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EFFICACY OF SOME FUNGICIDES FOR THE IMPROVEMENT OF SEED QUALITY IN LENTIL

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ABSTRACT

Hoque MA, Ali MA, Mahfuzul Haque AHM, Mehraj H, Jamal Uddin AFM (2014) Efficacy of some fungicides for the improvement of seed quality in lentil. *Int. J. Sustain. Crop Prod.* 9(3), 22-26.

An experiment was conducted in the Plant Pathology Laboratory, Bangladesh Agricultural University, Mymensingh during winter 2011-2012 to evaluate the efficacy of some fungicides for improving the quality of seeds of lentil. The test fungicides were Rovral (0.2%), Secure 600WG (0.2%), Bavistin 70WP (0.2%), Captan 50WP (0.2%). BARI Masur-1 was used in the experiment. Around 57% healthy seed was recorded from the Secure 600WG sprayed plot. Germination was 21.63% in case of Secure 600WG against 18.94% in Control. Four fungal pathogens namely *Aspergillus flavus*, *Aspergillus niger*, *Penicillium* spp. and *Fusarium* spp. were associated with lentil seeds. Among the treatments, Secure 600WG (0.2%) was found to be the most effective fungicide in controlling seed borne fungi. Germination (%) and seedling vigor was also increased due to application of Secure 600WG (0.2%). The highest germination was found to be 86.00% and the highest vigor index was 522.02 in Secure treated plants in comparison to 63% and 250.11 in untreated control.

Key words: *BARI Masur-1, fungicides, seed health*

INTRODUCTION

Lentil (*Lens culinaris*) is one of the important food legumes in Bangladesh. It is a cheap source of protein for people and also for domestic animals in country (Sattar *et al.* 1996). Lentil is affected by several fungal diseases like Foot and Root rot, Fusarium wilt, Stemphylium blight, in Bangladesh. Foot and root rot of lentil caused by *Fusarium oxysporum* and *Sclerotium rolfsii* (Dey *et al*. 1993) are common in Bangladesh and causes seedling death at early stage resulting very poor plant stand which ultimately produces very low yield. Lentil is susceptible to number of seed borne diseases. Seed treatment with fungicides not only controls the seed-borne diseases but also improves seed health, plant stand and crop yield (Tanweer 1982). Fungicidal seed treatments are known to reduce the seed borne mycoflora and thereby improve the seed germination (Shah and Jain, 1993; Klich *et al.* 1994). Fungicides have been successfully employed to control seed-borne mycoflora (Ahmed and Ali, 1990; Kale *et al.* 1992; Solunkey and Kore, 1993). Quality seed is essential for increasing the yield of lentil. Reports on effect of seed treatment of lentil for improving seed health status are not available. Therefore the present study was undertaken to evaluate efficacy of some fungicides to ensure good quality of seed.

MATERIALS AND METHODS

The experiment was carried out at the laboratory of the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh during October, 2011 to May, 2012. BARI Masur-1 a susceptible variety was chosen for the study. There were five treatments *viz.* T_1: Rovral 50 WP (0.2%) (Iprodione); T_2: Secure 600 WG (0.2%) (Fenamidone + Mancozeb); T_3: Bavistin 70 WP (0.2%) (Carbendazim); T_4= Captan 50 WP (0.2%) and T_5: Control in the trial. Completely Randomized Block Design (CRD) was followed and there were three replications. Seed samples were collected after harvesting from the treated plot. Seed samples were placed in a clean brown paper bag, labeled properly and preserved at 5-8ºC temperature in refrigerator for subsequent use.

Dry inspection: Randomly 400 seeds were taken from each seed sample. The seeds were categorized into the groups of apparently healthy seeds, discolored seeds, spotted seeds, unfilled grains and deformed grains. Separations of different categories of seeds were done with unaided eyes. A 10x hand lens was used whenever necessary. Species wise insect population, inert matter, and other plant parts were also observed but not counted in this experiment. The different seed categories were expressed in percentage.

Seed health test (blotter method): Four hundred seeds were randomly selected from each treatment. The seeds were placed on water soaked three folds blotter paper in plastic petri dishes after 15 days of harvesting. In each petri dish, 25 seeds were plated at equal distance (Fig. 1). The seeds were incubated at 22±2ºC under 12 hours cycle of alternating near ultraviolet light and darkness (ISTA 2001). After 8 days of incubation, seed borne pathogens were detected (ISTA 2001). Numbers of seeds sprouted were counted and the data were expressed as percentage.

Germination and Seedling vigor test: Germination test was carried out according to (ISTA 2001). Iron trays (30 cm x 30 cm) were used for this test. The trays were filled in with moist sand at field capacity. Four trays were used for each treatment (fungicide). One hundred seeds were sown in each tray. Polyethylene bags were used for mulching (Fig. 2). After 15 days of sowing, percent germination was calculated. Ten seedlings from each tray were randomly selected, and shoot and root length was measured. The seedling vigor index was determined the by following formula:

Vigor Index = (Mean root length + Mean shoot length) x Seed germination (%)

Collected data were statistically analyzed using MSTAT-C Computer Package Program. The significance of the difference among the treatments means was estimated by the least significant difference (Lsd) test at 5% level of probability (Gomez and Gomez, 1984).

Fig. 1. Blotter test

Fig. 2. Seedling Vigor test

RESULTS AND DISCUSSION

Dry inspection

The percentage of healthy seed ranged from 35.50% to 57.00%; maximum was in T_2 (57.00%) while minimum in T_5 (35.50%). T_3 and T_4 showed 45.00% apparently healthy seed and they were statistically similar to T_1 (43.75%) (Table 1). Maximum 3.25% of discolored seed was in T_1 followed by 2.25% in T_2 and minimum 0.25% in T_5 (Table 1). Maximum (28.25%) spotted seed was found in T_5 and minimum (15.50%) in T_3 (Table 1). T_4 showed the maximum 3.25% unfilled seed whereas T_2 and T_5 showed 0.25% unfilled seed (Table 1). Maximum 37.25% deformed seed was in T_3 and minimum 23.75% in T_2 (Table 1).

Table 1. Percentage of healthy and different types of abnormal lentil seeds[X]

Treatment	Apparently healthy seed (%)	Discolored seed (%)	Spotted seed (%)	Unfilled seed (%)	Deformed seed (%)
T_1	43.75 b	3.25 a	19.00 c	2.50 b	31.50 d
T_2	57.00 a	2.25 b	16.75 d	0.25 d	23.75 c
T_3	45.00 b	1.25 c	15.50 d	1.00 c	37.25 a
T_4	45.00 b	0.50 d	20.75 b	3.25 a	30.50 b
T_5	35.50 c	0.25 e	28.25 a	0.25 e	35.75 a
LSD0.05	4.46	0.22	1.27	0.13	1.89
CV	5.43	8.03	3.48	4.78	4.01

[X]Figures in the column having same letter(s) do not differ significantly at 5% levels by Lsd

Dry inspection revealed that apparently healthy seeds looked shiny and filled. The seed coat had discoloration due to association of seed borne fungi. Some seeds had prominent and visible spots on the seed coat. The unfilled seeds were much smaller in size and depression on the seed coat. From the results of the present experiment it was observed that seed health status of lentil seeds was improved due to due to application of fungicides. Ahmed and Ali (1990) and Kale *et al*. (1992) also reported about successful application of fungicides to control seed borne mycoflora.

Blotter test

After incubation of lentil seeds on blotter paper, four seed-borne fungi such as, *Aspergillus flavus*, *Aspergillus niger*, *Penicillium* spp., *Fusarium* spp. (Plate 1) were detected. *Fusarium oxysporium and Fusarium moniliforme* have been reported to occur on lentil seed.

The seed-borne infections of fungi varied greatly with respect to different seed sample (Table 2). Maximum percent association (11.50%) of *Aspergillus flavus* was found in T_5 minimum 5.75% was in T_2 (Table 2). Minimum infection (1.00%) of *Aspergillus niger* was in T_1 maximum 2.00% in T_3 and T_5 (Table 2). Maximum percentage of infection by *Penicillium* spp. was 5.25% in T_5 which was statistically similar with T_3 (5.00%) followed by T_4 (4.00%) whereas minimum in T_2 (3.20%) which was statistically insignificant with T_1 (3.50%) (Table 2). Maximum association of *Fusarium* spp. was 8.25% in T_5 while T_1 showed 6.25% infection by *Fusarium* spp. On the other hand, minimum 5.25% infection by *Fusarium* spp. was found from T_2 which was statistically similar with T_3 (5.50%) (Table 2).

Table 2. Prevalence of seed borne infection of lentil seeds by blotter method[X]

Treatments	Seed-borne infection (%)			
	Aspergillus flavus	*Aspergillus niger*	*Penicillium* spp.	*Fusarium* spp.
T_1	9.50 b	1.00 d	3.50 c	6.25 b
T_2	5.75 e	1.50 b	3.20 c	5.25 c
T_3	8.50 c	2.00 a	5.00 a	5.50 c
T_4	7.00 d	1.25 c	4.00 b	5.75 bc
T_5	11.50 a	2.00 a	5.25 a	8.25 a
$LSD_{0.05}$	0.75	0.14	0.48	0.51
CV	4.89	4.88	6.28	4.53

[X]Figures in the column having same letter(s) do not differ significantly at 5% levels by Lsd

The health status of the seedlings is presented in Plate 1. Percent germination varied from 80 to 96%. Maximum germination by blotter method was 96.00% in T_2 while minimum (80) was in T_5. T_1 showed 94.00% germination which was statistically similar to T_3 (90%) and T_4 (94%) (Table 3). Maximum 94.00% healthy seedling was in T_2 and minimum was 76.00% in T_5 (Table 3). Infected seed ranged from 6.00% to 24.00%. The maximum 24.00% of infected seed was in T_5 while minimum was 6.00% in T_2 (Table 3).

Table 3. Percent germination and health status of lentil seeds by blotter method[X]

Treatments	Germination (%)	Healthy seedlings (%)	Infected seeds (%)
T_1	94.0 a	92.0 a	8.0 d
T_2	96.0 a	94.0 a	6.0 e
T_3	90.0 a	82.0 bc	10.0 c
T_4	94.0 a	88.0 ab	12.0 b
T_5	80.0 b	76.0 c	24.0 a
$LSD_{0.05}$	8.7	6.2	1.3
CV	5.3	3.9	6.1

[X]Figures in the column having same letter(s) do not differ significantly at 5% levels by Lsd

The present observations are in agreement with that of Lal and Singh (1997) and Sahu and Jena (1997) on mungbean On the other hand a higher control had been reported on mustard seeds (Ghosh and Das, 1999). Blazej (1995) reported successful control of organisms like *Fusarium* sp., *Alternaria* and *Cladosporium* sp. Difenoconazole and flusilazole had been successfully used for seed treatment of rice to control several seed-borne pathogens (Previero *et al.* 1997). Sitara and Nusrat (2011) found that Ridomil Gold @0.15 & 0.25% inhibited the growth of all fungi while *Asafetida* and *Nigella sativa* powder @0.25% were found to be more effective, however, it was less effective against *Fusarium moniliforme* in chilli seed.

Germination

The germination of a seed is of major concern. It was observed that the seeds showed significantly higher germination due to fungicidal treatment as compared to untreated control. The highest germination was found in T_2 (86%) and lowest (63%) in T_5 (Table 4). There were healthy seedlings that ranged from 59.00% to 83.00% (Table 4). The maximum healthy seedling was 83.00% in T_2 while minimum healthy seedling was 59.00% in T_5; T_4 showed 73.00% of percentage of healthy seedling whereas 72.00% was in T_1 and 69.00% in T_3 (Table 4). Infected seedlings ranged from 19.00% to 47.00% (Table 4). Maximum infected seedling was 47.00% in T_5 while minimum was 19.00% in T_2 (Table 4). T_4 showed 37.00% infected seedling whereas 21.00% was in T_1 and 42.00% in T_3 (Table 4).

Table 4. Percent germination and health status of lentil seeds in germination test[X]

Treatments	Germination (%)	Healthy seedlings (%)	Infected seedlings (%)
T_1	82.00 ab	72.00 b	21.00 d
T_2	86.00 a	83.00 a	19.00 d
T_3	72.00 c	69.00 b	42.00 b
T_4	79.00 b	73.00 b	37.00 c
T_5	63.00 d	59.00 c	47.00 a
$LSD_{0.05}$	6.07	4.47	2.60
CV	4.37	3.45	4.31

[X]Figures in the column having same letter(s) do not differ significantly at 5% levels by Lsd

Some seeds were not germinated. It ranged between 14.00% in T_2 and 37.00% in T_5. Present findings are in accordance with the observation of Goulart *et al.* (1999). The negative impact of mycoflora on seed germination was also reported by Lima *et al.* (1984), Soleymany *et al.* (1993) and Solunke and Kore (1993).

Seedling vigor index

In respect of seedling vigor test of lentil seeds a wide range of variation was found (Table 5). Maximum shoot length was 3.79 cm in T_2 while minimum was 2.79 cm in T_5. Maximum length of root was 2.28 cm in T_2 while minimum 1.18 cm in T_5. Maximum root + shoot length was 6.07 cm in T_2 while minimum was 3.97 cm in T_5. Maximum seedling vigor index was 522.02 in T_2 followed by T_4 (409.22) and minimum 250.11 in T_5. The impact of such mycoflora on seedling vigour was also reported by Lima *et al.* (1984), Soleymany *et al.* (1993) and Solunke and Kore (1993). Considerable reduction in root vigour of fungicide treated seeds has been reported in mungbean (Siddiqui and Arif-uz-Zaman, 2004).

Table 5. Effect of treatments on germination and seedling vigor of lentil[X]

Treatments	% Germination	Shoot Length (cm)	Root Length (cm)	Root + Shoot Length (cm)	Vigor Index
T_1	82.00 b	3.18 b	1.69 b	4.84 b	396.88 c
T_2	86.00 c	3.79 a	2.28 a	6.07 a	522.02 a
T_3	72.00 a	3.75 a	1.41 c	5.16 b	371.52 c
T_4	79.00 ab	3.66 a	1.52 c	5.18 b	409.22 b
T_5	63.00 d	2.79 c	1.18 d	3.97 c	250.11 d
$LSD_{0.05}$	3.88	0.26	0.13	0.78	50.59
CV	2.53	4.25	4.23	8.54	6.54

[X]Figures in the column having same letter(s) do not differ significantly at 5% levels by Lsd

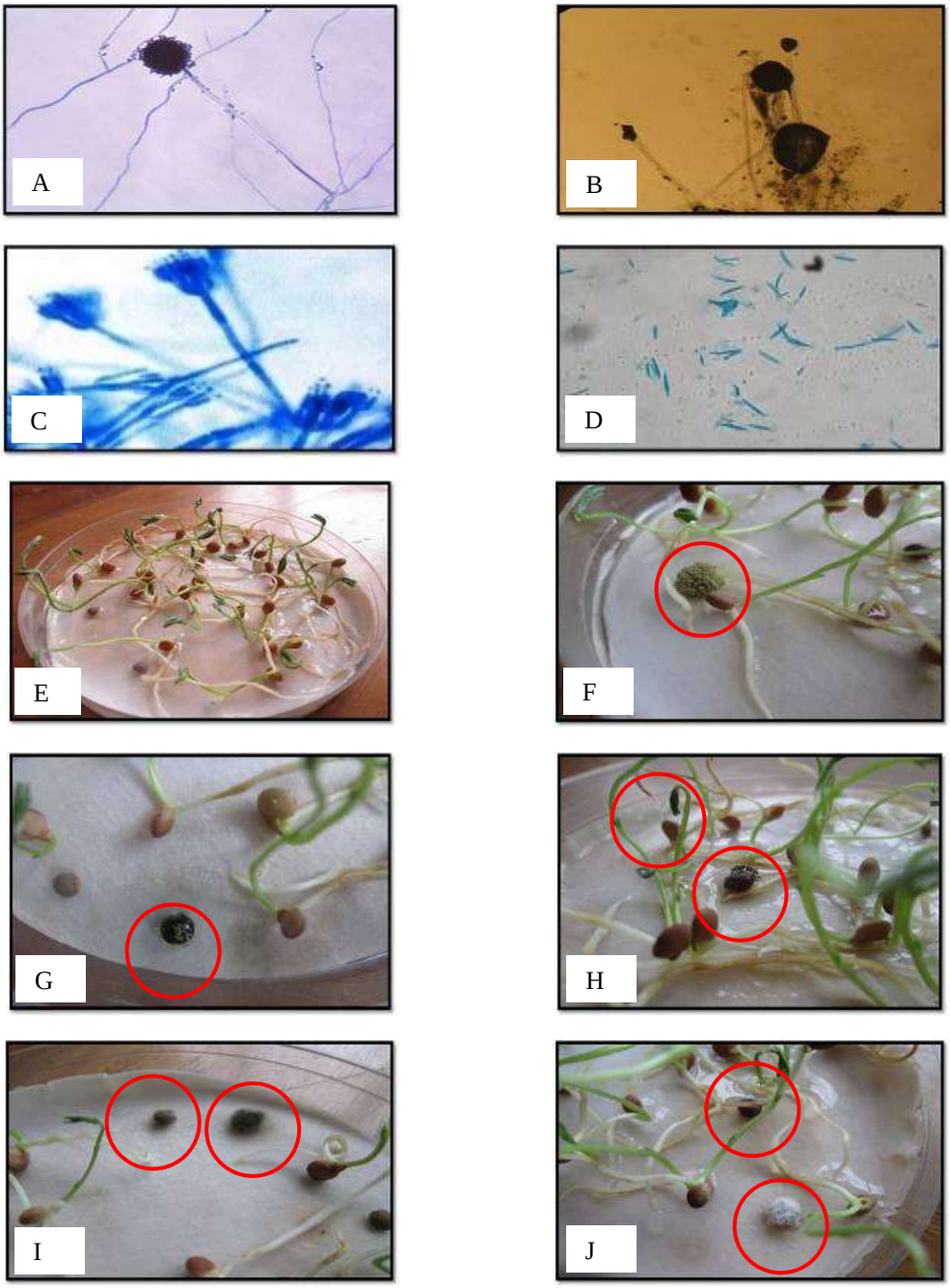

Plate 1. Figures of fungal species and seedling infection by different fungi.
A. *Aspergillus flavus* B. *Aspergillus niger* C. *Penicillium* spp. D. *Fusarium* spp. E. Healthy seedling F. Seedling infection by *Aspergillus flavus* G. Seedling infection by *Aspergillus flavus* H. Seedling infection by *Aspergillus niger* I. Seedling infection by *Fusarium* sp. J. Seedling infection by *Fusarium* sp.

CONCLUSION

Results obtained from the present trial showed that there is positive influence of seed treatment with fungicides on seed health status of Lentil seeds. Seed treatments with Secure 600WG (0.2%) resulted in better germination and vigour, reduced the number of contaminated and dead seeds. Among the different fungicides tested Secure 600WG (0.2%) was the most effective fungicide in controlling seed borne fungi.

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