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Efficacy of Systemic Fungicides on the Incidence of *Fusarium oxysporum*, Seed Germination and Seedling Vigour Index of Mungbean

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ABSTRACT: Mungbean is an important summer pulse, which has a demand in the domestic market as well as good potential for trade and export. The production of mungbean has adversely affected by many fungi, which infest seeds. The present study was taken up on the effect of systemic fungicides on seeds of mungbean naturally infected by seed mycoflora, and artificially inoculated by *Fusarium oxysporum*. Seeds of mungbean from two different storage sources were tested for seed-borne fungi. Paper towel method, standard blotter paper method and agar plate method were used to isolate seed-borne fungi, among which standard blotter paper method was found to be the best. Seeds from traditional storage were found to be more infested with seed-borne fungi in comparison to seeds in commercial packs from the market. Among isolated fungi species, four dominant species such as *Fusarium oxysporum, Curvularia lunata, Aspergillus flavus*, *Aspergillus niger* and Among them *Fusarium oxysporum* was taken for treatment. Out of seven tested systemic fungicides, Carbendazim (50% WP) @ 1.5 g/kg of seed was found to be most effective, with the lowest incidence of *F. oxysporum* (5.00%) and maximum reduction in the incidence (92.30%) with maximum seed germination (90.00%) and the highest increase in seed germination over control (39.08%) and highest with maximum seedling vigour index (1651) and the highest increase in SVI over control (36.64%). In naturally infected seeds, the seed treatment with fungicides Carbendazim (50% WP) @ 1.5 g/kg was found most effective with significantly highest seed germination (87.48%) and having highest seedling vigour index (1612) and its maximum increase in SVI over control (31.51%).

Keywords: Mungbean, Mycoflora, *Fusarium oxysporum, Curvularia lunata, Aspergillus flavus*, *Aspergillus niger* and Carbendazim

INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilczek) is the third-best-known pulse crop among the thirteen food legumes in India after chickpea and pigeon pea. This crop is also popularly known as green gram or golden gram. It is a short-duration legume crop belonging to the family leguminosae [1, 2]. In the arid and semi-arid tropics mungbean which is one of the most important pulse crops [3]. Apart from this, pulses possess several other qualities, such as being rich in protein, improving soil fertility and physical structure, fitting into mixed or intercropping systems, crop rotation and providing green pods for vegetables and nutrition fodder for cattle. It can also be grown as a green manure crop [4]. It can fix atmospheric nitrogen through a symbiotic relationship with soil bacteria and improve the fertility of the soil. So, it contains 24 per cent highly nutritious sources of protein, 1.3 per cent fats, 56.6 per cent carbohydrates from the edible part of the seed, and 3 per cent dietary fibers.

The seed mycoflora associated externally or internally with the testa and cotyledon of seeds infected in the form of mycelium, pycnidium and conidia or spores may cause seedling blight, root rot, stem rot, leaf rot and pod rot caused by *Macrophomina* sp., *Curvularia* sp. and *Alternaria* sp., which are some major fungal diseases of mungbean and result in low germination. Some fungal seed-borne pathogens have the ability to kill the seedling or plant and substantially reduce the productive capacity [5]. For determining the seeds quality and longevity the important roles play by mycoflora of seed.

Seed borne fungal pathogens associated with mungbean reported *viz. Macrophomina phaseolina*, *Aspergillus flavus*, *Colletotrichum* sp., *Drechslera* sp. and *Myrothecium* sp. These fungi had a negative effect on the germination and vigour of seeds [6]. Seed borne diseases are regarded as major constraints in the mungbean production. Thus, due to seed borne diseases, there is a reduction in production, resulting in a failure to

fulfill the demand for mungbean seeds. Among them, diseases play an important role [7, 8]. Neergaard [9] stated that leguminous crops carry seed borne diseases so commonly. It has been found to affect the growth and productivity of crop plants.

All fungi present on seeds of mungbean can be controlled by different fungicide treatments. Seed treatment with fungicides has been reported effective controls many seed borne pathogen; thereby act as improving seed quality, seed germination and seed vigour. The tested efficacy of Thiram, Bavistin, Difolaton, Dithane M-45, Cereson and reported Bavistin was the most effective fungicide for better emergence, less seedling mortality and better yield in mungbean [10]. Fungicide inhibits the growth of mycoflora on the seeds and prevents damage of seeds. Seed treatment with fungicides has been reportable effective control of several seed borne pathogens, thereby act as rising seed quality, seed germination and seedling vigour.

MATERIAL AND METHODS

Standard analytical grade chemicals, reagents, and fungicides used in the experimentation were obtained from the Department of Plant Pathology, College of Agriculture, VNMKV, Parbhani. The efficacy of eight fungicides on the incidence of *Fusarium oxysporum* (Artificially inoculated to seeds) and their effects on seed germination and seedling vigour index of mungbean, was studied by adopting the standard blotter method as described by ISTA rules. Hence the following experiment was conducted in three replications with eight treatments in CRD design.

Standard blotter method

Seeds of each sample were placed on three layers of moistened blotters with sterilized water in sterilized Petri dishes (9 cm diameter). Ten seeds were placed in each Petri plate so that eight seeds formed the outer circle and two seeds in the inner part. The Petri dishes were incubated at 20 ± 2°C under alternating cycles of 12 hrs. near ultraviolet (NUV) and 12 hrs. darkness for seven days. The root and shoot length (cm) of randomly selected 10 normal seedlings from each towel paper were measured with the help of scale and seedling vigour index was computed by using formula given by [11].

Per cent germination, associated fungi and per cent frequency of various fungal species were calculated as described earlier under

$$\text{Per cent seed germination} = \frac{\text{No. of seeds germinated}}{\text{Total no. of seed plated}} \times 100$$

$$\text{Per cent frequency of mycoflora} = \frac{\text{No. of seeds containing a particular fungus}}{\text{Total no. of seeds examined}} \times 100$$

$$\text{Seedling vigour index} = [\text{Root length (cm)} + \text{Shoot length (cm)}] \times \text{Germination (\%)}$$

Treatment details

Tr. No.	Name of Fungicides	Dose (per kg of seed)
T_1	Metalaxyl – M 31.8%	2.00 ml
T_2	Carboxin 75%WP	2.50 ml
T_3	Tebuconazole 25.9% EC	1.00 g
T_4	Propiconazole 23%EC	1.00 g
T_5	Difenoconazole 25% EC	0.50 g
T_6	Thiophanate methyl 70% WP	1.00 g
T_7	Carbendazim 50% WP	1.50g
T_8	Control	-

RESULTS AND DISCUSSION

The results of the effect of systemic fungicides on incidence, seed germination and seedling vigour index of artificially inoculated to mungbean seeds with *Fusarium oxysporum* germination were presented in Table. All treatments were statistically significant over control in respect of incidence of seed borne *Fusarium oxysporum*, seed germination and seedling vigour index.

Effect on incidence of mycoflora

Seeds of mungbean treated with Carbendazim 50% WP @ 1.5 g/kg of seed was found to be more effective, with the lowest incidence of *Fusarium oxysporum* (5.00%) and maximum reduction in the incidence (92.30%) when compared with control, followed by Tebuconazole 25.9% EC @ 1 g/kg of seed (7.00 and 89.23%), Propiconazole 23% EC @ 1 g/kg of seed (9.00 and 86.15%), Difenconazole 25% EC @ 0.5 g/kg of seed (10.00 and 84.61%), Metalaxly - M 31.8% @ 2 ml/kg of seed (11.00 and 83.07%), Carboxin 75% WP @ 2.5 ml/kg of seed (12.00 and 81.53%), Thiophanate methyle 70% WP @ 1 g/kg of seed (13.00 and 80.00%), respectively as against 65.00 per cent incidence of mycoflora in control.

Effect on seed germination

Seeds of mungbean treated with Carbendazim 50% WP @ 1.5 g/kg of seed was found to be more effective of tested fungicides with maximum (90.00%) seed germination and the highest increase in seed germination over control (39.08%) followed by Tebuconazole 25.9%

Table 1. Efficacy of systemic fungicides on the incidence of *Fusarium oxysporum*, seed germination and seedling vigour index of mungbean

Sr. No.	Name of fungicides	Dose (per kg of seed)	Incidence of mycoflora (%)	Reduction in mycoflora over control (%)	Seed germination (%)	Increase in seed germination over control (%)	Seedling Vigour Index (%)	Increase in SVI over control (%)
T_1	Metalaxly- M 31.8%	2.00 ml	11.00 (19.33)	83.07	81.33 (64.38)	34.83	1306	19.90
T_2	Carboxin75%WP	2.50ml	12.00 (20.24)	81.53	81.00 (64.13)	34.56	1201	12.90
T_3	Tebuconazole 25.9%EC	1.00g	07.00 (15.31)	89.23	85.00 (67.19)	37.64	1531	31.74
T_4	Propiconazole 23%EC	1.00g	09.00 (17.43)	86.15	83.74 (66.20)	36.70	1409	25.76
T_5	Difenconazole 25%EC	0.50g	10.00 (18.42)	84.61	82.13 (64.97)	35.46	1357	22.91
T_6	Thiophanate methyle 70%WP	1.00g	13.00 (21.10)	80.00	80.96 (64.10)	34.53	1105	11.76
T_7	Carbendazim 50%WP	1.50g	05.00 (12.87)	92.30	90.00 (71.54)	39.08	1651	36.64
T_8	Control		65.00 (53.70)		53.00 (46.70)		1046	
SE m ±			0.55		0.44		18.20	
CD at 1%			1.67		1.34		55.05	

*Arcsine transformed values

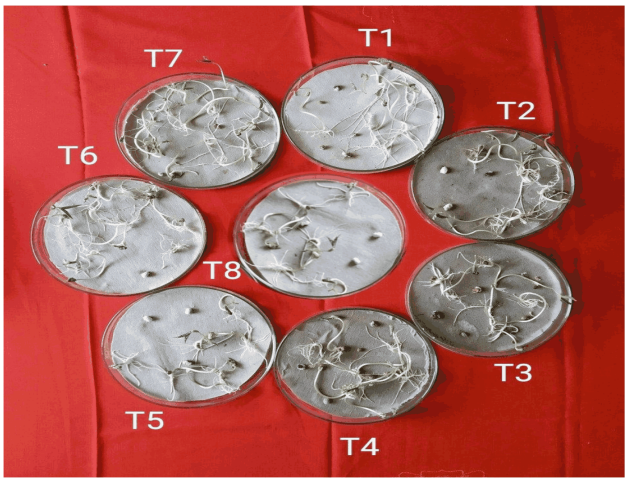

Plate 1. Efficacy of systemic fungicides on the incidence of *Fusarium oxysporum,* seed germination and seedling vigour index of mungbean.

T1=Metalaxly- M 31.8%
T2=Carboxin75%WP 2
T3=Tebuconazole 25.9%EC
T4=Propiconazole 23%EC
T5=Difenconazole 25%EC
T6=Thiophanate methyle 70%WP
T7=Carbendazim 50%WP
T8=Control

EC @ 1 g/kg of seed (85.00 and 37.64%), Propiconazole 23% EC @ 1 g/kg of seed (83.74 and 36.70%), Difenconazole 25% EC @ 0.5 g/kg of seed (82.13 and 35.46%), Metalaxly - M 31.8% @ 2 ml/kg of seed (81.33 and 34.83%), Carboxin 75% WP @ 2.5 ml/kg of seed (81.00 and 34.56%), Thiophanate methyle 70% WP @ 1 g/kg of seed (80.96 and 34.53%), respectively as against 53.00 per cent germination in control.

Effect on Seedling Vigour Index

Seeds of mungbean treated with carbendazim 50% WP @ 1.5 g/kg of seed was found to be more effective of tested fungicides with maximum seedling vigour index (1651) and highest increase in SVI over control (36.64%) followed by Tebuconazole 25.9% EC @ 1 g/kg of seed (1531 and 31.74%), Propiconazole 23% EC @ 1 g/kg of seed (1409 and 25.76%), Difenconazole 25% EC @ 0.5 g/kg of seed (1357 and 22.91%), Metalaxly - M 31.8% @ 2 ml/kg of seed (1306 and 19.90%), Carboxin 75% WP @ 2.5 ml/kg of seed (1201 and 12.90%), Thiophanate methyle 70% WP @ 1 g/kg of seed (1105 and 11.76%), respectively as compare to 1046 SVI in control.

Above results clearly showed that while all fungicides taken in the study significantly reduced mycoflora (*Fusarium oxysporum*) associated with seeds there by increase root and shoot length, seed germination and ultimately seedling vigour index. Carbendazim was found most effective. These results are more or less similar to the earlier findings [6, 12-18] and supports the findings of the present study.

REFERENCES

1. WILCZEK, R. (1954). *Vigna radiata*. In: Fiore du Congo Beige. 6:343-393.
2. VERDCOURT, B. (1970). Studies in the Leguminosae-Papilionoideae for the flora of tropical East Africa. IV. Kew Bulletin 24: 507-569.
3. CHEN, C.Y., TSOU, S.C.S. & WANG, H.H. (1987). Utilization patterns of mungbean in the Chienese diet. In mungbean-Proceedings of the Second International Symposium, Bangkok, Thailand. *AVRDC tropical vegetable information service*.
4. KUMARI, R., SHEKHAWAT, K.S., GUPTA, R. & KHOKHAR, M.K. (2012). Integrated management against root-rot of mungbean [*Vigna radiata* (L.) Wilczek] incited by *Macrophomina phaseolina. Journal of Plant Pathology and Microbiology*. 3:5.
5. SHAMSUR, R., SUCHADA, V. & SOMBAT, S., (1999). Detection of seed borne fungi in mungbean and black gram seeds. *Sustainable technology development in crop production.* 1-3.
6. SARITA, BUTS, A.K. & SINGH, R. (2014). Seed borne mycoflora of mungbean (*Phaseolus aureus* Roxb.) and its control by fungicides. *Advances in Applied Science Research*, 5(6):8-10.
7. Nene, Y.L., (1986). Opportunities for research on diseases of pulse crops. *Indian Phytopathology* 39 (3):333-342.
8. PAL, M., (1996). Pulse disease scenario. *Indian Phytopathology* 49 (2):129-131.
9. NEERGAARD, (1977). *Seed Pathology*. The Macmillan Press Ltd., London. pp. 1187.
10. KULSHRESHTHA, D.O. (1988). Seed borne infection of *Fusariella hughesii* in mung. *Current Science*; 37(7):384-386.
11. ABDUL, B. & ANDERSON, J. D. (1973). Vigour determination in soybean seeds by multiple criteria. *Journal of Crop Science*.13(9), 630-633.
12. DHUTRAJ, D.N. & GOKHALE, D.N. (2007). Efficacy of fungicides on longevity of mungbean seeds. *Journal Plant Diseases Science.* 2(1):63-64.
13. MARGARET, E., NEERAJA, P.V. & RAJESWARI, B., (2013). Screening of seed borne mycoflora of *Cicer arietinum* L. *International Journal of Current Microbiology and Applied Sciences.* 2(8):124-130.
14. PATRA, S. & BISWAS, M.K. (2016). Efficacy of fungicides for the management of chickpea wilt disease caused by *Fusarium oxysporum* f. sp. *ciceri. International Journal of Advanced Research*. 4, 1457-1461.
15. DOLAS, R.M., GAWADE, S.B. & KASTURE, M.C. (2018a). Studies of seed borne mycoflora of mungbean and its effect on seed germination and seedling vigour index. *International Journal of Chemical Studies*. 6(5): 802-806.
16. NIWAS, R., CHAND, R. & AZAD, C.S. (2020). *In vitro* efficacy of fungicides and bio agents against *Fusarium oxysporium* f. sp. *cubense. Annals of Plant Protection Sciences*. 28 (1): 47-51.
17. RAO, V.G., DHUTRAJ, D.N., NAVGIRE, K.D., AMBADKAR, C.V. & APET, K.T. (2020). *In vitro* efficacy of fungicides against *Fusarium oxysporum.* sp. *melongenae* causing eggplant wilt. *Chemical Science Review and Letters*. 9 (36):1074-1081.
18. SAHANE, P.A., CHAVAN, R.A., BRAHMANKAR, R.G., KOLHE, D.B. & UDAR, V.B. (2021). *In vitro* efficacy of fungicides against *Fusarium oxysporum* f. sp. *ciceri*. *Journal of Pharmacognosy and Phytochemistry.*10(1):978-984.