J. Mycopathol. Res. ***59(2)*** *: 185-187, 2021;* (ISSN 0971-3719)

Evaluation of bioagents against *Macrophomina phaseolina* (Tassi) Goid. causing dry root rot of chickpea (*Cicer arietinum L.*)

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Received : 27.04.2021 Accepted : 29.05.2021 Published : 28.06.2021

Chickpea (*Cicer arietinum* L.) is one of the important legume pulse crops and it is grown in India and other semi-arid regions of the world. It is originated in south-eastern Turkey. Dry root rot of chickpea is the most devastating disease of chickpea, 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* against *Macrophomina phaseolina*. In the dual culture assay, results revealed that all the tested bioagents remarkably inhibited mycelium and sclerotial growth of *M. phaseolina*, over control. Among the effective bioagents, highest average mycelial growth inhibition was recorded in *T. viride* (69.76%), *T. harzianum* (63.71%) and *T. virens* (59.68%) that was found at par with followed by *B. subtilis* (54.03%) and *P. fluorescens* (41.57%), were also found moderately effective against the pathogen. All the antagonists suppressed the formation of mycelium and sclerotia of *Macrophomina phaseolina*.

Key words: Chickpea, dry root rot, *in vitro*, *Macrophomina phaseolina*, dual culture, bioagents.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the important legume pulse crops and it is mainly grown in India and other semi-arid regions of the world. It originated in south-eastern Turkey from where it has spread to other countries of the world. Among the major pulse crops, chickpea contributes nearly 32.60 per cent and 40.50 per cent of total pulse area and total pulse production, respectively. In India, chickpea is cultivated in an area of about 8.32million ha with a production of 9.8 metric ton and 925 kg/ha productivity (Anonymous, 2018).

The chickpea crop was reported to be attacked by nearly 172 pathogens (67 fungi, 22 viruses, 3 bacteria, 80 nematodes) from all over the world. Some of the serious diseases of chickpea are - dry and wet root rot [*Rhizoctonia bataticola*, (Taub.) Butler], wilt [*Fusarium oxysporum* f. sp. *ciceri*,(Padwick) Snyd. & Hans.], ascochyta blight [*Ascochyta rabiei*, (Pass.) Labr.] and collar rot (*Sclerotium rolfsii* Sacc.). Among the diseases of chickpea, dry root rot has an emerging the most devastating and constraint to chickpea productivity and production, as the disease is more prevalent during hot temperature of 30 to 35°C and low soil moisture conditions (Pande and Sharma, 2010). *R. bataticola* is a soil-inhabiting pathogen and capable of infecting chickpea at any crop stage, but most commonly infects chickpea at post-reproductive stage in dry and warm regions (Sharma and Pande, 2013).

MATERIALS AND METHODS

Isolation of pathogens

Diseased specimens were to be brought to laboratory and examined under microscope for preliminary examination. To isolate the pathogen, small pieces of infected samples were cut from the diseased portion along with some healthy tissues and surface sterilized with 0.1 per cent mercuric chloride solution for 1min followed by three washing with sterilized distilled water. The surface sterilized

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pieces were transferred to 20 ml poured potato dextrose agar (PDA) plates and incubated at 27 ± 2 ºC. After seven days of incubation, the fungal growth was transferred aseptically on PDA slants and purified following hyphal tip method.

Preparation of culture media

The Petri plates containing 20 ml PDA medium inoculated aseptically with the *M. phaseolina* and the test organism (antagonist) by placing 5 mm diameter culture blocks at 70 mm apart from each other. Three 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).

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

Where, I = Antagonism index, C = Area of test fungus in control (mm2) and

T = Area of test fungus in respective treatment (mm2)

RESULTS AND DISCUSSION

All the antagonists tested against *M. phaseolina* were effective in inhibiting the growth of the pathogen. All the antagonists inhibited more than 50 per cent growth of the test fungus. The result presented in Table 1 revealed that among them, significantly lower mycelial growth of the pathogen was recorded in *T. viride* (5.04mm) which was at par with *T. harzianum* (5.52mm).

Next best in order of merit was *T. virens* (5.81mm) and *B. subtilis* (6.20mm) followed by *P. fluorescens* (6.99mm), produced comparatively higher mycelial growth. *T. viride* gave maximum per cent growth inhibition (69.76%) and appeared to be most superior over all the antagonists tested followed by *T. harzianum* (63.71%), *T. virens* (59.68%) and *B. subtilis* (54.03%), *P. fluorescens* (41.57%). were also found moderately effective against the pathogen *M. phaseolina*. It is evident from these studies that among all the antagonists evaluated by dual culture method, *T. viride, T. harzianum*, and *T. virens* consistently showed strong antagonistic property against *M. phaseolina* compared to the other antagonists tested hence considered as potential antagonists (Figs. 1 and 2). The experimental results obtained were compared with the work of Arya *et al*. (2017) who reported that maximum growth inhibition was recorded in *T. viride* (74.72 %) strain followed by *T. harzianum* (71.54%). Karthikeyan et al. (2015) also reported that among the *Trichoderma* spp. tested, *T. viride* exhibited strong inhibition of the growth (77.77%) against *M. phaseolina*. Adekunle *et al*. (2006) showed that *T. viride, T. harzianum* and *T. virens* could be used effectively to control the root rot of *M. phaseolina*.

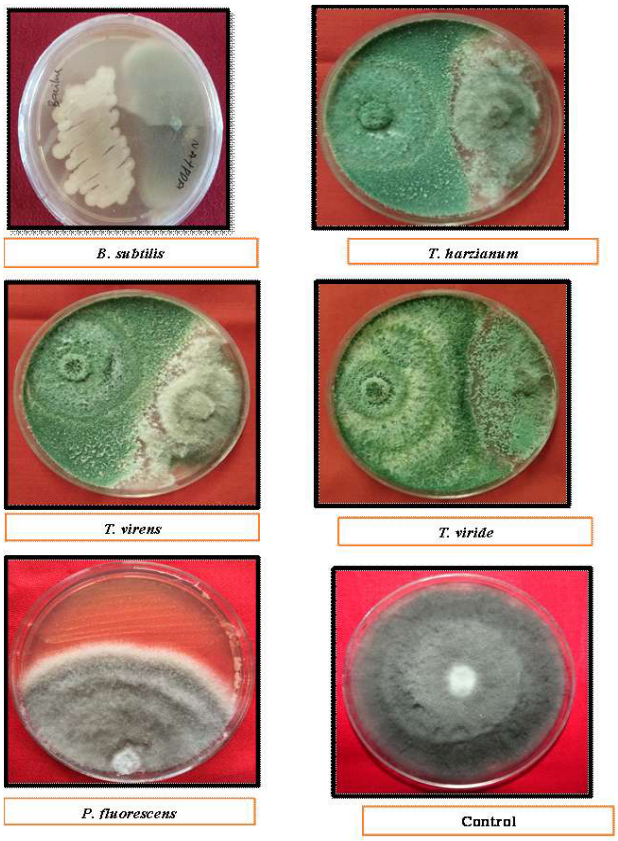

Fig. 1 : *In vitro* growth of *M.phaseolina* in petri plates inhibited by bioagents

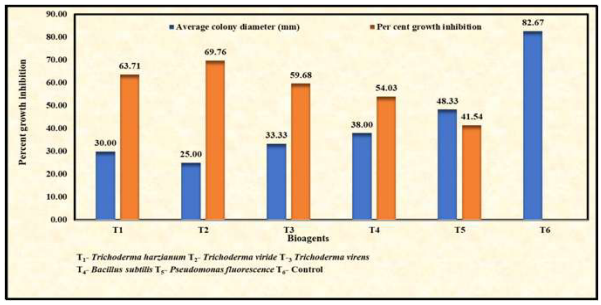

Fig. 2 : Evaluation of different biogents against *M.phaseolina in vitro*

Table 1: Evaluation of different bioagents against *M. phaseolina in vitro*

Tr. No.	Name of bioagents	Average colony diameter (mm)	Per cent growth inhibition over control
T_1	*Trichoderma harzianum*, NAU isolate	5.52 (30.00)	63.71
T_2	*Trichoderma viride*, NAU isolate	5.04 (25.00)	69.76
T_3	*Trichoderma virens*, NAU isolate	5.81 (33.33)	59.68
T_4	*Bacillus subtilis*, NAU isolate	6.20 (38.00)	54.03
T_5	*Pseudomonas fluorescence*, NAU isolate	6.99 (48.33)	41.57
T_6	Control	9.12 (82.67)	-
S. Em. ±		0.12	
C. D. at 5%		0.37	-
C. V. %		3.22	

@ Average of three replications
* Figures outside parenthesis are "x+0.5 transformed value
** Figures in parenthesis are original values

CONCLUSION

Results concluded that among the all the antagonists were significantly more effective in checking the growth of *M. phaseolina*. All the antagonists inhibited more than 50 per cent growth of the test fungus. Among them, significantly lower mycelial growth of the pathogen was recorded in *T. viride* (5.04mm) which was at par with *T. harzianum* (5.52mm). Next best in order of merit was *T. virens* (5.81mm) and *B. subtilis* (6.20mm) followed by *P. fluorescens* (6.99mm), produced comparatively higher mycelial growth. *T. viride* gave maximum per cent growth inhibition (69.76%) and appeared to be most superior over all the antagonists tested followed by *T. harzianum* (63.71%), *T. virence* (59.68%) and *B. subtilis.*

REFERENCES

Adekunle, A. T., Ikotun, T., Florini, D. A., Cardwell, K. F. 2006. Field evaluation of selected formulations of *Trichoderma* species as seed treatments to control damping off of cowpea caused by Macrophomina phaseolina. *Afr. J. Biotechnol*. **5**: 419-424.

Anonymous , 2018. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.

Arya, P., Godara, S. L., Bimla, Jat, A. 2017. Efficacy of antagonists against *Macrophomina phaseolina* inciting dry root rot of groundnut. *J. Pharmacogn. Phytochem*. **6**: 1171-1173.

Bell, D. K., Wells, H. D., Markham, C. R.1982. *In vitro* antagonism of *Trichoderma* species against six fungal plant pathogens. *Phytopathology* **72**: 379-381.

Karthikeyan, V., Sankaralingam, A., Nakkeeran, A. 2015. Management of groundnut root rot with biocontrol agents and organic amendment. *Arch. Phytopathol. Plant Protect*. **39**: 215-223.

Pande, S., Sharma, M. 2010. Climate Change: Potential Impact on Chickpea and Pigeonpea Diseases in the Rainfed Semi-Arid Tropics. In 5th International Food Legumes Research Conference (IFLRCV) & 7th European Conference on Grain Legumes (AEP VII) April 26-30, Antalya, Turkey.

Sharma, M., Pande, S. 2013. Unraveling effects of temperature and soil moisture stress response on development of dry root rot *Rhizoctonia bataticola* (Taub.) in chickpea. *Amer. J. Plant Sci*. **4**: 584-589.