RESEARCH ARTICLE

DISEASE CONTROLLING POTENTIAL OF *TRICHODERMA HARZIANUM* AND *TRICHODERMA VIRIDE* AGAINST COLLAR ROT OF CHICKPEA

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Abstracts: Disease controlling potential of *Trichoderma* strains are evaluated in vivo against collar rot in chickpea. Ten *Trichoderma strains (*T1,T2,T3,T4,T5,T6,T7,T18,T28) were taken among which nine were *Trichoderma harzianum* and one *Trichoderma viride* (T18) .All strains of *Trichoderma harzianum / Trichoderma viride* was superior over control for disease controlling parameters *i. e* mortality percentage , no. of pods per / plant ,yield (quintal/hectare), yield (g/plot),Test weight. Plant population / plot were counted from each plot after 25 days of sowing *Trichoderma* strains T18 and T28 were more effective showing higher degree of parasitism on *Sclerotium rolfsii* under field against collar rot in chickpea.

Keywords: Chickpea, *Sclerotium rolfsii ,Trichoderma harzianum, Trichoderma viride*

INTRODUCTION

Chickpea is known in this country since ancient times. It is a widely grown major pulse crop in India, accounts for nearly 75 per cent of the total pulse production in the world. Chickpea crop is prone to many diseases viz., *Fusarium* wilt, dry root rot, collar rot, *Ascochyta* blight, *Verticillium* wilt, black root rot, *Phytophthora* root rot, wet root rot, foot rot, *Pythium* rot and seed rot etc. Among these, collar rot caused by *Sclerotium rolfsii* which is gaining importance. *Sclerotium rolfsii* is an economically important pathogen on numerous crops worldwide. It has an extensive host range; at least 500 species in 100 families are susceptible, the most common hosts are legumes, crucifers and cucurbits, and commonly occurs in the tropics, subtropics, and other warm temperate regions (Punja, 1985). *Sclerotium rolfsii* has wide host range, abundant growth of the pathogen and its capability of producing excessive sclerotia that may persist in soil for several years (Chet and Henis, 1972). Hence management of *Sclerotium rolfsii* causing collar rot of chickpea is difficult to achieve chemically, in this context plant extracts and bioagents can be used as an alternative source for controlling soil-borne diseases.

MATERIALS AND METHODS

Experiment was conducted under direct sown conditions chickpea cultivar Garouv in upland chickpea field having clay loam soil. The land was well prepared by ploughing two three times. Sick soil was prepared using Sclerotia of *Sclerotium rolfsii* @ 3800/ plot. Talc powder based formulations of different strains of *Trichoderma* spp. were developed and used as seed treatment. Seeds of chickpea were treated with Different strains of *Trichoderma* spp. @ 10 g /kg seed. Hexaconazole +Zineb were used @ 3 g kg/seed. Untreated control was kept for making comparison. Seeds @ 100 kg/ha were sown in each plot under randomized block design with three replications. Fertilizers i.e. NPK @ 20:60:0/ha were applied as basal dose. Plant population / plot were counted from each plot after 25 days of sowing. Plant growth parameters i.e. root & shoot length / plant, fresh /dry weight of root and shoot/ plant, number of nodules / plant and weight of nodules /plant were recorded randomly from three plants of each plot. Number of dead plants were counted form each plot at an interval of 15 days till the harvest of crop. Mortality per cent was calculated taking number of dead plant and total number of plant from each plot. Number of pods / plant, yield g/plot, yield q/ha were calculated from each treatment.

Glasswares and plasticwares

Whenever required, the glasswares of Borosil make plastic plates of Tarson make, blotter paper of standard grade and chemicals of standard grade (Merck, Qualigens, S.D. fine etc.) were used during the course of investigation. All the glasswares, polythene bags, ethyl alcohol, formalin, chemicals and other materials were procured from the Thakur Chhedilal Barrister College of Agriculture and Research Station Bilaspur (C.G.).

Equipments used

The following equipments or materials used in present investigation were-

1. Autoclave for media sterilization
2. BOD incubator for incubation
3. Binocular research microscope
4. Compound microscope
5. Hot air oven for glassware sterilization
6. Forceps, needles, blades, inoculation needle, cork borer, petri dishes
7. Growth chamber
8. Laminar air flow for isolation and purification

Preparation of bio mass of strains of *Trichoderma viride and Trichoderma harzianum*

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Potato dextrose broth was prepared and sterilized in 500 ml conical flasks. Sterilization of media was done by autoclaving at 1.41 kg cm-² pressure for 20 minutes. Broth containing flasks were further inoculated with fungal disc of different strains and incubated at 25 ± 2^{0}C inside the B.O.D. Incubator for 15 days. Green biomass along with extract was homogenized using grinder mixer for developing formulations.

Preparation of Talc based formulations of strains of *Trichoderma viride and Trichoderma harzianum*

Talc powder in 250 g poly bags was sterilized. Sterilization of talc powder was done by autoclaving at 1.41 kg cm-² pressure for 20 minutes. Homogenized green biomass of each strain was incorporated in talc powder in the ration of 1: 10 (one part of bio mass in 10 parts of talc powder) and thus 10 % (W/V) talc based formulation of each strain was obtained. Talc based formulations of different strains were used as seed treatment, soil treatment and foliar on different crops under various sets of experiments. CFUs were also counted from talc based formulations and it was ranged between 10^9 to 10^{10} / g sample.

Chemicals used

Analytical grade chemicals supplied by different manufacturers and some of the chemicals were procured from Thakur Chhedilal College of Agriculture and Research Station Bilaspur (C.G.).

4.Disease parameters : Mortality per cent

(Number of wilted plant / total number of plant x 100)

RESULTS AND DISCUSSION

Experiment was conducted under *in vivo* to study the plant growth promoting and disease controlling potential of *Trichoderma harzianum* / *Trichoderma viride* strains against collar rot of chickpea caused by *Sclerotium rolfsii*. All strain used as seed treatment @10g/kg seed along with recommended dose of fertilizer and agronomical practices. Data indicates that all strains of *Trichoderma harzianum* and *Trichoderma viride* were found significantly effective in reducing mortality % and enhancing yield and yield components over control.However, *Trichoderma* strains i.e *Trichoderma viride* (T 18), *Trichoderma harzianum* (T 28) were more effective in controlling collar rot of chickpea. All strains of Trichoderma *harzianum / Trichoderma viride* was superior over control for disease controlling parameters i. e mortality percentage , no. of pods per / plant ,yield (quintal/hectare), yield (g/plot). Minimum mortality percentage was recorded in *Trichoderma viride* strain number T18 followed by T8, T28 and maximum mortality percentage was recorded in *Trichoderma* strain T1 and T7. Highest number of pod /plant was recorded in Trichoderma strain number T6 (55.20) followed by T5 whereas least number of pod / plant recorded in T4 (26.80) but superior over control (7.40). Higher yield in quintal / hectare was recorded in *Trichoderma* strain T18 (18.97) followed by T 28(17.05) ,T 6(16.99) ,T 7 (16.20) whereas least yield in quintal/hectare was recorded in *Trichoderma* strain T3 (10.84) . similarly higher yield g/ plot was recorded in T18 (0.22),T8 (0.21), T6 (0.19),T5 (0.17),T7 (0.17) whereas least in strain T2 (0.12).test weight (weight of 100 grain) was maximum recorded in strain T6 (16.02), T18 (13.54) which is statistically at par among themselves followed by strain T8 (13.04),T3 (12.08), T6 (12.06) and least test weight was recorded in strain T2 (10.10). Similar study were proposed by Jabber *et al*. (2014) *in vitro* shows the bio efficacy of eight antagonists tested through dual culture technique respectively against *S. rolfsii* causing collar rot of chickpea. Among the eight bioagents tested against *S. rolfsii*, *Trichoderma harzianum*-55 IIHR recorded maximum inhibition of 70% followed by T. *harzianum* (62%).

Table 1. Disease controlling potential of indigenous strains of *Trichoderma harzianum / Trichoderma viride* as seed treatment against collar rot of chickpea.

***Trichoderma* strains**	**Designation**	**Mortality %**	**No. of pods / plant**	**Yield qt./ ha**	**Yield g/plot**	**Test weight**
Trichoderma harzianum	T1	9.04	31.60	11.41	0.13	11.90
Trichoderma harzianum	T2	6.94	19.60	11.93	0.12	10.10
Trichoderma harzianum	T3	7.71	16.00	10.84	0.13	12.08
Trichoderma harzianum	T4	4.83	26.80	14.71	0.15	11.70
Trichoderma harzianum	T5	6.15	51.40	15.98	0.17	12.06
Trichoderma harzianum	T6	5.81	55.20	16.99	0.19	16.02
Trichoderma harzianum	T7	9.89	27.60	16.20	0.17	11.30

Trichoderma harzianum	T8	3.23	28.80	11.66	0.21	13.04
Trichoderma viride	T18	1.14	37.80	18.97	0.22	13.54
Trichoderma harzianum	T28	3.76	37.40	17.05	0.19	15.02
Control		12.29	7.40	7.64	0.13	6.65
S E m(±) CD 5%		0.39 1.16	0.51 1.50	0.61 1.84	0.01 0.05	0.83 2.48

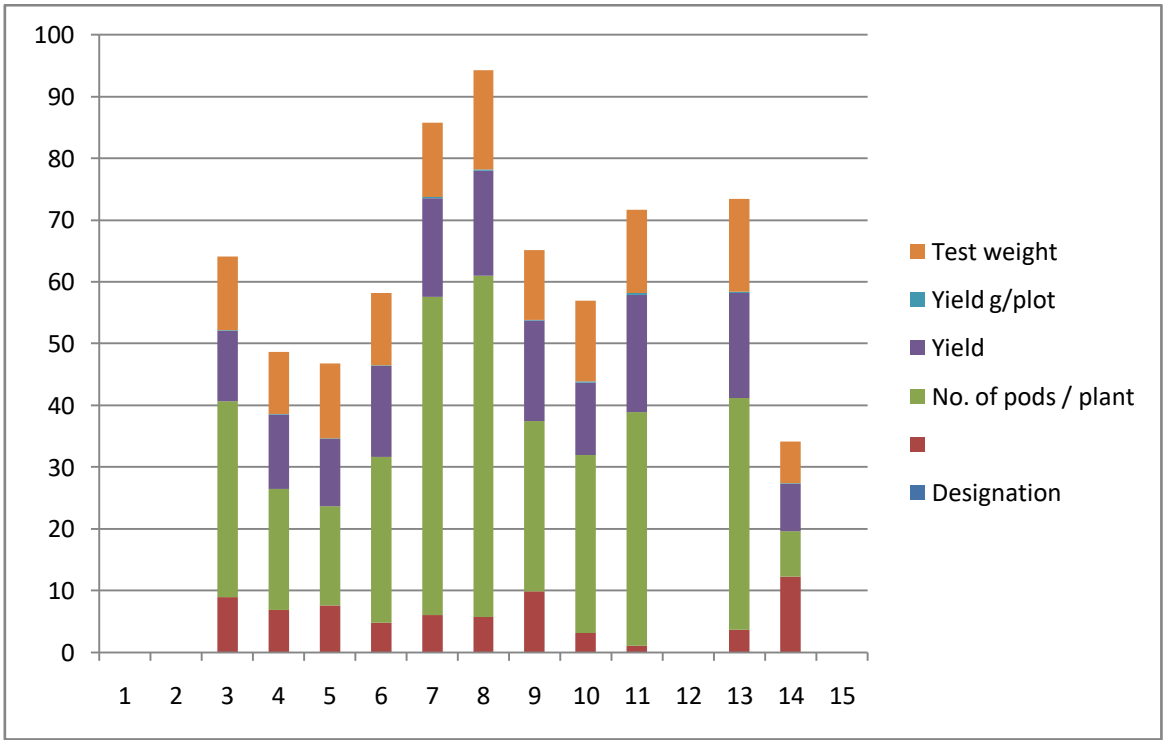

Fig. 1. Disease controlling potential of indigenous strains of *Trichoderma harzianum / Trichoderma viride* as seed treatment against collar rot of chickpea.

Plate 1: Effect of different indigenous strains of *Trichoderma viride and Trichoderma harzianum* against disease controlling potential against Collar rot of chickpea.


T3


T4


T5


CONTROL


T6


T7


T8


T18

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