Efficacy of bioformulations against bacterial wilt of tomato caused by *Ralstonia solanacearum*

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**ABSTRACT:** Bacterial wilt of tomato caused by *Ralstonia solanacearum* is the dreaded diseases causing severe yield loss (25-75%) in farmers’ field. A field experiment at demonstration farm of KVK West Tripura was conducted for the evaluation different chemicals, botanicals and bioformulation against the disease. The study revealed that all the treatments were significantly effective over the control. However, soil drench with antibiotic @ 100 ppm was found best with lowest (23.6%) disease incidence and highest yield (228.2 q/ha). This was followed by copper oxychloride in terms of disease incidence (28.4%) and Biofor Pf in terms of yield (220.6 q/ha). Highest disease incidence (78.67%) with lowest yield(86.5 q/ha) was recorded in control plot.

**KEY WORDS:** Bacterial wilt, management, tomato

(Article chronicle: Received: 17-09-2013; Revised: 10-01-2013; Accepted: 18-02-2013)
University, Jorhat against *R. solanacearum*. Chemicals and botanicals were applied as soil drenching @ 400 ml/plant, bioformulation was applied in circular ring, 15 cm away from the plant base @ 100 gm/plant. For soil application of Biofor Pf, 1 kg of the formulation was mixed with 10 kg dry cow dung and applied the mixture @ 100 gm/plant. All the management approaches were tried for three applications i.e. at 15, 30 and 45 days after transplanting.

Percentage mortality due to bacterial wilt was recorded per plot. The data were analysed using Fisher’s method of analysis of variance. The per cent values were transformed to corresponding angular values before analysis.

**RESULTS AND DISCUSSION**

All the treatments were significantly effective in reducing the wilt incidence as compared to inoculated control (Table 1). Lowest disease incidence (23.6%) was recorded in Plantomycin treated plot with highest yield (228.2 q/ha), this was followed by soil drenching with copper oxychloride and asafoetida: turmeric: water for disease incidence. Yield data recorded in Biofor Pf treated plot shows second highest in production (220.0 q/ha) but highest wilt per cent (34.68%). This was followed by soil drench with copper oxychloride and asafoetida: turmeric: water with a yield of 209.6 q/ha and 182.1 q/ha respectively. Lowest disease incidence with highest yield recorded in the Plantomycin treated plot might be due to immediate antibacterial action of the chemical on the bacterial population surviving in the soil which causes quick/direct death of the bacteria and indirectly helps the plant for maximum and efficient nutrient uptake, leads to the higher yield. Plantomycin acts on ribosome and inhibits protein synthesis, and also act directly on the microorganism as killing agents or as inhibitors of growth and reproduction by binding to bacteria. Dutta et al., (2009) reported that antibiotics acted against bacteria by interfering with their enzyme systems and then producing physiological disturbance which first inhibited and then they destroyed the bacteria. In the effect of bioformulation for the management of bacterial wilt of tomato, bioformulation Biofor Pf was found effective in minimizing the disease (Table 1). The efficacy of the bioagent might be attributed to the production of siderophore like metabolite which has strong inhibitory effect on *R. solanacearum* (Ciampi et al., 1997). The fact behind the reduced disease incidence recorded in Biofor Pf treated plot is that *P. flourescens* rapidly colonized and inhibited certain components of the root zone microflora. The antagonist beneficially alters the composition of the rhizosphere leading to reduced plant disease incidence. Similarly higher yield observed in the Biofor Pf treated plot might be associated with reduction in disease incidence, increased uptake of soil nutrients, rejuvenation of soil and enhanced plant growth regulators (Anonymous, 2008). Jha et al. (2005) reported that soil application of *Pseudomonas* spp. besides reducing disease incidence helps in growth of the tomato plants.

Table 1. Effect of chemicals, botanicals and bioformulation on bacterial wilt and yield of tomato

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Disease Incidence (%) **</th>
<th>% Disease reduction over control</th>
<th>Yield (q/ha) **</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 = Soil drench with Plantomycin (@ 100 ppm)</td>
<td>23.6 (29.06) *</td>
<td>70.00</td>
<td>228.2</td>
</tr>
<tr>
<td>T2 = Soil drench with Copper Oxychloride (@ 0.3% w/v)</td>
<td>28.4 (32.20)</td>
<td>63.90</td>
<td>209.6</td>
</tr>
<tr>
<td>T3 = Soil drench with Asafoetida : Turmeric powder : Water (@ 1 gm: 5 gm: 10,000ml)</td>
<td>31.60 (34.20)</td>
<td>59.83</td>
<td>182.1</td>
</tr>
<tr>
<td>T4 = Soil application of Biofor Pf (@ 100 gm/plant)</td>
<td>34.68 (36.08)</td>
<td>55.92</td>
<td>220.0</td>
</tr>
<tr>
<td>T5 = Control (No chemicals + No botanicals + No Formulation)</td>
<td>78.67 (62.49)</td>
<td>–</td>
<td>86.5</td>
</tr>
<tr>
<td>CD (p = 0.05)</td>
<td>2.33</td>
<td>–</td>
<td>4.62</td>
</tr>
</tbody>
</table>

* Data in the parentheses are arcsine transformed value

** Data are mean two years and four replications
Earlier, soil application of asafoetida (1 gm) + turmeric powder (5 gm) in 10 litres of water was reported as an effective measure against tomato wilt disease in North East India (Anonymous, 2005). Copper oxychloride has been reported earlier as an effective chemical against bacterial disease of tomato. Copper ion (Cu²⁺) is toxic to all bacterial cells because it reacts with sulphhydryl (–SH) groups of certain amino acids and causes denaturation of proteins and enzymes. The possible reasons for not getting total control of the disease in the present study could be due to improper and/or no coverage of bacterial sick soil by the treatments to the whole rhizosphere, failure of the treatment to penetrate the cells of already infected plants where bacterial cell still viable and infective and also the endemic nature of the disease.

ACKNOWLEDGEMENT

The authors are grateful to Indian Council of Agricultural Research, New Delhi for the financial support. The valuable suggestion and encouragement received from Dr. V. Venkatasubramanian, ADG (AE), ICAR, New Delhi, Dr. A. K. Gogoi, ZPD, Zone-III, ICAR, Meghalaya-3 and Mr. P. Kanungo, GS, Sri Ramakrishna Seva Kendra, 81, Bondel Road, Kolkata in various spheres of work is highly appreciated.

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