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Efficacy of fungicides and bioagent against *Rhizoctonia bataticola*

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Abstract
The experiment was conducted to manage on control the pathogen which has caused severe disease in this plant. In this experiment fungicides were used at different concentration *viz*., Carbendazim @ 0.1% and Carboxin + Thirum @ 0.3% were efficient in completely inhibiting the growth of *Rhizoctonia bataticola* (100%) *in vitro* and also biocontrol agent *Trichoderma viride* was found antagonistic and the *in vitro* mycelia inhibition of *Rhizoctonia bataticola* was 50.9%. In the pot experimentation the mycorrhizal spores was recorded as 3.3, 5.3, 9.0, 13.3 and 14.0 at 15, 30, 45, 60 and 75 DAS respectively in the treatment of VAM @ 5kg/ha alone and no mycorrhizal spores was obtained in control treatment during each observation.

Keywords: efficacy, fungicides, bioagents, *Rhizoctonia bataticola*

Introduction
Dry root rot (DRR) caused by *Rhizoctonia bataticola* (Taub.) Butler [Pycnidial stage: *Macrophomina phaseolina* (Tassi) Goid] was found as a potentially emerging constraint to chickpea production. The disease generally appears during reproductive phase of the crop. The disease may also appear at seedling stage, however, the susceptibility of the plant increases with age. The disease generally appears when day temperature is more than 30^0 C.
Being mainly a soil-inhabiting pathogen, many environmental and soil factors are responsible for the development of disease. The disease is very difficult to control after its initiation. The best management practice is to avoid the infection by physical, chemical or biological means. The ill effect of chemicals is now well known. Physical means are having number of limitations and hence biological method is best suited.

Material and Methods
R. bataticola was isolated from root rot infected chickpea plants on PDA by tissue isolation method. The sorghum grain soaked partially for one hour in warm water (40 to 45 ^{0}C) and then spread on clean blotting paper for air drying. About 300 g moistened grains were filled in each 1000 ml flask with 10 ml water and autoclaved for 30 min. at 15 lbs pressure. The mycelial bits of pure culture of *Rhizoctonia bataticola* were inoculated under aseptic condition in those flask containing grains and incubated at $28+2^0$ C for 10 days. Meanwhile flask were shaken to avoid clumping of grains and to facilitate early growth of test fungus. The grains turn blackish due to growth of test fungus.
Soil was put in gunny bag and sterilized in autoclave at 1.05 kg/cm^2 pressure for 1 hour consequently for 3 days. The mass multiplied inoculum was added in 1:10 proportion to soil and thoroughly mixed. Thus soil was made sick. The pots were taken and surface sterilised with 0.1% formalin. The sick soil was filled in sterilized pot 1/4th of its capacity. The pots were watered lightly and incubated for 4 days. Chickpea seeds of Digvijay were sown (12 seeds per pot) and the pots were monitored for seedling mortality.
Dual culture technique as described by Vincent (1927) was adopted for estimating the ability of antagonistic organisms as an antagonist against *Rhizoctonia bataticola.* The pathogen *R. bataticola* and antagonistic *Trichoderma* was grown separately on PDA up to 7 days. The discs of 5 mm from 7 days old culture of *R. bataticola* were placed on one side of the petri-plates containing PDA. Similarly, 5 mm disc of *T. viride* were cut from 7 days old culture and placed on opposite sides of the pathogen. Each treatment was replicated three times.

The inoculated plates were incubated at 28±2^{0}c for 5 days. On seventh day the growth of *Rhizoctonia bataticola* was measured.

Poison food technique was employed to test the efficacy of commonly used fungicides i.e. Carbendazim @ 0.1% and Carboxin + Thirum (combined products) @ 0.3%. Against *Rhizoctonia bataticola.* Prepared PDA in flask (used separate stock for each fungicide) and sterilized. Measured quantity of chemicals were added to make required final concentration and mixed well. Poured in sterilized petri plates and allowed to solidify. The small discs (0.5 cm dia) of 7 days old fungal culture were cut and placed on the petri plates in the centre with proper control (PDA without chemicals). Three replications were maintained for each chemical and control Plates were incubated for 7 days at 28± 2^{0}C.

Results and Discussion

During the investigation, association of mycorrhiza with characteristic feature was observed. Only one type of spores could be seen in rhizosphere which was found singly and in cluster. The shape was globuse, smooth or shiny roughened from adherent debries. Some spores were light yellow brown or bright yellow and transparent to translucent when young and became black brown to black at maturity. Some spore was two layered, outer wall thicker than inner filled with granular particle. Spore was also found with one straight to recovered funnel shape subtending hyphae. The colour of hyphae was observed as yellow to brown. The hyphal growth and penetration of hyphae in roots could be seen under microscope.

Pathogenicity Test of *Rhizoctonia bataticola*

The infected leaves of chickpea showing typical symptoms of root rot were used for isolation of the pathogen. The isolated pathogen was inoculated on healthy plants by soil inoculum method and then re-isolated from plants showing symptoms of root rot to confirm that the *R. bataticola* was pathogenic to chickpea (plate 5). The fungus grew rapidly on potato dextrose agar (PDA) and produced brown to grey coloured mycelium that became darker with age. The hypha was thin, hyline, aseptate and dichotomously branched and later produced typical black sclerotia. After proving pathogenicity of *R. bataticola* the pot culture experiment was conducted in *R. bataticola* sick soil. Amrutha *et al*.... (2014b) [3] also proved the pathogenicity of *R. bataticola* in chickpea by soill inoculation method.

Plate 6a: *In vitro* efficacy of *Trichoderma viride* against *Rhizoctonia bataticola*

Plate 6b: *In vitro* efficacy of fungicides against *Rhizoctonia bataticola*

Effect of different treatments of mycorrhizal spores in pot culture

To confirm the trend of data observed in field condition the same experiment was also conducted in pot culture and the data obtained is depicted in Table 1.

Table 1 revealed that maximum number of mycorrhizal spores was recorded in the treatment of VAM application alone i.e. 3.3, 5.3, 9.0, 13.3 and 14.0 at 15, 30, 45, 60 and 75 DAS. The trend of the results was same as obtained in field experiment. However under field condition, control treatment also exhibited some VAM spores might be due to migration of spores from one plot to another which is restricted in pot culture. Obviously no mycorrhizal spores was obtained in control treatment during each observation as it was completely devoid of VAM application. In pot culture experiment also the fungicides and herbicide exhibited adverse effect on VAM spores as their number get reduced in combination treatments compared to alone treatment of VAM. Although during the observations application of VAM with *Trichoderma* either as seed treatment or soil application yielded statistically at par mycorrhizal spores with alone application of mycorrhiza, the mycorrhizal spores get reduced with *Trichoderma* also at 75 DAS (Fig. 1).

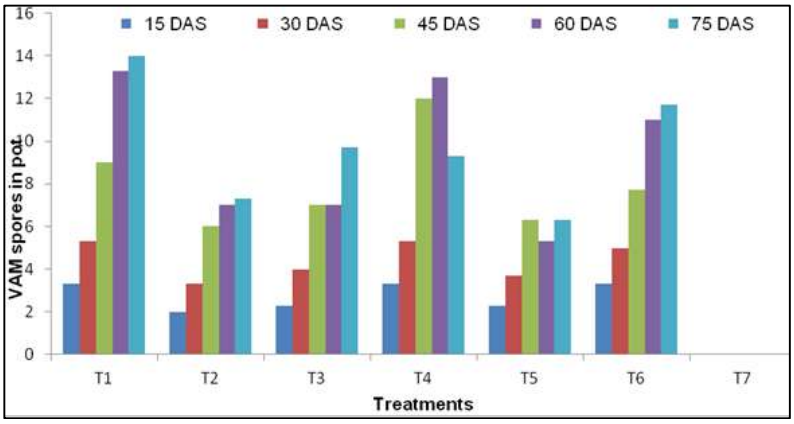

Fig 1: Effect of different treatment on mycorrhizal spores in pot culture

Table 1: Effect of different treatment on mycorrhizal spores in pot culture

Tr. No.	Treatment	Mycorrhizal spores in pot culture				
		15 DAS	30 DAS	45 DAS	60 DAS	75 DAS
T_1	VAM @ 5kg/ha.	3.3	5.3	9.0	13.3	14.0
T_2	T_1 + Seed treatment with Carbendazim 50 WP @ 0.1%	2.0	3.3	6.0	7.0	7.3
T_3	T_1 + Seed treatment with Carboxin + Thirum@ 2.0 g/kg	2.3	4.0	7.0	7.0	9.7
T_4	T_1 + Seed treatment with *Trichoderma*@ 4g/kg	3.3	5.3	12.0	13.0	9.3
T_5	T_1 + Soil application of *Pendimethalin*@ 1.5 kg/ha	2.3	3.7	6.3	5.3	6.3
T_6	T_1 + Soil application of *Trichoderma*@ 2.5 kg/ha	3.3	5.0	7.7	11.0	11.7
T_7	Control	0.0	0.0	0.0	0.0	0.0
	F test	Sig	Sig	Sig	Sig	Sig
	SE(m)	0.34	0.54	0.44	0.85	1.56
	CD (0.05)	1.05	1.67	1.38	2.65	4.87

From the studies of field and pot culture experiment it is evident that VAM alone performed better in suppressing the root rot incidence and population of *R. bataticola* and its application with chemicals and bio agent had adverse effect on root colonization and population of VAM in chickpea.

Effect of bioagent and fungicides on growth of *Rhizoctonia bataticola in vitro*

Rhizosphere mycoflora has an ability to inhibit the growth of disease causing pathogen. Therefore antagonistic effects of *Trichoderma* were assessed against the pathogenic fungi *R. bataticola* by dual culture method and the effect of fungicide viz., Carboxin + Thirum (0.3%) and Carbendazim (0.1%) were evaluated against this pathogen by poison food technique. The growth inhibition of *R. bataticola* due to *Trichoderma* and chemical fungicides is calculated and presented in Table 2.

Table 2: Efficacy of bioagents and fungicides against *Rhizoctonia bataticola* by dual culture and poison food method

Particulars	Mean radial mycelial growth (mm) of *R. bataticola*	Growth inhibition (%)
(Bioagent)		
1. *Trichoderma*	44.16	50.9
2. Control	90	-
(Fungicides)		
1. Carboxin + Thirum (0.3%)	0	100
2. Carbendazim (0.1%)	0	100
3. Control	90	-

Radial mycelial growth of *R. bataticola* in presence of *Trichoderma* was recorded as 44.16 mm with inhibition of *R. bataticola* by 50.9%. Reported that *Trichoderma sp.* was the most antagonists microorganism to charcoal rot disease pathogen i.e. *Macrophomina phaseolina* and reduced the colony growth of *Macrophomina phaseolina* significantly

compared to the control. Viswanathan *et al*. (2015) and Rasmi (2012) [9] also demonstrated strong inhibition of *R. bataticola/ M. phaseolina* by Trichoderma *in vitro.*

Both the tested fungicides i.e. Carboxin + Thirum (0.3%) and Carbendazim (0.1%) were found effective for arresting 100% myelial growth of *Rhizoctonia bataticola*. Khan *et al.* (2012) also reported 100% mycelial inhibition of *Rhizoctonia bataticola* in dry root rot of chickpea with Carbendazim (0.1%).

References

1. Akhtar MS, Siddique ZA. Biocontrol of a Chickpea root-rot disease complex with Glomus intraradices, Pseudommonas putida and Paenibacillus polymyxa. Journal of Australasian Plant Pathology. 2007, 175-180.
2. Amrutha GV, Reddy NP, Reddy BV, Prasanthi L. Potential of *Trichoderma* spp. as biocontrol agents against *Rhizoctonia bataticola* causing Dry Root Rot of Chickpea. International Journal of Plant, Animal and Environmental Science. 2014a; 5(1):195-196.
3. Amrutha NP, Reddy BV, Reddy, Prasanthi L. Pathogenicity Tests and Evoluation of efficacy of Fungicides against *Rhizoctonia bataticola* the causal agent of dry root rot of chickpea. International Journal of Applied Biology and Pharmaceutical Technology. 2014b; 4(1):78-81.
4. Islam MS, Saha AK, Mosaddeque HQM, Amin MR, Islam MM. *In vitro* studies on the reaction of fungi *Trichoderma* to different herbicides used in tea plantation. International Journal Sustainable Crop Production. 2008; 3(5):27-30.
5. Lioussanne L. Review. The role of the arbuscular mycorrhiza- associated rhizobacteria in the biocontrol of soilborne phytopathogens. Spanish Journal of Agricultural Research. 2010; 8(1):3-5.
6. Nevadita SC Singh, Sharma A. Compatibility of *Trichoderma viride* and its interaction with different fungicides. International Journal of Technical Research and Application. 2015; 3(6):253-257.
7. Pancheshwar DK, Varma RK. Effect of *Rhizoctonia bataticola* isolates on mortality of soybean cultivar. A Journal of Multidisciplinary Advance Research. 2013; 2(1):99-104.
8. Raguchander T, Rajappan K, Samiappan R. Evaluating methods of application of biocontrol agent in the control of mungbean root rot. Indian phytopathology. 1997; 50(2):229-234.
9. Rashmi S, Mourya S, Upadhyay RS. Antifungal potential of *Trichoderma species* against Macrophomina Phaseolina. Journal of Agricultural Technology. 2012; 8(6):1925-1933.
10. Rashmi V, Kumar V. *Rhizoctonia bataticola* (Taub.) Butler. is a serious pathogen causing Root Rot disease in smooth Gourd. Global journal for Research Analysis. 2016; 5(1):68-70.
11. Sangappa G, Mallesh SB. Effect of bioagents and chemicals for the management of aerial blight and dry root rot of blackgram incited by Rhizoctonia bataticola. International Journal of plant protection. 2016; 9(2):224-229.
12. Yashoda RH, Ammajamma R. Efficacy of fungicides against *Rhizoctonia bataticola* causing wilt of Coleus forskohlii. International Journal of Plant Protection. 2009; 2(1):31-32.