Biological Control of Sugarbeet Root Rot Caused by *Sclerotium rolfsii*

Thilagavathi Rasu, Nakkeeran Sevugapperumal, Raguchander Thiruvengadam and Samiyappan Ramasamy

***Abstract*—**Strains of bacterial and fungal bicontrol agents were tested for their effectiveness on the sugarbeet root rot pathogen, *S. rolfsii*. Out of 12 strains of *Pseudomonas fluorescens* tested, maximum per cent inhibition of 48.9 was exhibited by Pf1 in dual plate technique. The *B. subtilis* strain, EPCO 16 showed greatest per cent inhibition (44.4) than other two strains. Among 12 different *Trichoderma* sp. tested, *Trichoderma asperellum*, TTH 1 exhibited better inhibition of mycelial growth of the pathogen (64.4 per cent). The Farm yard manure based bioformulations of these effective biocontrol agents were tested individually and in combination against root rot of sugarbeet under pot culture (glasshouse) conditions. Next to the difenoconazole treatment, significant reduction in root rot incidence was observed in the combination of *P. fluorescens* (Pf1) and *T. asperellum* (TTH1) than individual and control treatments. Similarly, increased yield was observed in the combination of Pf1 and TTH1 treated sugarbeet plants under pot culture conditions.

Keywords*—In vitro* antagonism, *P. fluorescens*, *B. subtilis*, *Trichoderma* sp., pot culture, root rot, *S. rolfsii*,

I. Introduction

SUGARBEET (*Beta vulgaris* L. ssp. *vulgaris* var. *altissima* Doll. Chenopodiaceae) is an important sugar producing tuber crop as it accumulates high concentration of sucrose in its white roots of conical shape. The conditions suitable for growth and development of the crop are also favourable for the quick development, proliferation and spread of disease, among them root rot caused by *S. rolfsii* is the most serious one resulting in significant yield loss. Control of root rot diseases using fungicides are normally recommended which are not economical and causing environmental hazards. In this context, biological control of plant diseases is advocated instead of chemical pesticides. Application of single bioagent can have limitations with regard to the consistency of the product and efficacy in different environments [1]. Cocktails of biocontrol agents may have advantages of broad spectrum activity, enhancing the efficacy and reliability of the biological control and they communicate with each other to maximize biocontrol efficacy. The present study was undertaken to study the combination of effictive biocontrol agents against root rot of sugarbeet and to develop ecofriendly management practices to control the disease.

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II. MATERIALS AND METHODS

A. Pathogen and biocontrol agents

The root rot pathogen *Sclerotium rolfsii* was isolated from infected sugarbeet plant. *Trichoderma asperellum* (TTH1), *T. viride* (TNAU TV1), strains of *P. fluorescens* and *Bacillus subtilis* were obtained from culture collection section, Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, India. Other *Trichoderma* sp. isolates were obtained from rhizosphere soil of different crops grown in different locations of Tamil Nadu.

B. In vitro screening

To study the antagonism of bacterial antagonists *viz*., *P. fluorescens* and *B. subtilis* strains on *S. rolfsii*, a nine mm mycelial disc from actively growing colony of *S. rolfsii* was placed at the centre of the Petri plate containing PDA medium. After 12 h of incubation, a sterile Whatman No. 40 filter paper discs with six mm dia were placed one cm away from the edges of the Petriplate at four sides centering around the fungal disc. About 25µl of bacterial cell suspension from 48 h old broth cultures was dropped over the filter paper discs. Sterile water was used as a check. Four replications were maintained for each bacterial antagonist [2]. To study the antagonism of fungal antagonists on *S. rolfsii*, three days old culture from *Trichoderma* sp. isolates was placed five mm away from the periphery of the PDA plate and opposite to the culture disc of *S. rolfsii* [3]. Control plate was maintained with *S. rolfsii* alone and incubated at room temperature (27±2ºC). Four replications were maintained. Observations were taken after the *S. rolfsii* reached full growth in the control plate. The radial mycelial growth of the *S. rolfsii* and per cent reduction over control was calculated by using the formula, Per cent inhibition over control

$$= \{(C-T)/C\} \times 100 \quad (1)$$

Where, C- mycelial growth of *S. rolfsii* in control; T- mycelial growth of *S. rolfsii* in dual plate.