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Bio-Efficacy of Bio-Agents against Pre-Emergence and Post-Emergence Mortality of Brinjal (*Solanum melongena* L.) under Agro-Climatic Condition of Tripura

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ABSTRACT

Brinjal or eggplant (*Solanum melongena* L.) under agro-climatic condition of Tripura is attacked by various diseases of fungal as well as bacterial origin. The present study revealed that pre-emergence and post-emergence mortality of brinjal may be significantly controlled by seed treatment of bio-agents namely, *Trichoderma viride*, *Pseudomonas fluorescens* and *Bacillus subtilis* followed by their soil application. Seed treatment with Carbendazim 50% also significantly reduces pre-emergence and post-emergence mortality of brinjal.

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INTRODUCTION

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics. The name brinjal is popular in Indian subcontinent and is derived from Arabic and Sanskrit; whereas, the name eggplant has been derived from the shape of the fruit of some varieties, which are white and resemble in shape to chicken eggs. Brinjal belongs to the family *Solanaceae*. The family contains 75 genera and over 2000 species, out of which, about 150-200 are tuber bearing. The majority of species (about 1800) are non-tuber bearing. Cytological studies have indicated that basic chromosomal number (2n=24) is same in almost all the varieties and species. Brinjal is known to have ayurvedic medicinal properties and is good for diabetic patients. It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993).

Solanum melongena L. is a crucial vegetable crop in Tripura, faces significant threats from various fungal and bacterial diseases. This study explores the efficacy of bio-agents like *Trichoderma viride*, *Pseudomonas fluorescens* and *Bacillus subtilis* in controlling these diseases, providing an eco-friendly alternative to chemical treatments.

Important fungal and bacterial diseases affecting the brinjal crop in Tripura are *Alternaria* blight (*Alternaria* spp.), Late blight (*Phythophthora* spp.), Fusarium wilt (*Fusarium solani*), Phomopsis wilt (*Phomopsis vexan*), Damping off (*Pythium* spp., *Phytophthora* spp., *Rhizoctonia* spp., *Sclerotium* spp., *Sclerotinia* spp.), Cercospora leaf spot (*Cercospora egenula*), Bacterial wilt (*Pseudomonas solanacearum*) and Little leaf of brinjal (Phytoplasma).

A variety of fungi like *Pythium* spp., *Phytophthora* spp., *Rhizoctonia* spp., *Sclerotium* spp., and *Sclerotinia* spp. are found to be associated with the cause of pre-emergence and post emergence mortality in brinjal causing different diseases like seed rot, root rot, collar rot, stem rot, *etc*. Among various management practices, biological control of plant pathogens is considered as a potential control strategy in recent years because chemical control results in accumulation of harmful chemical residues and may lead to serious ecological problems thus, the present case of study was undertaken.

MATERIALS AND METHODS

Two multi-location field trials were designed to test germination and seedling mortality *in vivo* condition. The experiment was designed in Randomized Block Design (RBD) with five (5) treatments replicated to four (4) times. The treatments include seed treatment along with soil application of *Trichoderma viride*, *Pseudomonas fluorescence*, *Bacillus subtilis*, Carbendazim and untreated or control plots. Different treatments under the trial were T_1 = Seed treatment with *Trichoderma viride* (10 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *T. viridae* mixed with 50 kg of dry well rotten farm yard manure ha^{-1}), T_2 = Seed treatment with *Pseudomonas fluorescens* (4 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *P. fluorescens* mixed with 50 kg of sand ha^{-1}), T_3 = Seed treatment with *Bacillus subtilis* (@ 5 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *B. subtilis* mixed with 50 kg of sand ha^{-1}), T_4 = Seed treatment with Carbendazim 50% (2 g kg^{-1} of seeds) and T_5 = untreated or control plots, where no management practices were undertaken. The final count for germination was taken at 10 days after sowing. The seedlings were allowed to grow for two (2) weeks. The seeds failed to emerge were taken out of soil to ascertain the percent incidence of seed rot and pre-emergence seedling mortality. The seedlings showing symptom of collar rot, rotting and black discoloration of roots and foliage were also noted.

RESULTS AND DISCUSSION

Fungi belonging to the genus *Trichoderma* and bacteria such as *Pseudomonas* and *Bacillus* are the most promising bio-control agent against a range of plant pathogens under a variety of environmental conditions. The results of the present trial revealed that treatments where bio-control agents were used namely, T_1 = Seed treatment with *Trichoderma viride* (10 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *T. viride* mixed with 50 kg of dry well rotten farm yard manure ha^{-1}), T_2 = Seed treatment with *Pseudomonas fluorescens* (4 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *P. fluorescens* mixed with 50 kg of sand ha^{-1}) and T_4 = Seed treatment with Carbendazim 50% (2 g kg^{-1} of seeds) were found to be significantly effective against pre- and post-emergence mortality of brinjal (Table 1). The treatment namely T_3 = Seed treatment with *Bacillus subtilis* (@ 5 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *B. subtilis* mixed with 50 kg of sand ha^{-1}) was also found to be significantly superior against untreated or control plots (Table 1).

Efficacy of *Trichoderma* spp. against soil borne pathogens was supported by work conducted by Adan *et al.* (2015), who reported that *Trichoderma* formulation based on black gram bran proved the best among eight substrate combinations in reducing the damping off, pre-emergence and post emergence death of seedlings and tip over of eggplant seedlings.

Ramezani (2008) tested four fungal bioagents *viz*.,

Trichoderma hamatum, *T. harzianum*, *T. polysporum* and *T. viride in vitro* condition against the eggplant root-rot pathogen caused by *Macrophomina phaseolina*. Among the bioagents, *T. harzianum* produced the maximum inhibition zone of 18.20% compared to the minimum of 7.30% by *T. hamatum*. He also revealed that soil application of talc-based formulation of *T. harzianum*, *T. polysporum* and *T. viride* effectively controlled the root- rot of egg-plant under field condition. Mechanism by which antagonistic micro-organisms affect pathogen populations are not always clear but they are generally attributed to direct parasitism, competition with the pathogen for food, direct toxic effects on pathogen, indirect toxic effects on pathogen, *etc*. Bio-agent like *Trichoderma harzianum* parasitizes many pathogens like *Rhizoctonia*, *Sclerotium*, *Pythium*, *Phytophthora* and other fungi like *Fusarium* and *Fomes*. Bacteria of the genera *Bacillus* also parasitizes and inhibits pathogens like *Pythium*, *Phytophthora*, *Sclerotium*, *Gaeumannomyces*, *etc*. (Agrios, 2005).

Table 1: Effect of treatments on weed density at 30 DAS

Sl. No.	Treatments	Average of pre- and post-emergence mortality (%)
1.	T_1 = Seed treatment with *Trichoderma viride* (10 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *T. viridae* mixed with 50 kg of dry well rotten farm yard manure ha^{-1})	22.07
2.	T_2 = Seed treatment with *Pseudomonas fluorescens* (4 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *P. fluorescens* mixed with 50 kg of sand ha^{-1})	26.31
3.	T_3 = Seed treatment with *Bacillus subtilis* (@5 g kg^{-1} of seeds) along with soil application (@ 2.5 kg of *B. subtilis* mixed with 50 kg of sand ha^{-1})	27.82
4.	T_4 = Seed treatment with Carbendazim 50% (2 g kg^{-1} of seeds)	23.25
5.	T_5 = Untreated or Control Plots	34.42
	CD (0.05)	4.28

CONCLUSION

In conclusion, the study underscores the significant role of bio-agents such as *Trichoderma viride*, *Pseudomonas fluorescens* and *Bacillus subtilis* in effectively controlling pre-emergence and post-emergence mortality of brinjal under the agro-climatic conditions of Tripura. The findings highlight that these bio-control agents, when used as seed treatments and in soil applications, provide a sustainable alternative to chemical treatments like Carbendazim 50%. The efficacy of *Trichoderma* spp. and other bio-agents in suppressing soil-borne pathogens is well-supported by previous research, demonstrating their potential to enhance plant health through mechanisms such as direct parasitism, competition and toxin production. This study reinforces the importance of integrating biological control methods into pest management strategies, thereby promoting environmentally friendly and effective agricultural practices for brinjal cultivation. Future work should focus on exploring the synergistic effects of combining multiple bio-agents and optimizing their application methods for enhanced disease control in brinjal cultivation.

Conflict of Interest

The authors declare no conflict of interest.

REFERENCES

Adan, M.J., Baque, M.A., Rahman, M.M., Islam, M.R., Jahan, A., 2015. Formulation of *Trichoderma* based bio-pesticide for controlling damping off pathogen of eggplant seedling. *Universal Journal of Agricultural Research* 3(3), 106-113. DOI: https://doi.org/10.13189/ujar.2015.030305.

Agrios, G.N., 2005. Control of plant diseases. Chapter 9. In: *Plant Pathology*. 5th Edition. (Ed.) Agrios, G.N. Academic Press, Elsevier, London. pp. 293-353. DOI: https://doi.org/10.1016/B978-0-08-047378-9.50015-4.

Ramezani, H., 2008. Biological control of root-rot of eggplant caused by *Macrophomina phaseolina*. *American-Eurasian Journal of Agricultural and Environmental Science* 4(2), 218-220.

Shukla, V., Naik, L.B., 1993. Agro-techniques of solanaceous vegetables. In: *Advances in Horticulture*, Volume 5. Vegetable Crops, Part-1. (Eds.) Chadha, K.L. and Kalloo, G. Malhotra Publishing House, New Delhi. pp. 365-399.

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