

ABSTRACT

Aprilia Wahyu Cahyani. Optimization of CO₂ Fixation by Microalgae *Arthrospira maxima* by Increasing Biomass Production as a Protein and Phycocyanin Producer. Supervised by **Endang Kusdiyantini** and **Noor Hidhayati**

The high carbon dioxide (CO₂) concentration in the atmosphere has caused global warming. The utilization of microalgae *Arthrospira maxima* is a promising solution as it possesses several advantages, such as the ability to fix carbon, rapid growth productivity, and high protein and pigment content. The purpose of this study was to determine the optimum conditions for light intensity, CO₂ volume, and initial biomass amount for biomass production, as well as high CO₂ fixation ability in *A. maxima*. *A. maxima* was cultivated in 50 mL of Zarrouk media in a 100 mL vial bottle for 7 days with cultivation conditions arranged according to the Response Surface Methodology (RSM) - CCD. Optimization of *A. maxima* was designed in 20 experiments by combining variations of three factors to determine the optimum biomass response. The dry biomass weight concentration was entered into RStudio software to obtain ANOVA and the recommended optimum conditions. The response of *A. maxima* biomass at optimum conditions compared to control conditions. CO₂ fixation rate capability was tested using the colorimetric method, protein productivity was tested using the Lowry method, and phycocyanin productivity was tested using the freezing and thawing method. The RSM result provided a model of the interaction from three factors that influenced each other. The selected optimum conditions were light intensity at 8.985,228 lux, CO₂ volume at 34,859 mL, and initial biomass at 0,368 g/L. Optimum conditions can increase 65,59% CO₂ fixation rate, 77,04% biomass productivity, and 41,73% protein productivity, while phycocyanin productivity was lower 19,53% than the control.

Keyword: *Arthrospira maxima*, biomass productivity, CO₂ fixation, optimization