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Management of rhizome rot caused by *Pythium*, *Fusarium* and *Ralstonia* spp in ginger (*Ginger officinale*) under natural field conditions

AJIT KUMAR SINGH[1]

Regional Agricultural Research Station, Indira Gandhi Agricultural University, Raigarh, Chhattisgarh 496 001

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ABSTARCT

An experiment was conducted during 2005–08 to study the management practices to control rhizome rot caused by *Pythium*, *Fusarium* and *Ralstonia* in ginger (*Ginger officinale* Rosc) the seed treatment with Ridomil MZ 72% WP (metalaxyl 8% mancozeb 64% (1.25 g /litre) found 81.6% of plant survival and maximum yield of 10.2 tonnes /ha, followed by the treatment with *T. harzianum* 72.05% plant survival and 7.6 tonnes /ha of yield. Both the best treatments are statistically different regarding plant survival and yield.

Key words: *Fusarium*, Integrated disease management, *Pythium*, *Ralstonia*, Rhizome rot

Ginger (*Ginger officinale* Rosc.) is one of the important spice crops grown all over the world and India is the largest producer consumer and exporter of the world (Arya 2000). Ginger is widely used in food, beverage, confectionary and also as medicine. Ginger crop is affected by three major diseases, i e rhizome rot caused by *Pythium* spp, yellow disease caused by *Fusarium* spp and bacterial wilt caused by *Ralstonia solanaceraum* (Rajan *et al*. 2002). Symptoms of disease described by different scientist are as *Pythium* spp pathogen infection begins in collar region of pseudostem and spread in to rhizomes and complete decay of inner tissue associated foliar symptoms appears initially as yellow of lower levels which gradually spread to all the leaves of plants, followed by wilting and complete desiccation (Selvan *et al*. 2002). In case of the *Fusarium* wilt main symptoms of the disease are including yellowing and blighting of the stem as the rhizome rot (SO and Kim 1980). Bacterial wilt infected plants wilt with yellowing of leaves and the entire plant dries up and affected pseudo stem comes off easily with gentle pull (Dhanbir 2000). Ginger is clonally propagated and least variability and strong resistant mechanism is not available against these pathogens. Only efficient management practices would be viable option for successful cultivation of ginger. Therefore, different disease management practices are evaluated in this experiment.

MATERIALS AND METHODS

Field experiments were conducted in randomized block design during 2005–08 and at Regional Agricultural Research Station, Indira Gandhi Agricultural University, Boirdadar, Raigarh (C.G) with six treatments, viz T_1, Seed treatment with Mancozeb (0.3%); T_2, *T. harzianum* 250 g formulation in 10 litres of water for 10 kg of seed rhizome; T_3, Rhizome solarization (solarization packet in polyethelene bag, 1 kg seed rhizome in polyethylene bag size 30 cm × 45 cm for 2 hr (9 to 11 AM) before sowing; T_4, seed treatment with commercial formulation of Ridomil MZ 72% WP (metalaxyl 8%+ mancozeb 64%) (1.25 g/litre)T_5, Hot water treatment (51°C for 30 min); T_6, control. Trial was laid in standard plot size 3 m ×1 m in ridge and furrow method and rhizome planted in 30 cm×20 cm apart. Fifty rhizomes were planted in each bed having each 25–30 g average weight of rhizome. Plantings were done in last week of June in all three consecutive years with recommended dosage of fertilizers. Total amount of phosphatic fertilizer and half dosage of potassic fertilizer was given as basal dosage. Half amount of nitrogenous fertilizer given at 45 days and half amount of potassic and half amount of nitrogenous fertilizers given at 90 days after planting. Irrigation was given as per the plant requirements. Bioagent, namely *Trichoderma harzianum* procured from Indira Gandhi Agricultural University, Thakur Chedi Lal Baristar College of Agriculture, Sarakanda, Bilaspur (CG) local isolate product as Indira Tricho (cfu 4.3×10^7) were used. Data regarding sprouting of rhizome, tillers arises of individual rhizome may be counted as one plant and per cent sprouting of rhizome was calculated. Observations regarding disease incidence were taken one month before digging the crop as difference between sprouting and survival of plant, plant mortality considered

Scientist (Senior Scale) (e mail: singh_ajit8@yahoo.co.in, singh_ajit8@rediffmail.com)

Table 1 Effect of different treatments on *Pythium*, *Fusarium* and *Ralstonia* infection in ginger

Treatment	Sprouting of rhizome (%)			Survival of rhizome (%)			Disease incidence (%)			Projected yield (tonnes/ha)			Pooled data			
	2005–06	06–07	07–08	2005–06	06–07	07–08	2005–06	06–07	07–08	2005–06	06–07	07–08	Sprouting of rhizome (%)	Survival of rhizome (%)	Disease incidence (%)	Yield (tonnes/ha)
T_1: Seed treatment with Mancozeb (0.3%)	89.5	90	90	74.5	71.5	58.1	15	18.5	35.44	6.9	7.2	6.7	89.83	68.03	22.98	6.9
T_2: *T. hazianum* 250 g formulation in 10 liters of water for 10 kg of seed rhizome	89.5	91	90.5	73.5	74.5	69.5	16	16.5	23.07	6.6	8.4	7.7	90.33	72.05	18.52	7.6
T_3: Rhizome solarization (solarization packet in polyethylene bag, 1 kg seed rhizome in polyethylene bag size 30×45 cm for 2 hr (9–11 AM) before sowing	90.0	91	91.3	69	72.5	66.5	21	18.5	27.55	5.8	7.4	6.3	90.76	69.33	22.35	6.5
T_4: Ridomil MZ 72%WP (metalaxyl 8%+ mancozeb 64%) (1.25 g./ litre)	87	94.5	95	83.5	87.5	74.9	3.5	7	21.15	9.5	11.3	9.8	92.16	81.96	10.55	10.2
T_5: Hot water treatment (51°C for 30 min.)	92	90	89.4	7.6	73.5	65.9	18	16.5	26.28	6.6	7.6	6.6	90.46	71.08	20.26	6.9
T_6: Control	92	90	90.0	71.5	69	46.3	20.5	21	48.55	4.2	4.2	4.9	90.66	62.26	30.16	4.4
CD (P=0.05)				6.04	7.92	6.35	1.53	2.62	1.35	.78	1.18	.81		3.4	1.4	1.1

only plant has affected by diseases. Per plot yield weight were taken an at the time of harvesting and root, rootlets were removed from rhizome.

RESULTS AND DISCUSSION

Result indicated in Table 1 that seed treatment with Ridomil MZ 72% WP (Ridomil 8% Mancozeb 64% (1.25 g/ litre) as seed treatment found 81.6% of plant survival and maximum yield 10.2 tonnes/ha .This result is similar as seed treatment with Metalaxyl found effective against rhizome rot of ginger (Ram and Thakur 2009). Ridomil MZ (metalaxyl 8% + mancozeb 64%) effective against Pythiaceous group of fungi and reduce both growth and sporulation of fungus while Mancozeb only inhibits spore germination Singh 2001, Next best treatment was found seed treatment with *T. harzianum* found 72.05% plant survival and 7.6 tonnes/ha yield . Although the most common method of managing the disease is seed treatment with fungicides, but the excessive use of chemical is not desirable and create resistance of the pathogen to various fungicides has been reported by Ogawa (1988). Turmeric rhizome rot caused by *Pythium aphanidermatum* easily managed by bio control consortia which contain *Trichoderma viride* as seed and soil applicants reported by Muthulaxmi and Saveetha (2009) and in ginger rhizome rot by Abarazado *et al*. (1998).

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