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EVALUATION OF FUNGICIDES, BIOAGENT AND PLANT EXTRACTS AGAINST *FUSARIUM OXYSPORUM* F.SP.MELONGENAE CAUSING BRINJAL WILT ON DIFFERENT VARIETIES UNDER GREEN HOUSE CONDITION

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ABSTRACT

Brinjal (*Solanum melongena* L.) is an important vegetable crop in India. This crop is affected by many diseases. Among them wilt disease is one of the most common diseases of brinjal caused by *Fusarium oxysporum*; a soil borne fungus. The present investigation therefore was carried out to evaluate the effects of fungicides, bioagent and plant extracts, against this pathogen. Two fungicides (Bavistin and Mancozeb) one bio-agent (*Trichoderma viride*) and two plant extracts (*Allium sativum* and *Allamanda cathertica*) were tested against the disease in *in vivo* condition. Among the treatments applied in the presents experiments, Bavistin, Mancozeb and *Trichoderma viride* showed 100 percent reduction of wilt disease in all the three varieties; while *Allium sativum* and *Allamanda cathertica* extracts showed (V_1= 81.2, V_2= 69.8, V_3= 76.8)% and (V_1= 62.4,V_2= 39.7,V_3= 53.7) percent reduction respectively over control.

Keywords: Wilt, Brinjal, Fungicides, Bioagent, Plant extracts.

1. INTRODUCTION

Brinjal (*Solanum melongena* L.) belongs to the family solanaceae is one of the most popular vegetables in India. It is commonly called egg plant. In India brinjal is consumed as cooked vegetable in various ways. It has nutritive value in human diet, because it contains about 1.4 g proteins, 4.0 g carbohydrate, 0.3 g fat, 18 mg calcium, 2.0 mg potassium and 0.9 mg iron per 100 g of edible portion. It also provides vitamins A, B and C [1]. Besides having nutritive value, it also possesses medicinal properties. The white type brinjal is said to be good for diabetic patients [2]. The seeds of brinjal are used as a stimulant [3]. Among the different diseases that attack eggplant wilt is one of them caused by *Fusarium oxysporum* has become a major disease causing significant reduction in yield [4]. The wilt of eggplant is characterized by yellowing of foliage drooping of apical shoot to ultimate death of whole plant. This soil inhabiting fungus colonizes the senescing tissues of the diseased plant and may survive in the soil for many years [5]. Indiscriminate use of pesticide has led to serious environmental threat. Hence, the present study was undertaken to evaluate the efficacy of fungicides, bio-agent; and plant extracts against the pathogen to manage the disease.

2. MATERIAL AND METHODS

2.1. Preparation of pot

Earthen pots (30 cm in diameter and 45 cm in height) were washed with sterilized water followed by 70 percent alcohol. Garden soils were collected broken into powdery form and removed root bits and other foreign materials. The soil was mixed with decomposed cow dung and sand in a ratio of 2:1:1 and sieved through 4 mm sieve and sterilized in an autoclaves at 15 lb/inch^2 pressure for one hour for three successive days.

2.2. Inoculation of *Fusarium oxysporum*

Brinjal Seeds (cv. Pusa Kranti, Pusa Purple Oval and Pusa Purple Long) were collected from the central seed godown, Department of Agriculture, Government of Assam, Guwahati. Seeds were surface sterilized by dipping them in 10% sodium hypo chloride separately for 1 min. followed by 70% alcohol for 30 second and finally they were washed several times with sterile distilled water. They were allowed to grow on sterilized sand in earthen flat pots. One month old healthy seedlings were selected to receive treatment with *F. oxysporum* f. sp. *melongenae*. All the seedlings except the control were treated with *F. oxysporum* f.sp *melongenae*. Two hundred ml of sterile 7 days old PDB culture @

$1x10^6$ conidia/ml were taken in an Erlenmeyer's flask, the healthy brinjal seedlings were dipped in the PDB culture and the seedlings were then planted in the earthen pots prepared as described earlier.

2.3. Root-dip method

Healthy brinjal seedlings at six leaf stage were uprooted from sterilized soil; wounded roots were submerged for10 min. in a conidial suspension (10^6conidia/ml), while control plants were dipped in sterile tap water. Seedlings were then transplanted into sterilized pots. Symptoms were observed on the plants after inoculation of 3 weeks and the pathogens were re-isolated. This was carried out following the methods of Biles and Martin [6].To find out the best treatment for the control of *Fusarium* wilts disease of brinjal aused by *Fusaium oxysporum* f. sp. *melongenae*. Sick soils were prepared by inoculating the giant culture of *F. oxysporum* f.sp. *melongenae* to the sterile soils. The pot culture experiments were carried out in a completely randomized block design with seven treatments and with three replications. Each replication was containing six plants.

The seven treatments were as follows:

T_1 = Control, (without *F.oxysporum*)

T_2 = Inoculated control only *F.oxysporum*.

T_3 = Soil treatment + root treatment with Bavistin @ 0.1% + *F. oxysporum*

T_4 = Soil treatment + root treatment with Mancozeb @ 0.2% + *F. oxysporum*

T_5 = Soil treatment + root treatment with *T.viride* @ 10^8 conidia/ml + *F. oxysporum*

T_6 = Soil treatment + root treatment with *Allium sativum* @ 15% + *F.oxysporum*.

T_7 = Soil treatment + root treatment with *Allamanda cathertica* @ 15% + *F.oxysporum*.

Observations were taken on percent disease incidence with following formula:

$$PDI = \frac{\text{No. of infected plants in each treatments}}{\text{Total no.of plants receiving that treatments}} \times 100$$

3. RESULTS AND DISCUSSION

On the basis of good performance showed at in vitro tests two fungicides, one fungal antagonism and two botanical extracts were applied against the wilt incidence of brinjal. The result presented in Table 1 and Fig.1 showed that among the various treatments tested, fungicides have given the good result. Disease was completely absent in Bavistin, Mancozeb and Trichoderma viride in all the three varieties. Among the two botanical extracts applied, Allium sativum extract showed (V1=5,V2=5,V3=5) PDI while the extracts of Allamanda cathertica recorded (V1=10, V2=10, V3=10) incidence (PDI) of wilt disease which were observed significantly better over control. The result indicated that among the treatments applied in the present experiment 100 percent reduction of wilt incidence was observed in Bavistin, Mancozeb and T. viride of all the three varieties. Allium sativum and Allamanda cathertica extracts were observed (V1=81.2, V2=69.8, V3=76.8) and (V1=62.4, V2=39.7, V3= 53.7) percent reduction respectively over control. The result indicated all the treatments were significantly effective ($P \leq 0.05$) against the development of wilt disease in brinjal as compared to the control.

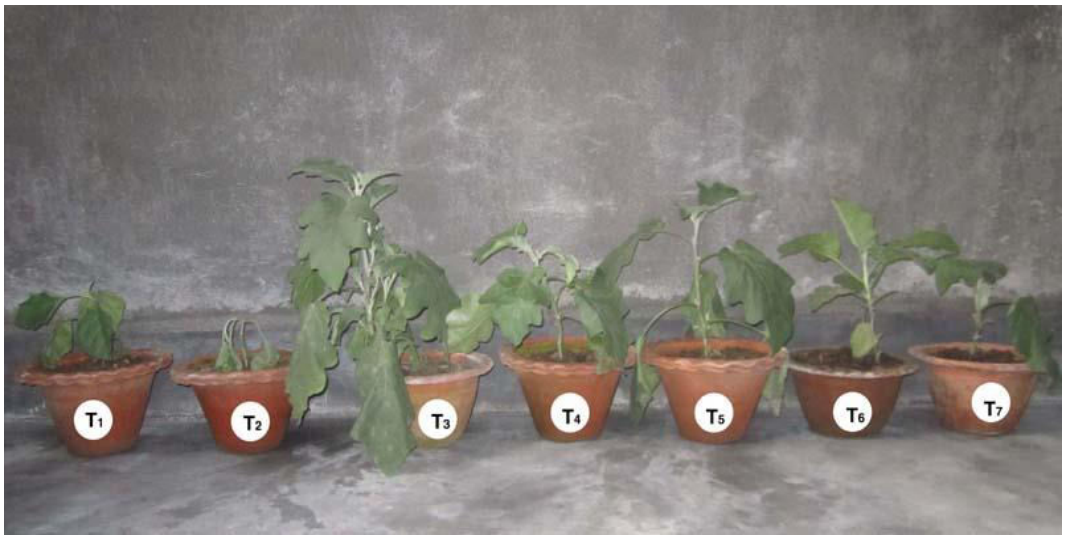
Values within the same column having a common letter (s) do not differ significant ($P \leq 0.05$) by DMRT.

Table 1: Effect of fungicides, *T.viride* and botanicals extracts against *Fusarium* wilt of three varieties of brinjal in pot experiment

Varieties	Treatments	% disease incidence	% disease reduction over control
V_1	T_1 (Control)	26.6^a	000
	T_2 (Inoculated control)	100^b	000
	T_3 (Bavistin)	0^c	100
	T_4 (Mancozeb)	0^c	100
	T_5 (*T.viride*)	0^c	100
	T_6 (*Allium sativum*)	5c	81.2
	T_7(*Allamanda cathertica*)	10c	62.4
V_2	T_1 (Control)	16.6^a	000
	T_2 (Inoculated control)	100^b	000
	T_3 (Bavistin)	0^c	100
	T_4 (Mancozeb)	0^c	100

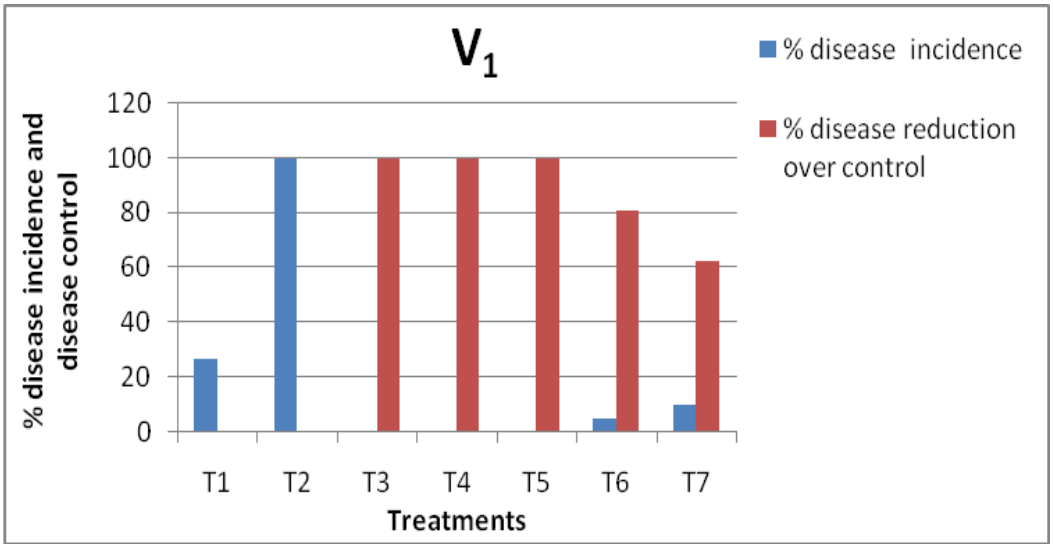
	T_5 (*T.viride*)	0^{c}	100
	T_6 (*Allium sativum*)	$5^{c,d}$	69.8
	T_7(*Allamanda cathertica*)	$10^{a,e}$	39.7
V_3	T_1 (Control)	21.6^{a}	000
	T_2 (Inoculated control)	100^{b}	000
	T_3 (Bavistin)	0^{c}	100
	T_4 (Mancozeb)	0^{c}	100
	T_5 (*T.viride*)	0^{c}	100
	T_6 (*Allium sativum*)	5^{c}	76.8
	T_7(*Allamanda cathertica*)	10^{c}	53.7

V_1 = Pusa Kranti, V_2 = Pusa Purple Oval, V_3 = Pusa Purple Long



T_1 = Control (without pathogen), T_2= Inoculated control (with F.oxysporum), T_3= Carbendazim,T_4= Mancozeb, T_5= T.viride , T_6= Allium sativum, T_7= Allamanda cathertica

Plate 1: Effect of fungicides, *T.viride* and botanical extracts against *Fusarium* wilt on the growth of brinjal in pot culture.



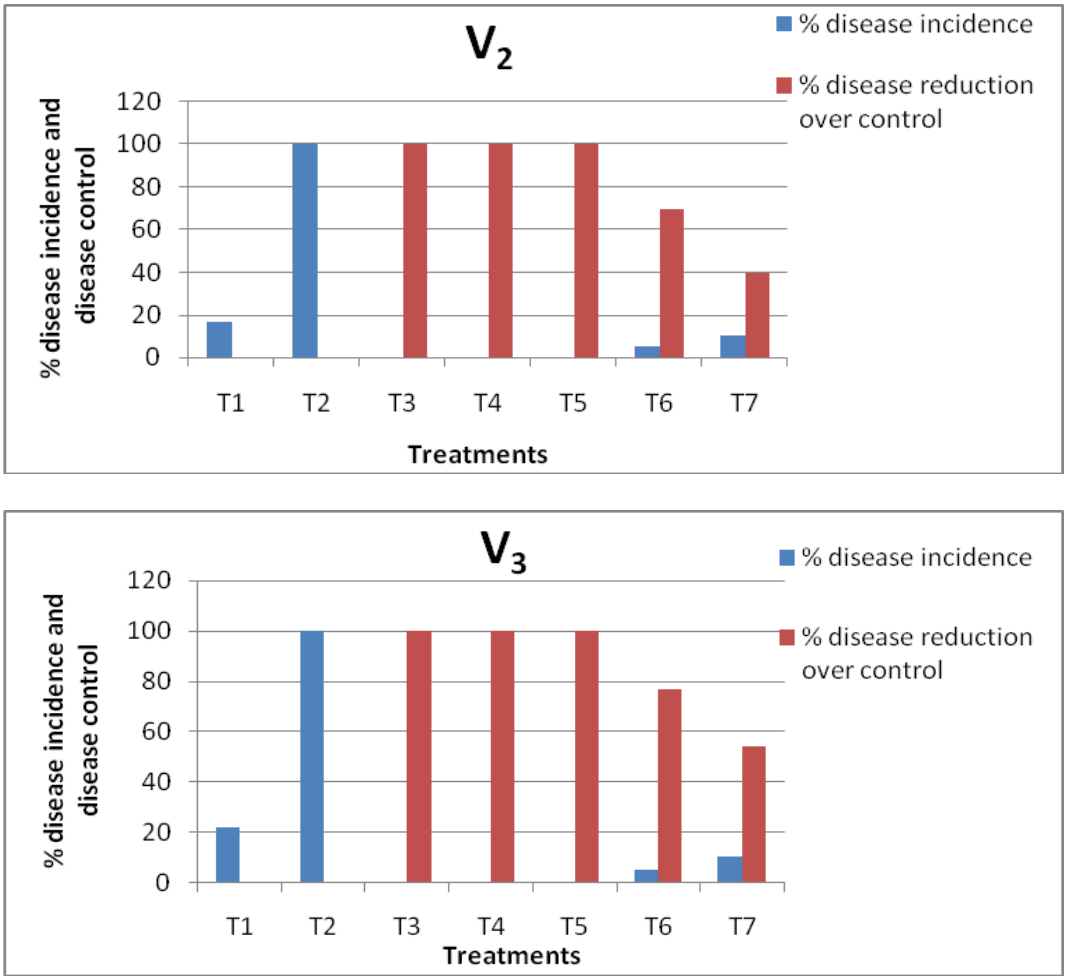


Fig.1: (V_1, V_2 & V_3) Effect of fungicides, *T.viride* and botanicals extracts against *Fusarium* wilt of three varieties of brinjal in pot culture.

The results showed that among the various treatments applied wilt disease was completely absent in Bavistin Mancozeb and *T. viride* in all the three varieties. Among the two botanical extracts, *Allium sativum* extract observed (V_1= 81.2, V_2=69.8, V_3=76.8) percent reduction followed by *Allamanda cathertica* (V_1=62.4, V_2=39.7, V_3=53.7) percent was recorded Table (1).

The results are in confirmity with the observation of Prakash and Ganesan, [7]. Parimala et al., [8], Padma-vathi et al., [9], Sandrou et al., [10] and Kumar and Dubey, [11], in cowpea, blackgram, brinjal and sun-flower respectively. They found maximum reduc-tion in disease incidence using Anucop, Bavistin, Captan (0.2%) and Mancozeb M-45 (0.3%) in pot experiment. Similarly Monaim et al., 2014 [12] obtained same result using *T.viride* against *Fusarium* wilt disease in pot experiment. *T.viride* is one of the most efficient antagonists against *Fusarium* wilt reported [13-15]. Various workers have also recorded similar results using plant extracts on rice Natarajan and Lalithakumari [16].

4. CONCLUSION

Fusarium oxysporum can cause severe losses in brinjal.It has been concluded from present study that soil and root treatment with fungicides, fungal antagonist and botanical extracts were most effective in terms of reducing of wilt disease of brinjal.Hence it can be effectively used by the farmers.

5. ACKNOWLEDGEMENTS

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Conflict of Interest

Author declares that there is no any conflict of interest.

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