

ABSTRACT

Sulis Setyowati. 24020120120012. Molecular Characterization of *Nannochloropsis* sp. Based on *tufA* Genetic Marker and Potential Test of *Nannochloropsis* sp. as a Cadmium (Cd) Heavy Metal Bioremediation Agent. Under the guidance of Hermin Pancasakti Kusumaningrum and Siti Nur Jannah.

Cadmium (Cd) heavy metal pollution not only affects aquatic ecosystems, but also has toxic effects on human health. Bioremediation strategy using microalgae *Nannochloropsis* sp. is considered more economical and sustainable to overcome heavy metal pollution. This study aims to molecular characterization of *Nannochloropsis* sp. with *tufA* gene markers, determine the effect of different Cd concentrations on the growth and morphology of *Nannochloropsis* sp., and the ability of *Nannochloropsis* sp. in absorbing Cd concentrations. The methods used include DNA isolation Doyle & Doyle 1987, quantitative and qualitative analysis of DNA, amplification of *tufA* gene, sequencing result analysis, phylogenetic tree analysis, bioremediation test. *Nannochloropsis* sp. growth was observed for 11 days, then ICP-OES test was conducted to measure Cd absorption and microscopic analysis to see morphological changes after exposure to Cd metal. This study used a Completely Randomized Design (CRD) to test the effect of variations in Cd concentration (0, 2, 4, and 6 ppm) with 3 replicates each on the growth of *Nannochloropsis* sp. analyzed by ANOVA and BNT (Least Significant Difference) test ($\alpha=0.05$). The results of molecular characterization showed that *Nannochloropsis* sp. has similarities with *N. oceanica* strain BR2 plastid (CP044614.1) with low phylogenetic results, namely 60% bootstrap value. *Nannochloropsis* sp. can grow at different Cd concentrations, but optimal growth at 0 ppm Cd concentration. Morphology of *Nannochloropsis* sp. cells after the application of Cd concentration showed morphological differences in the cell structure that is broken and the color of the cells that turn into increasingly clear. In addition, *Nannochloropsis* sp. has the potential to absorb heavy metal Cd with the highest absorption of 62.6% at a concentration of 6 ppm. Different concentrations of Cd metal on the growth of *Nannochloropsis* sp. gave a significant effect on the decline in the growth of *Nannochloropsis* sp. *Nannochloropsis* sp. showed potential in absorbing heavy metal Cd. Cd absorption efficiency increased with increasing Cd concentration, the highest absorption was 62.6% at a concentration of 6 ppm and reduced Cd levels in the contaminated environment by 3.76 ppm.

Keywords: *Nannochloropsis* sp., *tufA*, Bioremediation, Cadmium, ICP-OES