

ABSTRACT

Nerazura Putri Hagiasofia D.S. 24020121140162. **Bioprospecting Rhizobia from Red Bean Root Nodules (*Phaseolus vulgaris* L.): Characterization of PGPR and Detection of *Nod* and *Nif* Genes.** Supervised by Anto Budiharjo and Nurhayati.

Red beans are one of the most commonly consumed legumes, but red bean cultivation faces challenges related to dependence on chemical fertilizers. Rhizobia are known as symbiotic bacteria of leguminous plants that have PGPR (*Plant Growth Promoting Rhizobacteria*) properties. This study was conducted to explore the diversity of rhizobia from the root nodules of red beans (*Phaseolus vulgaris* L.), including the isolation and characterization process, PGPR ability test, and detection of *nod* and *nif* genes. Bacteria isolation was carried out using the crush nodule, slice nodule, and stepwise dilution methods, followed by morphological characterization of the isolates. The PGPR tests consisted of nitrogen fixation, IAA production, and phosphate solubilization. The detection of rhizobia bacterial genes was performed molecularly based on the *nodA*, *nodB*, *nodC*, *nodD*, *nifA*, and *nifH* gene primers. The isolation results obtained 14 bacterial isolates (KCM1-KCM14) with Gram-negative. The results of rhizobia isolate characterization microscopically were spherical (3 isolates), short bacilli (3 isolates), and bacilli (8 isolates). KCM isolates have potential as PGPR, including nitrogen fixation with the highest concentration of 27,09 ppm by KCM13, IAA production reaching 43,38 ppm by KCM4, and strong phosphate solubilization with KCM3 having an IKF of 4,3. The *nodB*, *nifA*, and *nifH* genes were successfully detected in all KCM isolates, while the *nodA*, *nodC*, and *nodD* genes were detected in the majority of KCM isolates. This study shows the potential of rhizobia as a biofertilizer with good PGPR capabilities, supported by the presence of nodulation (*nod*) genes and nitrogen fixation (*nif*) genes.

Keywords: *red bean, rhizobia, PGPR, nod gene, nif gene*