Effect of plant growth promoting rhizobacterial (PGPR) inoculation on growth and nitrogen incorporation of tissue-cultured Musa plantlets under nitrogen-free hydroponics condition

ABSTRACT

Banana requires large amounts of chemical fertilizers which are costly and can be hazardous to the environments when are used excessively. Biological N2 fixation (BNF) technology can play a vital role as substitution to commercially available N-fertilizer in crop production and reduction of environmental problem to some extent. An experiment was conducted in the shade-house of University Putra Malaysia, Malaysia under hydroponics condition using nitrogen-free plant nutrient solution to evaluate the effect of PGPR (Plant Growth Promoting Rhizobacterial) inoculation on growth and N2 fixation of tissue-cultured banana plantlets under nitrogen (N) free hydroponics condition. The experiment was a completely randomized design with six replicates. There were three treatments viz. T1: (control; N0 -PGPR), T2: (N0 + Sp7) and T3: (N0 + UPMB10). One tissue-cultured banana plantlet (ex-laboratory, about 10-11 cm height of three-leafed stage) cv. 'Berangan' (Musa spp. dessert type) was planted per pot (4.0 L). The results indicated that a remarkable increase in root growth, namely length (33-44%), volume (76-168%) and mass (137-141%) were recorded due to the PGPR inoculation, beside a higher shoot growth (123-202%) and N yield (94-144%). The inoculated plants showed higher formation of root hair which was visible within 7 days of inoculation. The growth attributes namely, leaf area, chlorophyll content, and consequently the total biomass were also increased due to PGPR inoculation. The overall growth performance of inoculated seedlings was higher in compare to un-inoculated control. Thus, it might be concluded that PGPR strains Sp7 and UPMB10 could be used as crop-enhancer and bio-fertilizer for vigor seedling and production of bananas.

Keyword: Banana seedlings; Biofertilizers; Growth; Hydroponics; N2 fixation; PGPR