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Effect of Different Pathotypes of *Bipolaris sorokiniana* on Leaf Blight Severity and Yield Contributing Characters of Wheat Cv. Kanchan Inoculated at Maximum Tillering Stage

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Abstract: A total of representatives eleven isolates of six different pathotypes of *Bipolaris sorokiniana* were compared for their effect on leaf blight severity and yield contributing characters by inoculating plants of wheat cv. kanchan at maximum tillering stage under control condition in pot trials. The pathotypes differed among themselves in respect of leaf blight severity that scored from 61 to 81. In case of yield contributing characters, the pathotypes did not differ among themselves that indicates all available pathotypes of *B. sorokiniana* in Bangladesh are of equal value in respect of wheat cultivation.

Key words: Wheat, *Bipolaris sorokiniana,* pathotype, inoculation, maximum tillering stage

Introduction

Wheat (*Triticum aestivum* L.) an important cereal crop and second staple food crop next to rice in Bangladesh is produced widely and extensively all over the world. The crop is vulnerable to many diseases (Anonymous, 1978; Rangaswami, 1979). Leaf blight of wheat *Bipolaris sorokiniana* is worldwide and economically one of the most important pathogen of wheat (Anonymous, 1980; Dubin and Ginkel, 1991). The disease is a common constraint of limiting wheat production in the warmer areas.

Cultivation of wheat in Bangladesh is gradually increasing, but unfortunately national average yield (2.26 t ha^{-1}) is too low in comparison with world wheat production of 2.72 t ha^{-1} (FAO, 1999). There are many factors behind the low yield of wheat in Bangladesh. Among these factors disease play an important role where leaf blight is the most devasting one. The severity of *Bipolaris* leaf blight has been increasing in an alarming proportion in Bangladesh (Hossain and Azad, 1992; Alam *et al*., 1993). The yield loss of wheat cultivar Kanchan has recorded to 14-16% (Anonymous, 1994). The loss may be upto 100%, if the plants are attacked severely (Hossain and Azad, 1994). Zhang *et al*. (1999) assessed the loss of yield of wheat. Hossain *et al*. (1998) reported that the leaf blight disease caused by *Bipolaris sorokiniana* reduced yield upto 40 and 80% over the control (untreated) under field and artificial inoculation, respectively. Ahmed *et al*. (2001) found six pathotypic variation of *Bipolaris sorokiniana* in Bangladesh. From the foregoing discussion, the research work was undertaken to compare the effect of different pathotypes of *Bipolaris sorokiniana* on leaf blight severity and its influence on yield contributing characters when plants get infection at maximum tillering stage.

Materials and Methods

Experimental period: The experiments were conducted during the period of 1999 to 2000.

Collection and maintenance of pathotypes of *Bipolaris sorokiniana*: The representative isolates of six different pathotypes of *Bipolaris sorokiniana* were collected from the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh. The pure culture of the isolates of *B. sorokiniana* were transferred to slants and stored in refrigerator at 5^0C for further research work following the method of Gilchrist (1985).

Collection of soil and preparation of earthen pots: The soil was collected from the Agronomy Farm, Bangladesh Agricultural University (BAU), Mymensingh. The compost was collected from the Dairy Farm, BAU, Mymensingh. The collected soil and compost (4:1) were mixed thoroughly and the earthen pots (20 cm dia) were filled with the mixture of soil and compost.

Raising of seedlings: Wheat seeds (10 pot^{-1}) were sown in pots and finally 5 seedlings were allowed to grow. Plants were watered whenever necessary. Three pots were used for each treatment.

Preparation of inocula: Eleven representatives selected isolates of six pathotypes of *Bipolaris sorokiniana* were transferred from stock cultures and were grown PDA in petriplates for 10 days at room temperatures (22-24^0C). Then the petriplates were kept under NUV light for 5 days

for formation of maximum conidia. Conidial suspension were prepared with distilled water by collecting the conidia from the agar surface of PDA. The conidial suspension was then filtered through cheese cloth to remove mycelial fragments and lumps of agar. The conidial suspension was then prepared to 10^4ml conidia ml^{-1} following the CIMMYT method (Gilchrist, 1985).

Inoculation of the materials: The inoculation was done by spraying conidial suspension at maximum tillering stage of wheat plants with a spore suspension (10^4 conidia ml^{-1}) using a self compressed sprayer (Hossain and Azad, 1992). Just after inoculation, the pots were covered with previously moistened polyethylene bags for 36 h for maintaining moisture. After removing the polyethylene bags the leaf surfaces were exposed but watering of pots were continued for supplying moisture to the seedlings. Control treatment was maintained by protecting the plants with Tilt (0.1%) following spray method as Tilt was found most effective for controlling *Bipolaris* leaf blight of wheat (Hossain *et al*., 2001).

Determination of leaf blight severity: *Bipolaris* leaf blight (BpLB) severity was recorded after 15 days of flowering using (BpLB terminal score), double digit scale proposed by CIMMYT after Saari and Prescott (1975).

Determination of yield contributing characters: Yield contributing characters were determined following the method of Hossain and Azad (1994). Data were collected from each plants on Plant height (cm), ear length (cm), number of grains/ear, healthy and diseased grains/ear, grading of seeds (0-5 scale) following CIMMYT method (Gilchrist, 1985), weight of grains/ear (g), 1000 grains weight (g) and yield of grains/pot (g).

Grading of seeds: The grading of seeds were done following the 0-5 rating scale of CIMMYT (Gilchrist 1985) as used by Hossain and Azad (1994).

Results and Discussion

Effect of different pathotypes on leaf blight severity, plant height and ear length: The disease score under different pathotypes ranged from 61 to 82 (Table 1). The pathotypes showed variation in respect of BpLB terminal score, where the maximum disease score, (82) was found in case of the pathotypes P_6(100a) and the minimum (61) was recorded in P_5(67b). But the lowest disease score (41) was recorded under control where the plants were sprayed with Tilt (0.1%) for controlling the disease. The different pathotypes did not exert profound effect of variation effect in respect of plant height. The highest plant height (66.87 cm) was recorded in P_3 (21a) and the lowest (58.47 cm) in P_1 (179a) (Table 1). But the pathotypes resulted significant variation on ear length that ranged from 5.23 to 7.13 cm, while the highest ear length was found in control and the lowest in P_1 (179a).

Effect of different pathotypes on number of grains/ear, number of healthy grains and diseased grains/ear: The effect of pathotypes did not differ significantly in respect of on the grains/ear (Table 2). The total grains/ear ranged from 15.27 to 22.47, while the lowest number of grains/ear 15.27 was recorded in P_2 (42a) and the highest number of grains/ear was recorded in control (Tilt 0.1%). In case of number of healthy grains/ear, it was observed that the highest number of healthy grains/ear (20.87) was obtained in control (Tilt 0.1%), while the lowest number of healthy grains/ear (11.07) was found in P_2 (42a) though the effect of pathotypes did not differ significantly among themselves (Table 4). The pathotypes were also found to have similar effect on the formation of diseased grains/ear though their performance were found to differ from control (Tilt at 0.1% spraying). It had been observed that the pathotypes resulted up to 47.74 and 88.85% reduction in number of grains/ear and healthy grains/ear, respectively over the control (Tilt 0.1%).

Effect of different pathotypes on weight of grains/ear, 1000-grains weight and grain/yield/pot: The effect of pathotypes of *Bipolaris sorokiniana* on grain weight/ear and 1000 grains weight did not differ significantly (Table 3). Likewise pathotypes showed similar effect on grain yield/pot though they differ over control. Grain yield of wheat varied from 3.03 to 5.12 g pot^{-1} (Table 3). The highest grain yield was obtained in control (Tilt 0.1%) and the lowest 3.03 in P_2 (42a).

Grading of seeds: Grading of seeds were done on the basis of 0-5 rating scale. The grading zero indicates no diseases and 5 grade indicates maximum diseased symptom. The effect of pathotypes on formation of grade 0 grains/ear was significantly different over control but the pathotypes did not differ amongst themselves (Table 4). The pathotypes did not show any marked variation among themselves in addition to control on the formation of grains under grade 1-5. (diseased grains).

From this study it has clearly been found that the pathotypes of *Bipolaris sorokiniana* showed similar effect on grain formation though variation in respect of leaf blight were severity recorded. This is the first time report in Bangladesh. So, no reference in this respect under Bangladesh condition is available. This leaf blight disease is of serious concern to wheat growers as well as

Table 1: Effect of different pathotypes of *Bipolaris sorokiniana* on disease severity, plant height and ear length of wheat cv. Kanchan

Pathotypes (isolates)	Disease score in double digit (00-99)	Plant height (cm)	Ear length (cm)
P_1 (123d)	63	63.76	6.20a-c
P_1 (179a)	62	58.47	5.23c
P_2 (42a)	72	62.55	5.63bc
P_2 (40b)	82	66.00	7.00ab
P_3 (21a)	63	66.57	6.97a-b
P_3 (132a)	71	62.73	6.10a-b
P_4 (61a)	71	60.60	6.77a-b
P_5 (67b)	61	60.70	6.37a-b
P_5 (189a)	63	61.43	5.93a-b
P_6 (37b)	81	63.97	5.70a-b
P_6 (100a)	82	66.00	6.33a-b
Control (Tilt 0.1%)[a]	41	66.00	7.13a
LSD (P≤0.05)		NS	1.24

Table 2: Effect of different pathotypes on the formation of grains/ear, healthy grains/ear and diseased grains/ear of wheat cv. Kanchan

Pathotypes (isolates)	No. of grains/ ear	No. of healthy grains/ear	No. of diseased grains/ear	Decreased over the control (%)	
				Grains/ear	Healthy grains/ear
P_1 (123d)	18.07	13.65b	4.40a	24.32	52.89
P_1 (179a)	15.73	11.20b	4.73a	41.05	86.33
P_2 (42a)	15.27	11.07b	4.20a	47.74	88.85
P_2 (40b)	21.87	17.27b	4.93a	2.74	20.08
P_3 (21a)	21.47	16.20ab	5.06a	4.65	28.88
P_3 (132a)	16.80	12.47b	4.33a	33.75	67.36
P_4 (61a)	21.07	16.10ab	4.86a	6.64	29.62
P_5 (67b)	20.93	16.67ab	4.26a	7.35	25.19
P_5 (189a)	17.13	12.07b	3.06a	31.17	72.90
P_6 (37b)	17.13	12.60b	4.53a	31.17	65.63
P_6 (100a)	21.13	16.87ab	4.26a	6.34	23.71
Control (Tilt 0.1%)[a]	22.47	20.87a	4.46b	-	-

Table 3: Effect of different pathotypes on the grain formation of wheat cv. Kanchan.

Pathotypes (Isolates)	Weight of grains/ear (g)	1000- grains weight (g)	Grain yield (g/pot)
P_1 (123d)	0.17	41.60	3.77ab
P_1 (179a)	0.66	41.80	3.32ab
P_2 (42a)	0.60	39.03	3.03b
P_2 (40b)	0.98	44.71	4.84ab
P_3 (21a)	0.96	44.63	4.74ab
P_3 (132a)	0.64	38.60	3.23av
P_4 (61a)	0.90	43.10	4.54ab
P_5 (67b)	0.90	42.73	4.48ab
P_5 (189a)	0.61	40.20	3.05b
P_6 (37b)	0.66	38.87	3.31ab
P_6 (100a)	0.84	39.83	4.22ab
Control (Tilt 0.1%)[a]	1.02	45.42	5.12a

NS = Not significant [a]Tilt 0.1% sprayed for controlling the disease

Table 4: Effect of different pathotypes on the formation of different grade of grains (0 - 5) inoculated at maximum tillering stage

Pathotypes (Isolates)	Number of grains/ear under different grades					
	0	1	2	3	4	5
P_1 (123d)	13.65b	2.06	1.30	0.46	0.73	0.20
P_1 (179a)	11.20b	2.26	1.20	0.80	0.46	0.00
P_2 (42a)	11.07b	2.33	1.00	0.46	0.33	0.67
P_2 (40b)	17.27ab	1.43	1.66	0.53	0.26	0.20
P_3 (21a)	16.20ab	2.66	1.10	0.43	0.33	0.17
P_3 (132a)	12.47b	2.46	0.93	0.53	0.33	0.07
P_4 (61a)	16.13ab	2.73	1.53	0.33	0.20	0.07
P_5 (67b)	16.67ab	2.00	0.86	0.60	0.66	0.07
P_5 (189a)	12.07b	1.50	0.80	0.40	0.33	0.03
P_6 (37b)	12.60b	1.73	1.20	0.33	0.33	0.03
P_6 (100a)	16.87ab	1.50	1.20	0.73	0.46	0.03
Control (Tilt 0.1%)[a]	20.87a	0.53	0.60	0.26	0.12	0.07

NS = Not significant [a]Tilt 0.1% sprayed for controlling the disease

wheat researchers in the country. This information is highly required to wheat Pathologist as well as wheat growers in the country for developing a new wheat variety in Bangladesh when they will use *B. sorokiniana* as a test pathogen.

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