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Integrated Disease Management of Collar Rot of Lentil caused by *Sclerotium rolfsii*

Anjali Arya*, Prashant Mishra, Shashank Mishra and Ranvijay Siwach

Department of Plant Pathology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, India

**Corresponding author*

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A B S T R A C T

Lentil (*Lens culinaris* L.) is an important edible pulse crop. It is an important source of protein for human diet, plays a vital role as a rotational crop and enhances soil fertility. *Sclerotium rolfsii* causing collar rot disease on lentil crop is an important polyphagous pathogenic fungus causing substantial losses in quality and productivity (Punja and Grogan, 1988). In this study a combination of management practices such as addition of organic amendments (e.g. FYM and press mud), oilcakes (mustard cake and neem cake), biological control agents (e.g. *Pseudomonas fluorescens, Trichoderma harzianum)*, soil drenching with fungicides (Carbendazim) were applied for the control of collar rot disease of Lentil. It was recorded from this study that the lowest percent disease incidence (6.66%) and maximum yield was recorded in (T1) seeds treated with *Trichoderma harzianum* and *Pseudomonas fluorescens*. Other treatments also showed significant decrease in percentage disease incidence except (T4) soil application of mustard oilcake.

Introduction

Lentil is attacked by a range of plant pathogens. Among them, collar rot caused by *Sclerotium rolfsii Sacc*., is very common in all the major lentil growing areas. The pathogenic fungus is soil-borne in nature and produces sclerotia, which can survive in the soil for many years. The fungus can attack the crop during any stage of growth from seedling to flowering and is comparatively more destructive at the seedling stage (Njambere and Chen, 2011). The disease causes appreciable loss in yield, hence it is necessary to reduce the losses caused by this disease. Therefore, some integrated means of management of collar rot disease were tested in pot culture. The present investigation is

related to the study of the management of collar rot disease of Lentil by different fungicides, bio-agents and plant products and comparing their efficacy.

Integrated Disease Management (IDM)

Although the disease can be effectively controlled by fungicides, we need to limit their large-scale use because of phytotoxic effect and fungicidal residues causing human health hazards and environmental contamination. Moreover, by Integrated Management, very low quantities of different materials are required compared to chemical treatment alone.

Keeping in view the current requirement and trend of sustainable development in agriculture, the present study was undertaken for the management of Collar rot of lentil caused by *Sclerotium rolfsii* by combining fungicides, biocontrol agents and organic matters.

Materials and Methods

Isolation and identification of pathogen

Lentil plants showing the typical symptoms of Collar rot were collected from the 'Crop Research Centre' of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut situated at Chirori and from farmer's field in the vicinity of the campus during the crop season of 2018-19. The specimens were brought to the laboratory and critically examined and studied for the symptoms of the disease and isolation of the pathogen.

The part of collar region showing typical symptoms of the disease was cut into small pieces and surface sterilized with 0.1% sodium hypochlorite solution for one minute. These pieces were washed thoroughly in sterile distilled water three times to remove the traces of sodium hypochlorite solution, and then aseptically transferred to sterilized potato dextrose agar (PDA) plates. These plates were incubated at 27±1°C for three days for growth of the fungus. The pure culture of the fungus was maintained by further growing the culture and following hyphal tip culture under aseptic conditions.

Mass culture of *Trichoderma* species and *Pseudomonas fluorescens*

Wheat grains were used for mass culture of *Trichoderma harzianum and* were allowed to grow with periodic shaking of the flasks, so that the surface of all wheat seeds is colonized with growth of Trichoderma properly. Such colonized grains were then grinded properly using a grinder.

The mass culture of *Pseudomonas fluorescens* was prepared using King's 'B' broth. After 3 to 4 days of constant stirring, the broth containing the bacterial growth is collected and used for mixing with talc powder for preparation of formulation.

The pot experiments were conducted during Rabi season 2019-2020 at College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh). The experiments were conducted in (CRD) with three replications and pot of 5kg capacity each.

List of treatments used for management of collar rot of Lentil under pot conditions are depicted in Table 1.

The percent disease incidence (PDI) was calculated by using the formula devised by Mathur *et al.*, (1972)

$$PDI = \frac{\text{Infected Plants}}{\text{Total No. of plants observed}} \times 100$$

Results and Discussion

The results (Table 2 and Fig. 1) revealed that all treatments significantly reduced the percentage of disease incidence except Mustard cake treatment. The lowest percent disease incidence (6.66%) was recorded in (T1) seeds treated with *Trichoderma harzianum (*@5g/kg) + *Pseudomonas fluorescens (*@5g/kg) followed by (8.88%) in (T7) with Soil application of Neem cake (@25g/kg) + *Trichoderma harzianum* (@5g/kg) and (13.33%) in (T5) Soil application with Carbendazim (@2g/kg) + *Trichoderma harzianum* (@5g/kg). In case of (T2) soil application with *Trichoderma harzianum (@5g/kg) +FYM* (100g/pot), (15.55%) percent disease incidence was recorded and same (15.55%) in (T6) Soil application of Neem cake (@50g/kg) and (17.77%) in (T8) Soil application with *Trichoderma harzianum* (@5g/kg soil). The maximum disease incidence i.e. (40%) was recorded in (T4) where soil was treated with Mustard oilcake (@ 50g/kg soil), even more than the Control, where (37.77%) disease incidence was recorded.

These results are nearly in agreement with Tetali *et al.,* (2016) who reported the use of *Trichoderma viride* along with neem cake, produced the higher germination percentage, shoot length and significantly reduced the per cent disease incidence. Ganeshan *et al.,* (2005) reported Pseudomonas strains to able to significantly control a number of fungal, bacterial and nematode diseases in cereals, horticultural crops, oil seeds and others. The best treatment was found T1(seed treatment with *T. harzanium* and *Pseudomonas fluorescens* (5g kg^{-1} seed) each at the time of sowing followed by T7 (Soil application of Neem cake @25g/kg soil + *Trichoderma harzianum* @5g/kg soil).

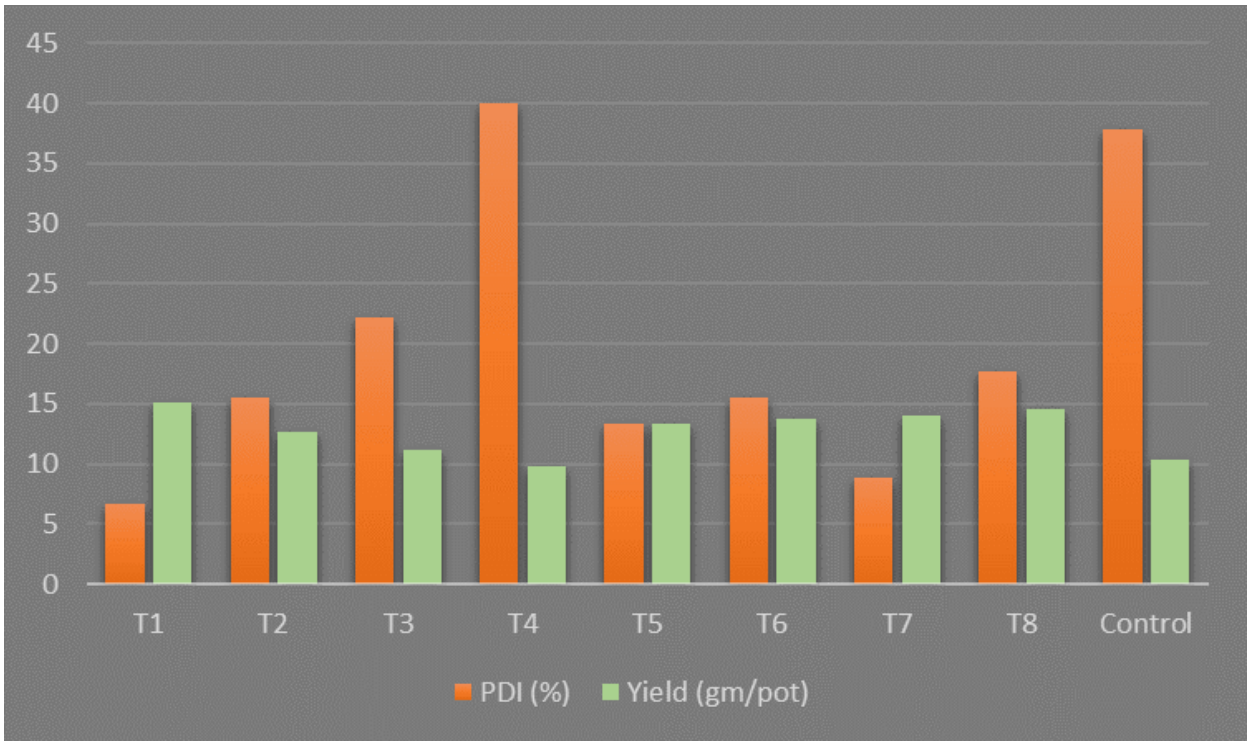
Table.1 Details of the treatments used for IDM of collar rot of Lentil

S. No.	Treatment	Treatment details
1	T1	Seed treatment with *Trichoderma harzianum* (5g kg^{-1} seed) +*Pseudomonas fluorescence* (5g kg^{-1} seed)
2	T2	Soil application of *Trichoderma harzianum* (5g kg^{-1}) + FYM @ 100g/pot
3	T3	Soil application of *Trichoderma harzianum* (5g kg^{-1}) + Pressmud 50g kg^{-1}
4	T4	Soil application of Mustard Cake(50 g kg^{-1})
5	T5	Soil application of Carbendazim (@2g Kg^{-1}) + *Trichoderma harizanum* (@5 g kg^{-1})
6	T6	Soil application of Neem Cake. (50 g kg^{-1})
7	T7	Soil application of Neem Cake (25 g kg^{-1}) + *Trichoderma harizanum* (@5 g kg^{-1})
8	T8	Soil application of *Trichoderma harzianum (5g kg^{-1})*
9		Control

Table.2 Percentage disease incidence and yield obtained

S. No.	Treatment	PDI (%)	Yield (gm/pot)
T1	Seed treatment with *Trichoderma harizanum* (@5g kg^{-1}) +*Pseudomonas fluorescens.* (@5 g kg^{-1})	6.66	15.08
T2	Soil application of *Trichoderma harzianum* (@5g kg^{-1}) + FYM (@100g/pot)	15.55	12.67
T3	Soil application of *Trichoderma harizanum* (@5 g kg^{-1}) + Press mud (@50g kg^{-1})	22.21	11.23
T4	Soil application of Mustard Cake (@ 50g kg^{-1})	40	9.83
T5	Soil application of Carbendazim (@2g kg^{-1}) + *Trichoderma harizanum* (@5 g kg^{-1})	13.33	13.40
T6	Soil application of Neem Cake (50 g kg^{-1})	15.55	13.76
T7	Soil application of Neem Cake (25 g kg-^{1}) + *Trichoderma harizanum* (@5 g kg^{-1})	8.88	14.06
T8	Soil application of *Trichoderma harizanum* (@5g kg^{-1})	17.77	14.56
	Control	37.77	10.35
	C.D.	7.683	0.987
	S.E.(m)	2.566	0.330

Fig.1 Graph representing the Percentage disease incidence (%) and yield (g/pot) obtained from lentil using IDM of collar rot



References

Akhtar, M. and Malik, A. (2000). Roles of organic soil amendments and soil organisms in the biological control of plant-parasitic nematodes: a review. *Bioresour. Technol*. 74, 35–47.

Anahosur, K.H., (2001) Integrated Management of potato sclerotium wilt caused by *Sclerotium rolfsii*. Indian Phytopathology 54; 158-166.

Duke, J.A. (1981). Handbook of legumes of world economic importance. Plenum Press, New York. p. 52-57.

Elad, Y., Chet, I. and Katan, J., (1980). *Trichoderma harzianum* a biological agent effective against *Sclerotium rolfsii* and *Rhizoctonia solani*. *Phytopathology*, **70**: 119- 121.

Ganeshan G. and Kumar A.M. (2007). *Pseudomonas fluorescens*, a potential bacterial antagonist to control plant diseases, Journal of Plant Interactions, 1:3, 123-134.

Kapoor, A.S. (2008). Biocontrol potential of *Trichoderma* against important soil borne diseases of vegetable crops. Indian Pytopath. 61(4):492-498.

Montealegre, J. R. and Henrique, J. L. (1990). Possibilities of integrated control of *Sclerotium rolfsii Sacc.* with T*richoderma* strains and fungicide. Fitopathologia. 25: 68-74.

Mougy, E.L., and Kader, A., (2008). Long –term activity of bio priming seed treatment for biological control of faba bean root rot pathogens. Australasian plant pathology 37:464-471

Muehlbauer, F.J., Cubero, J.I. and Summerfield, R.J. (1985). Lentil (*Lens culinaris* Medic.). p. 266-311. In: R.J. Summerfield and E.H. Roberts (eds.), Grain legume crops. Collins, 8 Grafton Street, London, UK.

Nene, Y.L., Thapliyal, P.N., Fungicides in plant disease control. Oxford and IBH pub. Co. Pvt. Ltd. New Delhi, 1982, 212-349

Njambere, E. and Chen, W. (2011). Compendium of Chickpea and Lentil Diseases and Pests. St Paul, MN: The American Phytopathol Society. pp. 13-15.

Papavizas, G. C., and Lewis, J. A. (1981). Introduction and augmentation of microbial antagonists for the control of soil born pathogen In: Biological control in crop production (ed Paparzas G C) Osmum Totawa. pp: 305-322.

Punja, Z.K. (1988). *Sclerotium rolfsii*, a pathogen of many plant species. In: Genetics of plant pathogenic fungi. (Ed.): G.S. Sidhu. Vol. 6. London: Academic Press. pp. 523-534.

Rawat, L., Singh, Y. and Kumar, J., (2012). Management of sclerotium root rot in lentil and Fusarium wilt in chickpea using Trichoderma isolates. International Journal of Agricultural Sciences 8 (2): 416-422.

Sahni S, Prasad BD (2020). Management of collar rot disease using vermicompost and a PGPR strain *Pseudomonas sp*. and their effect on defense-related enzymes in chickpea. Indian Phytopathology; DOI:https://doi.org/10.1007/s42360-020-00203-4

Suryawanshi, A. P., Borgaonkar, A. S., Kuldhar, D. P. and Dey, U. (2015). Integrated management of collar rot (*Sclerotium rolfsii*) of brinjal (*Solanum melongena*). Indian Phytopath. 68 (2):189-195.

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