Trichoderma harzianum and Chaetomium sp. as Potential Biocontrol Fungi in Management of Red Rot Disease of Sugarcane

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Red rot is a major disease of sugarcane in sub-tropical and tropical regions. It is particularly rampant in Uttar Pradesh and Bihar. The control of plant pathogens through biotherapy (Cook and Baker, 1983; Mukhopadhyay, 1987) is a distinct possibility for the future and can be exploited in modern sugarcane cultivation. Sugarcane plant-associated microflora consists of complex and dynamic communities of fungi, bacteria and actinomycetes that inhibit the pathogen in the soil or on the surface of root, stem (specially nodal region) and leaves. In many cases, micro-organisms prevent plant disease either by producing antibiotics like substances or by excluding the pathogen from the site by antagonism. Singh et al. (1982) obtained higher population of Trichoderma spp. in the rhizosphere of healthy sugarcane plants as compared to red rot-affected plants. Singh (1983) tested the antagonistic potential of major groups of fungi, isolated from the rhizosphere of sugarcane plant against Colletotrichum falcum Went. In the present investigation, some biocontrol agents were assessed for their antagonistic ability to control C. falcum by sett treatment.

Three isolates of Trichoderma harzianum Rifai (isolated from sugarcane) and Chaetomium spp. (isolated from dry leaf of sugarcane) were tested for antagonism in vitro against C. falcum Went (Isolate R-1, Co 1148) on oat meal agar by dual culture technique described by Mortan and Stroube (1955). Observations on growth and sporulation of C. falcum were recorded.

The three isolates of T. harzianum and Chaetomium sp. were mass cultured on sterilized wheat-bran saw-dust-water mixture (3:1:3.5 W/W/V) contained in 500 ml conical flasks and incubated at 28 ± 1°C for 15 days. A quantity of 100 g wheat-bran saw-dust per flask was optimum for the growth of the antagonists.

In order to study the efficacy of sett treatment with antagonists against the red rot pathogen, seed sets of Co1148 were first dipped in C. falcum spore suspension (10^5 conidia/ml) prepared in 0.5% carboxy methyl cellulose for 10 min. All the inoculated sets were fully covered with a polythene sheet and incubated at room temperature (10-32°C) for 24 h for development of incipient infections. After 24 h, development of initial infection was confirmed by microscopic examination. For sett treatment with antagonists, 500 g of 15 days-old wheat-bran saw-dust antagonist preparation was blended and mixed in 20 litres of water containing 0.5% carboxy methyl cellulose and the sets were dipped for 10 min and incubated for 24 h. For field trial, eighty sets were planted in each plot (5x3.6m). Six treatments i.e. (i) healthy sets, (ii) sets inoculated with C. falcum, (iii) inoculated sets + sett treatment with T. harzianum TR I, (iv) inoculated sets + sett treatment with T. harzianum TR II, (v) inoculated sets + sett treatment with T. harzianum TR III and (vi) inoculated sets + sett treatment with Chaetomium sp. were included in a randomised block design with three replications. The sets were planted in rows 90 cm apart. Germination was recorded after 60 days of planting. The number of clumps, developed in the different treatments was recorded in the month of July. Total number of millable cane and yield were recorded at the time of harvest. Disease incidence was recorded on clump and cane basis at monthly interval. The infected clumps were uprooted to avoid secondary spread of the disease.

Results indicated that all the three isolates of T. harzianum inhibited the sporulation of C.
Table 1. Effect of sett treatment with antagonists on red rot development through incipient infections

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Germination %</th>
<th>Number of clumps</th>
<th>Disease incidence %</th>
<th>Average millable canes/ha (x 10^3)</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy setts</td>
<td>34.4</td>
<td>52.7</td>
<td>1.3</td>
<td>112.8</td>
<td>78.5</td>
</tr>
<tr>
<td>C. falcatum (c.f.)</td>
<td>9.1</td>
<td>11.7</td>
<td>85.0</td>
<td>25.6</td>
<td>17.2</td>
</tr>
<tr>
<td>C.F. + T. harzianum TR I</td>
<td>15.8</td>
<td>19.0</td>
<td>56.5</td>
<td>66.7</td>
<td>56.5</td>
</tr>
<tr>
<td>C.F. + T. harzianum TR II</td>
<td>16.0</td>
<td>22.7</td>
<td>41.0</td>
<td>67.2</td>
<td>51.3</td>
</tr>
<tr>
<td>C.F. + T. harzianum TR III</td>
<td>13.0</td>
<td>18.3</td>
<td>56.0</td>
<td>65.6</td>
<td>54.5</td>
</tr>
<tr>
<td>C.F. + Chaetomium sp.</td>
<td>23.1</td>
<td>32.0</td>
<td>28.0</td>
<td>92.2</td>
<td>70.4</td>
</tr>
<tr>
<td>C.D. at 5%</td>
<td>4.9</td>
<td>8.5</td>
<td>14.4</td>
<td>17.4</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Present investigations indicated the positive role of Chaetomium sp. and T. harzianum in minimising the red rot pathogen in sugarcane. Therefore, a new vista in the management of red rot, the ‘cancer’ of sugarcane has been opened. Further investigations are in progress to exploit these antagonistic microflora in the management of red rot of sugarcane.

KEY WORDS::- Biocontrol, Chaetomium sp., Colletotrichum falcatum, Red rot, Sugarcane, Trichoderma harzianum

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