ABSTRACT

Micrococcus sp. GSB-L11 is an endophytic bacterium isolated from the Gedong Songo geothermal area with demonstrated antioxidant potential. However, repeated laboratory subculturing led to a phenotypic decline, marked by colony color change from yellow to white, suggesting reduced expression of secondary metabolite biosynthetic pathways. This study evaluated the effect of the OSMAC (One Strain Many Compounds) approach on the secondary metabolite profile and antioxidant activity of *Micrococcus* sp. GSB-L11, and characterized metabolite profile shifts using UV-Vis spectrophotometry, FTIR, and Principal Component Analysis (PCA). OSMAC was implemented through three culture condition variations MN1, MN05, and MNH5 to induce antioxidant secondary metabolite production. Secondary metabolites were extracted from culture supernatants using 70% ethanol, then characterized by UV-Vis and FTIR spectrophotometry and assessed for antioxidant activity via DPPH, ABTS, and FRAP assays; inter-condition metabolite profile differences were evaluated through PCA. Screening results showed that MN1, MN05, and MNH5 supported adequate growth, while MNH10 and MNH15 were presumed toxic to cell growth. The highest extract yield was obtained from EMN1 (824.3 ± 26.4 mg), followed by EMN05 (549.3 ± 27.5 mg) and EMNH5 (364.7 ± 20.7 mg). UV-Vis analysis of pellet fractions revealed a three-peak carotenoid absorption pattern in PMN1 and PMNH5, while PMN05 showed a weaker pattern. DPPH and ABTS assays produced a consistent activity ranking of EMNH5 > EMN05 > EMN1, with DPPH IC_{50} values of 70.85, 82.32, and 106.66 ppm and ABTS IC_{50} values of 13.1, 15.38, and 23.91 ppm, respectively. In the FRAP assay, EMN05 and EMNH5 showed nearly equivalent reducing capacity at 122.96 and 121.44 mg AEAC/g, both exceeding EMN1 (107.52 mg AEAC/g). FTIR characterization indicated that EMN05 and EMNH5 possessed richer carbonyl and oxygen-containing functional groups compared to EMN1, which was dominated by aliphatic hydrocarbon chains consistent with their higher antioxidant activity. PCA based on FTIR spectra showed clear separation of EMN1 from EMN05 and EMNH5, demonstrating that OSMAC treatment shifted the secondary metabolite profile toward more polar, antioxidant-rich compounds. These findings suggest that the OSMAC approach is effective in inducing enhanced antioxidant secondary metabolite production in *Micrococcus* sp. GSB-L11, with the combination of nutrient limitation and H_2O_2 elicitation (MNH5) producing the greatest induction response.

Keywords : OSMAC; Micrococcus sp. GSB-L11; metabolit sekunder; aktivitas antioksidan