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ASSESSMENT OF CHEMICAL AND BIO-CONTROL AGENT FOR THE MANAGEMENT OF LENTIL WILT CAUSED BY *FUSARIUM OXYSPORUM* F. SP. LENTIS

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ABSTRACT

A field experiment was conducted during consequently two rabi seasons of year 2007-08 and 2008-09 in farmers' participatory mode at randomly selected fields of farmers of Nalanda district as an on farm trial under supervision of Krishi Vigyan Kendra, Harnaut, Nalanda, Bihar. In this trial farmers oriented need based plan was formulated for management of wilt of lentil caused by *Fusarium oxysporum f. sp. lentis* by treating the seeds with *Trichoderma viride*, carbendazim and in combination with *T. viride* and carbendazim. The seed treatment with T. viride, carbendazim and in combination with T. viride and carbedazim have a significant effect on reduction of lentil wilt and increase in grain yield over farmers' practice (no seed treatment). Minimum wilt incidence 11.2 and 9.6 per cent, maximum grain yield 1401 kg/ha and 1500 kg/ha, net return Rs.14629 /ha and Rs.16480 /ha and B:C ratio 1.26:1 and 1.42:1 were obtained when plots received treated seeds with T. viride + carbendazim for the years 2007-08 and 2008-09, respectively.

Key words : *Lentil, Wilt, Fusarium oxysporum f. sp. lentis, Trichoderma viride, Carbendazim*

Lentil (*Lens culinaris* Medik) is one of the most important pulse crop rich in digestive proteins and rich in some other amino acids. It is commonly known as Masur. It was the first crop domesticated and has become an important food legume crop in the farming and food system of many countries globally (Sarker and Erskine, 2006). Lentil is an important food legume cultivated for its nutritious seeds and dry stroves and its straw is used as dry fodder for animals. It is grown through Northern and Central India. Due to biotic and abiotic stresses, the crop yield is below the attainable level. Among biotic factors diseases are serious threat to lentil production in many part of India. Among diseases, Fusarium wilt, caused by *Fusarium oxysporum f. sp. lentis*is the most important biological constraint to productivity of lentil worldwide (Bhalla et al.,1992). Wilt of lentil plays a major role in reducing lentil yield (Hamdi and Hassanein, 1996).

The prominent symptom of wilt disease is yellowing, drooping and drying of the leaves then plant, thereby reducing the yield of the crop upto 75 per cent in many areas.Fungus with high saprophytic ability can survive in soil for a long period during which they may have to go through different environmental stresses and biological competition which may lead to the existence of physiological races. The fungus belongs to ascomycetes and causes wilt disease of several important crops. Fungus produces microconidia, macroconidia and chlamydospores which persist in soil for several years. It was also reported by Erskine *et al.,* (1990) that the pathogen is seed borne in nature too and transmits from one place to another through seed material. Management of the disease is done through several biological, cultural and chemical practices. Several systemic and non-systemic fungicides tested against the pathogen which showed variability in the results. Singh and Jha (2003) used Bavistin (Carbendazim) against chickpea wilt and found effective against the pathogen.

In recent times, there has been a worldwide swing to use of eco-friendly methods for protecting the crops from diseases and pests. As such in present context, use of biocontrol agent offers a great promise.

MATERIALS AND METHODS

A field experiment was conducted during consequently two rabi seasons of year 2007-08 and 2008-09 in farmers participatory mode at randomly selected fields of 10 farmers of Nalanda district of Bihar as an on farm trial under supervision of Krishi Vigyan Kendra, Harnaut, Nalanda (Bihar). Experiment was conducted at 10 farmers' fields in 1.0 ha, in 0.1 haat each farmer's field. The composite soil samples of experimental fields was found clay loam with low in organic carbon

Table-1 : Effect of seed treatment with *T. viride* and carbendazim on wilt incidence,1000-grain weight and grain yield of lentil during 2007-08 and 2008-09.

Treatment	Dose g/kg seed	Disease incidence (%)		Disease decline (%)		1000-grain wt. (g)		Grain yield (kg/ha)		% increase in yield over FP	
		2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Farmers' practice (no seed treatment)	-	25.7	27.5	-	-	18.95	18.84	1184.0	1162.0	-	-
T. viride	5.0	16.3	15.1	36.57	45.09	20.67	20.87	1308.0	1319.0	10.47	13.51
Carbendazim	2.0	17.0	16.4	33.85	41.45	19.58	19.97	1254.0	1263.0	4.22	8.69
T. viride + carbendazim	2.5+1.0	11.2	9.6	56.42	65.09	22.05	22.57	1401.0	1500.0	18.32	29.08
SEm ±		1.39	1.51			0.21	0.23	7.12	8.13		
CD at 5%		4.01	4.37			0.63	0.80	22.23	24.87		

Table-2 : Economics and benefit cost ratio of different seed treatments against wilt incidence in lentil during 2007-08 and 2008-09.

Treatment	Gross cost of cultivation (Rs./ha)		Gross return* (Rs./ha)		Net return (Rs./ha)		B:C ratio	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Farmers' practice (no seed treatment)	11538	11538	22140	21729	10602	10191	0.92:1	0.88:1
T. viride	11568	11568	24459	24665	12891	13097	1.1:1	1.13:1
Carbendazim	11573	11573	23450	23618	11877	12045	1.02:1	1.04:1
T. viride + carbendazim	11570	11570	26199	28050	14629	16480	1.26:1	1.42:1

*Gross return was calculated only on grain yield not on straw yield
Present price of grain of lentil = Rs.1870/q
Price of *T. viride* = Rs.150/kg
Price of carbendazim = Rs.440/kg
Labour charge = Rs.100/manday

(0.49%), available nitrogen (222.1 kg/ ha), medium in available phosphorus (44.5 kg/ha) and K_2O (252.7 kg/ha), whereas pH was neutral with reading 7.2 and EC in normal range with observation of 0.43ds/m. A powder formulation of *Trichoderma viride* (5 g/kg seed), carbendazim 50% WP (2 g/kg seed) and *Trichoderma viride* + carbendazim (2.5g +1.0.g/kg seed) were used for seed treatment. Farmers' practice (No seed treatment) was considered as check. Forty kilogram seedsper hectare (for each farmer's field, 4.0 kg seeds provided) of variety KLS218 were sown in the month of November (between 10-15th November) during both the crop seasons with 30 cm inter row spacing and 3-4 cm sowing depth.Seeds were treated properly with powder formulation of *Trichoderma*, carbendazim and in combination with *Trichoderma* and carbendazim. Observations on disease incidence were made at 15 days of sowing till harvest of the crop. Data on disease incidence, grain yield and 1000-grain weight were recorded. Economics and benefit cost ratio of the trials were also calculated.

The disease incidence was recorded by using following formula :

$$\text{Per cent Disease Incidence} = \frac{\text{No. of infected plants}}{\text{Total number of plants assessed}} \times 100$$

RESULTS AND DISCUSSION

The field studies shown in table-1 revealed that all the treatments significantly reduced the disease incidence, increased the grain yield as well as 1000-grain weight as compared to check (farmers' practice). During 2007-08 crop season, plots received treated seeds with a mixture of sub normal dose of *Trichoderma viride* + carbendazim recorded lowest disease incidence(11.2%) followed by *T. viride* (16.3%) and carbendazim (17%) alone. The highest grain yield (1401 kg/ha) was recorded in *T. viride* + carbendazim treated plots followed by *T. viride* (1308 kg/ha) and carbendazim (1254 kg/ha) alone, while in check 1184 kg/ ha yield was recorded. Maximum 1000- grain weight (22.05 g) was recorded in T. viride + carbendazim treated plots followed by T. viride (20.67 g) and carbendazim (19.58 g) alone. Maximum percent decline in disease incidence (56.42) was

recorded when plots received treated seeds with *T. viride* + carbebdazim followed by T*. viride* (36.57) and carbendazim (33.85) alone.

Maximum percent increase in grain yield over farmers' practice (18.32) was recorded in *T. viride* + carbendazim treated plots followed by *T. viride* (10.47) and carbendazim (4.22) alone.

During the crop season 2008-09, *T. viride* + carbendazim treated plots again resulted in lowest disease incidence (9.6%) followed by *T. viride* (15.1%) and carbendazim (16.4%) alone. The highest grain yield (1500 kg/ha) was recorded in *T. viride* + carbendazim treated plots followed by *T. viride* (1319 kg/ha) and carbendazim (1263kg/ha) alone, while in check 1162 kg/ ha yield was recorded. Maximum 1000-grain weight (22.57g) was recorded in *T. viride* + carbendazim treated plots followed by T. viride (20.87g) and carbendazim (19.97g) alone. Maximum per cent decline in disease incidence (65.09) was recorded when plots received treated seeds with *T. viride* + carbendazim followed by *T. viride* (45.09) and carbendazim (41.45) alone. Maximum per cent increase in grain yield over farmers' practice (29.08%) was recorded in *T. viride* + carbendazim treated plots followed by *T. viride* (13.51) and carbendazim (8.69) alone.

Data depicted in table-2 clearly indicate that maximum net return Rs.14629/ha and B:C ratio 1.26:1 were realized when plots received treated seeds with *T. viride* + carbendazim followed by plots treated with *T. viride* , net return was Rs.12891/ha and B:C ratio was 1.11:1 and then carbendazim treated plots, net return was Rs.11877/ha and B:C ratio was 1.02:1 and in check plot (no seed treatment), net return was Rs.10602/ha and B:C ratio was only 0.92:1 for the year 2007-08.

During 2008-09 crop season, maximum net return Rs.16480.00/ha and B:C ratio 1.42:1 were realized when plots received treated seeds with *T. viride* + carbendazim followed by plots treated with *T. viride*, net return was Rs.13097/ha and B:C ratio was 1.13:1 and carbendazim treated plots, net return was Rs.12045/ha and B:C ratio was 1.04:1 and in check plot (no seed treatment), net return was Rs.10191/ha and B:C ratio was only 0.88:1 for the year 2008-09.

From several studies, it has been confirmed that *Trichoderma spp*. have antagonistic and biologically control potential against a diversity of soil borne pathogens (Grodona *et al.,* 1997, Bajwa *et al.,* 2004). Singh and Jha (2003) used carbendazim (Bavistin) against chick pea wilt and found effective against the pathogen. These results are in conformity with the present results.

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