (0.05). In case of 3rd leaf, maximum disease severity was recorded in the variety Sonalika (2.97) and the minimum (0.19) was recorded in the variety

Shatabdi. At the flowering stage, the highest disease severity (0.55) was recorded in the variety Sonalika followed by Akbar (0.39), Gourab (0.17), Kanchan (0.19) and Agrani (0.21) on the flag leaf. No infection on flag leaf at flowering stages were recorded in the varieties Shotabdi and Barkat. Leaf blight severity of second leaf and third leaf at flowering stages did not differ significantly through variations among the varieties were observed. In the 2nd leaf, highest disease severity (1.67) was recorded in the variety Sonalika and the lowest (0.35) in Shatabdi. In 3rd leaf, maximum disease severity (3.09) was recorded in the variety Sonalika and the minimum (1.97) was recorded in the variety Shatabdi. Bazlur Rashid *et al.* (1987) determined the effect of *D. sorokiniana* on some yield components of susceptible wheat cultivars under induced epiphytotic conditions. The lower leaves became significantly more infected than the flag leaves, but the infection of flag leaves caused the highest yield loss while infection of third leaves caused the least.

No significant variation was recorded in respect of disease severity at milking stage on flag leaf and 2nd leaf of different wheat varieties (Table 2). In case of 3rd leaf, significantly the highest disease severity (3.87) was recorded in the variety Sonalika which was statistically identical with the varieties Akbar, Gourab, Pavon-76, Kanchan, Protiva and Barkat. The minimum disease severity (2.69) was recorded in the variety Shatabdi. The disease severity at hard dough stage recorded on flag leaf and 2nd leaf of different wheat varieties were not significant. In case of 3rd leaf the highest disease severity (4.89) was recorded in the variety Sonalika which was statistically similar with the varieties Kanchan (4.69) and Protiva (4.55). The minimum disease severity (4.11) was recorded in the variety Shatabdi in the 3rd leaf at hard dough stage.

Table 2. Leaf blight severity of wheat varieties at different growth stages

Variety	Disease severity											
	Ear initiation stage			Flowering stage			Milking stage			Hard dough stage		
	Flag leaf	2 nd leaf	3 rd leaf	Flag leaf	2 nd leaf	3 rd leaf	Flag leaf	2 nd leaf	3 rd leaf	Flag leaf	2 nd leaf	3 rd leaf
Sonalika	0.22 a	1.00 a	2.97 a	0.55 a	1.67	3.09	0.52	1.84	3.87 a	1.45	2.92	4.89 a
Shatabdi	0.00 b	0.05 d	0.19 d	0.00 c	0.35	1.97	0.02	0.59	2.69 b	1.05	1.48	4.11 b
Akbar	0.28 a	0.43 c	1.55 bc	0.39 ab	0.97	2.55	0.25	1.72	2.88 ab	0.72	2.77	4.58 ab
Gourab	0.07 b	0.19 cd	0.67 cd	0.17 bc	0.61	2.02	0.50	1.15	3.11 ab	1.21	2.25	4.38 ab
Sourav	0.00 b	0.21 cd	0.69 cd	0.04 c	0.71	2.31	0.13	0.78	2.82 b	0.88	2.18	4.42 ab
Pavon-76	0.00 b	0.27 cd	1.35 bc	0.05 c	0.41	2.04	0.25	1.25	3.38 ab	0.95	2.48	4.45 ab
Kanchan	0.00 b	0.79 cd	1.73 b	0.19 bc	0.87	2.95	0.16	1.35	3.55 ab	0.97	1.92	4.69 a
Protiva	0.00 b	0.10 cd	1.41 bc	0.03 c	1.54	2.67	0.09	1.48	3.82 ab	0.77	2.07	4.55 a
Aghrani	0.08 b	0.28 cd	1.41 bc	0.21 bc	0.54	2.61	0.14	1.14	2.79 b	1.12	2.35	4.61 ab
Barkat	0.00 b	0.20 cd	1.27 bc	0.00 c	0.45	2.87	0.31	1.42	3.35 ab	0.95	2.47	4.47 ab
LSD _(0.05)	0.139	0.258	0.917	0.252	NS	NS	NS	NS	1.002	NS	NS	0.488

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability NS = Not Significant

Days to attain different growth stages

Days to attain particular growth stage of different wheat varieties are shown in Table 3. The variety Pavon-76 required maximum days 55.00 for booting which was closely followed by the varieties Kanchan (49.00 days). On the other hand, Sonalika required the minimum 35.00 days for booting. Pavon-76 and Kanchan required maximum days 64.00 to attain heading stage which was closely followed by the varieties Gourab (51.67 days) and the variety Sonalika required the minimum 42.00 days for heading. The variety Pavon-76, Kanchan, Protiva, Aghrani and Barkat showed the maximum 78.00 days for flowering which was closely followed by the varieties Gourab and Sourav (64.00 days). On the other hand, Sonalika required the minimum 49.00 days for flowering. Pavon-76, Kanchan, Protiva, Aghrani and Barkat showed the maximum 88.00 days for milking stage which was closely followed by the varieties Gourab and Sourav (78.00 days) and the variety Sonalika, Shatabdi and

Akbar required the minimum 64.00 days for milking. The variety Kanchan, Protiva and Aghrani required maximum 110.00 days to get maturity. On the other hand, varieties Sonalika, Shatabdi and Akbar showed the minimum 87.00 days for maturity.

Table 3. Growth performance of different wheat varieties in pot

Variety	Days required for booting	Days required for heading	Days required for flowering	Days required for milking	Days required for maturity
Sonalika	35.00 d	42.00 c	49.00 d	64.00 c	87.00 c
Shatabdi	42.00 c	49.00 b	55.00 c	64.00 c	87.00 c
Akbar	42.00 c	49.00 b	55.00 c	64.00 c	87.00 c
Gourab	42.00 c	51.67 b	64.00 b	78.00 b	101.3 b
Sourav	42.00 c	49.00 b	64.00 b	78.00 b	101.0 b
Pavon-76	55.00 a	64.00 a	78.00 a	88.00 a	109.0 a
Kanchan	49.00 b	64.00 a	78.00 a	88.00 a	110.0 a
Protiva	42.00 c	49.00 b	78.00 a	88.00 a	110.0 a
Aghrani	42.00 c	49.00 b	78.00 a	88.00 a	110.0 a
Barkat	42.00 c	49.00 b	78.00 a	88.00 a	109.0 a
LSD _(0.05)	3.754	3.692	3.074	3.214	2.294

In a column, means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Grain formation and grain yield of wheat

Grain formation and yield of different wheat varieties are shown in Table 4. Wheat varieties showed non significant variation in respect of total number of grains per ear that ranged from 33.55 to 36.95. The maximum number of grains per ear (36.95) was recorded in the variety Shatabdi (Table 4) and the minimum number of grains per ear (33.55) was recorded in the variety Aghrani. Wheat varieties showed statistically non significant variation on number of healthy grains per ear.

Table 4. Grain formation and grain yield of wheat

Variety	Number of grains/ear			Weight of grains/ear (g)			1000 seed weight (g)	Grain yield/pot (g)	Straw yield /pot (g)
	Total	Healthy	Diseased	Total	Healthy	Diseased			
Sonalika	36.22	33.00	3.22 ab	1.52	1.39	0.13	41.52	4.70	12.80ab
Shatabdi	36.95	36.43	0.52 c	1.52	1.42	0.10	42.55	4.60	9.10 b
Akbar	36.34	33.67	2.67 abc	1.52	1.38	0.14	42.55	5.23	11.63 ab
Gourab	35.34	31.67	3.67 a	1.49	1.34	0.15	43.10	5.97	11.53 ab
Sourav	33.56	32.00	1.56 abc	1.42	1.31	0.11	37.54	5.17	12.77 ab
Pavon-76	36.89	35.33	1.56 abc	1.47	1.35	0.12	36.28	4.40	11.13 ab
Kanchan	33.56	32.67	0.89 bc	1.47	1.34	0.13	39.03	5.17	10.63 ab
Protiva	35.15	33.78	1.37 c	1.49	1.38	0.11	35.56	5.40	11.63 ab
Aghrani	33.55	32.11	1.44 abc	1.52	1.37	0.15	37.02	5.67	12.47 ab
Barkat	35.83	34.67	1.16 c	1.45	1.33	0.12	39.21	5.13	14.13 a
LSD _(0.05)	Ns	NS	2.089	NS	NS	NS	NS	NS	3.490

Weight of grains per ear varied from 1.42 g to 1.52 g. The maximum weight of grains per ear (1.52 g) was recorded in the variety Shatabdi (Table 4) and the lowest weight of grains per ear (1.42 g) was recorded in the variety Sourav. No significant variation among the varieties was found in respect of 1000 seed weight. Weight of 1000 seeds varied from 35.56 to 43.10 g. The highest weight of 1000 seeds (43.10 g) was recorded in the variety Gourav (Table 4). The lowest weight of 1000 seeds (35.56 g) was recorded in the variety Protiva. In pot experiment wheat varieties showed non significant variation in respect of grain yield per pot. Grain yield per pot varied from 4.40 to 5.97 g. The highest

yield per per pot (5.97 g) was recorded in the variety Gourab (Table 4) and the lowest yield per pot (4.40 g) was recorded in the variety Pavon-76. Wheat varieties showed significant variation in respect of straw yield. Straw yield per per pot varied from 9.10 to 14.13 g. The highest straw yield per pot (14.13 g) was recorded in the variety Barkat (Table 4) which was closely followed by the variety Sonalika (12.80 g). The lowest straw yield (9.10 g) was recorded in the variety Shatabdi which was closely followed by the variety Kanchan (10.63 g).

The findings of the present study corroborate with the findings of Shahidullah (2006). He obtained highest grain yield (531.9 g/plot) in the variety Shatabdi among the 14 wheat varieties tested. Throughout the world massive researches are being done to screen *Bipolaris* leaf blight resistant varieties, but little success has been obtained (Fader *et al.*, 1989; Sinha *et al.*, 1991).

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