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In-vitro Efficacy of Bio-agents against Sudden Death Syndrome (wilt) Disease of Soybean Caused by *Fusarium oxysporum* f. sp. *virguliforme*

S. S. Gote*, P. H. Ghante, U. A. Asalkar, V. S. Mete and S. K. Deshmukh

Department of Plant Pathology, College of Agriculture, Badnapur, V.N.M.K.V Parbhani (M.H), India

**Corresponding author*

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A B S T R A C T

Sudden death syndrome (wilt) of soybean caused by *Fusarium oxysporum* f. sp. *virguliforme*. Therefore, the eco-friendly and environmentally safe management of wilt disease with the use of bio-agent is necessary. All bioagents were found antagonist against *Fusarium oxysporum* f. sp. *virguliforme* in laboratory condition. However, *Trichoderma viride* was found the most effective and recorded significantly highest mycelial growth inhibition *i.e.* 81.84 per cent of the test pathogen and *Aspergillus* niger was found least effective which recorded 52.58 per cent mycelial inhibition of *Fusarium oxysporum* f. sp. *virguliforme* in *in-vitro.*

Introduction

Soybean [*Glycine max* (L.) Merrill] is a native of northern China and is the most important legume crop in the world. Soybean is called 'Golden bean'. Soybean plants like many others legumes are capable of fixing and utilizing atmospheric nitrogen through symbiotic relationship with *Rhizobium* bacterium at the root of the crops.

The crop thus, improves soil fertility and economizes crop production not only for themselves but also for the next crop grown in rotation especially, cereal crops (Nassiuma and Wasike, 2002)[5]. It is one of the most important oilseed cash crops of India. It is a fascinating crop with innumerable possibilities of not only improving agriculture, but also supporting industries.

It is a unique crop with high nutritional value, providing 40 per cent protein and 20 per cent edible oil besides minerals and vitamins. Soybean oil is used as a raw material in manufacturing antibiotics, paints, varnishes, lubricants *etc*. Soybean meal is used as protein supplement in human diet, cattle and poultry feeds (Alexander, 1974)[1]. Soybean crop can be attacked by more than 100

pathogens (Sinclair and Schurtleff, 1975)[9]. About 35 pathogens were reported to infect soybean in India (Gupta *et al.,* 2001)[4]. Fungi, nematodes, viruses, bacteria, and phytoplasmas are known to cause diseases of soybean. The soybean crop is presently suffered due to one of the important disease known as sudden death syndrome. The sudden death syndrome disease is called as wilt of soybean. The soybean wilt is caused by *Fusarium oxysporum* f. sp. *virguliforme* (Aoki, 2003)[2]. *Fusarium* genus is a soil borne fungus that causes wilt of many crops. In many cases the fungus causing wilt in a particular crop is specific to that crop. In case of soybean, sudden death syndrome caused by the soil borne pathogen *F. solani* f. sp. *glycines* formerly called *Fusarium virguliforme* sp. in recent days which was first observed in Arkansas during 1971 (Roy *et al.*, 1997)[7]. It can cause great damage, as it may reduce the average yield of soybean by up to 59 per cent (Sinclair and Backman 1989)[10].

Materials and Methods

Seven bio-control agents were used to test antagonistic performance by dual culture technique with a test pathogen *Fusarium oxysporum* f. sp. *virguliforme.* These bio-agents were obtained from department of Plant Pathology VNMKV, Parbhani, multiplied and maintained on PDA medium and kept in BOD incubator at 270C for 7 days. 20 ml sterilized melted PDA medium was poured in 90 mm diameter petri plates. After solidification of the medium, 5mm disc of the antagonist and the test pathogen were separately cut with the help of a sharp sterilized cork borer from the edge of 7 days old culture and inoculated separately on half of petri plate at the same time. Plates without antagonist served as control. Three replications were maintained for each treatment. The inoculated petri plates were incubated at 27°C.

Observation on linear mycelial growth of fungus and bio-control agents and per cent inhibition of test fungus were calculated by applying formula given by Arora and Upadhay (1978)[3] as follows.

$$\text{Per cent growth inhibition} = \frac{C - T}{C} \times 100$$

Where,

C= Growth of test fungus in (mm) untreated control plates.

T= Growth of test fungus in (mm) treated plates.

Results and Discussion

The result obtained on mycelial growth and inhibition of *Fusarium oxysporum* f. sp. *virguliforme* with six fungal antagonists *viz*., *Trichoderma viride, Trichoderma harzianum, Trichoderma hamatum, Trichoderma koningii, Trichoderma longibrachiatum* as well as *Aspergillus niger* and one bacterial antagonist *viz*., *Pseudomonas fluorescens*. were evaluated *in vitro* for their efficacy against *Fusarium oxysporum* f. sp. *virguliforme* by applying dual culture on PDA as basal medium. All the antagonists were significantly superior over the untreated control. *Trichoderma viride* and *Trichoderma harzianum* were at par with each other but significantly superior over all other treatments.

The average mycelial growth was ranged from 16.33 mm growth (*Trichoderma viride*) to 42.66 mm (*Aspergillus niger*). Whereas, average percentage mycelial growth inhibition was in the range of 52.58 per cent (*Aspergillus niger*) to 81.84 per cent (*Trichoderma viride*) as against 00 per cent in untreated control. Amongst the tested anatagonists, *Trichoderma viride* was found

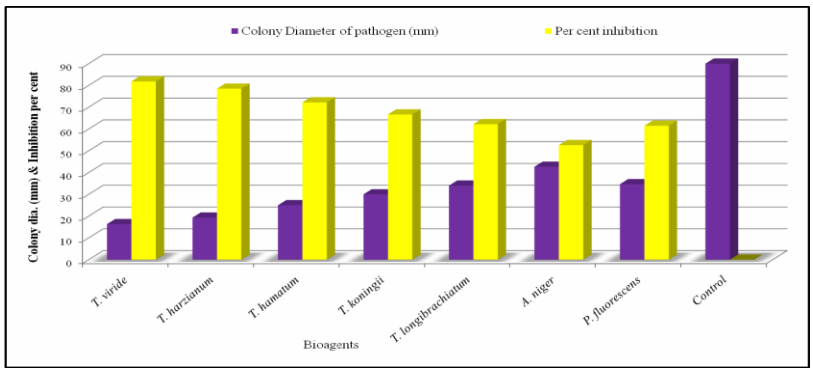
the most effective and recorded least mycelial growth of *Fusarium oxysporum* f. sp. *virguliforme i.e.* 16.33 mm with the highest per cent mycelial inhibition *i.e.* 81.89 per cent over the test pathogen. It was followed by *Trichoderma harzianum* which was shown 19.33 mm mycelial growth of test pathogen and 78.51 per cent inhibition of test pathogen. The maximum mycelial growth 42.66 mm of test pathogen with least mycelial growth inhibition *i.e.* 52.58 per cent were recorded in T6 treatment (*Aspergillus niger*), still it was significantly superior over untreated control (90 mm) (Fig. 1 and Table 1).

Table.1 *In vitro* efficacy of different bioagents against mycelial growth inhibition of *Fusarium oxysporum* f. sp. *Virguliforme*

Tr. No.	Treatments	Colony Diameter of pathogen* (mm)	Per cent inhibition
T1	*Trichoderma viride*	16.33	**81.84 (64.77)**
T2	*Trichoderma harzianum*	19.33	**78.51 (62.38)**
T3	*Trichoderma hamatum*	25.00	**72.21 (58.18)**
T4	*Trichoderma koningii*	30.00	**66.66 (54.73)**
T5	*Trichoderma longibrachiatum*	34.00	**62.22 (52.07)**
T6	*Aspergillus niger*	42.66	**52.58 (46.47)**
T7	*Pseudomonas fluorescens*	34.66	**61.48 (51.63)**
T8	Control	90.00	**00.00 (00.00)**
	SE±	**1.04**	**1.16**
	CD at 1%	**3.16**	**3.51**

*: Average of three replications
Figures in parenthesis are arcsine transformation values

Fig.1 *In vitro* efficacy of different bioagents against *Fusarium oxysporum* f. sp. *virguliforme*



The results of present investigation resembled with the finding of earlier workers *viz.*, Wani *et al.*, (2009)[11] who reported that the efficacy of biocontrol agents such as *Trichoderma viride*, *T. harzianum*, *Glomus mossae* and *G. fasciculatium* for the control of wilt disease caused by *Fusarium oxysporum* f. sp. *lycopercici* on tomato. Such similar findings mentioned by Ram and Pandy (2011)[6], Sahu (2015).[8]

References

1)Alexander MV. Soybean in Virginia experimentation division Virginia Polytech. Institute, State University, 1974, 4.

2) Aoki, T. (2003). Sudden death syndrome of soybean is caused by two morphologically and phylogenetically distinct species within the *Fusarium* species complex *F. virguliforme* in North America and *F. tucumaniae* in South America. *Mycologia.*, 95 (4): 660-684.

3)Arora, D. K. and Upadhyay, R. K. (1978). Effect of fungal staling growth substances on colony interaction. Pl. Soil., 49: 685-690.

4) Gupta, C. P., Sharma, A. Dubey, R. C. and Maheshwari, D. K. (2001). Plant growth enhancement and suppression of *M. phaseolina* causing charcoal rot of peanut of florescent *pseudomonas*. *Ind. J. Exp. Biol.*, 39: 1318-1321.

5) Nassiuma, D. and Wasike, W. (2002). Stability assessment of soybean varieties in Kenya. *Afr. Crop Sci. J.*, 10(2): 139-144.

6) Ram, H. and Pandey, R. N. (2011). Efficacy of bio-control agents and fungicides in the management of wilt of pigeon pea. Indian Phtytopath., 64 (3): 269-271.

7) Roy, K. W., Rupe, J. C., Hershman, D. E. and Abney, T. S. (1997). Sudden death syndrome of soybean. *Plant Dis.*, 81:1100-1111.

8) Sahu, M. K. (2015). *In vitro* screening for antagonistic potential of *Trichoderma*

species and *fluorescent pseudomonas* against *Fusarium solani* for management of soybean wilt., 10(4): 1877-1881.

9) Sinclair, J. B. and Schurtleff, M. C. (1975). Compendium of soybean diseases. *Amer. Phytopathol. Soc.*, St Paul, Minnesota., 69.

10) Sinclair, J. B. and Blackman, P. A. (1989). Compendium of soybean diseases. *The American Phytopathological Society Str., J*-106.

11) Wani, A. H., Taskeen-Un-Nisa and Mir, R. A. (2009). Biological control of *Fusarium oxysporum* f. sp. *lycopercici* on tomato / *Botanicals with fungal antagonists. J. Biol. Control*., 23(2): 169-173.

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