

## POTENTIALITY OF SEED TREATMENT WITH SOME PLANT EXTRACT TO CONTROL *BIPOLARIS* LEAF BLIGHT (*Bipolaris sorokiniana*) AND INCREASING YIELD OF WHEAT

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### ABSTRACT

A study was undertaken to evaluate the efficacy of plant extracts to control *Bipolaris* leaf blight (*Bipolaris sorokiniana*) and increasing grain yield of wheat. Water extracts of neem (*Azadirachta indica*), 'allamanda' (*Allamanda cathartica*), 'mehedi' (*Lawsonia alba*) leaves, 'bishkatali' (*Polygonum hydropiper*) shoot, 'garlic' (*Allium sativum*) clove, onion (*Allium cepa*) bulb, black cumin (*Nigella sativa*) seed, and ginger (*Zingiber officinalis*) rhizome were prepared at a concentration of 1:2. Wheat seeds were treated with individual plant extracts. Seeds were also treated with Vitavax-200 for comparison. It was found that all the plant extracts except mehedi increased seed germination on blotter. A remarkable reduction in incidence of seed borne *Bipolaris sorokiniana* was achieved with the botanicals. The disease severity was the lowest under Vitavax-200, followed by bishkatali and garlic extract. The highest disease severity was recorded under control. The increased grain yield over control was achieved with extracts of onion, garlic, black cumin, ginger, bishkatali and neem. The efficacy of plant extracts to decrease disease severity and to increase grain yield was more or less similar to that of Vitavax -200.

**Key words:** Plant extracts, leaf blight, *Bipolaris sorokiniana*, wheat

### INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the second most important cereal crop next to rice in Bangladesh. *Bipolaris* leaf blight (BpLB) caused by *Bipolaris sorokiniana* is a severe disease of the crop. The pathogen is also responsible for black point disease of wheat caused by *Bipolaris sorokiniana* has become a serious concern in Bangladesh. In farmer's field, the yield loss in wheat due to BpLB in the country has been reported to be 14.97% (Alam *et al.*, 1995). In the country, the yield loss may be up to 20 % (Razzaque and Hossain, 1991). The most acceptable method for the disease is cultivation of resistant variety. But in Bangladesh, none of the cultivated wheat varieties is resistant against the disease (Hossain and Azad, 1992). Though application of foliar fungicides is effective to manage the disease, but the method is not economically viable. Seed treatment with chemicals is also recommended in the country to control seed borne infection of *B. sorokiniana*. Seed treatment with botanicals may be an alternative approach in controlling seed borne infection of the pathogens to protect the crop from the disease. Experimentally, use of plant extracts against *B. sorokiniana* is found of to be effective (Hossain *et al.*, 1997). Hossain and Schlosser (1993) have been reported promising fungicidal effect of neem (*Azadirachta indica*) extracts against the pathogen. The present study was undertaken to find out the potentiality of some plant extracts as seed treating agents against BpLB of wheat and its causal fungus *B. sorokiniana*.

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## MATERIALS AND METHODS

Water extracts of neem (*Azadirachta indica*), 'allamanda' (*Allamanda cathartica*) and 'mehedi' (*Lawsonia alba*) leaves, 'bishkatali' (*Polygonum hydropiper*) shoot, 'garlic' (*Allium sativum*) clove, onion (*Allium cepa*) bulb, black cumin (*Nigella sativa*) seed, and ginger (*Zingiber officinalis*) rhizome were prepared at a concentration of 1: 2 followed the procedures of Hossain *et al.*, 2005. One hundred grams of a material was blended with 200 ml of distilled sterilized water in blender. After thorough blending the extracts were passed through double-ply cheese cloth.

Seeds of wheat CV Kanchan were collected from a farmer of Bogra district. The seeds were treated with individual plant extracts. For seed treatment, individual plant extracts was poured into a petri dish and 400 seeds were dipped in the extract for 30 minutes maintaining three replication. The excess extract was drain off, seeds were spread on blotting paper to soak excess moisture and air dried. Four hundred seeds were treated with plain water which served as control. The treated seeds were plated on moist and sterilized filter paper in petri dish and incubated at  $25 \pm 1^\circ\text{C}$  for 7 days. Data on germination and incidence of seed-borne *B. sorokiniana* were recorded.

Treated seeds were sown in the experimental field of Sher-E- Bangla Agricultural University farm during 2005-2006 wheat seasons. Seeds were treated with botanical extracts following the method described above. Seeds were also treated with a seed treating fungicide Vitavax-200 (0.3%) for comparison. The experimental field was medium high land with silty loam soil belonging to Modhupur tract under the Agro-Ecological Zone (AEZ) 28 of Bangladesh. Seeds were placed continuously in lines at the depth of 5cm and covered by soil with the help of hand. The distance between lines was 20 cm in every plot. The field experiment was laid out in a randomized complete block design with three replications.

The field was prepared properly and divided into three blocks with 10 unit plots in each. Each unit plot size was 2m X 1m. Block to block and plot to plot distances were 1m. Recommended doses of fertilizers and manures were applied. The rate of the fertilizer and manures were urea 220 kg /ha, TSP 180 kg /ha, MP 50 kg /ha, gypsum 120 kg /ha and cowdung 10 t/ha. One third of urea, total amount of TSP, MP and gypsum were applied at the time of final land preparation. Cow dung was applied two weeks before sowing during the land preparation. Remaining two- third of urea was applied as splits after 3 and 7 weeks of sowing. Irrigation and other intercultural operations were done whenever necessary.

The average BpLB severity of flag leaf, penultimate leaf (2<sup>nd</sup> leaf from top) and 3<sup>rd</sup> leaf from top of the plant was indexed on a 0-5 indexing scale (Hossain and Azad, 1992) from 25 selected plants per plot (five plants per line) at hard dough stage.

The crop was harvested at full ripening stage and data on grain yield was recorded. The % disease grain per panicle was recorded. The collected data were analyzed statistically using MSTAT-C computer program. The means were compared by Least Significance Difference (LSD).

## RESULTS AND DISCUSSION

### Germination

It was observed that the highest germination of 91 % was found in seed treated with black cumin extract. The lowest germination of 68 % was recorded under the treatment mehedi leaf extracts.

The extracts of garlic clove, neem leaf and bishkatali shoot were also effective to increase germination remarkably over control (Table 1).

**Table 1. Effect of seed treatment with plant extracts on germination and incidence of seed-borne *B. sorokiniana***

Treatment (Conc. of plant extract 1:2)	Germination (%)	Increase in germination (%)	Incidence of <i>B. sorokiniana</i>	Reduction in incidence of <i>B. sorokiniana</i>
Control	77 b	-	74 a	-
Onion bulb	89 a	15.58	23 bc	68.91
Garlic clove	78 b	1.29	19 cde	74.32
Black cumin seeds	91 a	18.18	25 bc	66.21
Zinger rhizome	89 a	15.58	22 b	70.27
Allamanda leaves	82 b	6.49	26 b	64.86
Bishkatali shoot and leaves	82 b	6.49	14 e	81.08
Neem leaves	87 a	12.98	16 cde	78.37
Mehedi leaves	68 c	- 11.68	20 bcde	72.97

#### Incidence of *B. sorokiniana*

Remarkable reduction in incidence of seed-borne *B. sorokiniana* was obtained with treatment of wheat seeds with different plant extracts over untreated control. The highest reduction was found in case of Bishkatali extract (Table 1).

Finding of the study showed that plant extracts tested as seed treatants gave satisfactory results to reduce incidence of *B. sorokiniana* and to increase germination of wheat seeds. Similar increase in seed germination and decrease in incidence of *B. sorokiniana* were recorded by other investigators after treatment of wheat seeds with different plant extract (Ashrafuzzaman and Khan, 1992; Khan and Kumar, 1992; Hossain and Schlosser, 1993; Hossain *et al.*, 1997; Hossain *et al.*, 2005). Ashrafuzzaman and Khan (1992) reported that bishkatali extract and neem extract inhibited the mycelial growth and spore germination of *B. sorokiniana*. The extracts inhibited the growth of the fungus in wheat seeds and also reduced its pathogenicity on wheat leaves. Hossain and Schlosser (1993) reported that germination of wheat seeds increased after treatment with extract of neem seeds and neem cake. Hossain *et al.* (1997) found that the plant extract of *Allium sativum* and *Lawsonia alba* showed remarkable effect in controlling the spore germination and mycelial growth of *B. sorokiniana*. Hossain *et al.* (2005) reported that neem extract reduced the incidence of *B. sorokiniana* significantly and increased seed germination over control. They also found that out of 6 plant extracts, neem extract was proved superior followed by garlic, bishkatali and vatpata.

#### Severity of BpLB disease

The effect of plant extracts on severity of BpLB of wheat is shown in Table 2. The disease severity indexed on a 0-5 scale varied from 1.49 to 2.98. All plant extracts and the fungicide gave significant reduction in disease severity over control. The least effective material was mehedi leaf extract. The lowest disease severity was recorded under Vitavax-200, followed by bishkatali and garlic extracts. The efficacy of the three materials was statistically similar. Efficacy of ginger,

onion, black cumin, allamanda and neem extracts to reduce the disease severity was statistically similar and significantly lower as compared to the rest three materials (Table 2).

**Table 2. Effect of seed treatment with plant extracts on severity of *Bipolaris* leaf blight (*B. sorokiniana*), diseased grain, yield and some yield contributing characters**

Treatments	Disease severity (0-5 scale)	Number of tillers/plant	Number of grains per ear	Diseased grain per ear (%)	1000-grains weight (g)	Grain yield (g/m <sup>2</sup> )
Control (water)	2.98 a	4.05 c	37.62 d	7.20 a	31.63 b	270.0 d
Fungicide (0.3%)						
Vitavax-200	1.49 e	4.92 bc	43.99 a	2.53 bc	41.36 a	350.0 a
Plant extract 1:2						
Onion bulb	2.25 bc	4.83 bc	40.23 bcd	3.56 bc	36.43 ab	320.0 abc
Garlic clove	1.63 de	5.83 a	43.73 a	4.16 b	40.00 a	345.0 ab
Black cumin seeds	2.23 bc	5.12 b	37.75 bcd	4.62 b	34.76 ab	315.0 bc
Zinger rhizome	1.91 cd	5.07 b	42.95 ab	3.93 bc	34.80 ab	315.0 bc
Allamanda leaves	2.16 bc	4.34 c	39.05 cd	4.99 b	37.80 ab	310.0 c
Bishkatali shoot and leaves	1.55 e	5.33 b	43.94 a	3.80 bc	40.83 a	350.0 a
Neem leaves	2.05 bc	4.46 bc	42.28 abc	3.95 bc	37.10 ab	320.0 abc
Mehedi leaves	2.26 b	6.48 a	39.91 bcd	4.11 b	35.53 ab	260.0 d

#### Number of tillers per plant

The tiller number per plant ranged from 4.05 - 6.48 under different treatments. The lowest number of tiller per plant was recorded under control, which was statistically similar to 'allamanda', 'neem' and 'onion' extracts and Vitavax-200. Other plant extracts caused significant increase in the parameters. The highest number of tiller per plant was recorded when seeds were treated with mehedi leaf extract, which was statistically similar to garlic extract. The tiller number under the treatments with 'bishkatali', black cumin and zinger extracts was statistically similar but significantly lower as compared to 'mehedi' leaf extract (Table 2).

#### Number of grain per ear

The maximum of 43.94 grains /ear was recorded when seeds were treated with Vitavax-200 and the lowest number of 37.62 grains per ear was recorded under control. Average grain number per ear was 43.73, 42.95, 42.28, 40.23, 39.91, 39.05 and 37.75 under the treatments with extracts of garlic, ginger, neem, onion, mehedi, allamanda and black cumin, respectively (Table 2).

#### Percentage of diseased grains per ear

The highest percentage (7.20 %) of diseased grains per spike were recorded under control. All treatments caused remarkable reduction of diseased grain per ear. The minimum of 2.53 % grains were diseased when seeds were treated with Vitavax- 200. Among the plant extracts, the lowest incidence of diseased grains per ear was found when seeds were treated with extract of onion bulb, which was followed by extracts of bishkatali, ginger, neem, mehedi, garlic, black cumin and allamanda resulting 3.56, 3.80, 3.93, 4.11, 4.16, 4.62 and 4.99 % diseased grains, respectively (Table 2).

### 1000-grains weight

The 1000-grains weight of wheat ranged from 31.63 to 41.36 g. The highest 1000-grain yield weight was recorded under Vitavax-200 and the lowest under control. The 1000-grain weight increased over control due to treatment of seeds with plant extracts as well as Vitavax-200; but the increase was significant under mehedi leaf extract and Vitavax-200 as compared to control (Table 2).

### Grain yield

The lowest grain yield of 260g/m<sup>2</sup> was recorded when seeds were treated with 'mehedi' leaf extract, which was not significantly different from control. Other eight materials gave significant increase in grain yield over control. The highest grain yield of 350 g/m<sup>2</sup> was achieved with Vitavax-200 and bishkatali extract. Effectiveness of the two materials to increase grain yield was statistically similar to garlic extract, onion extract and neem leaf extract (Table 2).

Results of the study reveal that plant extracts gave remarkable reduction in BpLB severity and prevalence of diseased seeds over control. They also influenced on important yield contributing characters and grain yield. The antifungal activity of botanicals as seed treating agent have also been reported by many other investigators (Rovesti *et al.*, 1992; Hossain and Schlosser, 1993; Khan and Hossain, 1993; Hossain *et al.*, 1997; Rhaman, 1998a; 1998b). Rhaman, (1998a, 1998b) found a remarkable reduction of leaf blight severity of wheat by spraying botanicals such as *Allium sativum*, *Nigella sativa*, *Lawsonia alba* and *Cymbopogon citratus*. Hossain and Schlosser (1993) observed the potential use of neem extract as a means of controlling *B. sorokiniana* of wheat. Khan and Hossain (1993) observed the the extracts of *Allium cepa*, *A. sativum*, *Datura stramonium*, *D. plumeiri*, *Lawsonia alba*, *Ricinus communis*, *Leomurus sibiricus* and *Mentha viridis* completely inhibited spore germination of *B. sorokiniana* at 1:3 (w/v) dilution ratio. Hossain *et al.*, (2005) further reported that extract of mehedi was found to be effective against *Bipolaris sorokiniana*.

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