

## ABSTRACT

Groundnut (*Arachis hypogaea* L.) is an important edible oil seed crop in India which constitutes nearly 50% area and accounts for 45% of oil production. India's annual production of groundnut oil is about 1.5 million tons.

The stem rot and charcoal root rot disease is deleterious to many cultivated crops. Stem rot and charcoal root rot in groundnut caused due to pathogen *Sclerotium rolfsii* and *Macrophomina phaseolina* results into heavy loss. There have been various approaches for controlling plant diseases. And the phenomenon of biological control of plant diseases is feasible and environment friendly alternative for harmful chemicals and pesticides which causes environmental pollution. Arbuscular mycorrhizal fungi (AMF) and *Trichoderma* species have been widely used as biological fungal antagonist agents as well as plant growth promoters.

The objective of the present study was to investigate potential biological disease diminution ability of antagonistic mycorrhizal fungi *G. fasciculatum* and *Trichoderma viride* to manage diseases of groundnut (*A. hypogaea* L.) plant. The *Arachis* cultivars (JL-24 and W-51) were found to be susceptible to fungal diseases caused by pathogens *S. rolfsii* and *M. phaseolina*. The fungus *S. rolfsii* was isolated naturally from infected *Arachis* plants and the fungus *M. phaseolina* was kindly provided by ARI (Agharkar Research Institute). The talc based *T. viride* was obtained by Agriculture College, Pune. The antagonistic ability of *T. viride* was screened *in vitro* by dual culture technique in which *T. viride* strongly inhibited the fungal growth of *S. rolfsii* and *M. phaseolina* by 75% and 71.42%, respectively. In pot culture study *Arachis* cultivars were inoculated with *G. fasciculatum* and talc based formulation of *T. viride* (@ 4g/kg seeds) were applied. The single application of either arbuscular mycorrhizal fungus *G. fasciculatum* or *T. viride* was effective in reducing disease. However, the combination of arbuscular mycorrhizal fungus *G. fasciculatum* + *T. viride* was found to be the most efficacious biocontrol agent in pot culture study. Application of *G. fasciculatum* and *T. viride* served as efficient growth promoters on tested growth parameters as well as played the role of biocontrol agent. The phenomenon of mycorrhizal colonization was denigrated scantily by pathogens *S. rolfsii* and *M. phaseolina* in roots of both *Arachis* cultivars. The present investigation showed level of phenolic compounds has been prominent in observation relating to resistance in both *Arachis* cultivars due to inoculation of mycorrhizal fungi and

*Trichoderma*. It is been observed by increased antioxidant enzyme activities of polyphenol oxidase (PPO), peroxidase (PER) and superoxide dismutase (SOD) to varying degrees at different stages of growth period, which involved in cell protection against oxidative stress, in both cultivars of *Arachis*. Total protein and proline content were increased significantly in both *Arachis* cultivars suggesting biotic stress by pathogens. The enzyme activities increased significantly in dual treatments of AM fungi and *Trichoderma* as compared to single or uninoculated control ones. The role of enzyme activities has been discussed in the relevant chapters. Total protein and proline content got elevated due to dual inoculation by AM fungi and *Trichoderma* species as compared to single or control ones. The acid and alkaline phosphatase activity was increased due to inoculation by mycorrhizal fungus *G. fasciculatum*. The efficacy of *G. fasciculatum* against *S. rolfsii* and *M. phaseolina* in field and their effect on physiological, growth and yield in different cropping system 15 cm and 30 cm spacing with *Arachis* plants was investigated. The results of field investigation showed successful disease reduction by AM fungus *G. fasciculatum* in 30 cm spacing as compared to 15 cm spacing.

In conclusion, the present study suggests that AM fungus *G. fasciculatum* and *T. viride* suppressed disease development in *Arachis* plants and for biocontrol of *S. rolfsii* and *M. phaseolina*, AM fungi and *Trichoderma* species should be considered.

*Key words:* *Arachis hypogaea* L., biocontrol, *Glomus fasciculatum*, *Trichoderma viride*, *Sclerotium rolfsii*, *Macrophomina phaseolina*, stem rot, charcoal root rot, arbuscular mycorrhizal fungi,

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