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Integrated management of collar rot and pod rot diseases in groundnut

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Abstract
Groundnut (*Arachis hypogaea* L.) is one of the important oilseed crop grown in India which is affected by several diseases. Among these diseases, collar rot caused by *Aspergillus niger* and pod rot caused by *Macrophomina phaseolina* are economically important. For the management of these diseases of groundnut various treatments were imposed. The fungicides and bio control agents with agronomical practices were tested against these diseases in groundnut. The experiment comprised of seven treatments replicated thrice in design RBD during *Kharif* - 2015 to 2017 at Oilseeds Research Station, Jalgaon. The results that revealed that the treatment, Deep summer ploughing with mould board plough + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha +Seed treatment with Tebuconazole 2DS 1.5 g/kg seeds followed by seed treatment with PGPR @625g/for per ha of seeds+ Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 DAS showed the highest germination 92.04% as against 73.43% in the control. The same treatment also recorded the least incidence of collar rot at 30 DAS 2.93% and pod rot at harvest 2.89% as against 10.79% and 7.53% in control, respectively.

Keywords: groundnut, soil application and seed treatment

Introduction
Groundnut (*Arachis hypogaea* L.) is an important is a leguminous oilseed crop and grown in many tropical and subtropical countries of the world. More than 40 fungal diseases attack the crop throughout the world. Amongst those, Collar rot and pod rot are the major biotic constraints taking heavy toll of the crop. An effective control for management for these serious diseases along with low cost of control measures is essential to minimize cost of production. Though fungicides offer certain degree of protection against soil borne pathogens, they are not so effective because of the multiplication and continual persistence of pathogens in the soil. The application of fungicides may give effective protection for up to 20-25 days, but it adversely affects beneficial rhizosphere organisms besides causing soil and air pollution. In this view, present study was planned to find out effective control measures against Collar rot and pod rot diseases of Groundnut.

Materials and Methods
A field trial was laid out using Randomized Block Design with seven treatments of different fungicides and bio control agents with agronomical practices distributed in three replications *viz.*, T_1- Deep summer ploughing with mould board plough + Seed treatment with Tebuconazole 2DS 1.5g/kg seeds followed by PGPR @ 625 g for per ha of seeds + Soil application of *Trichoderma* @ 4 kg/ha enriched in 250 kg FYM/ha at 35 and 70 DAS, T_2-Deep summer ploughing with mould board plough + Seed treatment with *T. viride* 10/kg seeds followed by PGPR @ 625 g for per ha of seeds + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 DAS,T_3 -Deep summer ploughing with mould board plough + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha + Seed treatment with Tebuconazole 2DS 1.5 g/kg seeds + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 DAS, T_4- Deep summer ploughing with mould board plough + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha +Seed treatment with Tebuconazole 2DS 1.5 g/kg seeds followed by seed treatment with PGPR @ 625g/for per ha of seeds+ Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 DAS, T_5- Deep Summer ploughing, T_6- Farmers' Practice (respective

centre) and T_7- Control (Without any treatment). The incidence of Collar rot was recorded at 30 DAS and pod rot was recorded at harvest.

Results and Discussion

The treatment i.e Deep summer ploughing with mould board plough + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha +Seed treatment with Tebuconazole 2DS 1.5 g/kg seeds followed by seed treatment with PGPR @ 625g/for per ha of seeds+ Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 was showed the highest germination 92.04% as against 73.43% in the control. The treatment T_4 recorded the least incidence diseases *viz.,* collar rot at 30 DAS 2.93% and pod rot at harvest 2.89% as against 10.79% and 7.53% in control, respectively. The results are in the agreement with the findings of Karthikeyan (1996) [3], Ganesan and Sekar 2004 [2], Chitradevi and Prasad (2009) [1], Rohtas *et al.,* (2016) [7], Manju Kumari and Mahabeer Singh (2017) [5]. Karthikeyan *et al.* 2018 [4]. Chitradevi and Prasad (2009) [1] studied the biointensive management of collar rot of groundnut caused by *Aspergillus niger* and reported that the collor rot incidence in groundnut was reduced by the application of *Trichoderma viride* as seed treatment along with fungicides. *In vitro* studies of fungal and bacterial antagonists, *viz.*, *Trichoderma* spp. and *Pseudomonas fluorescens* indicated that *T. viride* was more effective in inhibiting the pathogen *A. niger*. In pot culture experiment, the combined effect of seed treatment with *T. viride* and captan resulted in significant reduction of collor rot. Combination of antagonist and fungicide also improved the growth parameters like length of the plant, biomass and yield besides decreasing the disease incidence. Rekha Kumari *et al.* (2012) [6] studied the integrated management against root-rot of Mungbean incited by *Macrophomina phaseolina.* For the integrated management of the disease, biocontrol agents, fungicides, herbal oils, plant extracts and organic manure as well as their combinations were used. Among the tested biocontrol agents against *Macrophomina phaseolina*, *T. harzianum* was found the most effective against the fungus under *in vitro* and in pots conditions followed by *T. viride and T. polysporum.* In the case of organic manures, vermicompost was the most effective in reducing the root rot incidence under pots conditions. FYM and goat manure was found moderately effective in controlling root rot incidence. Rohtas *et al.* (2016) [7] tested the bioagents *viz.*, *Trichoderma viride*, *T. harzianum* and *Pseudomonas fluorescence* for their inhibition of mycelial growth of *A. niger in vitro* and reported that *T. viride* inhibited the mycelial growth up to 78.32 percent followed by *T. harzianum* 72.50%, while the bacterial agent *P. fluorescence* only managed to inhibit 23.80 percent of mycelial growth. Seed treatments and soil inoculation with bio-agents significantly reduced the disease incidence. Manju Kumari and Mahabeer Singh (2017) [5] studied management of collar rot disease of groundnut through bioagents and reported that the bio agents *viz.*, *Trichoderma viride*, *Trichoderma harzianum*, and *Pseudomonas fluorescens* were found significantly inhibitary to the fungal growth of *Aspergillus niger* causing collar rot in groundnut as compared to control *in vitro* and *in vivo*. Karthikeyan *et al.* 2018 [4] studied on management of groundnut root rot with biocontrol agents and organic amendments. Three isolates of *Trichoderma viride* and one isolate in each of T. *harzianum* and *Pseudomonas fluorescens* were evaluated *in vitro*, to assess their antagonistic potential against *Macrophomina phaseolina* causing root rot of groundnut. *T. viride* (Tv1) and *T. harzianum* were the most effective in reducing the mycelial growth and sclerotial formation of *M. phaseolina.* Culture filtrates of *T. viride* (Tv1) inhibited the growth of the pathogen as well as sclerotial germination to a greater extent. In greenhouse experiments, the application of *T. viride* with pungam cake each at 5 g/kg of soil markedly reduced root rot incidence recording 3.12% compared to 43.98% in control.

Table 1: Integrated management of colar rot and pod rot diseases in groundnut (Pooled data from *Kharif* 2015-2017).

Treatment	Germination (%)				Collar rot @ 30 DAS (%)				Pod rot at harvest (%)			
	2015	2016	2017	Pooled mean	2015	2016	2017	Pooled mean	2015	2016	2017	Pooled mean
T_1	83.0	95.12	85.75	87.96	5.33 (13.35)	3.52 (10.81)	4.49 (12.23)	4.45 (12.17)	4.82 (12.69)	4.82 (12.69)	4.82 (12.69)	4.82 (12.69)
T_2	80.9	91.17	84.01	85.36	6.00 (14.18)	4.92 (12.81)	5.05 (12.98)	5.32 (13.34)	5.69 (13.80)	5.69 (13.80)	5.02 (12.95)	5.47 (13.52)
T_3	80.4	90.41	84.12	84.98	5.89 (14.04)	4.97 (12.88)	5.15 (13.12)	5.34 (13.36)	6.04 (14.23)	6.04 (14.23)	5.04 (12.98)	5.71 (13.82)
T_4	88.8	97.10	90.22	92.04	3.11 (10.16)	2.2 (8.54)	3.49 (10.76)	2.93 (9.86)	2.76 (9.57)	2.76 (9.57)	3.16 (10.24)	2.89 (9.79)
T_5	78.1	88.04	80.77	82.30	6.89 (15.22)	7.76 (16.18)	6.84 (15.16)	7.16 (15.52)	6.82 (15.14)	6.82 (15.14)	5.79 (13.93)	6.48 (14.74)
T_6	80.2	89.48	82.02	83.90	6.33 (14.58)	4.72 (12.54)	5.76 (13.89)	5.60 (13.69)	5.25 (13.25)	5.25 (13.25)	4.59 (12.37)	5.03 (12.96)
T_7	68.4	79.36	72.53	73.43	10.56 (18.96)	10.09 (18.52)	11.71 (20.01)	10.79 (19.17)	7.72 (16.14)	7.72 (16.14)	7.16 (15.52)	7.53 (15.93)
SEm±				0.43				0.42				0.23
CD at 5%				1.33				1.31				0.71
CV %				0.86				5.71				3.09

Conclusion

The treatment i.e Deep summer ploughing with mould board plough + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha +Seed treatment with Tebuconazole 2DS 1.5 g/kg seeds followed by seed treatment with PGPR @ 625g/ for per ha of seeds + Soil application of *Trichoderma* @ 4 kg/ ha enriched in 250 kg FYM/ha at 35 and 70 was showed the highest germination 92.04% as against 73.43% in the control. The treatment T_4 recorded the least incidence of diseases *viz.*, collar rot at 30 DAS 2.93% and pod rot at harvest 2.89% as against 10.79% and 7.53% in control, respectively. In recent years much attention has been given to

non-chemical means of disease management, the present study has shown that the fungicides alongwith bio control agents and agronomical practices were much more effective and can be used for management of diseases as a integrated approach.

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