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BIOLOGICAL CONTROL OF STEM ROT OF RAJMASH *(Phaseolus vulgaris* L.*)*

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ABSTRACT : Stem rot caused by *Sclerotinia sclerotiorum* is an important disease of Rajmash (*Phaseolus vulgaris* L.) in Eastern U.P. The evaluation of four fungal and two bacterial bio-agents against the pathogen. Maximum inhibition (84.83%) of growth of the pathogen *in-vitro* was obtained with *Coniothyrium minitans* followed by *T. viride, T. harzianum, Trichoderma virens* and *Pseudomonas flourescens. Bacillus subtilis* proved to be least effective.*In-vivo* condition minimum disease incidence (12%) was recorded in the plots treated with *Coniothyrium minitans* followed by *Trichoderma viride* (16.0%) as regards to the management of the disease followed by *Trichoderma harzianum* (20.0%) and *Trichoderma virens* (28.0%). The maximum disease intensity (36%) was noticed with *P. flourescens* which proved worst among all the bio-agents.

Keywords : *Rajmash, Phaseolus vulgaris, stem rot, Sclerotinia sclerotiorum, bio-agents.*

Rajmash (*Phaseolus vulgaris* L.) is an important legume crop used as green pod vegetable as well as pulse. Pulses form an integral part of Indian dietary. They are an important source of protein and essential adjuncts to a predominantly cereal based diet and enhance the biological value of protein consumed. They are thus, not dependent on industrially fixed nitrogen, a process requiring energy, but add up to 30kg N/ ha to the soil and improve its fertility. It is a sad state of affair that the area under them has steedly declined and their total yield has received a serious set back due to several reasons and one of the most important being various plant diseases of different origin causing considerable losses to pulse crop every year. Being a major source of protein, rajmash provide all the eight basic form of amino acid or the eight essential amino acids. These amino acids act against a number of diseases and are important to maintain a healthy immune system. It is essential that a single cup of uncooked beans provide around 85% of the daily protein requirement.

It suffers from a number of viral, bacterial, nemtodal and fungal diseases. Among the fungal diseases, *Sclerotinia sclerotiorum* (Lib.) de Bary causing stem rot of Rajmash has been observed to be more destructive causing losses at 20-40 per cent during the recent years during under favourable environmental conditions. However, very meager information is available on this diaease. Therefore, it was felt necessary to explore the possibility for the control of the soil borne disease through the use different fungal and bacterial bio-agents.

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MATERIALS AND METHODS

(a) Effect of bio-agents against the pathogen In-Vitro :

An attempt was made to test the antagonistic nature of the fungi and bacteria isolated from sclerotia of the test fungus and rhizosphere of the Rajmash plants according to the dual culture technique described below (Johnson and Curl,3). For this purpose, 20 ml of sterilized PDA was aseptically poured in sterilized Petri dishes (90 mm diameter) and allowed to solidify. Five mm discs of isolated fungi and bacteria and test pathogen, each cut with the help of sterilized cork borer from the edge of three-day-old culture were placed on solidified PDA in such a manner that they may be placed on one side or at the centre of Petri dishes,60 mm apart. Plates uninoculated with a test pathogen served as control. These plates were incubated at 20 ± 1°C in BOD incubator. The whole set dual culture was replicated thrice. Observations on the mechanism of interaction between the test pathogen and other micro organisms were made.

Preparation of commercial formulation of bio-control agents:

The commercial formulation of bio-agents was prepared according to the techniques suggested by the scientists for different bio-agents. Formulation of *Coniothyrium* minitans as antagonist was prepared with wheat bran inoculum (Mc-Quilken and Whipps, 4) by using it as carrier whereas formulation of

Bacillus subtillis was prepared in nutrient broth using talc as carrier. *Trichoderma viride* formulations was prepared as per method suggested by Jeyarajan and Ramakrishnan (2).

(b) Efficacy of bio-control agents in pot experiments:

To evaluate the efficacy of bio-agents like *Coniothyrium minitans*. *Trichoderma viride, Trichoderma harzinum, Trichoderma virens* and *Pseudomonas flourescens* against the pathogen, pot experiment was conducted in wirehouse, Department of Plant Pathology during *Rabi* crop season, 2011-12 . Earthen pots (30 cm diameter) were with filled with 5 kg of soil taken from the same field in which disease was present in the previous year. Wheat bran incoculum *C. minitans* and talc formulation of *Trichoderma vride, Trichoderma harzinum, Trichoderma virens* and *Pseudomonas flourescens* were incorporated in to the earthen pots @ 2.0 g / pot three days before sowing of the seed. Twenty- five plants per pots were maintained for each treatment and replicated three times. An untreated control was also maintained for each treatment, which served as control. Observations on disease incidence were recorded after two months and analyzed statistically.

RESULTS AND DISCUSSION

(a) Effect of bio-agents against the pathogen In-Vitro.

The results presented in Table 1 showed that the mycelial growth of *Sclerotinia sclerotiorum* was reduced to a great extent by extensive growth of bio-agents in dual culture technique. Maximum inhibition (84.83%) of growth of the pathogen was obtained with *Coniothyrium minitans* followed by *T. viride, T. harzianum, Trichoderma virens* and *Pseudomonas flourescens. Bacillus subtilis* proved to be least effective as it inhibited 42.44 per cent growth of the pathogen only. However, the sclerotia production in the culture with bio-agents was much less as compared to control. Rotting of sclerotia was also observed in the case of *C. minitans* whereas the same was not with other bio-agents. Similar results were also reported by Whipps and Budge (8),Budge *et. al.*(1) and Singh *et. al.* (6), against *S. sclerotiorum* with the application of different bio-agents *in-vitro* condition.

Table 1: Effect of bio-agents against the pathogen in *in-vitro*

Bio-agents	Average growth (mm)		% inhibition over control
	Antagonist	Pathogen	
Coniothyrium minitans	59.23	13.65	84.83
Trichoderma viride	47.50	26.24	70.84
Trichoderma harzianum	45.85	28.95	67.83
Trichoderma virens	44.66	29.39	67.37
Pseudomonas flourescens	38.40	31.44	65.06
Bacillus subtilis	27.35	51.80	42.44
Control	-	90.00	-
CD (P=0.05)			4.74

(b) Effect of bio-agents against the pathogen In-Vivo.

The results presented in Table 2 showed that all the bio-agents were significantly superior over control. Minimum disease incidence (12%) was recorded in the plots treated with *Coniothyrium minitans* followed by *Trichoderma viride* (16.0%) as regards to the management of the disease followed by *Trichoderma harzianum* (20.0%) and *Trichoderma virens* (28.0%). The maximum disease intensity (36%) was noticed with *P. flourescens* which proved worst among all the bio-agents. Present results are in accordance with the

Table 2: Effect of bio-agents as soil applicant against stem rot of Rajmash.

Antagonist	No. of plant/plot	Average no. of affected plants per plot	Av. per cent disease intensity
Coniothyrium minitans	25	3	12.0 (20.27)*
Trichoderma viride	25	4	16.0 (23.58)
Trichoderma harzianum	25	5	20.0 (26.56)
Trichoderma virens	25	7	28.0 (31.95)
Pseudomonas flourescens	25	9	36.0 (36.87)
Control	25	10	40.0 (39.23)
CD (P=0.05)	-	-	2.87

*Figures in parenthesis are angular transformed values.

observations made by Singh and Sachan (5) who reported *Trichoderma viride* and *C. minitans* as soil application for effective management of sclerotinia blight of brinjal. Singh *et al.* (7) obtained an effective control of sclerotinia stem rot of Ajowan caused by *S. sclerotiorum* by the application of *C. minitans Trichoderma viride*, *Gliocladium virens* and *Bacillus subtilis* as soil applicant.

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