



IPM TECHNIQUE TO PREVENT SOFT ROT OF GINGER

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Abstract: An On Farm Trail was conducted to evaluate the efficacy of integrated module of chemicals and non-chemicals against soft rot disease in ginger (*Zingiber officinale* Rosc.) on farmers field at different villeges of Kishanganj district during 2012-13 and 2013-14. The *in vitro* study on mycelial growth inhibition of *Pythium aphanidermatum* revealed that among different antagonists evaluated *Trichoderma viride* proved most potent bioagent in limiting growth of the pathogen of soft rot of ginger. The two years field study indicated that Rhizome treatment with Coperoxy Chloride + soil treatment with *Tricoderma viride* @ 1Kg. mix with 100 kg. Vermicompost + *Pseudomonas* drenching in soil was most effective in limiting the incidence of soft rot on ginger besides having their significant response in improving the 30 per cent growth and yield over control.

Key words: Bioagents, Disease management, *Pythium*, *Trichoderma*.

Introduction:

India is largest ginger (*Zingiber officinale* Rosc.) producing country (3, 82,600 tonnes) in the world, accounting for about one-fourth of the total world production (1,615,974 tonnes). Major ginger-growing states are Kerala, Sikkim, Meghalaya, West Bengal, Simanchal of Bihar, Odisha and Himachal Pradesh. In Bihar, it is an important cash crop of simanchal area specially kishanganj district from wherre ginger cultivated and distributed in whoe Bihar for their domestic consumption. Ginger is a succulent herb and its rhizomes easily succumb to different biotic stresses. The cultivation of ginger is affected by different diseases which are soil- and rhizome-borne, viz. soft rot, yellows and bacterial wilt. Rhizome rot of ginger caused by *Pythium* spp. (Bhardwaj *et al.*, 1988) is one of the most serious constraints in production of ginger. This disease is seed and soil borne in nature (Kumar *et al.*, 1989). There have been many reports of successful use of antagonistic fungi to control soil borne pathogenic fungi. Species of *Trichoderma* have been evaluated by many workers for efficacy in the biocontrol of fungal plant pathogens (Chet *et al.*, 1981; Mukhopadhyay, 1994; Shankar and Jayarajan

Materials and Methods:

A field experiment was conducted in a randomized block design (RBD) in 2012-13 and 2013-14 at farmers field in different villages of Kishanganj district with three technological options viz., T1 = farmer's practice (control); T2 = Rhizome treatment with coperoxy chloride @ 2 gm./litter water; T3 = Rhizome treatment with coperoxy chloride + soil treatment with *Tricoderma viride* @ 1Kg. mix with 100 kg. Vermicompost + *Pseudomonas* drenching in soil. The trial was laid in a standard plot size of 3 x 1m² in ridges and furrows method and rhizomes were planted in 30 x 20cm apart. Fifty rhizomes were planted in each bed, each weighing about 25-30gm. planting was done in the last week of the June in both the years with recommended dosage of fertilizers. Total amount of phosphatic fertilizer and half dosage of potassic fertilizer were given as basal dosage.

Half the dose of nitrogenous fertilizer was given at 45 days nand half amount of potassic and half amount of nitrogenous fertilizers were given at 90 days after planting. Irrigation was given as and when required. *Trichoderma viridie* procured from bio pesticide a local isolate available as Tricho (cfu 4.3 x 10⁷), was used. Data on no of infected rhizome, total

no of rhizome. Observation on disease incidence was made one month before digging the crop. Per plot yield was taken at the time of harvesting after the removal of roots and rootlets. The per cent

infestation were counted and calculated (Anonymous, 2004) by using the formula as given below:

$$\% \text{ infestation} = \frac{\text{No of infected rhizome}}{\text{Total no of rhizome observed}} \times 100$$

Table 1: Effect of different technological option on incidence and yield economics soft rot of ginger

Treatments	% rhizome damage	Yield (q/ha)	% increase over control	Gross cost (Rs/ha)	Gross Return (Rs/ha)	Net Returns	B:C rati
T1= Farmers practice- (No treatment)	21	150	0	80000	225000	145000	2.81
T2= Rhizome treatment with coperoxy chloride @ 2 gm./litter water	18	156	4	81000	234000	153000	2.89
T3= Rhizome treatment with coperoxy chloride + soil treatment with trichoderma vride @ 1Kg. mix with 100 kg. Vermicompost +pseudomonas drenching in soil	4	195	30	85000	292500	207500	3.44
CD	1.07	2.87	-	-	-	-	-
SEm	0.37	0.99					
CV.	9.58	2.21					

Results and Discussion

Efficacy against Rhizome rot

The combination of Rhizome treatment with Coper oxy chloride @ 2.5 gm/L water dip method and soil treatment with *T. viridie* @ 1kg well mixed with vermicompost of 100 kg for 24 hours and soil drenching with *Pseudomonas fluorescens* (T3) was found to be most effective in controlling the rhizome rot with the per cent disease incidence of 4.0 (Table 1). Whereas only Rhizome treatment with Copper oxy chloride @ 2.5 gm/L water dip method (T2) and Farmers Practice i.e No any treatment showed higher per cent infestation of 18 and 21 per cent, respectively. Similar type of result also recorded by Sharma *et al.* (1991) and he reported that *T. viride* in combination with Ridomil MZ gave a greater protection against rhizome rot and also gave higher yield when given as rhizome treatment. Sagar (2006) found that

significant inhibition of *P. aphanidermatum* and *F. solani* growth by the application of systemic fungicides *viz.*, carbendazim, carboxin, iprodione + carbendazim (Quintal), mancozeb + carbendazim (SAAF) and metalaxyl MZ.

Effect on the yield and economics

The rhizome treatment with Coper oxy chloride @ 2.5 gm/L water dip method and soil treatment with *T. viridie* @ 1kg well mixed with vermicompost of 100 kg for 24 hours and soil drenching with *Pseudomonas fluorescens* (T3) recorded highest per cent in increase of rhizome yield (30%) over control i.e in comparision to Farmers practice who did not apply any chemical for management of soft rot. The treatment T2 also receive highest B:C ratio of 3.44, while rhizome treated with Coperoxychloride @ 2.5 gm/L water dip method (T1) recorded 4% increase

in rhizome yield over control and B:C ratio 2.89 which is close to Farmers practice (T1).

The combination of Rhizome treatment with Coper oxy chloride @ 2.5 gm/L water dip method and soil treatment with *T. viridie* @ 1kg well mixed with vermicompost of 100 kg for 24 hours and soil drenching with *Pseudomonas fluorescens* (T3) stood first with B:C ratio 3.44 and second T2 in the order with the B:Cratio of 2.89 & 2.81 the farmers practice (T1)

Conclusion

The combination of Rhizome treatment with Coper oxy chloride @ 2.5 gm/L water dip method and soil treatment with *T. viridie*@ 1kg well mixed with vermicompost of 100 kg for 24 hours and soil drenching with *pseudomonas fluorescens* can be used for minimizing the incidence of rhizome rot effectively.

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