

ABSTRACT

Ulina Rotua. 24020222120017. **Cultivation and Utilization of Filamentous Cyanobacterial Biomass (*Spirulina maxima*) as A Biological Agent for Improving Karst Soil Characteristics.** Under the guidance of Susiana Purwantisari and Devi Bentia Effendi.

Karst soil is a type of marginal soil characterized by low nutrient and organic matter contents as well as low soil biological activity. These conditions reduce soil productivity and necessitate sustainable and environmentally friendly improvement strategies. This study aimed to evaluate the utilization of filamentous cyanobacterial biomass (*Spirulina maxima*) as a biological agent for improving karst soil characteristics. *Spirulina maxima* was cultivated in Zarrouk medium for 10 days and harvested during the exponential growth phase. The harvested biomass was analyzed for its physiological composition, including protein, carbohydrate, lipid, chlorophyll-a, and carotenoid contents. The biomass was subsequently applied to karst soil, and its effects on soil nitrogen (N) and phosphorus (P) contents, soil biological activity, and the growth of the model plant *Arabidopsis thaliana* were evaluated. The results showed that *Spirulina maxima* was successfully cultivated, producing an average dry biomass of 2.59 g/L on day 10. The biomass contained 68.87% protein, 18.16% carbohydrate, 6.7% lipid, as well as chlorophyll-a and carotenoid pigments. Application of *Spirulina maxima* increased soil N and P contents to 2.98 mg/g and 0.07 mg/g, respectively, and enhanced the abundance and diversity of soil microorganisms compared to the control. In addition, *Spirulina maxima* treatment increased plant height to 14 cm and leaf number to three leaves in *A. thaliana*. These findings suggest that *Spirulina maxima* biomass has considerable potential as a biological agent for the sustainable improvement of karst soil quality.

Keywords: *Karst soil, Cyanobacteria, Spirulina maxima, Arabidopsis thaliana*