(144)

Rhizospheric Fungal spp. of Tomato (*Solanum lycopersicum* L.) and Their Effect on Tomato Plant Growth and on *Alternaria solani,* the Causative Agent of Early Blight of Tomato

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Abstract

Tomato (*Solanum lycopersicum* L.) is a widely consumed crop throughout the world including Sri Lanka. Use of agrochemicals for enhanced yields and managing diseases associated with tomato results in deleterious impacts on soil microflora, fauna and leads to human health problems. A possible alternative is the use of rhizospheric microorganisms, as they are reported to improve productivity and protect various crops. Hence this study aimed to isolate rhizospheric fungal assemblages of tomato plants and evaluate their ability to solubilize phosphate while, controlling *Alternaria solani*, the causative agent of Early Blight of tomatoes. Rhizospheric fungi were isolated from commercial tomato cultivations in two agro-ecological zones (WM3b and IM2b), using soil dilution plate technique. Composite samples of soil attached to the root systems of five healthy plants, uprooted from each field were prepared and 10 g of each sample was used for the isolations. Twenty-seven fungal genera were isolated and *Trichoderma* and *Penicillium* were the frequently isolated genera. Phosphate solubilization ability of each fungal species was evaluated using Pikovskaya's agar and liquid medium, and four isolates (*Eupenicillium* sp., *Talaromyces purpureogenus*, *Paecilomyces* sp., and *Purpureocillium lilacinum*) with the highest phosphate solubilizing abilities were evaluated on tomato plant growth under greenhouse condition. The inocula of each fungal sp. were prepared by adding fifteen, 6mm diameter mycelial discs from each 5-day-old culture into polypropylene bags containing 90 g of sterile rice husk medium and incubated for 02 weeks at room temperature. Each pot contained a 4.6 kg layer of non-sieved sterilized potting medium (Sand: topsoil: Compost at 2:1:1 ratio) and a 2.5 kg layer of sieved medium on top, which was mixed with 15 g of inoculum. Three-week old, healthy tomato seedlings (variety-Bathiya) were planted (with 3 replicates) and allowed to grow with regular watering. Control pots contained potting medium with uninoculated sterile rice husk. Growth parameters such as Root and shoot lengths, fresh and dry weights of roots, shoots, and leaves were evaluated at 02-week intervals for 02 months and the results were analysed using ANOVA with Tukey's pairwise comparison. Plants treated with *T. purpureogenus* and *P. lilacinum* showed significant increases ($p \leq 0.05$) in all growth parameters in every evaluation. Dual culture plate assay on the Potato Dextrose Agar was used to test the effect of rhizospheric fungal spp. on the radial colony growth of *A. solani,* and *Eupenicillium* sp. showed the highest percentage inhibition (85.09±5.68%). Microscopic observations of inhibition zones between two colonies showed the presence of coils, loops, knobs, and haustoria, formed by inhibitory rhizospheric fungal species. Assays for Chitinase and Glucanase enzyme production showed that *Mortierella* sp.-1, *P. lilacinum, Trichoderma* sp.-1, and *Acremonium* sp. were the highest chitinase producers, whereas *P. lilacinum* was the highest glucanase producer. These results indicate the ability of some rhizospheric fungal species of tomato to increase the growth of tomato plants significantly by phosphate solubilization and ability to inhibit the growth of foliar pathogen *A. solani* under *in vitro* conditions.

Keywords: Rhizospheric fungi, Phosphate solubilization, Dual culture plate, Plant growth parameters