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# BIOLOGICAL CONTROL OF *PYTHIUM APHANIDERMATUM*, MELOIDOGYNE INCOGNITA DISEASE COMPLEX IN CHILLI WITH ORGANIC AMENDMENTS

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**ABSTRACT**

Biological control of *Pythium aphanidermatum* (Edson) Fitz. - *Meloidogyne incognita* (Chitwood, 1949) disease complex in chilli with organic amendments *viz.*, Farm yard manure and neem cake were field evaluated. The antagonistic organisms used were *Trichoderma viride*, *T. harzianum* (antagonists against *Pythium aphanidermatum*) and *Paecilomyces lilacinus* (antagonist against *Meloidogyne incognita*). The incidence of damping-off of chilli was significantly reduced in all the treatments, when the seeds were treated with antagonistic organisms and the soil was amended with the organic amendments 15 days before sowing *viz.*, Farm yard manure or neem cake at the rate of 20 t/ha. The dry shoot and root weights were increased in *T. viride* + neem cake treatment followed by *T. viride* + farm yard manure treatment and the root-knot index was verymuch reduced in *P.lilacinus* + neem cake treatment followed by *T. viride* + farm yard manure treatment and the root-knot index was very much reduced in *P.lilacinus* + neem cake treatment and in *P. lilacinus* + Farm yard manure treatment.

KEY WORDS : Biological control, *Pythium* - *Meloidogyne* disease complex, Organic amendments.

Chilli (*Capsicum annuum* L.) also called 'red pepper' is an important cash crop in India and is grown for its pungent fruits, which are used both as green and riped one to impart pungency to the food. It is normally affected by the damping-off pathogen, *Pythium* spp. and also by root-knot nematode, *Meloidogyne* spp. Some times both the organisms are involved and cause complex diseases. Biological control method has been considerred as a promising approach for the management of soil borne diseases. If a biocontrol agent has consistently high antagonistic activity against *Pythium* and *Meloidogyne*, it may form a realistic alternative to complement other existing control methods. Thus it was thought to be worthwhile to undertake an investigation on biological control of *Pythium* - *Meloidogyne* disease complex in chilli with organic amendments.

The biological control of fungus-nematode complexes has been reported by Siddiqui and Hussain (1991) and Siddiqui and Mahmood (1993). Siddiqui and Mahmood (1993) found that pot treatments with fungal filtrates and green manuring were more effective against *M. phaseolina* alone on chick pea. The efficiency of organic amendments in the control of *Pythium* has been reported by several authors (Singh *et al.*, 1980 ; Chen, 1984 ; Harry and Fahy, 1986 ; Theradimani and Marimuthu, 1993). The effect of organic amendments on the control of nematodes has been re by Ahmed and Koppel (1986), Sivakumar and Vidyasekaran (1990) and Ahmed *et al.*, (1992).

## MATERIALS AND METHODS

The biological agents used for this experiment were *Trichoderma viride* and *T. harzianum* (antagonists against *Pytium*) and *Paecilomyces lilacinus* (antagonist against *Meloidogyne*). *P. lilacinus* was subcultured on Potato Dextrose Agar (PDA) slants. *T. viride* and *T.harzianum* were mass multiplied by inoculating in 250 ml conical flasks containing 70 ml of Molasses - Yeast medium (Molasses, 30 g and Yeast extract, 5g in one litre of distilled water and sterilized). The flasks were incubated at room temperature for 10 days. After 10 days, the suspension was pooled and one litre of each of *Trichoderma* suspension was mixed with 2kg of talc powder. To one kg of this mixture 10 g of Carboxy Methyl Cellulose (CMC) was added and shade dried for 1 to 2 hours and it was packed in poly bags. These talc based formualtions were further used for the seed treatment.

Two field trials were laid out for controlling the *Pythium* - *Meloidogyne* disease complex in chilli. The experiment was carried out in a Factorial Randomized Block Design (FRBD) with three replications in the year 1995 with cv. Co2 as test cultivar.

$T_1$ - *Trichoderma viride* + FYM

$T_2$ - *T.viride* + Neem cake

$T_3$ - *T.viride* + FYM

$T_4$ - *T.harzianum* + Neem cake

$T_5$ - *Paecilomyces lilacinus* + FYM

$T_6$ - *P.lilacinus* + Neem cake

$T_7$ - *T.viride* alone

$T_8$ - *T.harzianum* alone

$T_9$ - *P.lilacinus* alone

$T_{10}$ - FYM alone

$T_{11}$ - Neem cake alone

$T_{12}$ - Control

The nursery beds of sizes 30 x 45 cm and 60 cm apart were prepared. The FYM and neem cake were applied in the respective beds 15 days before sowing at the rate of 20 t/ha. Seeds were treated with *T.viride* or *T.harzianum* 24h before sowing, with talc based formulation of the antagonist at the rate of 4g/kg of seed. *P.lilacinus* was applied as seed treatment at the rate of 1g of culture per kg of seed with a spore load of $10^6$ spores/g. The seeds were surface sterilized with 0.1 per cent mercuric chloride and after drying they were treated with the antagonists. Seeds were sown at the rate of 1 g seed / bed in lines. The germination percentage of chilli cv. Co2 was determined by roll towel method.

The weekly plant stand was taken by counting the normal seedlings. The Root Knot Index was determined by using 1-5 scale, where

1 = Less than 1% of total roots galled

2 = 1 to 25% of total roots galled

3 = 26 to 50% of total roots galled

4 = 51 to 75% of total roots galled

5 = 76 to 100% of total roots galled

The seedlings were dried in an oven at a temperature of 70°C for 24h and the dry shoot weight and root weight were determined, at 45 days after sowing (DAS).

## RESULTS AND DISCUSSION

The per cent incidence of pre- and post-emergence damping - off of chilli were 1.75 and 3.32 in *T.viride* + neem cake treatment, followed by *T. viride* + FYM treatment which recorded 4.72 and 7.3 per cent respectively. Krishnamoorthy (1987) reported the higher germination percentages of tomato seeds in the treatments comprising the soil amendments with neem cake / FYM (25 t/ha) + seed treatment with *T.viride*. He also reported that the seed treatment results in higher population buildup of *T.viride* in soil. The reduction in damping-off incidence may be due to the reduction in the population of *Pythium*. The attributable reasons, for the population decreases of *Pythium* may be, the possible toxic effect of decomposition products of the organic amendments interfering with the growth of pathogen directly or such decomposition products might have encouraged the population of antagonists in the soil. Similar observations were also made by Rajan and Singh (1973) and Papavizas and Lumsden (1980).

Application of *T. viride* + FYM recorded an increase in the shoot weight by 36.19 per cent over control followed by *T. viride* + neem cake (33.26) and *P.lilacinus* + FYM treatment (30.54). The root weight also increased to 107.41 per cent over contorl in *T. viride* + FYM treatment, followed by *T. viride* + neem cake (90.47), *P. lilacinus* + FYM (86.24), *P. lilacinus* + neem cake (84.13) and *T.harzianum* + FYM (69.31) treatment in chilli. The present investigation revealed that in both the dry weights of shoot and root were maximum in *T. viride* + FYM treatment followed by *T. viride* + neem cake and *P. lilacinus* + FYM treatments. The organic amendments might influence the growth of the plants by providing nutrition. The work of Chindo and Khan (1986), Goswami and Meshram (1991) and Ahmed *et al.* (1992) suggest that organic amendment application enriches the soil organic matter and also reduced the plant parasitic nematodes which supports the present investigation.

Table 1. Effect of organic amendments with antagonists on *Pythium* and *Meloidogyne* on chilli at 45 DAS.

| Treatments | % incidence of damping-off | | Shoot weight/ plant (g) | Root weight/ plant (g) | Root knot Index |
|---|---|---|---|---|---|
| | Pre-emergence | Post-emergence | | | |
| 1. *T.viride* + FYM | 4.72$^{i}$ | 7.34$^{f}$ | 1.351$^{a}$ | 0.392$^{a}$ | 2.50$^{ab}$ |
| 2. *T.viride* + Neem cake | 1.75$^{i}$ | 3.32$^{g}$ | 1.322$^{a}$ | 0.360$^{ab}$ | 2.50 |
| 3. *T.harzianum* + FYM | 11.01$^{g}$ | 12.59$^{e}$ | 1.249$^{a}$ | 0.320$^{bcd}$ | 2.75$^{a}$ |
| 4. *T.harzianum* + Neem cake | 8.39$^{gh}$ | 9.62$^{ef}$ | 1.235$^{ab}$ | 0.308$^{cd}$ | 2.75$^{a}$ |
| 5. *P.lilacinus* + FYM | 7.69$^{gh}$ | 12.41$^{d}$ | 1.295$^{a}$ | 0.352$^{abc}$ | 1.75$^{c}$ |
| 6. *P.lilacinus* + Neem cake | 6.99$^{h}$ | 9.44$^{ef}$ | 1.258$^{a}$ | 0.348$^{abc}$ | 1.75$^{c}$ |
| 7. *T.viride* alone | 12.94$^{ef}$ | 15.56$^{c}$ | 1.109$^{bc}$ | 0.297$^{de}$ | 2.75$^{a}$ |
| 8. *T.harzianum* alone | 18.18$^{d}$ | 23.95$^{b}$ | 1.100$^{bc}$ | 0.296$^{de}$ | 2.00$^{bc}$ |
| 9. *P.lilacinus* alone | 21.15$^{c}$ | 23.95$^{b}$ | 1.100$^{bc}$ | 0.296$^{de}$ | 2.00$^{bc}$ |
| 10. FYM alone | 26.57$^{b}$ | 31.99$^{a}$ | 1.112$^{bc}$ | 0.261$^{e}$ | 2.75$^{ab}$ |
| 11. Neem cake alone | 21.33$^{c}$ | 23.08$^{b}$ | 1.020$^{bc}$ | 0.296$^{e}$ | 2.50 |
| 12. Control (untreated) | 29.55$^{a}$ | 34.44$^{a}$ | 0.992$^{c}$ | 0.189$^{f}$ | 3.00$^{a}$ |
| CD (P=0.05) (A) | 0.634 | 0.951 | 0.062 | 0.021 | 0.247 |
| (B) | 0.733 | 1.099 | 0.072 | 0.024 | 0.285 |
| (AxB) | 1.269 | 1.903 | 0.125 | 0.041 | 0.494 |

Mean of two trials

Mean of three replications

In the columns each figure followed by a same letter do not differ significantly at 5 per cent level by DMRT.

The present investigation shows that the root-knot index was appreciably reduced in seed treatment with *P. lilacinus* + soil amendment with FYM, followed by *P. lilacinus* + neem cake treatment. The present findings are in line with the observations of Sivakumar and Vidyasekaran (1990) and Jonathan (1994).

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# SEED STORAGE STUDIES IN *Gymnema sylvistre*

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**ABSTRACT**

Studies were conducted with freshly harvested *Gymnema* seeds to assess the influence of seed treatment and containers on storability of seeds. The seeds treated with thiram at 2 g $kg^{-1}$, stored both in cloth bag and 700 gauge polythene lined cloth bag at 8 per cent moisture content recorded 48 per cent germination after 6 months of storage. The untreated seeds recorded lower germination and vigour than the treated seeds. But vigour index values were significantly higher in 700 gauge polythene bag than in cloth bag stored seeds. The electrical conductivity of seed leachate was also lower order in treated seeds stored in moisture vapour proof containers. The protein and oil content of stored seeds showed significant differences.

KEY WORDS: Seed treatment, Quality parameters, Storage, *Gymnema*

Seed storage is an important aspect of post harvest production technology which focuses its value in meeting the demand forecast and supply of seeds in needy time with high quality. This aspect fetches more weightage in high cost low volume seeds like seeds of medicinal plants. *Gymnema* is one of the important medicinal plants and its seed has a market value. Studies on seed production and preservation were very meagre in this crop, hence at attempt was made to evaluate the storage potential of seed with fungicide treatment and storage containers.

## MATERIALS AND METHODS

The freshly harvested seeds were collected from *Gymnema sylvistre* plants maintained at coconut nursery area of Tamil Nadu Agricultural University, Coimbatore and dried to uniform moisture content of 8 per cent. The seeds were graded using air blower with 0.5 water pressure. The seeds were treated with thiram at 2 g $kg^{-1}$ and packed in cloth bag and 700 gauge polythene bags along with untreatedseeds and stored under ambient conditions (25 ± 2°C and 90 ± 2% RH) for 6 months. The seed samples were evaluated initially and subsequently at monthly interval using the following parameters.

The germination test was conducted with 4 x 100 seeds using and sand media in a germination room maintained at 25 ± 3°C and 95 ± 3 per cent RH. At the end of 12 days the number of normal seedlings were counted and germination percentage calculated to the total number of seeds tested. The vigour index was computed from germination (%) and seedling length (cm) (Abdul-Baki and Anderson, 1973). Electrical conductivity test was conducted as per the procedure of Presley (1958) using 20 seeds in 40 ml of deionised water and soaked for 6h at room temperature. The seed leachate was collected by decanting and EC was measured and expressed as $dSm^{-1}$.

Oil content of seed was estimated as per the procedure described by A.O.S.A. (1945) and