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The Potential Use of Plant Growth-Promoting Rhizobacteria (PGPR) as Antagonists and Biocontrol Agents in *Hevea* Diseases

Gunarathne L.H.S.N.*, Fernando T.H.P.S.

Plant Pathology & Microbiology Department, Rubber Research Institute of Sri Lanka

**samudragunarathne@yahoo.com*

Abstract

The rhizosphere related bacterial species have a significant capability in plant growth promotion, referred to as Plant Growth Promoting Rhizobacteria (PGPR). Several substances produced by antagonistic rhizobacteria have been related to pathogen control and indirect promotion of growth in many plants. The objectives of this study were to identify effective PGPR bacteria in rubber soils of Sri Lanka, determine the potential use as antagonists and biocontrol agents to control economically important *Hevea* diseases in nurseries, and identify effective novel inoculant formulations. Soil samples were collected from the root rhizosphere of cover crops in *Hevea* fields in Rubber Research Institute of Sri Lanka (RRISL), Dartonfield. Bacteria were isolated by TSA plate method. Isolated PGPR bacteria were subjected to test the enzyme secretion ability. Pectinase, Lipase, and Amylase secretion ability of PGPR were tested in specifically developed media. Auxin production of PGPR were measured using freshly prepared Salkowsky reagent. Phosphorous solubilizing ability of PGPR was tested using Pikovskaya (PVK) medium. Antagonistic ability of PGPR was tested against the *Rigidoporous microporus*, *Fusarium sp.* and *Pythium sp.* causing white root disease and Patch Canker disease in rubber respectively. Paper disc diffusion method was used to test the antagonism of selected bacteria and the percentage growth inhibition was calculated. Plasmid DNA extraction of antagonistic PGPR was done following the alkaline SDS method. Gene sequencing of selected bacteria was further carried out. Among 13 selected PGPR bacterial species, 3 bacteria were showing significant antagonism towards *R. microporus*. (Percentage growth inhibition by 51.2%, 46.8% and 44.3% respectively) *Fusarium sp.* was controlled by 7 PGPR species. *Pythium sp.* was controlled by 2 PGPR (Percentage growth inhibition by 41.6% and 38.7% respectively) 5 types of combinations of bacteria were tested. Among 5 types, 2 types were highly effective in control of *R. microporus* (Percentage growth inhibition by 79.8% and 72.6% respectively). All 5 combinations were moderately effective in control *Fusarium sp.* and 1 type was highly effective in control of *Pythium sp.* (Percentage growth inhibition by 67.8%). PGPR can be used as effective biocontrol agents in control of *Hevea* pathogens. The combinations of PGPR are more effective than the individual bacterial species. This will be leading to improve the productivity of *Hevea* plantations in Sri Lanka.

Keywords: Plant Growth Promoting Rhizobacteria, Antagonism, *Hevea* pathogens