

## **Inoculation of *Bacillus sphaericus* UPMB-10 to young oil palm and measurement of its uptake of fixed nitrogen using the $^{15}\text{N}$ isotope dilution technique**

### **ABSTRACT**

There are increasing applications of diazotrophic rhizobacteria in the sustainable agriculture system. A field experiment on young immature oil palm was conducted to quantify the uptake of N derived from  $\text{N}_2$  fixation by the diazotroph *Bacillus sphaericus* strain UPMB-10, using the  $^{15}\text{N}$  isotope dilution method. Eight months after  $^{15}\text{N}$  application, young immature oil palms that received 67% of standard N fertilizer application together with *B. sphaericus* inoculation had significantly lower  $^{15}\text{N}$  enrichment than uninoculated palms that received similar N fertilizers. The dilution of labeled N served as a marker for the occurrence of biological  $\text{N}_2$  fixation. The proportion of N uptake that was derived from the atmosphere was estimated as 63% on the whole plant basis. The inoculation process increased the N and dry matter yields of the palm leaflets and rachis significantly. Field planting of young, immature oil palm in soil inoculated with *B. sphaericus* UPMB-10 might mitigate inorganic fertilizer-N application through supplementation by biological nitrogen fixation. This could be a new and important source of nitrogen biofertilizer in the early phase of oil palm cultivation in the field.

**Keyword:**  $^{15}\text{N}$  isotope dilution; Biological nitrogen fixation; *Elaeis guineensis* Jacq.; Inoculation; PGPR