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EVALUATION OF DIFFERENT BIOAGENTS AGAINST PHOMOPSIS BLIGHT IN BRINJAL CAUSEDS BY PHOMOPSIS (Sacardo and Syndow)

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ABSTRACT
A study was conducted in the Department of Plant Pathology, College of Horticulture, (VCSGUUHF) Bharsar. During Kharif season 2016. result revealed that per cent growth inhibition of Phomopsis vexans is maximum in Trichoderma harzianum (62.29%) followed by Bacillus ceresus (53.30%), Pseudomonas fluorescence (48.89%) and minimum per cent inhibition growth was reported in Rhizobium japonicum (42.07%). In vivo result revealed that per cent disease index maximum in Rhizobium japonicum (42.70%) with yield (25.35t/ha) followed by Azotobacter chorococum (39.22%) with yield (26.25t/ha), Bacillus substilis (38.05%) with (26.60t/ha) and minimum Trichoderma harzianum (28.64%) with (28.96t/ha). This result shows that Trichoderma harzianum is very effective bio control agent and should be exploited for the control of Phomopsis blight of Brinjal. So, Trichoderma harzianum @ 5 g/kg seed is maximum effective for the control of phomopsis blight of brinjal.

INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most important Solanaceous vegetable crops of sub - tropics and tropics. India is considered to be the centre of origin of cultivated brinjal form where it spreads to other parts of the world. It is commonly called as 'egg plant' and also known as 'Guinea squash'. Brinjal occupies second position among the vegetable in production in India. Brinjal is known to have ayurvedic medicinal properties and good for diabetic patients and has also been recommended as an excellent remedy for those who suffering from liver complaints (Shukla and Naik (1993)).Unripe fruit is primarily consumed as cooked vegetables in various ways and dried shoots are used as fuel in rural areas (Sharma *et al*. (1963)).

Nutrition values of 100g brinjal fruit includes moisture (92.7 g), protein (1.4 g), fat (0.3 g), minerals (0.3 g), fiber (1.3 g), carbohydrates (4.0 g), calcium (18 mg), magnesium (16 mg), oxalic acid (18 mg), phosphorus (47 mg), iron 0.9 mg, sodium 3.0 mg, potassium 2.0 mg, copper 0.17 mg, sulphur 44.0 mg, chlorine 52.0 mg, vitamin A 124 I.U, thiamine 0.04 mg, riboflavin 0.11 mg, nicotinic acid 0.09 mg and vitamin C 12.0 mg present in brinjal crop (Aykroyd,1963).

In field conditions, P. vexans affect mostly stem, leaves and fruits of brinjal. Serious infection of this fungal disease on stem of brinjal plant includes the symptoms of brown or dark sunken lesions slightly above the soil surface. Seedling eventually collapses and die. The pathogen attacks leaves but older once are more susceptible. Lesions are epically circular, grey to brown and develop a light center. In the center of older lesions, numerous fruiting body, called pycnidia, can be observed small, black pimples, embedded in the host tissue. Affected leaves turn yellow and drop prematurely. Stem and cankers can form on mature stem or branches. The most important symptoms are observed on the fruit. Fruit injury begins as a pale, sunken, oval area on the surface. These subsequently enlarge and become depressed. With one lesion or several spots coalescing, large portions of the fruit are affected (Singh *et al*. (2014)).

Continuous use of chemicals it leads different types of problems, *viz*. soil health problems, envirmental pollution, crop resdidues, so in this experiment we want to control Phomopsis vexans (Sacardo and Sydow) causing phomopsis blight in brinjal through Biocontrol agents. We selected eight biocontrol agents for evaluation In vitro and In vivo condition.

MATERIALS AND METHODS

The diseased samples of phomopsis blight were collected from Organic research block Bharsar. The Pusa Purple Round variety was used which is susceptible to the disease. The infected tissues of leaves showing typical symptoms of phomopsis blight and fruit rot sprouts were cut in to small pieces of 1-2 mm size. The surface sterilized with sodium hypochlorite solution (1%) for 2 min, rinsed thrice with sterile distilled water, blot dried and placed on PDA medium. Pathogen was identified by following the cultural and morph biometric characteristics criteria cultural characteristics were observed directly by pigmentation on medium and mycelial growth pattern on PDA plates. Identification of pathogen:

Phomopsis vexans was isolated from infected potato leaves. Pure cultures of Phomopsis vexans were maintained by sub culturing and pathogenicity test was done for the confirmation of the pathogen.

In vitro bioassay of different treatments:

The efficacy of different biocontrol agents against P. vexans were evaluated in vitro by dual culture technique was conducted by using eight treatments with three replication and per cent growth inhibition of pathogen was calculated after 7 days and data was analysed statistically and designed simple CRD. (Vinecent, 1947).

In vivo study:

Field experiment was conducted on during Kharif session 2016 by using cultivated variety Pusa Purple Round with three replication, Plot size: 1.80m x 1.20m, Spacing: 60 × 45cm after preparation of field sowing was done date 22 May 2016 and calculate the per cent yield increase over check.

Treatments	Dose (gm)
Bacillus sustilis	5
Rhizobium japonicum	5
Azotobacter choroococum	5
Frateuria aurantia	5
Pseudomonas fluorescence	5
Bacillus ceresus	5
Azospirillium brasilens	5
Trichoderma harzianum	5
Check	0

Field experiment was conducted during crop session 2016.

Growth inhibition:

In case of dual culture technique the inhibitory activity of each treatment was expressed as the per cent growth inhibition which was calculated using the following formula (Pandey and Pandey 2002):

$$\text{Growth inhibition\%} = \frac{DC - DT}{DC} X100$$

Where, DC = Diameter of control and DT = diameter of fungal colony with treatment.

Per cent yield increase over control is calculated by using the following formula

$$\text{Pecent yield increase over control} = \frac{T - C}{C} X100$$

RESULTS AND DISCUSSION

The result In vitro result revealed that per cent growth inhibition of Phomopsis vexans is maximum Trichoderma harzianum (62.29%) followed by Bacillus ceresus (53.30%), Pseudomonas fluorescence (48.89%) and minimum Rhizobium japonicum (42.07%) was recorded (Table 1).

In vivo result revealed that per cent disease index maximum in Rhizobium japonicum (42.70%) with yield (25.35t/ha) followed by Azotobacter chorococum (39.22%) with yield (26.25q/ha),Bacillus substilis (38.05%) with (26.60q/ha) and minimum Trichoderma harzianum (28.64%) with (28.96q/ha) in Table (2).

Table 1: Effect of different treatments on per cent growth inhibition of Phomopsis vexans:

T.NO	Treatments	Per cent growth inhibition of Phomopsis vexans
T•	Bacillus sustilis	53.07 (46.74)
T,	Rhizobium japonicum	44.96 (42.07)
Tƒ	Azotobacter choroococum	50.11(45.04)
T„	Frateuria aurantia	54.82(47.75)
T…	Pseudomonas fluorescence	56.80(48.89)
T†	Bacillus ceresus	64.25(53.30)
T‡	Azospirillium brasilens	55.26(48.00)
Tˆ	Trichoderma harzianum	78.42(62.29)
	C.D	3.976
	S.E.	1.860

Das *et al*. (2014) studied about In vitro evaluation of fungicides and two species of Trichoderma against Phomopsis vexans causing fruit rot of brinjal (*Solanum melongena* L.). In in-vitro condition the two species of Trichoderma harzianum, T. viride was found to be most effective with inhibition over control after 7th days of incubation.

Sundramurthy and Balabhasker 2013. Reported that application of ANR-1 strain of Trichodrema harzianum when applied in the combination (seedling dip @ 2% + soil application at 15 and 30 DAT @ 2%) showed a significant stimulatory effect on plant height (73.62 cm) and increased the dry weight (288.38 g) of tomato plants infected with Fusarium oxysporum f. sp. lycopersici causing wilt in comparison to other isolates and untreated control.

Abdel *et al*. (2012) the reported that different approaches of bio-control agents for controlling root rot incidence of some vegetables under greenhouse conditions. Results revealed that the antagonist T. harzianum showed significant superior effect to reduce diseases incidence followed by B. subtilis.

Rhouma *et al*. (2008) reported that chemical and biological control of Phomopsis amygdali the causal agent of constriction canker of almond in Tunisia. The study carried out in laboratory and in the field, was to test antagonists Trichoderma spp. 106spore/ml was deposed on the leaves scars. Biological experiments showed that the antagonists Trichoderma viride and Trichoderma harzianum reduced significantly the mycelial growth of P. amygdali.

Barari, H. (2016) reported that maximum growth inhibition in vitro conditions, the results revealed that Trichoderma harzianum, isolate N-8, was found to inhibition effectively the radial mycelial growth of the pathogen (68.22%) and greenhouse conditions, the application of T. harzianum (N-8) exhibited the least disease incidence (by 14.75%). Also, tomato plants treated with T. harzianum (N-8) isolate showed a significant stimulatory effect on plant height (by 70.13 cm) and the dry weight (by 265.42 g) of tomato plants, in comparison to untreated control (54.6 cm and 195.5 g).

Dewangan *et al*. (2014) reported that characterization of Pseudomonas fluorescens in different media and its antagonistic effect on phytopathogenic fungi the used dual culture method; P. fluorescens on co-inoculation with fungal pathogens decreased their growth rate. Maximum inhibition

Table 2: Effect of different treatments on per cent disease index, yield (Q/ha), per cent disease reduction:

T. N0.	Treatments	Per cent disease index	Yield (t/ha)	Per cent disease reduction
T•	Bacillus sustilis	38 (38.05)	26.6	30.90 (33.76)
T,	Rhizobium japonicum	46 (42.70)	25.35	16.39(23.80)
Tƒ	Azotobacter choroococum	40 (39.22)	26.25	27.27(31.38)
T„	Frateuria aurantia	32 (34.36)	27.16	41.82(40.28)
T…	Pseudomonas fluorescence	30 (33.07)	27.87	45.45(42.38)
T†	Bacillus ceresus	25(29.99)	28.59	54.55(47.61)
T‡	Azospirillium brasilens	26.5(30.98)	28.23	51.82(46.04)
Tˆ	Trichoderma harzianum	23 (28.64)	28.96	58.82(49.70)
CD.		4.21	3.11	3.24
SE.		1.4	1.45	1.06

of Pseudomonas fluorescens was observed in Sclerotium rolfsii (63.15%) followed by Fusarium oxysporum (61.85%), Rhizoctonia bataticola (55.56%) and R. solani (53.15 %) recorded.

Toppo, R. S. and Tiwari, P. (2015) reported that a total of four Pseudomonas isolates were obtained from rhizospheric soil. The result from in-vitro analysis showed that PKJ25 was the most active isolate and significantly suppressed the vegetative growth of all the test fungi by restricting the hyphal growth of Rhizoctonia spp., Fusarium spp. and Colletotricum spp. to 0.73, 1.54 and 2.01cm with 91.20%, 78.90% and 77.67% inhibition. In vivo, PKJ25 had the least disease incidence in tomato and highest per cent disease control. The survival % of tomato plantlets was significantly higher with isolate PKJ25 in comparison to other isolates and was recorded 93% in case of damping off due to Rhizoctonia spp., 86% in case of wilt due to Fusarium spp., 86% in case of fruit anthracnose due to Colletotrichum spp.

Rajput *et al*. (2013) reported that the results revealed that out of all the eight bioagents used, three bio agents viz., Trichoderma viride (IARI isolate) (74.77%, 69.04% and 79.45%), Trichoderma viride (Navsari isolate) (74.14%, 66.08%, and 76.99%) maximum growth inhibition in dual culture), T. harzianum (Junagadh isolate) (71.25%, 59.96% and 74.78%) maximum growth inhibition in dual culture, pathogen at periphery and pathogen at the centre methods respectively, showed strong antagonistic effect to inhibit the mycelia growth of the pathogen significantly.

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