

Effect of nitrate on lipid production by *T. suecica*, *M. contortum*, and *C. minutissima*

Research Article

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Abstract: Microalgae are an alternative and sustainable source of lipids that can be used as a feedstock for biodiesel production. Nitrate is a good nitrogen source for many microalgae and affects biomass and lipid yields of microalgae. In this study, the effect of nitrate on cell growth and lipid production and composition in *Monoraphidium contortum*, *Tetraselmis suecica*, and *Chlorella minutissima* was investigated. Nitrate affected the production of biomass and the production and composition of lipids of the three microalgae tested. Increasing the nitrate concentration in the culture medium resulted in increased biomass production and higher biomass productivity. Furthermore, increasing the nitrate concentration resulted in a reduction in lipid content and productivity in *M. contortum*; however, the opposite effect was observed in *T. suecica* and *C. minutissima* cultures. *C. minutissima* and *M. contortum* lipids contain high levels of oleic acid, with values ranging from 26 to 45.7% and 36.4 to 40.1%, respectively. The data suggest that because of its high lipid productivity (13.79 mg L⁻¹ d⁻¹) and high oleic acid productivity (3.78 mg L⁻¹ d⁻¹), *Chlorella minutissima* is a potential candidate for the production of high quality biodiesel.

Keywords: *Chlorella minutissima* • *Monoraphidium contortum* • *Tetraselmis suecica* • Biodiesel • Lipid production • Fatty acid composition

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1. Introduction

The growing global demand for energy, the increasing price of oil and its derivatives, the depletion of fossil fuels, the growing problem of air, soil, and water pollution caused by the extensive use of fossil fuels, and the problems pollution causes for human health and public security have prompted the search for energy sources that are renewable, sustainable, and environmentally

friendly. Biodiesel is an attractive source of renewable energy and is expected to play a major role in the global energy market in the future [1].

Biodiesel is a mixture of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats (<http://www.astm.org>). As a fuel, biodiesel is used in its pure state or is blended with petroleum-based diesel for conventional diesel engines. In addition, biodiesel can be used in the existing petroleum-based

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