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Management of Seedling blight disease (*Macrophomina phaseolina*) of Gerbera (*Gerbera jamesonii* Bolus ex.Hook f.) by using biocontrol agents

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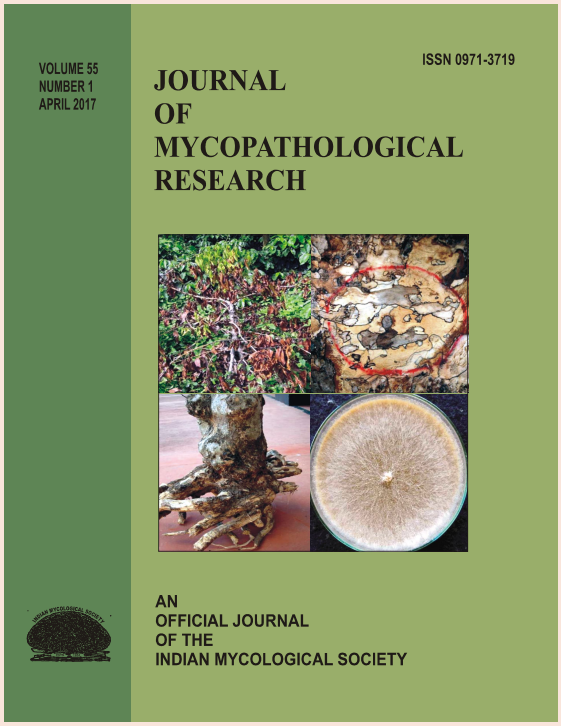

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Management of Seedling blight disease (*Macrophomina phaseolina*) of Gerbera (*Gerbera jamesonii* Bolus ex.Hook f.) by using biocontrol agents

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Gerbera as a flowering crop has vast potential for expansion in Odisha and India as a whole but it's spread is challenged by attack of fungal pathogens causing foot rot, wilt, root rot, blight, and grey mold diseases, among which seedling blight is fairly new to the crop. The disease is caused by *Macrophomina phaseolina* (Tassi) Goid which is soil borne and it becomes damaging when the period of hot and dry weather extended. The disease has been managed by chemical application which are uneconomical and not ecofriendly. As an alternative bio-agents have been employed to manage the disease. Bio-efficacy of bioagents on *Macrophomina phaseolina* study was conducted *in vitro* by using dual culture method. Among the various bioagents used *Pseudomonas fluorescence* and *Bacillus subtilis* were found to be highly effective and exhibited absolute control over the test fungus. Other bioagents such as *Trichoderma viride, Trichoderma harzianum* and *Verticillium lecani* which could attain 43.83,29.16 and 33.83 per cent inhibition of test fungus respectively were significantly less effective than *P. fluorescens* and *B. subtilis*..

Key words: *M. phaseolina*, *T. viride*, *T. harzianum, P. fluorescence, B. subtilis, V. lecani*

Gerbera is an herbaceous perennial flowering plant with long stalk and daisy like flower which has been in the arena of commercial floriculture because of high aesthetic value. It is one of the most popular cut flowers in the world and occupies fourth place in the floriculture trade.

As per National Horticulture Database 2012 published by National Horticulture Board, during 2011-2012 the area under floriculture production in India was 253.65 thousand hectares with a production of 1.652 million tones loose flowers and 750.66 million tones cut flowers. In Odisha 7,110 ha of area is under flower crops and produces 25.300 million tones of loose flowers and 5356 lakh numbers of cut flowers annually. In India, Maharashtra produces highest number of gerbera followed by Karnataka.

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Though the potential of area expansion under gerbera is high, its spread is affected by disease problems. It is subjected to the attack by foot rot, wilt, root rot complex, blight and grey mold (Padgham and Gade, 2006). However, seedling blight of gerbera is a new introduction to this crop caused by *M. phaseonila.*

The crop is damaged by a soil borne pathogen *M. phaseonila* (Tassi) Goid which has a very wide host range and causes root rot, charcoal rot, any stem blight and seedling blight.

The disease is more damaging when the period of hot and dry weather is extended. The soil borne disease is difficult and uneconomical to control with chemicals. The fungus is reported to have resistance to some of the fungicides. Further eradication of soil borne plant pathogen is a challenge

because they are soil habitats and they can survive for longer period in the absence of host plants through resting spores. The fungus survived in soil by producing multicellular jet black microsclerotia enormously during parasitic and low saprophytic phase.

Efforts have been made to manage the disease with bioagents as they have been found effective to manage the seedling blight/root rot disease in several crops. Biological control, however found to be long lasting, ecofriendly and economical and can be alternative method to chemical control. The effect of *Trichoderma* species, *P. flourescence* and *B. subtilis* (Manjunatha *et al.* 2013; Govindappa and Lokesh, 2011; Bhatia *et al.* 2008) in plant disease management has been well documented. But management strategy to control seedling blight disease of gerbera in Odisha is lacking and so far not sufficient information is available from India. Thus keeping this in view, this research was carried out to manage the disease with bioagents.

In vitro study on effect of biocontrol agents against seedling blight disease of gerbera caused by *M. phaseolina* was conducted at the Post Graduate Laboratory, Department of Plant Pathology, OUAT, Bhubaneswar. Antagonistic potential of the biocontrol agent was assessed against many soil borne plant pathogens. Antagonistic potential of the biocontrol agent against *M.phaseolina* (Tassi) Goid was evaluated through dual culture technique. The biocontrol agents used were *Tricoderma viride*, *T.harzianum, Verticillium lecani*, *Pseudomonas fluorescence* and *Bacillus subtilis* against test fungus. The biocontrol agents were screened against the test pathogen on Potato Dextrose Agar. The relative growth rate measured as a function of incubation period. Mycelial disc (5 mm diameter) taken from the margin of young vigorously growing 5 day old culture of the test fungus and the antagonists were inoculated at the periphery opposite to each other in sterilized Petriplate (90 mm diameter) containing 20ml sterilized PDA under aseptic condition. The treatments were replicated four times. Observations were recorded on the inhibitory effect up to 5 day of incubation of antagonists against pathogen on PDA at 27±10^{0}C. The per cent inhibition of growth was calculated following the formula :

$$\text{Mean Percentage inhibition} = \frac{C-T}{C} \times 100$$

where, C – Colony diameter in control
T– Colony diameter in treatment

All the biocontrol agents used in the study as antifungal agents were found to be superior to untreated control in restricting mycelial growth of *Macrophomina phaseolina* causing seedling blight disease of gerbera (Table 1). However, the biocontrol agent exhibited variability in their effectiveness. The most effective ones among them were *P. fluorescence* and *B. subtilis* which obtained absolute control on growth of test fungus. Other biocontrol agents were significantly inferior to the *P. fluorescence* and *B. subtilis.* The antifungal activity of *T.viride* with 43.83% inhibition was next but far low in comparison to *P.fluorescens* and *B. subtilis*. It was followed by *V.lecani* and *T. harzianum*. The difference between *T. harzianum* and *V. lecani* was statistically insignificant but both of them were significantly inferior to that *T. viride.* A search revealed lack of literature on gerbera isolate of *M. phaseolina*. However, literatures available on efficacy of *T. viridae*, *B. subtilis, T. harzianum* and *P. fluorescence* against *M. phaseolina* isolated from chick pea, pea nut, sorghum, moong bean revealed similarity with effectiveness obtained in the present study (Bhatia *et al.* 2008; Govindappa and Lokesh, 2011).

Table 1 : Percent growth inhibition *of M. phaseolina* by bio agents

Antagonist	Mean diameter of test fungi in dual culture(cm)	% growth inhibition
Trichoderma viride	3.37	43.83
Trichoderma harzianum	4.25	29.16
Pseudomonas fluorescence	0.00	100
Bacillus subtilis	0.00	100
Verticillium lecani	3.97	33.83
Control	6.00	–
SE(m)±	2.64	
CD(0.05)	8.15*	
CV(%)	9.16	

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