

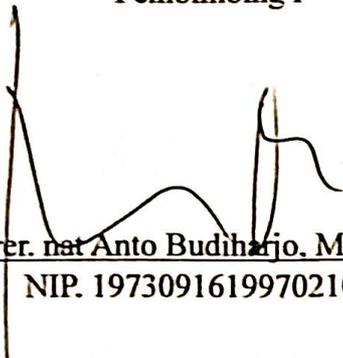
## ABSTRACT

Ariya Putra. 24020122420015. The Potential of Rhizobial Isolates from Soybean (*Glycine max* (L.) Merr.) and Groundnut (*Arachis hypogaea* L.) as Biofertilizer *in planta*: Isolation and Molecular Characterization.

Soybean and peanut are important legume in Indonesia. Nitrogen is a limiting nutrient for plants, and the excessive use of chemical fertilizers raises environmental concerns. Rhizobia serve as potential biofertilizer for their symbiotic nitrogen fixation with legumes, although this interaction is highly specific. This study aimed to isolate and characterize rhizobia from soybean and groundnut nodules. The isolates underwent nodulation test on siratro, analyzed using BOX-PCR, followed by *in vitro* PGPR tests and molecular identification via *16S rRNA* sequencing. Further analyses included the detection of *nodA*, *nodC*, *nodD*, *nifH*, and *rhcN* genes, evaluation of free-living nitrogen fixation, and assessment of their effects on the growth of soybean and peanut *in planta*. The siratro nodulation test yielded four isolates: ED6, AH12, AH12-1, and AH15. ED6 tested positive for IAA production and phosphate solubilization, AH12 and AH15 tested positive for ACC deaminase production and phosphate solubilization, while AH12-1 tested negative for all PGPR traits *in vitro*. Based on 16S rRNA analysis, ED6 is closely related to *Rhizobium* sp., AH12 to *Ralstonia* sp., AH12-1 to *Bradyrhizobium japonicum*, and AH15 to *Burkholderia* sp. The *nifH* gene was detected in ED6 and AH12-1, while *nodA*, *nodC*, *nodD* were absent in all isolates. The *rhcN* gene was found exclusively in AH12-1, which also exhibited free-living nitrogenase activity. *In planta* tests showed that ED6 and AH12-1 did not nodulate soybean varieties Grobogan and Chiang Mai 60, nor did they affect chlorophyll content and dry weight. In contrast, while ED6 failed to induce nodulation in groundnut, AH12-1 successfully formed nodules and demonstrated nitrogenase activity on the Gajah and Tiger Pattern varieties, with a significant positive impact observed only on the Gajah variety. This study contributes to the development of a rhizobia-based biofertilizer for the groundnut, with further research needed to assess their potential in other legumes.

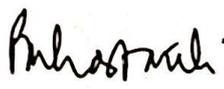
**Key words:** PGPR, *nodA*, *nodC*, *nodD*, *nifH*, *rhcN*, free-living

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