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## RESEARCH ARTICLE

### MANAGEMENT OF RHIZOME ROT DISEASE OF GINGER IN BUNDELKHAND REGION OF MADHYA PRADESH

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#### ABSTRACT

Ginger (*Zingiber officinale* Rose) is an herbaceous perennial. The crop is heavily suffered due to rhizome rot in the light soil of Bundelkhand region of Madhya Pradesh where ginger is grown as cash crop. Highest germination and minimum rhizome rot incidence and maximum yield of Ginger was recorded in Copper hydroxide which is at par with *Trichoderma viride*. Seed treatment followed by soil drenching by Mancozeb and Soil application *Trichoderma viride* with FYM suppressing the rhizome rot of Ginger at farmer's field with higher yield in comparison to farmers practice.

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#### INTRODUCTION

Ginger (*Zingiber officinale* Rose) is an herbaceous perennial, the rhizomes of which are used as a spice. India is a leading producer of ginger in the world and during 2006-07 the country produced 3.70 lakh tones of the spice from an area of 1.06 lakh hectares. In Madhya Pradesh, it occupying 4400 ha with very low productivity 1.27 tonnes per ha. The reason of low productivity seems to be continuous use of degenerated seed which is prone to various diseases like rhizome rot or soft rot. Rhizome rot is widely prevalent throughout the ginger producing countries including India. It is mostly caused by different species of *Fusarium* and / or *Pythium*. The rhizome rot disease was first observed in the year 1949 and in later it acquired an epiphytotic form resulting in very heavy losses. During extensive survey conducted in farmer's field in the conventional ginger growing area in Chhatarpur district of Madhya Pradesh. The disease is indicated by leaves turning yellow. They ultimately wither and die out. The whole shoot is finally affected and the foot of the plant becomes watery and soft. The rhizome is discolored and gradually decomposes forming a watery mass enclosed by the tough round. The roots also rot and the rhizome formation ceases. Present study was undertaken to study the effect of different newer fungicide and *Trichoderma viride* against rhizome rot of ginger in light soil of Bundelkhand region of Madhya Pradesh where ginger is grown as cash crop and heavily suffered by rhizome rot.

#### MATERIALS AND METHODS

The present investigation was carried out at Agriculture research station (Betelvine), Nowgong Chhatarpur during 2008-09 and 2009-10. The local variety "Baruasager" of ginger was sown in the Kharif season in light soil. Recommended agronomical practices and fertilizer dose was applied before the planting. Nitrogen was applied in two split doses. Weeding and hoeing was done manually to keep plots weed free after one month of mulching with leaves of "Palas" chemicals like Ridomil 0.2%, Mancozeb 0.3%, Carbendazim 0.2%, Blitox (copper oxy chloride) 0.3% *Trichoderma viride* 0.5%. Seed pieces were treated with the chemical solutions for half an hour. The sowing was done on 3<sup>rd</sup> July in 2x3 met plots at spacing of 20 cm. For each treatment, there replications were maintained and arranged in randomized block design. A separate control was also maintained in which no fungicide was applied. Second and third round application of fungicides as drenching was done two and three months after planting. After rainy seasons 5-8 irrigations were given in a period of four months. Crop was harvesting at the end of January to first week of February. Data on germination, disease incidence and yield were recorded.

Demonstration on seed treatment and soil were conducted on easily available and cheaper chemical Mancozeb during 2008-09 in the village Maheba at 10 farmers field. The soil application of *Trichoderma viride* (Bio-safe) was demonstrated / tested at 10 farmer's field during 2009-10 and 2010-11 through Krishi Vigyan Kendra, Chhatarpur (M.P.) with farmer's participatory approach. The data on disease

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**Table 1. Efficacy of various chemicals in the control rhizome rot disease**

Treatment	Germination (%)	Rhizome rot (%)	Rhizome yield (q/ha)
Vitavax power (Thiram 37% + Carbendazim 37%)	81	10.1	83
Mancozeb	86	8.8	93
Ridomil MZ (Metalaxyl 8% + Mancozeb 64%) (Bio-safe)	91	6.4	126
<i>Trichoderma viride</i>	92	6.2	133
Hi-dice (Copper hydroxide)	72	28.6	61
Control	72	28.6	61
C.D. (5%)	1.6	4.8	12.8

**Table 2. Farmers participatory disease management in Ginger with fungicide (Mean of 10 farmers)**

S. No.	Treatment	Rhizome rot incidence (%)	Disease control (%) in comparison to farmers practice	Yield (q/ha)	Increase in yield (%)	B:C ratio
1	Rhizome treatment with Mancozeb 0.3 % followed by soil drenching with Mancozeb 0.3 %	11.2	72.2	76.8	58.3	6.35
2	Farmers practice (Rhizome treatment with Carbendazim 0.2 %)	40.4	-	32.0	-	3.28

**Table 3. Farmers participatory disease management in Ginger with fungicide (Mean of 10 farmers)**

S. No.	Treatment	Rhizome rot incidence (%)	Disease control (%) in comparison to farmers practice	Yield (q/ha)	Increase in yield (%)	B:C ratio
1	Soil application with <i>Trichoderma viride</i> 2.5 kg/ha with FYM	1.4	80.2	73.1	27.7	3.65
2	Farmers practice (Rhizome treatment with Carbendazim 0.2 %)	7.1	-	57.2	-	2.42

incidence was recorded fortnightly and yield at harvest of the crop.

## RESULTS AND DISCUSSION

Seed treatment with fungicides increased germination of ginger significantly. Maximum germination was found in copper hydroxide treated plots (92%) which is at par with *Trichoderma viride* (91 %) in comparison to control (72%). During the crop season, foliar yellowing and wilting were more conspicuous and at the time of harvest, dry rot and rotten rhizome were noticed which reduce the market value of the produce and makes it unfit for seed purpose. Haware and Joshi (1973) also reported same types of symptoms from ginger crop due to presence of *Fusarium oxysporum*. All the chemicals inhibited the growth of *Fusarium solani* as compared to control (Table-1). However the highest inhibition and minimum rhizome rot incidence was observed in Copper hydroxide (6.2%) treated plots. The second best was *Trichoderma viride* (6.4%) than Mancozeb (8.8%), Ridomil (9.2%) and Vitavax power (10.1%) minimized the disease in comparison to control (28.6%). The results are in accordance with Rajan *et al.* (2002) who proved the role of Copper oxy chloride (Phytolon) in management of rhizome rot. Sahare and Ashthana (1962) found Dithane M-45 and Benlate were effective against *Fusarium oxysporum* in Ginger. The yield of Ginger also increased with reduced disease incidence. The highest Ginger yield were 133 q/ha in Copper hydroxide which is at par with *Trichoderma viride* (126 q/ha) treated plots in comparison to control (61 q/ha). At farmer's field, Mancozeb controlled disease

effectively. The seed treatment followed by soil drenching by Mancozeb controlled rhizome rot by 72.2 % given 58.3 % higher yield in comparisons to control. The B: C ratio was also higher 6.35 in comparison to 3.28 in farmers practice (Table-2). Soil application of *Trichoderma viride* with FYM suppressing the rhizome rot of Ginger by 80.2 % and given 27.7 % increase in yield. The results are in accordance with Rathore *et al.* (1992) and Mathur *et al.* (1992) they found that rhizome rot suppression with *Trichoderma viride* by rhizome pelleting.

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