

Effects of *Azospirillum* inoculation on N₂ fixation and growth of oil palm plantlets at nursery stage

ABSTRACT

Nitrogen fertilizer is the most expensive nutrient input in oil palm production, with an average total nitrogen fertilizer cost estimated at RM 470 million yr⁻¹. The use of nitrogen fixing bacteria (e.g. *Azospirillum* spp.) as a biofertilizer and bioenhancer can reduce the production cost of this crop. A glasshouse experiment was undertaken to observe the effects of *Azospirillum* inoculation on N₂ fixation, plant growth and photosynthetic rate of the host plant. This experiment was conducted in undrained pots with ¹⁵N labelled Selangor series soil and each pot was planted with a two-month-old oil palm plantlet (MPOB clone, P149). Three treatments were applied: 1) control [+ killed inoculum (Sp7)], 2) *Azospirillum* brasilense (Sp7) inoculation and 3) *A. lipoferum* (CCM 3863) inoculation. This experiment was laid out in a randomized complete block design with four replications and harvested four months after planting. Two weeks before harvest, the first fully expanded leaf from each seedling was analysed for light and CO₂ response using a closed system of portable infrared gas analyser. At harvest, the plantlets were separated into tops and roots, dried, weighed and ground for total nitrogen and ¹⁵N analyses. Results showed that *Azospirillum* inoculation contributed up to 40% of the total nitrogen requirement of the oil palm plantlets, stimulated top and root growth by 30% and 60%, respectively and increased the host photosynthetic rates compared to the control. *Azospirillum* (Sp7 and CCM 3863) is a potential biofertilizer and bioenhancer for sustainable oil palm plantlet cultivation and saves cost on nitrogen fertilizer.

Keyword: *Elaeis guineensis*; *Azospirillum*; Biofertilizer; N₂ fixation; Bioenhancer; Photosynthesis; ¹⁵N isotope dilution