

Effect of root exuded specific sugars on biological nitrogen fixation and growth promotion in rice (*Oryza sativa*).

ABSTRACT

Biological Nitrogen Fixation (BNF) is an energy involving process. A ^{15}N tracer study was conducted under growth chamber and glasshouse conditions to determine the effect of glucose, galactose and arabinose (common sugars found in root environments) on BNF by two diazotrophs, *Rhizobium* sp. Sb16 and *Corynebacterium* sp. Sb26, previously isolated from rice genotypes (Mayang Segumpal and MR219). Diazotrophs have preferences for specific sugar utilization and plant association. Sb16 showed high preference for galactose, and Sb26 preferred arabinose. Application of 10 mM sugar in the experimental pot (5 kg soil), either galactose or arabinose, to the respective rice genotype enhanced diazotroph population growth, N_2 fixation activity and simultaneously plant growth. Mayang inoculated with Sb16 applied with galactose increased plant N concentration 4.2 ± 0.07 %, whereby, 42 ± 1.06 % of the N was derived from the atmosphere. About 40 ± 1.29 % of the N concentration of MR219 inoculated with Sb26 and arabinose was obtained from BNF. The association between Mayang with Sb16 increased 195 ± 40 % of plant biomass as compared to control, and 36 ± 19.8 % over 60 kg ha^{-1} of N-fertilizer. On the other hand, the association of MR219 with Sb26 resulted in 108 ± 37.07 % biomass increment as compared to control, and 89 ± 22.34 % over fertilized-N in different sugar treatments. The association between the plant-diazotrophs along with sugar significantly increased photosynthetic activity. The study indicated that growth and N_2 fixation activity of rice can be increased by increasing the availability of specific sugars in the rhizosphere.

Keyword: Arabinose; Diazotrophs; Glucose; Galactose; Indoleacetic acid; Photosynthesis.