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Effect of Different Levels of Black Pointed Seeds on Disease Incidence, Leaf Blight Severity and Healthy Seed Production of Wheat

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***Abstract* – The experiments were conducted in the Seed Pathology Laboratory and experimental Field of Plant Pathology Department, Sher-e-Bangla Agricultural University, Dhaka-1207, during the period from October 2008 to April 2009 to find out the effect of different levels of black pointed seeds on disease incidence, leaf blight severity and healthy seed production of wheat. Eight levels of black pointed seed samples namely T_1 = 0% black pointed seeds treated with Bavistin 50 WP @ 0.25% of seed weight); T_2 = 0% black pointed seeds treated with Provax 200 WP @ 0.25% of seed weight; T_3 = 10% black pointed seeds; T_4 = 15% black pointed seeds; T_5 = 20% black pointed seeds; T_6 = 25% black pointed seeds; T_7 = 40% black pointed seeds and T_8 = 55% black pointed seeds. Leaf blight severity showed significant variation at flag leaf stage, panicle initiation stage, flowering stage, milk stage and hard dough stage in respect of sowing different levels of black pointed seeds. Significantly lowest disease severity at flag leaf stage (0.09), panicle initiation stage (0.15), flowering stage (0.43), milk stage (1.14) and hard dough stage (2.30) were recorded when 0% black pointed seeds treated with Bavistin 50 WP were sown. On the other hand the highest disease severity of 0.45, 1.06, 1.32, 2.10 and 3.81 were recorded at the above mentioned growth stage of the crop respectively when seeds were sown with 55% level of black pointed seeds. Significantly the highest (3.67 t/ha) grain yield was obtained in Bavistin treated apparently healthy (0% black pointed seeds) whereas the lowest yield (2.25 t/ha) was obtained in sowing seeds having 55% black pointed seeds.**

***Keywords* – Seed Transmission, *Bipolaris Sorokiniana*, Leaf Blight, Black Point, Wheat.**

I. INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops as well as staple food all over the world. About two third of the world's population consume wheat as staple food [1]. The largest area of wheat cultivation in the warmer climates exists in the South-East Asia including Bangladesh, India and Nepal [2]. In Bangladesh it is the second most important cereal crops next to rice that contribute to the national economy by reducing the volume of import of cereals for fulfilling the food requirements of the country [3]. In spite of its importance, the yield of the crop in our country is low (2.2 t ha^{-1}) in comparison to other countries of the world [4]. The area, production and yield of wheat have been increasing dramatically during the last two decades, at present about 707.56 thousand hectares of land in Bangladesh is covered by wheat with the annual production of 1578 thousand tons [5].

Wheat suffers as many as 120 different diseases, out of which 42 are seed borne and seed transmitted including 35 diseases caused by fungi alone. Among them, seedling blight, leaf spot, bipolaris leaf blight (BLB), leaf blotch, head blight and black point caused by *Bipolaris sorokiniana* has become a serious concern in the recent years [6]. In Bangladesh, yield loss due to leaf blight diseases has been reported to be 20%, in Sonalika, whereas 14% and 8% in Akbar and Kanchan, respectively [7]. In farmer's field, the yield loss was estimated to be 14.97% [8], whereas 29% yield reduction was estimated during 1991-92 in Kanchan [9]. The diseases now days are devastating and common in the country. It may result even 100% yield loss of wheat if the plants attacked severely [10].

The possibility of transmission of Bipolaris sorokiniana through wheat seeds in Bangladesh was indicated [11]. *B. sorokiniana* is pathogenic to the germinating seeds and seedlings of wheat [12]. Twenty seven fungal species associated with wheat seeds have been identified of which *B. sorokiniana* was most predominant pathogen [13]. Like *Drechslera graminea* causing barely leaf stripe, *Biopolaris sorokiniana* is believed to penetrate directly from the coleoptile into the sheathing base of the first leaf and from the first leaf into the second leaf in contact with it and thus the penetration process from outer leaf to the inner leaf is repeated for all the subsequent leaves as well as the ear. A significant correlation among vertical spread of Bipolaris leaf blight, head blight and black point incidence was observed [14]. The level of black point infection was dependent on infection of leaves, spikes and nodes. Leaf blight severity increased in the field with the increasing level of seed infection and the incidence of *Bipolaris sorokiniana* on harvested seeds increased with the increasing level of seed infection in the seed samples during sowing [15]. The present research work was therefore designed to evaluate the effect of different levels of black pointed seeds on subsequent leaf blight development by *Bipolaris sorokiniana* in the field and on healthy seed production of wheat.

II. MATERIALS AND METHODS

The experiments were conducted in the Seed Pathology Laboratory and experimental Field of Plant Pathology Department, Sher-e-Bangla Agricultural University, during the period from October 2008 to April 2009.

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A. Test crop and seed collection

Wheat (*Triticum aestivum L.*) variety Shatabdi (BARI Gom 21) was used in this study. Wheat seed samples were collected from BADC in Gazipur district of Bangladesh. The collected samples were stored in paper bag covered with polythene in normal temperature in Seed Pathology Laboratory, Department of Plant Pathology, Sher-e-Bangla Agricultural University, Dhaka.

B. Seed processing for grading

The collected seed sample was physically sorted out to separate apparently healthy looking seeds with bold golden color and black pointed seeds to classify the seeds in different grades containing different level of black pointed seed. Healthy seeds treated with Bavistin 50 WP and Provax 200 WP (@ 0.25% of seed weight) was graded as T_1 and T_2, respectively. There were eight samples that used as treatments for the different experiments which are as follows:

T_1 = 0% black pointed seeds treated with Bavistin 50 WP @ 0.25% of seed weight
T_2 = 0% black pointed seeds treated with Provax 200 WP @ 0.25% of seed weight
T_3 = 10% black pointed seeds
T_4 = 15% black pointed seeds
T_5 = 20% black pointed seeds
T_6 = 25% black pointed seeds
T_7 = 40% black pointed seeds and
T_8 = 55% black pointed seeds

C. Preparation of the main field

The experiment plot was opened in the first October 2008 with a power tiller, and was exposed to the sun for a week, after which the land was harrowed, ploughed and cross-ploughed several times followed by laddering. Weeds and stubble were removed, and finally obtained a desirable tilth and properly leveled for seed sowing. The main plot was sub-divided into 24 unit plots with sized 2 m × 1.5 m.

D. Fertilizers and manure application

The fertilizers N, P, K, S, Zn and B in the form of Urea, TSP, MP, Gypsum, Zinc sulphate and borax, respectively were applied. The entire amount of TSP, MP, Gypsum, Zinc sulphate and borax were applied during the final preparation of land. Urea was applied in two equal installments at final land preparation and before flowering after 45 days of seeds sowing. The dose and method of application of fertilizer are applied as BARC fertilizer recommendation guide [16].

E. Sowing of seeds

Wheat seeds were sown in the field on 5th December, 2008 at the rate of 120 kg/ha. The seeds were placed continuously in lines properly at a depth of 5 cm and were covered with the help of hand. The distance between lines was 25 cm that made 6 rows in unit plot.

After care viz. irrigation and drainage, weeding and topdressing were done as per requirements.

F. Tagging and data collection

Randomly five plants were selected from each row of the plot and tagged. There were six rows in each plot and 30 plants/plot was tagged for ratting and mean values were determined to get rating score of each treatment.

G. Isolation and identification of pathogen

The diseased leaves were collected and were taken to the laboratory. The leaves were then cut into small pieces (about 0.5 cm) with diseased and healthy portion and surface sterilized with $HgCl_2$ solution (0.01%) for 30 seconds. The cut pieces were then washed in water at three times and were placed on to PDA media in petridish. The plate is then incubated at 25±1^{0}C for 7 days. Later the pathogen was purified using hyphal tip culture method and grown on PDA media at 25±1^{0}C for 2 weeks and identified as *Bipolaris sorokiniana* with the help of relevant literature (CMI Description) [17].

H. Evaluation of leaf blight severity

Leaf blight severity of 1st and 2nd leaf was recorded in five growth stages of plant viz. flag leaf stage, panicle initiation stage, flowering stage, milk stage and hard dough stage. The severity of leaf blight disease was recorded following 0-5 grade of [18].

I. Harvesting, threshing and data collection

The crop was harvested at the maturity of plant at 29th March, 2009 and harvesting was done manually from each plot. The harvested crop of each plot was bundled separately, properly tagged and brought to threshing floor. Enough care was taken for harvesting, threshing and also cleaning of wheat grains. Data on yield and yield attributes were recorded.

J. Statistical analysis

The collected data were complied and analyzed to find out the statistical significance among the treatments. The collected data were analyzed by MSTAT–C software. The means for all recorded data were calculated the analyses of variance of all characters were performed. The mean differences were evaluated by Duncan's Multiple Range Test (DMRT) [19].

III. Results

The present research work was carried out to find out the effect of different levels of black pointed seeds on leaf blight severity and healthy seed production of wheat. The results have been presented under the following headings:

A. Number of seedlings/m^2

Different level of black pointed seeds in field condition showed significant variations in terms of number of healthy seedlings/^{2}. With the increase of black pointed seeds in the seeds samples number of healthy seedlings/m^2 decreased which varied from 88.33 to 132.33 (Table 1). The maximum number of healthy seedlings/m^2 (132.33) was recorded in T_1 which was statistically identical with T_2 (129.33), T_3 (122.67), T_4 (115.00). On the other hand, the minimum number of healthy seedlings/m^2 (88.33) was recorded in T_8 (55% black pointed seeds) which was statistically similar with T_7 (90.67), T_6 (94.33), and T_5 (107.67). Significant differences were recorded for different black pointed seeds in field condition for infected seedlings/^{2}. Number of infected seedlings/m^2 increased with the increase of black pointed seeds in the seeds samples (Table 1). The minimum number of infected seedlings/m^2 (1.00) was recorded in T_1 which was statistically identical with T_2 (1.33) followed by T_3

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(10.00), T_4 (12.33) and T_5 (14.33), while the maximum (27.67) was recorded in T_8 (55% black pointed seeds) which was followed by T_7 (20.33) and T_6 (15.67).

B. Leaf blight severity

Leaf blight severity (0-5 grade) was measured in 1st and 2nd leaf and average also calculated treatment wise at flag leaf, panicle initiation, flowering, milk and hard dough stage and significant variation was recorded (Table 2, Table 3 and Table 4). At flag leaf stage, in case of 1st leaf the lowest disease severity (0.05) was recorded in T_1 (0% black pointed seeds) which was followed by T_2 (0.08) again the highest disease severity (0.38) was found in T_8 (55% black pointed seeds) followed by T_7 (0.25). In 2nd leaf, the lowest disease severity was recorded in T_1 (0.12) which was statistically similar with T_2 (0.14) followed by T_3 (0.18) and T_4 (0.20), again, the highest disease severity was recorded in T_8 (0.52) which was followed by T_7 (0.38). In an average, the lowest disease severity was recorded in T_1 (0.09) which was followed by T_2 (0.11) and the highest was obtained in T_8 (0.45) which was followed by T_7 (0.32).

At panicle initiation stage, in case of 1st leaf the lowest disease severity (0.09) was recorded in T_1 and T_2 (0% black pointed seed) which was statistically identical with T_3 (0.14) and followed by T_4 (0.24) and T_5 (0.31), whereas the highest disease severity (0.57) was found in T_8 which was followed by T_7 (0.45). In 2nd leaf, the lowest disease severity was found in T_1 (0.21) which was statistically similar with T_2 (0.28), T_3 (0.42) and T_4 (0.47) and followed by T_5 (0.57), while the highest disease severity was recorded in T_8 (1.56) that was followed by T_7 (0.86) and T_6 (0.71). In an average, the lowest disease severity was observed in T_1 (0.15) which was statistically similar with T_2 (0.18) followed by T_3 (0.28) and T_4 (0.36), whereas the highest was found in T_8 (1.06) which was followed by T_7 (0.66).

Table 1: Effect of different levels of black pointed seeds on disease incidence at 21 DAS of wheat in the field

Treatment	Number of seedlings/m^2	
	Healthy	Infected
T_1	132.33 a	1.00 e
T_2	129.33 a	1.33 e
T_3	122.67 ab	10.00 d
T_4	115.00 ab	12.33 cd
T_5	107.67 bc	14.33 cd
T_6	94.33 c	15.67 bc
T_7	90.67 c	20.33 b
T_8	88.33 c	27.67 a
$LSD_{(0.01)}$	18.14	4.703
CV(%)	6.78	15.08

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability.

Table 2: Effect of different levels of black pointed seeds on leaf blight severity of wheat at flag leaf and panicle initiation stage

Treatment	Disease severity (0-5 grade) at flag leaf stage			Disease severity (0-5 grade) at panicle initiation stage		
	1st leaf	2nd leaf	Average	1st leaf	2nd leaf	Average
T_1	0.05 h	0.12 f	0.09 h	0.09 e	0.21 e	0.15 f
T_2	0.08 g	0.14 f	0.11 g	0.09 e	0.28 e	0.18 f
T_3	0.11 f	0.18 e	0.15 f	0.14 e	0.42 de	0.28 e
T_4	0.14 e	0.20 e	0.17 e	0.24 d	0.47 cde	0.36 e
T_5	0.18 d	0.26 d	0.22 d	0.31 cd	0.57 cd	0.44 d
T_6	0.21 c	0.32 c	0.27 c	0.36 c	0.71 bc	0.53 c
T_7	0.25 b	0.38 b	0.32 b	0.45 b	0.86 b	0.66 b
T_8	0.38 a	0.52 a	0.45 a	0.57 a	1.56 a	1.06 a
$LSD_{(0.01)}$	0.024	0.024	0.018	0.077	0.255	0.078
CV(%)	11.73	6.82	4.62	10.35	16.44	10.86

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability

Table 3: Effect of different levels of black pointed seeds on leaf blight severity of wheat at flowering and milk stage

Treatment	Disease severity (0-5 grade) at flowering stage			Disease severity (0-5 grade) at milk stage		
	1st leaf	2nd leaf	Average	1st leaf	2nd leaf	Average
T_1	0.28 e	0.58 d	0.43 e	0.80 f	1.47 b	1.14 g
T_2	0.28 e	0.58 d	0.43 e	1.00 ef	1.57 b	1.29 f
T_3	0.36 de	1.04 c	0.70 d	1.13 de	2.14 a	1.64 e
T_4	0.38 de	1.04 c	0.71 d	1.28 cd	2.14 a	1.71 de
T_5	0.42 cd	1.32 bc	0.87 c	1.38 bcd	2.23 a	1.81 cd
T_6	0.51 c	1.49 b	1.00 bc	1.43 bc	2.33 a	1.88 bc
T_7	0.66 b	1.61 ab	1.14 b	1.57 ab	2.38 a	1.98 ab
T_8	0.77 a	1.87 a	1.32 a	1.77 a	2.43 a	2.10 a
$LSD_{(0.01)}$	0.109	0.317	0.147	0.266	0.352	0.147
CV(%)	8.91	10.93	10.14	8.33	6.87	5.00

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability

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At flowering stage, the lowest disease severity (0.28) of 1st leaf was found in T_1 and T_2 which was statistically identical with T_3 (0.36), T_4 (0.38) T_5 (0.42) which was followed by T_6 (0.51), while the highest disease severity (0.77) was found in T_8 that was followed by T_7 (0.66). In 2nd leaf, the lowest disease severity was found in T_1 (0.58) which was statistically similar with T_2 (0.58) followed by T_3 (1.04), T_4 (1.04) and T_5 (1.32). On the other hand, the highest disease severity was recorded in T_8 (1.87). In an average, the lowest disease severity (0.43) was found in T_1 and T_2 which was followed by T_3 (0.70) and T_4 (0.71), whereas the highest was found in T_8 (1.32)

Table 4: Effect of different levels of black pointed seeds on leaf blight severity of wheat at hard dough stage

Treatment	Disease severity (0-5 grade) at hard dough stage		
	1st leaf	2nd leaf	Average
T_1	1.76 d	2.84 c	2.30 d
T_2	1.86 cd	2.92 c	2.39 d
T_3	1.92 cd	3.50 b	2.71 c
T_4	2.03 cd	3.60 b	2.82 c
T_5	2.21 c	3.70 b	2.96 c
T_6	2.64 b	3.84 ab	3.24 b
T_7	3.07 a	3.90 ab	3.49 b
T_8	3.27 a	4.35 a	3.81 a
$LSD_{(0.01)}$	0.384	0.521	0.266
CV(%)	6.79	5.98	5.13

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability

At milk stage, the lowest disease severity (0.80) of 1st leaf was recorded in T_1 which was statistically identical with T_2 (1.00) and whereas the highest disease severity (1.77) was found in. In 2nd leaf, the lowest disease severity was obtained in T_1 (1.47) was statistically similar with T_2 (1.57) and the highest was recorded in T_8 (2.43). In an average, the lowest disease severity (1.14) was recorded in T_1 and the highest was found in T_8 (2.10) which was statistically similar with T_7 (1.98) followed by T_6 (1.88).

Similar trend of leaf blight severity was recorded at hard dough stage, where the lowest disease severity (1.76) of 1st leaf was recorded in T_1 and the highest disease severity (3.27) was found in T_8. In 2nd leaf, the lowest disease severity was recorded in T_1 (2.84) which was statistically similar with T_2 (2.92) and the highest disease severity was recorded in T_8 (4.35). In an average, the lowest disease severity (2.30) was recorded in T_1 which was statistically similar with T_2 (2.39) and the highest was found in T_8 (3.81) which was followed by with T_7 (3.49) and T_6 (3.24).

C. Yield contributing characters

Yield contributing characters of wheat differed significantly for different treatments in field condition under the present trial (Table 5 and Table 6).

Highest number of healthy grains per ear (42.20) was recorded in T_1 which was statistically similar with T_2 (40.90), T_3 (37.00) and T_4 (36.20). On the contrary, the minimum number of healthy grains per ear (23.00) was observed in T_8 which was statistically identical with T_7 (28.00) and followed by T_6 (30.20). In case of diseased grains per ear the minimum number of diseased grains per ear (2.70) was recorded in T_2 which was statistically similar with T_1 (2.80) and followed by T_3 (4.40) and T_4 (4.80), whereas, the maximum (8.80) was found in T_8 which was statistically identical with T_7 (8.40) followed by T_6 (7.20). In case of total grains per ear the maximum (45.00) was recorded in T_1 which was statistically similar with T_2 (43.60), T_3 (41.40), T_4 (41.00) and T_5 (39.40), while, the minimum number of grains per ear (31.80) was recorded in T_8 which was statistically similar with T_7 (36.40) and T_6 (37.40).

Table 5: Effect of different levels of black pointed seeds on number and weight of grains per ear of harvested seeds of wheat

Treatments	Number of grains per ear			Weight of grains per ear (g)		
	Healthy	Diseased	Total	Healthy	Diseased	Total
T_1	42.20 a	2.80 f	45.00 a	1.88 ab	0.08 f	1.96 ab
T_2	40.90 a	2.70 f	43.60 ab	1.92 a	0.07 f	1.99 a
T_3	37.00 ab	4.40 e	41.40 abc	1.66 abc	0.13 e	1.79 ab
T_4	36.20 abc	4.80 de	41.00 abc	1.63 bc	0.16 d	1.79 ab
T_5	33.40 bcd	6.00 cd	39.40 abc	1.53 cd	0.21 c	1.74 abc
T_6	30.20 cd	7.20 bc	37.40 bcd	1.39 cd	0.34 b	1.73 abc
T_7	28.00 de	8.40 ab	36.40 cd	1.29 de	0.38 a	1.67 bc
T_8	23.00 e	8.80 a	31.80 d	1.06 e	0.39 a	1.45 c
$LSD_{(0.01)}$	5.767	1.478	6.198	0.266	0.024	0.277
CV(%)	7.01	10.79	6.46	7.22	7.58	6.39

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability

The maximum (1.92 g) of healthy grains per ear was recorded in T_2 which was statistically similar with T_1 (1.88 g) and T_3 (1.66 g) followed by T_4 (1.63 g), whereas the minimum weight of healthy grains per ear (1.06 g) was found in T_8 which was statistically identical with T_7 (1.29 g) followed by T_6 (1.39 g) and T_5 (1.53 g). The minimum weight of diseased grains per ear (0.07 g) was found in T_2 which was statistically similar with T_1 (0.08 g) and, while, the maximum (0.39 g) was found in T_8 which was statistically identical with T_7 (0.38 g). In case of total

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weight of grains per ear, the maximum value was recorded in T_2 (1.99 g) which was statistically similar with T_1 (1.96 g), T_3 (1.79 g), T_4 (1.79 g), T_5 (1.74 g) and T_6 (1.73 g), while, the minimum weight of total grains per ear (1.45 g) was obtained in T_8 which was statistically similar with T_5 (1.74 g), T_6 (1.73 g) and T_7 (1.67 g).

D. Grain and straw yield

Weight of 1000 grains under different treatments varied significantly where, the highest value obtained in T_1 (44.85 g) which was statistically similar with T_2 (43.02 g), T_3 (42.54 g), T_4 (41.55 g), T_5 (41.47 g), T_6 (41.10 g) and T_7 (40.53 g), while, the lowest weight of 1000 grains (38.03 g) was observed in T_8 (Table 6).Grain and straw yield of wheat differed significantly for different treatments in field condition (Table 6).

Table 6: Effect of different levels of black pointed seeds on yield of wheat

Treatments	Weight of 1000 seeds (g)	Grain yield (t/ha)	Straw yield (t/ha)
T_1	44.85 a	3.67 a	6.37 a
T_2	43.02 a	3.58 a	6.13 ab
T_3	42.54 ab	3.50 ab	5.46 bc
T_4	41.55 ab	3.33 abc	5.30 cd
T_5	41.47 ab	3.00 bcd	5.23 cd
T_6	41.10 ab	2.83 cd	4.70 cde
T_7	40.53 ab	2.70 de	4.57 de
T_8	38.03 b	2.25 e	4.37 e
$LSD_{(0.01)}$	4.393	0.4800	0.749
CV(%)	5.34	6.34	5.85

In a column mean values having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.01 level of probability

The highest grain yield was recorded in T_1 (3.67 t/ha) which was statistically similar with T_2 (3.58 t/ha), T_3 (3.50 t/ha) and T_4 (3.33 t/ha) while, the lowest yield (2.25 t/ha) was recorded in T_8 which was statistically similar with T_7 (2.70 t/ha) and followed by T_6 (2.83 t/ha). The treatment T_8 reduced up to 38.69% grain yield over T_1. The highest straw yield was recorded in T_1 (6.37 t/ha) which was statistically similar with T_2 (6.13 t/ha). The lowest straw yield (4.37 t/ha) was obtained in T_8 which was statistically similar with T_7 (4.57 t/ha) and T_6 (4.70 t/ha).

IV. Discussion

In the present experiment, significant effect of different levels of black pointed seeds on disease incidence, leaf blight severity, yield contributing characters, yield and healthy seed was recorded both laboratory and field condition. Eight levels of black pointed seeds where used as treatment follows: T_1 = 0% black pointed seeds treated with Bavistin 50 WP @ 0.25% of seed weight); T_2 = 0% black pointed seeds treated with Provax 200 WP @ 0.25% of seed weight; T_3 = 10% black pointed seeds; T_4 = 15% black pointed seeds; T_5 = 20% black pointed seeds; T_6 = 25% black pointed seeds; T_7 = 40% black pointed seeds and T_8 = 55% black pointed seeds.

In field condition, different levels of black pointed seeds showed significant variations for number of healthy seedlings/m^2. Increasing number of black pointed seeds resulted increased number of diseased seedling/m^2 in the field. These results were well supported by the others researchers earlier. Significant decrease in plant stand in field has been observed with the increase in number of black pointed seeds in seed samples [20]. Seed infected with *Helminthosporium sativum* produced only 24.8% plant stand and resulted 80.6% seedling infection [21].

From the present study, it was evident that leaf blight severity (0-5 grade) was measured in 1st and 2nd leaf and average also calculated as treatment wise at flag leaf, panicle initiation, flowering, milking and hard dough stage and significant variation due to the effect of increasing levels of seed infection subsequently was very significant with the increasing trend of leaf blight severity. The minimum leaf blight severity was recorded in the plots of T_1 (0% black pointed seeds) and the maximum severity was recorded in T_8 (55% black pointed seeds) in every growth stages. Leaf spot/leaf blight development is a usual consequence of the seed to plant to seed transmission of the pathogen *(B. sorokiniana)* under field condition [22 and 23]. The disease severity was found to increase with the age of the plant and the maximum disease severity was observed in hard dough stage in all the treatments than the other stages. Age was one of the important factors influencing disease intensity and susceptibility of wheat plant to *H. sativum* increased with the age of the plants [24]. Higher age of crop plant resulted higher incidence of leaf spot (*B. sorokiniana*) [18]. Higher the level of seed borne fungal infection, there will be higher primary inoculum level in the field resulted higher infection in the field [20]. He also found that the maximum infection severity was attained at hard dough stage due to favorable temperature range 25-28^{0}C for disease epidemic in March when the plants turn to soft dough to hard dough stage. The maximum seed infection level gave rise the highest disease severity in adult plants [25].

Grain formation and grain weight were significantly differed with the different levels of seed infection. Number of grains/ear and number of healthy grains/ear were decrease with the increase of seed infection whereas number of diseased grains/ear was increased with the same pattern. Considering the weight of 1000 grains, grain and straw yield of wheat differ significantly for different treatment in field condition. The highest weight of 1000 grains, grain and straw yield was recorded in T_1 while, the lowest was obtained in T_8. These findings were supported by different researcher earlier with working in similar condition. The relationship of leaf blight incidence with the seed quality and seed quality affect on number of healthy, infected and total spikelets per ear and as well as grains/ear was described [26]. Leaf infection at flowering stages has direct effect on the formation of healthy grains with the increase in number of black pointed seeds. Shriveled grain and black pointed kernel symptoms have been recorded as the effect of seed to plant to seed

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transmission of *B. sorokiniana* [23]. The higher level of black point infection in the seed sample encouraged more disease to the crop plants resulting formation of higher number of diseased seed in the field condition and ultimate results was the highest grain and straw yield was obtained from the seeds with no or minimum infection.

Significant and positive relationship of leaf blight severity with grain infection has been found [20]. It has been found that 65.36% disease severity interning the corresponding 17.42% seed infection [25]. In the view of above findings, it has been found that minimum level of black pointed seeds resulted minimum disease incidence and subsequent disease development in the field as well as for quality seed production. The present study are in accordance with the findings of [28] where they reported that seed samples having 12% black pointed seeds showed good results in respect of germination of seeds, disease severity and healthy seed production of wheat.

V. Conclusion

From the present research work it has been found that increasing levels of black pointed seeds resulted increasing seedling disease incidence, leaf blight severity and reduced seed quality of harvested seeds. Use of the healthy seeds treated with Bavistin 50 WP reduced up to 80%, 85.85%, 67.42%, 45.71% and 39.63% average leaf blight severity at flag leaf stage, panicle initiation, flowering stage, milk stage and hard dough stage respectively and increased 38.69% grain yield over the use of 55% black pointed seeds. Considering healthy seed production and grain yield it has been concluded that sowing 15% black pointed seeds of wheat cv. Shatabdi gave statistically similar results with sowing of 0% black pointed seeds treated with Bavistin 50 WP.

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