

Isolation and Characterization of Root Nodule Rhizobia from Non-Edible Legume Crops in Anuradhapura District to Formulate Bio-Fertilizer for Edible Legume Cultivation

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There is a wide variety of edible and non-edible legumes in Sri Lanka which perform symbiotic Nitrogen (N) fixation with native rhizobia. There are only a few studies that have been reported on non-edible legume - rhizobia systems in Sri Lanka. The main objective of the current study is to isolate and screen native rhizobia species which are well adapted to local climatic and soil conditions from the root nodules of non-edible legumes to formulate efficient and robust N biofertilizers for edible legume cultivation in Sri Lanka. Root nodules were collected from seven different non-edible legume plants (Buffalo clover, Sickle Senna, White lead tree, Wild Indigo, Sleeping Grass, Tick-trefoil, and Jewel Vine) from seven different locations in Anuradhapura district (Thambuttegama, Thalawa, Anuradhapura New Town, Mihinthale, Mahailuppallama, Galnewa, and Kekirawa). Sixteen rhizobial strains were isolated. Nine of them demonstrated capability of N fixation, inorganic phosphate solubilization, and indole acetic acid production. These nine strains were tested for their tolerance to adverse environmental conditions, such as extreme pH, salinity, drought, and high temperature. Three isolates (TBII-1, TBAS-2, and KEPT-1) had the highest tolerance to extreme saline (5.0%) conditions. TBII-1 and KEPT-1 grew well at 45 °C due to their tolerance to higher temperatures. KEPT-1 had the best survival at 0.1%, 0.2%, and 0.4% of PEG concentration. Most of the isolates showed optimum growth in the range of pH 5 to 8. Out of the 16 rhizobial strains isolated, 3 strains (TBII-1, TBAS-2, and KEPT-1) showed the best survival under the tested extreme environmental conditions and possessed growth-promoting abilities. Therefore, these 3 strains can be concluded as possible candidates to produce biofertilizers for edible legume cultivation in Anuradhapura district of Sri Lanka upon testing of competency in host plant infectivity, nodulation and plant growth promotion.

Keywords: Biofertilizers, Non-edible legumes, Plant growth promotion, Rhizobia, Stress tolerance

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