Identification, determination and quantification of indole-3-acetic acid produced by Pseudomonas aeruginosa UPMP3 and its effect on the growth of oil palm (Elaeis guineensis Jacq)

ABSTRACT

Pseudomonas species have founded as greatest and potentially most promising group of plant growth promoting rhizobacteria (PGPR). Pseudomonas aeruginosa UPMP3 is an important PGPR isolated from oil palm rhizosphere. This rhizobacteria is likely to synthesize and release phytohormone indole-3 acetic acid (IAA). Production of IAA is one of the main reasons to promote plant growth and yield. The aim of this study was to detect, identify and quantify the IAA production by P. aeruginosa UPMP3 in vitro and its influence on oil palm seedling growth. Nutrient broth medium supplemented with 1-5 mg/ml L-tryptophan and without L- tryptophan were used for bacterial culture. The pH levels of culture media were optimized under shaken and static conditions and incubated at 28±2°C in different incubation periods. The production of IAA by P. aeruginosa UPMP3 was extracted, purified, detected and quantified by Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC) analyses. Production of IAA was quantified by HPLC in liquid culture and achieved 12.08µg/ml with a retention time of 13.711 min. On the other hand, the maximum 52 µg/ml IAA was recorded in the medium supplemented with 4 mg/ml L- tryptophan in compare to control. The optimum pH level of the culture medium was recorded as 7 under shaken conditions at 150 rpm with 5 days incubation. The influence of IAA produced by the UPMP3 on oil palm seedling growth was carried out in the pot experiment. The germinated oil palm seedlings were treated with the extract of bacterial strain and observed a positive effect on seedling growth in respect to average root and leaf number, root, shoot, and leaf length compare to the synthetic IAA and the control.

Keyword: Indole-3-acetic acid; Pseudomonas aeruginosa UPMP3; Thin layer chromatography; High performance liquid chromatography; Oil palm