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IN VITRO EVALUATION OF BIOAGENTS AGAINST *PHOMOPSIS VEXANS* (SACC. & SYD.) HARTER, CAUSING STEM BLIGHT AND FRUIT ROT OF BRINJAL *(SOLANUM MELONGENA* L.)

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ABSTRACT

The Brinjal *(Solanuum melongena* L.) – "King of Vegetables" is principal vegetable crops grown in the tropical and subtropical areas. Stem blight and fruit rot of brinjal is considered to be the most serious and wide spread disease. The efficacy of three fungal and two bacterial bioagents *viz, Trichoderma viride, Trichoderma harzianum, Trichoderma virens, Bacillus subtilis* and *Pseudomonas fluorescens* were evaluated *in vitro* condition against *Phomopsis vexans*. In the dual culture assay, results revealed that all the tested bioagents were significantly inhibited mycelial growth of *P. vexans*, over untreated control. Among the effective bioagents, highest average mycelial growth inhibition was recorded in *T. virens* (49.11%) that was found at par with *T. viride* (47.32%) followed by *P. fluorescens* (43.05%), *T. harzianum* (38.82%) and *B. subtilis* (31.47%) were also found moderately effective against the pathogen. All the antagonists suppressed the formation of pycnidia.

KEYWORDS: Brinjal stem blight and fruit rot, *in vitro*, *Phomopsis vexans*, dual culture method, bioagents, per cent growth inhibition.

INTRODUCTION

Brinjal (*Solanum melongena* L.) is the second most important vegetable crop in respect area 735.0 thousand hectare and production was 12987.0 thousand MT of fruits with productivity of 17.7 MT/ha. (Anonymous, 2019). It grows as an annual crop throughout the year in tropics and sub-tropics. The brinjal fruit contains carbohydrates, protein, moisture etc. and minerals like calcium, magnesium and iron. In Gujarat, it's grown in an area over 74.06 thousand hectare with a total production of 1471.16 thousand MT having productivity of 19.87 t/ha. (Anonymous, 2017).

The low productivity is due to the many biotic and abiotic stresses, insect and diseases attack play an important role in reducing the yield throughout the world. This crop is suffered by many diseases caused by various microbes. Among them, stem blight and fruit rot of eggplant caused by *Phomopsis vexans* (Sacc. &Syd.) Harter, is a serious disease which attacks all above ground parts of the plant (Das, 1998). The disease was first reported from the Gujarat state in 1914 and since then from many parts of India. It is mentionable damaging to the crop and is a threat particularly in kharif season and late crop in winter season. It has been reported that *P. vexans* reduces yield (15-20%) and marketable value of the crop nearly 20-30% (Jain and Bhatnagar, 1980). Certain protective fungicides although hazardous to environment are still used for the control of fungal diseases (Nwankiti, 1990). Therefore, *in vitro* experiment was undertaken to find out the effective bioagents in managing stem blight and fruit rot of brinjal.

MATERIALS AND METHODS

Isolation of pathogens

Brinjal (Surati Ravaiya and GNRB-1) showing the typical stem blight and fruit rot symptoms were collected and brought to the laboratory and subjected to tissue isolation. After 48 hrs of incubation, the culture appeared initially as dull white floccose mycelium with circular to irregular shape of colony which gradually turned to dark grayish white as it grew older. Numerous black, globose to irregular pycnidia were also produced in a month old culture on sterilized potato dextrose agar (PDA) medium. The culture was further purified by single hyphal tip method and the purified culture was maintained on PDA slants for further studies. The periodical sub-culturing and multiplication were made on PDA plates to keep the culture fresh and to use throughout the investigations. After purification of the pathogen as described cultural and morphological characters of the fungus on PDA,

were studied for identification and compared with those described in the literature.

Preparation of Culture Media

The Petri plates containing 20 ml PDA medium inoculated aseptically with the *P. vexans* and the test organism (antagonist) by placing 5 mm diameter culture blocks at 70 mm apart from each other (Dhingra and Sinclair, 1985). Four repetition of each treatment were kept and the Petri plates with only pathogen at center served as control. All the plates were incubated at 27±2 ^{0}C. Observations on colony diameter were recorded up to the complete coverage of control plates, which were inoculated with only pathogen. Index of antagonism was determined in each treatment by following standard formula as (Bell *et al.*, 1982).

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Antagonism index

C = Area of test fungus in control (mm^2)

T = Area of test fungus in respective treatment (mm^2)

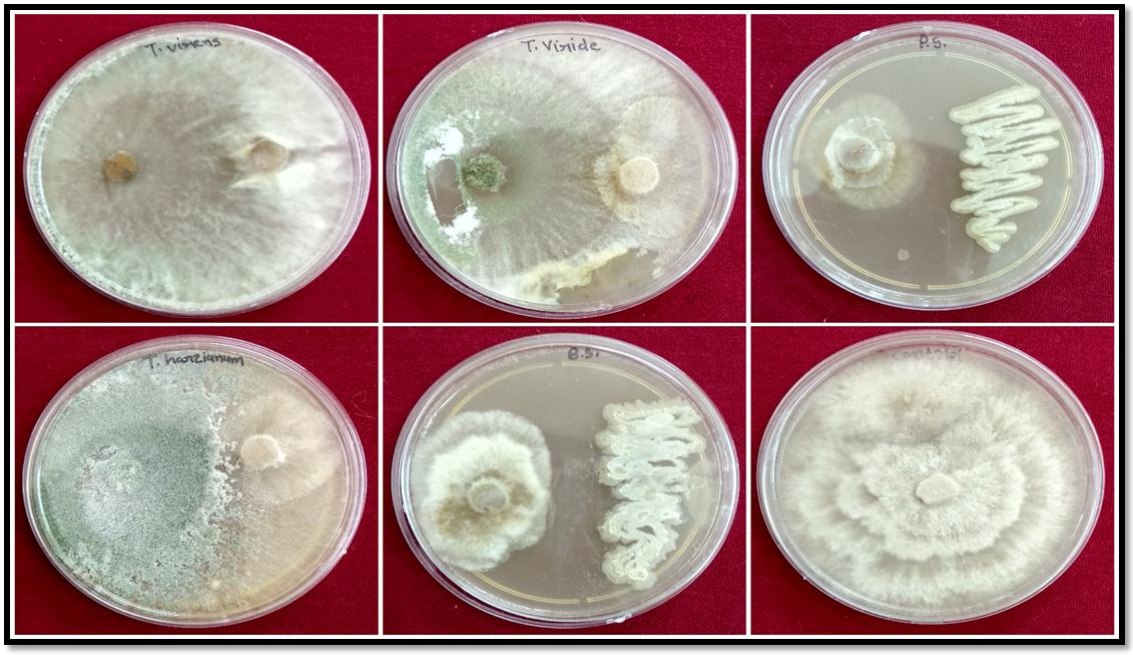

Plate 1: Growth inhibition of *P. vexans* on PDA with different biocontrol agents *in vitro*.

RESULTS AND DISCUSSION

Table 1: Evaluation of various bioagents against *Phomopsis vexans in vitro*.

Sr. no.	Treatments	Colony diameter of pathogen (mm) @	Growth inhibition over control (%)
1	*Trichoderma virens*	4.77*(22.25)**	49.11
2	*Trichoderma viride*	4.94(23.88)	47.32
3	*Pseudomonas fluorescens*	5.34(28.00)	43.05
4	*Trichoderma harzianum*	5.73(32.38)	38.82
5	*Bacillus subtilis*	6.42(40.75)	31.47
6	Control	9.37(87.38)	-
	S.Em. ±	0.06	
	C.D. at 5 %	0.18	
	C.V. %	2.00	

@ Average of four replications

* Figures outside parenthesis are √x+0.5 transformed value

** Figures in parenthesis are original values

All the antagonists tested against *P. vexans* were effective in inhibiting the growth of the pathogen. All the antagonists inhibited more than 30 per cent growth of the test fungus. Among them, significantly lower mycelial growth of the pathogen was recorded in *T. virens* (4.77 mm) which was at par with *T. viride* (4.94 mm). Next best in order of merit was *P. fluorescens* **(**5.34 mm), followed by *T. harzianum* (5.73 mm) and *B. subtilis* (6.42 mm) produced comparatively higher mycelial growth. The result presented in Table-1 reveled that *T.*

virens gave maximum per cent growth inhibition (49.11 %) and appeared to be most superior over all the antagonists tested followed by*T. Viride* (47.32%), *P. fluorescens* (43.05%), *T. harzianum* (38.82%) and *B. subtilis* (31.47%) were also found moderately effective against the pathogen. It is evident from these studies that among all the antagonists evaluated by dual culture method, *T. virens*, *T. viride* and *P. fluorescens* consistently showed strong antagonistic property against *P. vexans* compared to the other antagonists tested hence considered as potential antagonists. Our results are in harmony with earlier workers. Kathal (2001) reported that *T. viride* showed maximum inhibition (24.5 mm) among five biocontrol agents toward *P. vexans* under *in vitro* condition. Jakatimath *et al.* (2017) revealed that fungal bio agents were better than bacterial bioagents in inhibiting the growth of *P. vexans* was effectively inhibited by *T. harzianum*-p (70.66%). Sharma (2009) *T. virens* (Ts-1) completely overgrew the *P. vexans* and covered the entire medium surface. Das *et al.* (2014) found that *T. viride* was found to be most effective with 84% inhibition over control after 7^{th} days of incubation *in vitro*.

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