Study of Suppressive Effect of Biological agent Fungus, Natural Organic Compound and Carbofuran on Root knot Nematode of Tomato (lycopersicon esculentum)

Taouseef Khan, Shazia Shadab, Ruhina Afroz, Mohsin Abdul Aziz, Mazahar Farooqui

ABSTRACT

Root knot Nematodes are major pests of field and vegetable crops. They cause damage to many economically important horticultural crops like potato, cotton, and tomato. Plant parasitic Root knot Nematodes cause considerable losses in both commercial and subsistence tomato production systems and their control remain difficult. Tomato (lycopersicon esculentum) is highly susceptible to Root knot Nematodes; Meloidogyne incognita various Nematode antagonistic fungi have been studied for their use as biocontrol agents. In these experiment potential fungi trichoderma harzainum, paecilomyces lilacinus and arthrobotrys oligospora along with natural organic compound (neem compound mix) to control the Nematodes; M. incognita was evaluated. Also there potential to control Nematode was compared with that achieved by using the chemical control agent; carbofuran. The fungal agent evaluated significantly controlled Nematode population and enhance the plant growth.

Key words-Root knot Nematodes, Trichoderma harzainum, lycopersicon esculentum, Carbofuran, Neem extract.

INTRODUCTION:

Tomato (lycopersicon esculentum) is highly susceptible to the Root knot Nematode; Meloidogyne incognita. Infestation results in Root galling, stunted growth of the plant and low productivity (Pandey and kalra, 2003). Not only tomato but many other commercially important plants such as betelvine, ginger suffer severe damage from M. incognita infections (Bhatt et al., 2002a, b; Vadhera et al., 1998). Chemical methods have been mostly used to control Nematodes. Chemical agents such as halogenated aliphatic hydrocarbons (e.g., 1,3-dichloropropene), methyl isothiocynate mixtures, oxamyl, Thionazin and carbofuran are effective in the management of
Nematodes but are not ecofriendly and in the course of time may cause serious threat to the ecological balance. In soil these agents increase the probability of mutagenesis in microbes. Chemical pesticides have been tested and evaluated for their ill effects such as reproductive toxicity and carcinogenesis in mammals. High doses of these agents have been proved to be fatal to animals. These facts have been reported under ‘Food and Environment Protection Act, 1985, Part III. Control of Pesticide regulations 1986’ by Pesticide Safety Directorate (Kings Pool, York Y01 7PX) in 1992. therefore, biological control agents are gaining importance in the field of Nematode management. Another importance of these agents is their role as plant growth promoting microorganism (Sharon et al., 2001). Trichoderma spp. found in close association with Roots contribute as plant growth stimulators (Ousley et al, 1994). Many fungal and bacterial agents have been examined over a period of time for their potential as biocontrol agents. In research performed on fungi, it has been shown that fungi possess appropriate characteristics for biological control of Nematodes, for example, fungal enzymes such as chitinases are capable of rupturing Nematode egg shells contributing to parasitism of fungi on Nematodes (Gortari and Hours, 2008). Also, mutualistic endophytic fungi such as non-pathogenic strains of Fusarium oxysporum and species of Trichoderma have been evaluated for their activity against plant parasitic Nematodes.

**MATERIAL AND METHODS**

In the experiment, the natural antagonists of Nematodes isolated from infected Nematodes and healthy plant Roots from Nematode infested area were screened for their nematicidal potential against Nematode; M. incognita. Fungal lawns were developed on Potato Dextrose Agar medium (PDA) Isolated strains of Trichoderma harzianum, Paecilomyces lilacinus and Arthrobotrys oligospora were selected for the pot experiment on the basis of screening test. Besides potential biocontrol agents, Carbofuran as chemical treatment and Neem (Azadiracta indica) compound as natural organic compound treatment were also included in the experiment. Healthy seedlings of tomato (lycopersicon esculentum) were planted in pots containing autoclaved soil. The three test fungi grown on Maize Sand medium were separately mixed with the soil of experimental pots, at concentrations of 109 cfu/gm of medium. Carbofuran and Neem compound were also included in the experiment, at 5gm/pot, in separate treatments. After two days, Nematodes (approx. 1000/pot) were inoculated in each of the experimental pots. Pots were watered as required and observations were taken after one month. The observations were subjected to statistical analysis.

**Numbers of galls per plant Root:**

galls on the entire Root system of the selected
Tomato plants were counted with low power stereo microscope (x6) and their means were calculated.

**Galling index (GI):**
The galling index for each Root system was determined using a 0 to 10 scale (0=no galls, 10=100% galled), following Brides and Page(1980)
RESULTS AND DISCUSSION

Measurement of plant growth parameters and Root Knot Index (RKI) in Tomato (lycopersicon esculentum) after application of treatments against Nematode; Meloidogyne incognita.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Fresh Weight(gm)</th>
<th>Dry Weight(gm)</th>
<th>Length(cm)</th>
<th>RKI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shoot</td>
<td>Root</td>
<td>Shoot</td>
<td>Root</td>
</tr>
<tr>
<td>1. Trichoderma harzianum</td>
<td>38.66</td>
<td>8.50</td>
<td>10.60</td>
<td>2.40</td>
</tr>
<tr>
<td>2. Neem compound</td>
<td>33.66</td>
<td>7.47</td>
<td>8.00</td>
<td>1.87</td>
</tr>
<tr>
<td>3. Carbofuran</td>
<td>26.00</td>
<td>8.04</td>
<td>3.97</td>
<td>2.2</td>
</tr>
<tr>
<td>4. control</td>
<td>10.66</td>
<td>2.77</td>
<td>1.67</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Fig 1. The Nematode; Meloidogyne incognita trapped by Nematode trapping fungi Arthrobotrys oligospora

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CONCLUSION

The efficiency of the potential biocontrol agents in the management of Root knot Nematode was assessed from the reduction in Root galling expressed in terms of Root Knot Index (RKI). The efficiency of T. harzianum was found to be comparable to that of carbofuran (RKI=2), followed by compound. Biocontrol agents improve the health of plants and thus contribute to overall productivity. These agents are also self propagating under favourable conditions, and therefore, may remain in the soil for a long period. Although chemical agents like carbofuran are efficient in controlling Nematodes, but, their persistence may pose ecological problems. Therefore, biocontrol is suggested to be a safer Solution.
REFERENCES