ABSTRACT

This study focuses on the isolation and characterization of Rhizobium strains as nitrogen-fixing bacteria. The primary objective was to assess their nitrogen fixation activity, evaluate their indole-3-acetic acid (IAA) production capability, investigate phosphate solubilization potential, examine enzymes solubilization, and determine their resistance to salinity and pH variations. The isolation process involved obtaining root nodules from the sample of *Pueraria javanica* and subsequently culturing the bacteria. Nitrogen fixation activity was determined using the nitrogen-free bromthymol (NFB); the test showed that most of the isolates could convert atmospheric nitrogen into a biologically available form. IAA production was assessed through the colorimetric Salkowski's method. The Rhizobium isolates exhibited significant IAA production, indicating their potential to enhance plant growth and development through hormone synthesis. Phosphate solubilization was evaluated using Pikovskaya's agar medium. The Rhizobium strains demonstrated the ability to solubilize insoluble forms of phosphate, which could improve the availability of this vital nutrient for plants. Enzyme solubilization potential was assessed by examining the ability of the Rhizobium isolates to produce extracellular enzymes, including amylase, cellulase, and protease. Results indicated the strains exhibited diverse enzymatic activities, suggesting their potential involvement in nutrient cycling and organic matter degradation. The Rhizobium isolates were subjected to salinity and pH stress tests to investigate their adaptability to challenging environmental conditions. The strains displayed varying degrees of resistance, highlighting their potential to thrive in adverse soil conditions. Overall, this study successfully isolated and characterized nitrogen-fixing Rhizobium strains. The findings demonstrate their ability to fix nitrogen, produce IAA, solubilize phosphate, exhibit enzymatic activity, and tolerate salinity and pH fluctuations. These characteristics underscore the potential of Rhizobium as beneficial plant symbionts and contributors to sustainable agriculture practices. However, this study failed to find an isolate that can excel in all the conducted tests.

Keywords: Rhizobium, nitrogen fixation, indole-3-acetic acid, phosphate solubilization, enzyme solubilization, salinity resistance, pH resistance.