Eco friendly management of *Sclerotinia* rot in Indian mustard (*Brassica juncea*)

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ABSTRACT

Sclerotinia sclerotiorum (Lib.) de Bary is a soil borne pathogen capable of infecting more than 400 host plants worldwide. It is a major pathogen that plays a crucial role in reducing the yield in economically important crops. The capability of sclerotia to survive for more than 4 years becomes very difficult to manage the crop from the infection of fungus. Eco-friendly management agents for the control of *Sclerotinia sclerotiorum* can be targeted towards reducing numbers of sclerotia in the soil with microbial parasites or inhibiting infection of host tissue by propagules of the pathogen.

Most of the conventional methods are not effective in the management of *S. sclerotiorum.* In an experiment laid out at DRMR, Bharatpur on Sclerotinia infested field, T. harzianum isolate GR given 69% Sclerotinia reduction over control followed by soil application with FYM of *T. harzianum* isolate SI-02 (60.8%), while foliar spray of garlic bulb aqueous extract (60.8%) was also significantly at par. Yield was higher (3156 kg/ha) in treatments when *T. harzianum* isolate GR applied as seed and soil treatments.

Key words: *Trichoderma harzianum* - *Allium sativum* - disease control - yield

INTRODUCTION

Sclerotinia sclerotiorum is a necrotrophic, phytopathogenic, filamentous ascomycete. It is recognized as an omnivorous plant pathogen with broad host range and worldwide distribution. Over 400 species of plants are susceptible to this pathogen. The majority of these hosts are dicotyledonous, although a number of agriculturally significant monocotyledonous plants also are hosts (Purdy, 1979; Boland and Hall 1994).

Rot of mustard caused by Sclerotinia sclerotiorum (Lib.) de Bary has become important in recent times in India and elsewhere with high disease incidence and severe yield losses leading to discouragement of growers of the crop (Chattopadhyay et al. 2003). Due to the importance of the disease and the difficulty of its control through the prevalent methods, it seems that an integrated control by a combination of several methods will be useful in disease management. As for effective biocontrol of soil-borne plant pathogens, hyphal growth of Trichoderma through soil is important for colony extension and colonization of target propagules after introduction into soil (Dandurand and Knudsen, 1993). There is also concern about the sustainability of fungicides and the associated problems with their continued use, including i) damage to the environment, ii) food safety iii) development of resistance to the fungicides by Sclerotinia, and iv) enhanced degradation that may occur after repeated use.

MATERIALS AND METHODS

Field experiment was laid out in randomized block design (RBD) with three replications during post-monsoon (*Rabi*) season of 2007-08 at the experimental farm of the Directorate of Rapeseed-Mustard Research, Bharatpur [77°27'E, 27°12'N, 140 m above mean sea level, loam-type soil with pH 8.0] to test the different bio formulations of four tested isolates of *Trichoderma harzianum* (GR, P, SI-01 and SI-02) against Sclerotinia rot disease of Indian mustard at experimental area of Plant Pathology, DRMR, Bharatpur.

Twenty two treatments were laid out in randomized block design in plots of 5x3 m size with 30x10 cm spacing replicated thrice. Indian mustard cv. Rohini was the test variety sown. Among the treatments, formulations were prepared in two different ratios (1:9 and 1:19) of four different isolates of *T. harzianum* and applied as seed treatment @ 5 g/kg seed. Soil application (SA) was made @ 2g/kg FYM. Separate seed treatment (ST) and foliar spray (SPR) of plant

extract of garlic (*Allium sativum*) bulb extract @ 2% (w/v) and recommended fungicides mancozeb spray @ 2.5g/l and carbendazim seed treatment @ 2 g/kg and spray @ 1g/l were applied.

RESULTS

Plant stand was significantly higher in plots where *T. harzianum* was applied with FYM in soil. Percentage Sclerotinia rot reduction noted in the experiment were foliar spray of *T. harzianum* isolate GR @ (1:9) 5g/l (69%) followed by soil application with FYM of *T. harzianum* isolate SI-02 @ (1:9) 2g/kg (60.8%), foliar spray of garlic bulb aqueous extract (w/v) 2% (60.8%), soil application of *T. harzianum* isolate GR @ (1:9) 2g/kg (57.7%), seed treatment of *T. harzianum* isolate GR @ (1:9) 5 g/kg (53.6%), which were significantly superior over control (table 1). Yield was higher in treatments *T. harzianum* GR-ST @ (1:9) 5 g/kg (3156 kg/ha), *T. harzianum* SI-01-ST @ (1:9) 5g/kg (3156 kg/ha), *T. harzianum* P-SA@ (1:9) 2g/kg FYM (3100 kg/ha).

Table 1. Effect of bio-formulations on Sclerotinia rot reduction and seed yield in Indian mustard

Treatment	% Sclerotinia rot reduction over control*	Seed yield (kg/ha)
T. harzianum-GR-ST @ (1:9) 5 g/kg	47.3 (53.6)	2444
T. harzianum-P-ST @ (1:9) 5 g/kg	33.2 (29.9)	2645
T. harzianum-SI-01-ST @ (1:9) 5 g/kg	30.7 (25.8)	2744
T. harzianum-SI-02-ST @ (1:9) 5 g/kg	25.8 (18.6)	2645
T. harzianum-GR-ST @ (1:19) 5 g/kg	30.7 (25.8)	3156
T. harzianum-P-ST @ (1:19) 5 g/kg	42.1 (45.4)	2945
T. harzianum-SI-01-ST @ (1:19) 5 g/kg	30.0 (24.7)	3156
T. harzianum-SI-02-ST @ (1:19) 5 g/kg	41.0 (43.3)	3045
T. harzianum-GR-SA @ (1:9) 2 g/kg FYM	49.6 (57.7)	2989
T. harzianum-P-SA @ (1:9) 2 g/kg FYM	39.8 (41.2)	3100
T. harzianum-SI-01-SA @ (1:9) 2 g/kg FYM	45.6 (50.5)	2655
T. harzianum-SI-02-SA @ (1:9) 2 g/kg FYM	51.4 (60.8)	2500
T. harzianum-GR-SPR @ (1:9) 5 g/l	56.2 (69.1)	2933
T. harzianum-P-SPR @ (1:9) 5 g/l	23.6 (15.5)	2733
T. harzianum-SI-01-SPR @ (1:9) 5 g/l	39.8 (41.2)	2989
T. harzianum-SI-02-SPR @ (1:9) 5 g/l	42.7 (46.4)	2967
Carbendazim-ST @2g/kg	35.1 (33.0)	2966
Carbendazim-SPR @2.5g/l	28.0 (21.6)	2767
Mancozeb SPR @2.5g/l	28.7 (22.7)	2900
Garlic-ST(w/v) 2%	39.2 (40.2)	2745
Garlic-SPR(w/v) 2%	51.4 (60.8)	2811
Control	-	2655
C.D. (P<0.05)	10.0	413

* Figures in parentheses are actual values while others are arc sin transformed.

DISCUSSION

In the experiment, GR isolate of *T. harzianum* showed efficacy as a better bioprotectant when applied as foliar spray, soil application and seed treatment. Singh and Kaur (2001) observed that *Trichoderma harzianum* showed mycoparasitism whereas *T. viride* showed antibiosis against *S. sclerotiorum*. Keeping in view the earlier report (Chattopadhyay et al*.,* 2003) of severe losses in seed yield due to the disease, these observations find significance. Extract of *A. sativum* has been reported to be successful in checking foliar disease in another crop (Chattopadhyay, 1999). The reduction of *S. sclerotiorum* biocontrol efficacy of *Trichoderma* due to increased interactions between *Trichoderma* and soil microorganisms, and the favored shift from hyphal growth to sporulation because of the microbial competition in soil has been indicated most recently (Bae and Knudsen, 2005).

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