ABSTRACT

Nidia Rizki MZ. 24020222120002 **Potential of Co-Culture of Microalgae (*Chlorella* sorokiniana)-Lactic Acid Bacteria (*Lactiplantibacillus plantarum*) for the Increase of *Polyunsaturated Fatty Acid* (PUFA) and Bioactive Compounds as Functional Foodstuffs**. Guided by Siti Nur Jannah and Nisrina Fitri Nurjannah.

Lifestyle changes and unhealthy diets increase the risk of degenerative diseases, thus encouraging the development of functional foods rich in bioactive compounds. The microalgae *Chlorella sorokiniana* has the potential to be a source of proteins, pigments, polysaccharides, and PUFAs that are beneficial for metabolic health. Meanwhile, Lactic Acid Bacteria (BAL) is known as an organic acid-producing probiotic, antimicrobial peptide, and vitamin. BALs that come from mangrove ecosystems have high adaptability so that they have the potential to produce secondary metabolites, such as bacteriocins, exopolysaccharides, and other antimicrobial compounds. This study aims to analyze the influence of co-culture between *C. sorokiniana* and BAL on the increase in the content of PUFA and other bioactive compounds. The study used an experimental design with two treatments, namely *C. sorokiniana* monoculture as a control and *C. sorokiniana* co-culture with *L. plantarum* with an initial cell density ratio of 100:1 as the treatment, each with 3 replicates. The observed parameters included culture growth, biomass, cell density, and number of BAL colonies using *the Total Plate Count* (TPC) method. The fatty acid profile was analyzed using GC-MS after the process *of direct transesterification* and conversion to *Fatty Acid Methyl Acid* (FAME). Other bioactive compounds were extracted by *the cold maceration* method using ethanol and analyzed using GC-MS in *an untargeted* manner. Fatty acid profile data was analyzed using *independent t-test*, while bioactive compound data was analyzed using *Principal Component Analysis (*PCA). The results showed that co-culture *of C. sorokiniana* with *L. plantarum* increased cell density from 4.6 x 106 cells/mL to 5.5 x 10^6 cells/mL and biomass from 0.32 g/L to 0.45 g/L. Co-culture also significantly increased the percentage of DHA area from 59.13% to 70.43% ($p<0.05$) compared to monocultures. GC-MS analysis showed that the profiles of monoculture and co-culture bioactive compounds were relatively similar, but there were changes in the proportion of some compounds due to co-culture interactions. The results of the study show that the co-culture system has the potential to improve the quality of biomass and the content of microalgae bioactive compounds for the development of functional foods.

Keywords: Bioactive Compound, Chlorella sorokiniana, Co-culture, Lactiplantibacillus plantarum, PUFA