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Full Length Research Paper

Evaluation of different treatment on the occurrences of seed borne fungi of Mungbean *Vigna radiata* (L.) Wilczek seed

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The efficacy of different treatment measures *viz*., corbendazim, Benomyle, Vitavax, Neem, Garlic, *Trichoderma harzianum* and *Trichoderma viride* were evaluated for the occurrences of seed borne fungi *viz*., *Aspergillus spp*, *Penicillium spp*, *Alternaria alternata*, *Rhizopus* and *Fusarium spp* which were isolated from two genotype of Mungbean *viz*., HUM-4 and HUM-12, from, 180 and 360 days period of storage. Both genotypes were taken from the Department of Genetics and Plant Breeding, Institute of Agricultural Science, B.H.U Varanasi. All treatments were found to significantly reduce the incidence of seed borne fungi but did not completely control it. The results showed that the incidence of seed borne fungi was found to be significantly declined when seeds were treated with different treatments but did not completely control it. Seed treated with mungbean seed showed least incidence. Due to an increase in storage period, efficacy of different treatment against seed borne fungi was found to be declined. After 180 days period of storage, effect of treatment was found to be intermediate. Least effect of treatment was shown at 360days period of storage due to an increase in the number of fungal population. Among all treatment, Benomyle, Corbendazim and Vitavax showed minimum occurrences against all fungi followed by Neem, Garlic and *T. harzianum.*

Key words: seed borne fungi, Pulses, mungbean

INTRODUCTION

Pulses are rich source of vegetative protein and they play an important role in nutritional security of the majority of vegetarian population in India. India is the largest producer and consumer of pulses occupying 33% of the world's area and 22% of the production (FAO, 2008). Pulse production in the country has fluctuated widely between 13 and 15 million tonnes (mt) with no significant growth trend between 1991 and 2010. The latest estimate indicates that the present production of pulses has reached 14.7 million tons (mt) with productivity of 637 kg/ha although, the projected pulse requirement by the year 2030 (32 mt) is estimated to be more than double

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the current production level (Anonymous, 2011). Mungbean (*Vigna radiate* L.) Wilczek) is a short duration; herbaceous, annual, self-pollinated legume pulse crop under the family. It also has the ability to fix atmospheric nitrogen in soil, which enriches the soil quality (Ather Nadeem et al., 2004). It is an excellent source of proteins considered as a “poor men’s protein” (Mian, 1976). It contains 26% protein, 51% carbohydrate, 10% moisture, 4% minerals and 3% vitamins (Khan, 1981).

Areas for cereals and other pulses have decreased, however, that for mungbean has doubled in the last two decades with an annual rate of 2.5%. The area under pulses in India is around 24.38 million hectares with a production of 14.52 million tonnes. Nearly 8% of this area is occupied by mungbean which is the third most important pulse crop of India in terms of area cultivated and production next to gram and pigeon pea (Sathyamoorthi et al., 2008). To reduce the occurrences of seed borne fungi, seed treatment with fungicides plant extract and Bioagent plays an important role in prevention of seed borne fungi Erdey et al. (1997). Keeping these views in mind, the present research work has been undertaken to determine the efficacy of seed treating methods against the major seed borne pathogens of mungbean. Seed treatment with different botanicals including garlic extract has been tested and found effective alternative approaches to combat the seed-borne diseases of many crops including cucumber (Alice and Rao, 1987; Kurucheva and Padmavathi, 1997; Rahman et al., 1997; Islam et al., 2001; Anon., 2004). Hence, in the present study fungicides and chemicals were used as seed treatment to evaluate their efficacy in controlling seedborne fungi to enhance the seed quality.

MATERIALS AND METHODS

Corbendazim, Benomyle, Vitavax, Neem, Garlic and *T. harzianum* were tested for the occurrences of seed borne fungi. The required quantity of each seed dressing fungicide at 0.3%, plant extract 5% and bioagent 0.8% were weighed and treated separately as dry seed treatment. One hundred gram (100 g) each of unsterilized mungbean seeds were treated with 250 ml conical flasks by shaking, using a wrist action shaker to ensure uniform coating of the fungicide on the seed surface. The treated seeds were air dried overnight and were placed on half-strength Potato dextrose agar (PDA) medium and blotter plate at 16 seeds per Petri plate. The untreated seeds of respective crops served as control. The experiment was replicated thrice. The plated seeds were incubated at 25°C in a Biochemical Oxygen Demand (BOD) incubator for 5 days under 12 h alternate light and dark conditions. Incidences of different fungal pathogen was recorded as under:

$$\text{Incidence (\%)} = \frac{\text{No of infected seed}}{\text{Total number of treated seed assessed} \times 100}$$

RESULT

The percent reduction in seed-borne infection of target pathogenic fungi recorded in mungbean seeds were treated with five different treatments. Result found that, all treatments were found to significantly reduce the occurrences of seed borne fungi but did not completely control them. Efficacy of different treatment on occurrences of seed borne fungi is illustrated in details.

Testing of different treatment on seed borne fungi on fresh mungbean seed

Table 1 shows that Benomyle was found to be most effective against *Aspergillus spp*. it showed least incidence (1.00 and 2.90%) in genotype HUM-12 and HUM-4 through blotter method. The second best treatment was Corbendazim against Aspergillus spp., it reduced the occurrences (1.56%) in genotype HUM-12 through blotter method followed by (3.33%) in genotype HUM-4 through blotter method. Some treatment like *viz.* Vitavax, Neem, Garlic and Ginger were found to reduce the incidence (2.26, 4.80, 7.00 and 8.23%) in genotype HUM-12 through blotter method and low occurrences (6.64, 10.9, 11.0 and 13.9%) in genotype HUM-4 through Agar plate methods against *Aspergillus niger*. Among all the treatment against *Penicillium spp*, Corbendazim showed least incidence (0.67 and 1.18%) in genotype HUM-12 and HUM-4 through Blotter method and Benomyle showed the least incidence (1.58 and 1.67%) in genotype HUM-12 and HUM-4 through blotter paper methods. *Alternaria alternata* was found to be controlled most effectively when seed is treated with Vitavax and Corbendazim. It showed (0.67 and 1.00%) occurrences in genotype HUM-12 through blotter paper method. *Fusarium spp* was found to be controlled most effectively when seed is treated with Benomyle; it showed (0.50%) occurrences in genotype HUM-12 through Agar plate method. Benomyle and Vitavax were found to be most effective against *Rhizopus spp;* it reduced the (1.00 and 1.19%) occurrences in genotype HUM-4 through blotter methods. Neem, Garlic and *T. harzianum* were found to be most effective against *A. alternata.* It showed the least incidence (1.56, 2.00 and 3.00%).

Testing of different treatment on seed borne fungi on mungbean seed at the 180 days period of storage

Table 2 reveals that an increase in the incidence of seed borne fungi during storage and the efficacy of different treatments were found to be decreased against seed borne fungi of Mungbean seed. Present result showed that, Benomyle was found to be most effective against *Aspergillus spp*. it showed least incidence (6.98 and 7.45%) in genotype HUM-12 and HUM-4 through blotter method and Corbendazim reduced the maximum occurrences (8.85 and 9.98%) in genotype HUM-12 and HUM-4 through blotter method. Some treatment like *viz.* Vitavax, Neem, Garlic and Ginger were found to reduced

Table 1. Testing of different treatment on occurrences of seed borne fungi on fresh seeds.

Treatment	Genotype																							
	HUM-4												HUM-12											
	Agar plate method						Blotter plate method						Agar plate method						Blotter plate method					
	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th
Aspergillus spp	5.09	4.63	6.64	10.9	11.0	13.9	3.33	2.90	4.32	7.67	9.10	11.3	4.00	3.51	5.54	3.90	9.78	12.5	1.56	1.00	2.26	4.80	7.00	8.23
Penicillium spp	2.30	2.97	3.89	4.08	4.88	8.00	1.18	1.67	2.00	3.35	3.78	7.67	1.98	2.00	3.17	4.60	4.80	8.98	0.67	1.58	1.88	2.00	2.67	5.31
Alternaria alternata	2.47	2.00	1.35	3.80	3.90	5.89	1.33	1.56	0.94	2.00	2.56	3.90	1.80	1.98	1.20	2.20	3.00	4.32	1.00	1.28	0.67	1.56	2.00	3.00
Fusarium spp	1.34	1.32	1.21	3.00	3.21	5.32	3.89	2.09	2.00	4.98	5.06	7.89	1.00	0.50	1.00	1.56	2.67	4.21	2.00	1.08	1.55	3.52	3.98	6.62
Rhizopus spp	2.00	1.67	1.87	2.56	3.00	4.67	1.67	1.00	1.19	2.00	2.86	3.33	3.00	2.98	2.78	3.33	4.00	5.16	2.67	1.80	1.98	3.00	3.85	5.00
C.D. at 1%	1.58	0.56	2.00	1.73	0.75	1.69	2.00	2.33	1.50	1.21	0.50	0.44	1.32	2.00	2.74	0.98	2.58	1.83	1.55	2.79	1.84	2.50	1.75	1.55

Keys: Co = Corbendazim, Be = Benomyle, Vi = Vitavax, Ne = Neem, Ga = Garlic and Th = *Trichderma harzianum*.

Table 2. Testing of different treatment on occurrences of seed borne fungi on 180 days period of storage.

Treatment	Genotype																							
	HUM-4												HUM-12											
	Agar plate method						Blotter plate method						Agar plate method						Blotter plate method					
	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th
Aspergillus sp	9.19	12.8	13.6	16.9	18.0	22.6	9.98	7.45	10.6	13.9	14.6	18.8	10.8	8.98	11.8	14.8	16.9	20.8	8.85	6.98	8.90	11.8	12.8	16.6
Penicillium sp	3.70	4.15	4.96	5.58	7.83	11.8	2.31	3.00	3.36	4.56	6.67	9.84	3.24	3.98	4.56	5.00	7.09	10.5	2.00	2.56	3.08	3.27	6.00	8.84
Alternaria alternata	4.46	3.50	4.16	4.98	5.38	6.98	2.98	3.00	3.23	3.34	4.67	5.00	4.32	3.00	3.81	4.15	5.00	6.32	2.43	2.46	2.40	3.00	3.38	4.69
Fusarium sp	3.08	2.45	2.66	4.91	5.10	9.98	5.10	3.61	3.95	6.93	8.83	11.5	2.08	2.00	2.56	3.38	4.00	7.98	4.81	2.86	3.98	5.11	6.83	10.8
Rhizopus spp	3.32	3.56	3.32	3.89	4.56	6.67	3.80	2.56	2.50	3.78	3.82	5.50	5.85	5.00	4.56	5.00	6.67	7.00	4.00	4.56	4.18	3.50	4.00	7.60
CD (%)	1.70	0.82	1.98	1.70	0.73	1.65	2.34	1.03	2.20	0.82	1.00	0.34	1.02	0.34	1.74	0.92	1.58	0.83	1.50	0.79	0.84	2.00	0.75	1.50

Keys: Co = Corbendazim, Be = Benomyle, Vi = Vitavax, Ne = Neem, Ga = Garlic and Th = *Trichderma harzianum*.

the incidence (8.90, 11.8, 12.8 and 16.6%) in genotype HUM-12 through blotter method and lowest occurrences (13.6, 16.9, 18.0 and 22.6%) in genotype HUM-4 through Agar plate methods against *Aspergillus niger*. Among all treatment against *Penicillium spp*, Corbendazim showed least incidence (2.00 and 2.31%) in genotype HUM-12 and HUM-4 through Blotter method. *Alternaria alternata* was found to be controlled most effectively when seed is treated with Vitavax and Corbendazim, it showed (2.40 and 2.43%) occurrences in genotype HUM-12 through blotter paper method. *Fusarium spp* was found to be controlled most effectively when seeds were treated with Benomyle and Corbendazim it showed (2.00 and 2.06%) occurrences in genotype HUM-12 through Agar plate method. Benomyle and Vitavax were found to be most effective against *Rhizopus spp* it reduces the (2.56 and 2.50%) occurrences in genotype HUM-4 through blotter methods. Neem, Garlic and *T. harzianum* was found to be most effective against *A. alternata* it showed the least incidence (3.00, 3.38 and 4.69%).

Testing of different treatment on seed borne fungi on mungbean seed at 360 days period of storage

Table 3 shows that due to an increase in storage period, some great amount of seed borne fungi were found in substantial number and efficacy of

Table 3. Testing of different treatment on occurrences of seed borne fungi on 360 days period of storage.

Treatment	Genotype																							
	HUM-4												HUM-12											
	Agar plate method						Blotter plate method						Agar plate method						Blotter plate method					
	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th	Co	Be	Vi	Ne	Ga	Th
Aspergillus spp	12.6	14.9	16.9	18.8	20.8	24.9	10.0	10.6	12.9	15.8	16.9	20.9	10.4	12.8	14.4	17.7	17.9	22.4	9.98	9.95	10.7	13.3	15.5	18.9
Penicillium spp	4.59	5.00	6.79	8.56	10.6	13.9	3.56	3.78	4.00	6.78	8.00	11.7	4.23	4.35	4.78	8.00	9.98	12.5	2.98	3.33	3.09	5.78	7.80	9.80
Alternaria alternata	6.80	5.00	4.98	5.32	6.98	9.98	4.78	3.38	3.20	4.32	6.00	8.00	5.80	4.67	4.19	5.30	6.17	8.56	3.00	3.56	2.98	4.30	5.56	7.98
Fusarium spp	5.50	3.56	2.00	3.00	6.35	8.00	7.15	4.80	2.78	4.09	7.76	10.7	4.00	2.98	1.53	3.86	5.00	5.80	6.05	4.00	3.60	3.33	6.56	8.90
Rhizopus spp	4.89	2.55	4.51	7.45	8.43	9.00	4.00	2.26	3.43	4.09	5.13	6.00	7.00	4.42	6.98	3.81	3.93	7.00	6.56	3.00	5.51	2.18	3.94	6.67
CD (%)	1.86	1.21	2.50	1.98	0.56	1.68	3.00	1.55	2.56	0.85	1.42	0.50	1.27	0.31	1.70	0.82	1.60	0.85	1.51	0.80	0.87	2.13	0.85	1.51

Keys: Co = Corbendazim, Be = Benomyle, Vi = Vitavax, Ne = Neem, Ga = Garlic and Th = *Trichderma harzianum*.

different treatment *viz*., Benomyle, Corbendazim, Vitavax, *T. harzianum,* Neem and Garlic decreased against seed borne fungi of Mungbean seed. Benomyle showed least incidence (9.95 and 10.6%) in genotype HUM-12 and HUM-4 through blotter method, Corbendazim reduced the incidence (9.98%) in genotype HUM-12 through blotter method followed by (10.00%) in genotype HUM-4 through blotter method and some treatment like Vitavax, Neem, Garlic and Ginger reduced the incidence (10.7, 13.3, 15.5 and 18.9%) in genotype HUM-12 through blotter method against *Aspergillus spp.* Among all treatment against *Penicillium spp*, Corbendazim showed least incidence (2.98%) in genotype HUM-12 through Blotter method and Benomyle (3.33%) in genotype HUM-12 through blotter method. *A. alternata* was found to be controlled most effectively when seed is treated with Vitavax and Corbendazim.

It showed (2.98 and 3.00%) occurrences in genotype HUM-12 through blotter paper method. *Fusarium spp* was found to be controlled most effectively when seed is treated with Benomyle, it showed (2.98%) occurrences in genotype HUM-12 through Agar plate method. Benomyle was found to be most effective against *Rhizopus spp* as it reduces the (2.26%) occurrences in genotype HUM-12 through blotter methods. Neem, Garlic and *T. harzianum* were most effective against *A. alternata* as it showed the least incidence (4.30, 5.56 and 7.98%).

DISCUSSION

The obtained results showed that all treatment measures significantly, reduced the occurrences of seed borne fungi. Singh et al. (2002) has made a comparative *in vitro* study with some fungicides like Captan, Dithane M-45, Vitavax, and Bavistin for their efficacy in controlling the occurrence of seed borne disease of mungbean and found that all fungicide significantly reduced the occurrences of seed borne fungi. Vitavax, Thiram and Mancozeb were fungicides that performed better in reducing incidence of almost seedborne fungi (Sisterna and Ronco, 1994; Rahman et al., 2000; Continho et al., 2000; Parisi et al., 2001).

Plant extracts have played a significant role in the inhibition of seedborne pathogens such as *Fusarium oxysporum* and in the improvement of seed quality and emergence of seed embryo (Nwachukwu and Umechuruba, 2001). Reports of De and Chaudhary (1999) are also in confirmation with the present findings, who observed the minimization of wilt disease due to Bavistin, Mancozeb M-45 and Vitavax. Garlic extract was also found effective, in controlling seedborne pathogenic fungi such as *A. tenuis, B. sorokiniana, C. lunata* and *Fusarium spp* in wheat by Hossain et al. (1993). Different concentrations of fungicides against various pathogens Dithane M-45 and Bavistin were reported to be effective in reducing the incidence of seed-borne infection of maize seeds (Kumar and Agarwal, 1998). Raza et al. (1993) reported that seed treatment with Benomyle inhibited the growth and sporulation of *F. moniliforme in vitro,* while it enhanced the germination of seeds and reduced fungal infection effectively. Ouf (1993) also controlled seed–borne; *Aspergillus niger, A flavus, penicillium spp* and *Fusarium spp* when treated with the chemical. Narmada and Kang (1992) reported that laboratory evaluation of seed treatment of rice with Carbendazim controlled seed-rot, and significantly decreased seedling mortality.

Conclusion

The seed-borne disease infection can be effectively reduced if the seeds are treated before sowing as this is necessary for direct disease control. Work on Vitavax-200 has been done to control seed-borne pathogens of mungbean seeds by seed treatment which is in agreement with Jain and Kahare (1972), Shanmugan and Govindaswamy (1973), Rodriguez (1984), Singh and Singh (1986), Mortuza and Bhuiya (1988). Efficacy of Neem was also observed by Bhutta et al. (1999) against five seed borne fungi *viz*., *A. alternata*, *Aspergillus niger*, *Fusarium solani*, *Macrophomina phaseolina* and *Stemphylium helianthi*. Bhutta et al. (2001) also reported the effectiveness of seed diffusates of neem in controlling several other fungi as *A. alternata* and *Aspergillus niger* and there was a significant increase in seed germination after elimination of fungi. Garlic tablet had better performance in controlling seed-borne infection of *A. tenuis* in Sherpur sample (94.7%) and *C. Lunata*. Zaman et al. (1997) reported that the efficacy of garlic, neem, ginger and onion extracts on seed borne fungi of mustard declined with increase dilution. Rathod (2004) reported that *T. harzianum* showed higher inhibition of mycelium growth of the *A. Alternata.*

Conflict of Interest

The authors have not declared any conflict of interest.

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