**Phosphate and Nitrate Concentration Effects on Biomass and Biochemical Profiles of the Microalgae *Chlorella vulgaris***

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**ABSTRACT**

The present study investigates the influence of varying phosphate and nitrate concentrations on the biomass production and biochemical composition of *Chlorella vulgaris*. Cultures were grown under different nutrient regimes to assess growth performance, and key biochemical parameters, including protein, carbohydrate, total phenolic content, and antioxidant activity as measured by DPPH radical scavenging capacity, were analyzed. Results demonstrated that increased nitrate concentrations significantly enhanced biomass yield and protein content, indicating a strong nitrogen dependency in protein biosynthesis. Conversely, elevated phosphate levels promoted carbohydrate accumulation, suggesting its role in carbon assimilation pathways. Total phenolic content and DPPH activity varied in response to nutrient stress, with moderate nutrient limitation leading to increased antioxidant potential. These findings highlight the critical role of nutrient availability in modulating both growth and biochemical properties of *Chlorella vulgaris,* offering insights for optimizing microalgae cultivation for food, feed, packaging, and bioactive compound production.