

EFFECT OF SEED TREATMENT WITH SOME BOTANICALS ON SEEDLING GROWTH AND SEVERITY OF BIPOLARIS LEAF BLIGHT (*Bipolaris sorokiniana*) OF WHEAT

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ABSTRACT

An experiment was conducted to find out the effect of 13 botanicals on seedling growth and severity of Bipolaris leaf blight (*Bipolaris sorokiniana*) of wheat in a net house of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during November 2006 to March 2007. It was found that seed treatment with *Allium cepa*, *A. sativum*, *Curcuma longa*, *Aegle marmelos*, *Lawsonia alba*, *Allamanda cathartica* extracts caused considerable increase in germination and seedling growth. Pre-sowing treatment of seeds with all of the plant extracts caused significant reduction in disease severity over control. The severity index values under control were 1.55, 2.00, 3.22, 4.55, 4.66 and 4.66, respectively at flag leaf, booting, panicle initiation, flowering, milk and hard dough stages of wheat plants. Seed treatment with the materials reduced disease severity within the range of 0.33-1.22, 0.99-1.77, 1.11-2.00, 1.22-2.22, 1.66-3.00 and 2.00-3.83, respectively for the above mentioned growth stages of the crop.

Key words: Leaf blight, *Bipolaris sorokiniana*, control, seed treatment, plant extract

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the staple food crops in the world. It is the second most important cereal crop in Bangladesh. The average yield of wheat is 1.7 t ha⁻¹ in the country, which is lower in comparison to many wheat growing countries of the world (FAO, 2005). Disease is the major constraint of successful wheat production. *Bipolaris sorokiniana* is a major pathogen of wheat causing leaf blight, leaf spot, leaf blotch, foot rot, seedling blight, black point, etc (Hossain and Azad, 1992). Seed treatment with botanicals may be an excellent option in controlling seed borne pathogens as well as seed transmitted disease in the field. Control of plant disease by biological means instead chemicals has drawn special attention all over the world. Plant extracts have been reported to possess antifungal properties by many researchers (Ahmed and Agnihotri, 1972; Misra and Dixit, 1977; Islam *et al.*, 2006; Rahman *et al.*, 2007). Islam *et al.* (2006) reported that seed treatment with *Allamanda cathartica*, *Polygonum hydropiper*, *Azadirachta indica*, *Allium sativum*, *Allium cepa*, *Zingiber officinalis* and *Nigella sativa* increased seed germination and reduced leaf blight severity of wheat over untreated control. In view of the above facts, the present study was undertaken to evaluate some plant extracts for their effect on seedling growth and leaf blight (*Bipolaris sorokiniana*) severity of wheat.

MATERIALS AND METHODS

The experiment was carried out in a net house of Sher-e-Bangla Agricultural University, Bangladesh during the period from November, 2006 to March, 2007. Wheat seeds, cultivar Kanchan, were collected from Bangladesh Agricultural Research Institute (BARI). The botanicals were collected from different locations of the country. The extracts were prepared following the method of

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Ashrafuzzaman and Hossain (1992). One hundred grams of plant parts were crushed in 200 ml water in a blender. Seeds of wheat were treated by dipping them separately in different extracts in sterilized conical flasks for 30 minutes. The excess extract was drained off and the treated seeds were kept in blotting paper to remove excess moisture from seed surface. Seeds under control were treated with plain water. To prepare pot, soil, sand and cowdung were mixed at 2:1:1 ratio 15 days before potting. Then each pot was filled up with the soil. Seeds were planted at the depth of 5 cm in pot soil. Each pot received 50 seeds. Time to time watering was done to keep the soil moist. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications (pots). Data on germination and vigor index of wheat seedlings were recorded at 15 days after sowing. To determine vigor index, five seedlings/pot were carefully uprooted and cleaned with water. Finally three seedlings/pot were allowed to grow. Leaf blight severity was recorded from three selected plants per pot on flag leaf and penultimate leaf (2nd leaf from the top) of the plant. The data were recorded at flag leaf, booting, panicle initiation, flowering, milk and hard dough stages. The disease severity was recorded following 0-5 rating scale as used by Hossain and Azad (1992), where 0 means no infection, 1 means few minute lesions on leaves, 2 means black lesions with no distinct chlorotic halos covering $\leq 10\%$ of the leaf area, 3 means typical lesions surrounded by distinct chlorotic halos covering 10-50% of the leaf area, 4 means severe lesions on leaves with ample necrotic zones, drying over a part of the leaf covering $\geq 50\%$ of the leaf area and 5 means severe infection, drying of the leaf, spike infected to some extent. The collected data were analyzed statistically using MSTAT-C computer program. The means were compared by DMRT (Duncan Multiple Range Test).

RESULTS AND DISCUSSION

Germination

The lowest germination of 52.85% was recorded where seeds were treated with plain water (control). All treatments gave significant increase in seed germination over control. The highest germination of 80.47% was achieved, where seeds treated with leaf extract of *A. cathartica*, which was statistically similar to *A. cepa*, *C. longa*, *L. alba* and *A. sativum*. Extracts of other seven plant materials gave 67.61-70.00% germination. Their efficacy was not significantly different (Table 1).

Growth and vigor of seedling

The lowest shoot length of 17.33 cm was recorded under control. It was increased to 18.53-21.46 cm due to treatment with the botanicals. The increase was significant only in case of neem leaf extract. The lowest root length of 2.82 cm was found under control. Root growth increased to the range of 3.2-4.16 cm due to seed treatment with the materials. Except extracts of *A. sativum*, *C. guianensis* and *E. indica* other ten botanicals caused significant increase in this parameter. However, the increase was statistically similar among the effective botanicals. The minimum seedling weight of 0.54 g was found under control. It was increased to 0.58-0.94 g when seeds were treated with the plant extracts before sowing. Seedling weight under those six treatments ranged 0.72-0.94 g and their effectiveness was not significantly different (Table 1).

The lowest seedling vigor index of 1065 was recorded under control. All treatments caused significant increase in this parameter over control. Maximum vigor index of 1944 was obtained with *A. cathartica*, which was significantly higher as compared to only *C. guianensis* and *E. indica*. Other ten botanicals increased seedling vigor to 1555-1753, but their effectiveness were statistically similar (Table 1).

Table 1. Effect of seed treatment with plant extracts on germination, growth and vigor index of wheat seedlings at 15 days after sowing

Treatments	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling weight (g)	Vigor index
Control (Plain water)	52.85e	17.33b	2.82c	0.54f	1065c
<i>Allium cepa</i>	73.81a-c	18.78ab	3.73ab	0.63c-f	1665ab
<i>Allium sativum</i>	70.47a-d	18.85ab	3.54abc	0.60c-f	1580ab
<i>Azadirachta indica</i>	68.57b-d	21.46a	4.16a	0.94a	1753ab
<i>Couroupita guianensis</i>	68.57b-d	17.80ab	3.46abc	0.59d-f	1456b
<i>Curcuma longa</i>	73.33a-c	17.93ab	3.94ab	0.58ef	1601ab
<i>Erythrina indica</i>	61.90d	20.19ab	3.32bc	0.74b-d	1459b
<i>Aegle marmelos</i>	77.62ab	18.53ab	3.95ab	0.81ab	1745ab
<i>Nigella sativa</i>	63.80cd	20.97ab	3.61ab	0.63c-f	1555ab
<i>Lawsonia alba</i>	73.33a-c	19.07ab	3.57ab	0.68b-f	1656ab
<i>Allamanda cathartica</i>	80.47a	19.87ab	3.99ab	0.75bc	1944a
<i>Zingiber officinale</i>	67.61b-d	19.95ab	3.70ab	0.64c-f	1597ab
<i>Cynodon dactylon</i>	70.00b-d	19.45ab	3.83ab	0.72b-e	1630ab
<i>Eucalyptus calophylla</i>	70.00b-d	20.56ab	3.73ab	0.82ab	1700ab

Values within the same column with a common letter(s) do not differ significantly (P= 0.05).

Severity of Bipolaris leaf blight

At all stages of data collection, the highest severity of Bipolaris leaf blight (BpLB) of wheat was recorded under control, where seeds were treated with plain water (Table 2 and Table 3). Pre-sowing treatment of seeds with all of the plant extracts caused significant reduction in disease severity over control. However, appreciable variations were observed in their efficacy to reduce BpLB severity. The severity index values under control were 1.55, 2.00, 3.22, 4.55, 4.66 and 4.66, respectively at flag leaf, booting, panicle initiation, flowering, milk and hard dough stages of wheat plants. Seed treatment with the materials reduced disease severity to the range of 0.33-1.22, 0.99-1.77, 1.11-2.00, 1.22-2.22, 1.66-3.00 and 2.00-3.83, respectively.

Table 2. Effect of seed treatment with plant extracts on Bipolaris leaf blight severity index (based on 0-5 scale) of wheat at flag leaf, booting and panicle initiation stage

Treatments	Flag leaf stage	Booting stage	Panicle initiation stage
Control (Plain water)	1.55a	2.00a	3.22a
<i>Allium cepa</i>	0.33d	1.00e	1.22fg
<i>Allium sativum</i>	1.00bc	1.22c-e	1.55c-f
<i>Azadirachta indica</i>	0.73c	0.99e	1.33e-g
<i>Couroupita guianensis</i>	0.99bc	1.33c-e	1.55c-f
<i>Curcuma longa</i>	0.66cd	1.44b-d	1.44d-g
<i>Erythrina indica</i>	1.22b	1.77ab	1.88bc
<i>Aegle marmelos</i>	1.00bc	1.33c-e	1.66b-e
<i>Nigella sativa</i>	0.88bc	1.55bc	2.00b
<i>Lawsonia alba</i>	0.88bc	1.44b-d	1.77b-d
<i>Allamanda cathartica</i>	0.88bc	1.44b-d	1.77b-d
<i>Zingiber officinale</i>	0.66cd	1.11de	1.33e-g
<i>Cynodon dactylon</i>	0.77c	1.00e	1.11g

Values within the same column with a common letter(s) do not differ significantly (P= 0.05).

Table 3. Effect of seed treatment with plant extracts on leaf blight severity of wheat (0-5 Scale) at flowering, milk and hard dough stage

Treatments	Flowering stage	Milk stage	Hard dough stage
Control (Plain water)	4.55a	4.66a	4.66a
<i>Allium cepa</i>	1.55c-e	1.66c	2.00e
<i>Allium sativum</i>	1.55c-e	2.66bc	3.21b-d
<i>Azadirachta indica</i>	1.66c-e	2.77b	2.88cd
<i>Couroupita guianensis</i>	1.66c-e	3.00b	3.33b-d
<i>Curcuma longa</i>	1.66c-e	2.22bc	2.66de
<i>Erythrina indica</i>	2.22b	3.11b	3.33b-d
<i>Aegle marmelos</i>	1.77b-d	2.55bc	2.88cd
<i>Nigella sativa</i>	2.00bc	2.66bc	2.77de
<i>Lawsonia alba</i>	2.00bc	2.77b	2.99cd
<i>Allamanda cathartica</i>	2.22b	2.99b	3.10b-d
<i>Zingiber officinale</i>	1.44de	2.49bc	2.72de
<i>Cynodon dactylon</i>	1.22e	2.72b	3.83b
<i>Eucalyptus calophylla</i>	1.55c-e	2.77b	3.66bc

Values within the same column with a common letter(s) do not differ significantly (P= 0.05).

Findings of the present study are in accordance with the findings of other investigators. Alice and Rao (1986) found that seed treatment with plant extracts significantly increased germination and seedling vigor of wheat. Rahman *et al.* (2007) reported that seeds treated with extracts of *C. longa* rhizomes and *A. sativum* cloves caused remarkable reduction in leaf blight severity of wheat.

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