Plant Archives Vol. 19 No. 2, 2019 pp. 2376-2378 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

MANAGEMENT OF RHIZOCTONIA ROOT ROT DISEASE IN SOYBEAN IN BETUL DISTRICT OF MADHYA PRADESH

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Abstract

Soybean [*Glycine max* (L.) Merril] is a species of legume belongs to the family Leguminoseae and sub family Papiliodae are grown mainly in *Kharif* season. Continuous mono of Soybean in the same field and non adoption of suitable integrated disease management modules cause heavy loss due to build up of many insect, pest and diseases, which in recent years have become a foremost limiting factor in Soybean productivity. Rhizoctonia root and stem rot, caused by the fungus *Rhizoctonia solani*, is an important disease of soybean in Madhya Pradesh. Keeping the importance of this disease in Betule districts, On farm trials were conducted by Krishi Vigyan Kendra at 30 farmer's fields during *Kharif* season of the year 2015 to 2017. The disease management technology assessed was T_1- No seed treatment (Farmers practice), T_2- Seed treatment with *Trichoderma viride* @ 10 g/kg seed, T_3- Soil application of *Trichoderma viride* @ 2.5 kg/ha with FYM and Seed treatment with *Trichoderma viride* @ 10 g/kg seed. The results revealed that Rhizoctonia root rot incidence was 1.8 % in the plots where seed treatment done with *Trichoderma viride* @ 10 g/kg seed and disease incidence was 6.0 % where soil application and seed treatment done with *Trichoderma viride* in comparison to 9.8% in farmer practice plot. The increase of soybean yield in T_3 was 38.1 and 22.5 percent over T_1 and T_2 respectively, where disease incidence decreased in T_3 by 81.6 and 70 percent over T_1 and T_2, respectively. The additional cost Rs. 1400 (T_2) and Rs. 1800 (T_3) per ha increased the average net return of Rs. 4800 (T_2) and 8600 (T_3) per ha in the integrated disease management technologies. The use of IDM technologies also gave higher benefit cost ratio 3.25 (T_2) and 3.50 (T_3) as compared to 2.96 under farmers practice in the corresponding years.

Key words **:** Soybean, Rhizoctonia, Root rot disease.

Introduction

Soybean [*Glycine max* (L.) Merril] is a species of legume belongs to the family Leguminoseae and sub family Papiliodae are grown mainly in *Kharif* season. Soybean plant is classed as an oilseed rather than a pulse by UN Food and Agricultural Organization (FAO). The main producers of Soybean are the United State (35%), Brazil (27%), Argentina (19%), China (6%) and India (4%). Soybean accounts for 30 per cent and 21.3 per cent of total production and area under oilseed in the country. Soybean is a major Kharif crop of Madhya Pradesh. Rhizoctonia root and stem rot, caused by the fungus *Rhizoctonia solani*, is an important disease of soybean. The disease causes heavy mortality of soybean in suitable climate. Soybean can become infected at any stage, but damage is more severe when it occurs at the seedling stage. Rhizoctonia damage is more severe on seed and young seedlings with seed rot and root rot. It is often found in patches in field. The roots and hypocotyl may have a shrunken, reddish brown lesion, which will be dry when decayed. On older plants, the lesion is characterized by a reddish brown dry cortical root rot extending into the base of the stem. The foliar symptoms include leaf yellowing. The disease is favored by warm, wet conditions.

The root rot pathogenic fungi are major threat for this crop as these fungi attack on the root of the plant and destroy the proper functioning of the plant to take water and other nutrients upward. Though there is an extensive rise in area of Soybean, the average yield is very low and the main constraint for this low yield is the problem of insect pest and diseases. Continuous mono of Soybean in the same field and non adoption of suitable integrated disease management modules cause heavy loss due to build up of many insect, pest and diseases, which in recent years have become a foremost limiting factor in Soybean productivity. Soil borne diseases are notoriously difficult to control. Integration of Cultural

practices *i.e.* summer ploughing, application of microbial antagonists (*Trichoderma viride*) and Use of fungicide may be effective tool for the management.

Materials and Methods

On farm trials were conducted by Krishi Vigyan Kendra, Betul at 30 farmer's fields during *Kharif* season of the year 2015 to 2017 with farmer's participatory approach. The soils of the site were medium fertility status (low in available nitrogen, medium in available phosphors and potash). A list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of recommended production and protection technologies. Difference between technological interventions and farmer's practices were studied based on survey and group discussion with farmer interactive group (FIG) of soybean growers. The recommended package and other technical information were provided to farmers through two days on campus training at KVK. Each trial was conducted on an area of 0.20 ha and the same area adjacent to the demonstration plot was kept as farmer's practices as suggested by Das *et. al*., (1998). The disease management technology assessed was T_1- No seed treatment (Farmers practice), T_2- Seed treatment with *Trichoderma viride* @ 10 g/kg seed, T_3- Soil application of *Trichoderma viride* @ 2.5 kg/ha with FYM and Seed treatment with *Trichoderma viride* @ 10 g/kg seed. Seed sowing was done in the first week of July in every year with a seed rate of 75 kg/ ha and line sowing with spacing was 30 cm between rows and 10 cm between plants in the row. Recommended dose of fertilizer (20:60:20 NPK kg ha^{-1}) were supplied through urea, single super phosphate and murate of potash as basal application. One hand weeding was done at 30-35 DAS for effective control of weed and general spray of Trizophos at 40 DAS for management of girdle beetle and other insect. In the second plot, seed of Soybean was sown with basal dose of DAP 40 kg/ha and maintained as farmers practice.

The trials were regularly monitored from sowing till harvesting on farmer's field by Plant Protection Scientists. The data on incidence of root rot disease, grain yield of trial as well as farmers practice plot was recorded and analyzed. Different parameters as suggested by Dayanand *et al*., (2012) were used for calculating costs and net returns.

Results and Discussion

The occurrence of Rhizoctonia root rot disease in the Trichoderma viride treated plots was 6.0 and 1.8 per cent as against farmer's practice which was being 9.8 per cent during the years 2015 to 2017. This may be due to precautionary use of *Trichoderma viride* with FYM as basal application. Konde *et al*., (2008) also reported the effectiveness of *T. viride* and *T. harzianum* against collar rot and root rot diseases of Soybean. The genus *Trichoderma* comprises of a large species complex having potential as biocontrol agents against *R. solani*. *Trichoderma* isolates can parasitize hyphae, sclerotia and other structures of *R. solani*. The metabolites of *Trichoderma* spp. induce competitiveness against the pathogen and induce resistant to host plant (Abbas *et al*., 2017).

The proper application of nutrients and management of crop enhances the productivity of Soybean under technology demonstration plots. The yield of Soybean was found 38.1 (15.1 q/ha) and 22.5 percent (11.7 q/ha) more over farmers practice (T_1) 9.3 q/ha. The economic viability of Trichoderma application over traditional farmer's practices was calculated depending on prevailing prices of inputs and output costs. Different variables like seed, fertilizers (organic, inorganic and bio-fertilizer) and pesticides were considered as cash input for technology demonstrations as well as farmers practice. It was found that average cost of production of Soybean was Rs. 10800 (T_2) and Rs. 11200 (T_3) per ha in disease

Table 1: Performance IDM module for management of Rhizoctonia Disease in Soybean.

Details of Technology	Disease Incidence (%)	Yield (q/ ha)	Cost of cultivation (Rs./ ha)	Gross returns (Rs./ ha)	Net return (Rs./ ha)	B:C ratio
Sowing without seed treatment 9.8 (Farmers' Practice – T_1)	9.3	9400	27900	19500	2.96	
Summer ploughing, Seed treatment with *Trichoderma viride* @ 10 g/kg seed (T_2)	6.0	11.7	10800	35100	24300	3.25
Summer plounghing, Soil application of *Trichoderma viride* @ 2.5 kg/ha with FYM and Seed treatment with *Trichoderma viride* @ 10 g/kg seed (T_3)	1.8	13.1	11200	39300	28100	3.50

management treatments over farmers practice which was 9400 per ha. The average of additional cost Rs. 1400 (T_2) and Rs. 1800 (T_3) per ha increased the average net return of Rs. 4800 (T_2) and 8600 (T_3) per ha in the integrated disease management technologies. The use of IDM technologies also gave higher benefit cost ratio 3.25 (T_2) and 3.50 (T_3) as compared to 2.96 under farmers practice in the corresponding years. Hiremath and Nagaraju (2009) also found similar results of *Trichoderma viride* application for disease management. Singh *et al*., (2013) found that the adoption of improved production technology for the management of Rhizoctonia blight caused by (*Rhizoctonia soloni*), farmers led to increase in average yield by 18.2 per cent and net returns by 31.6 per cent over farmers' practice (1,320 kg/ha and 11, 358/ha).

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