Differential responses of the green microalga *Chlorella zofingiensis* to the starvation of various nutrients for oil and astaxanthin production

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Differential responses of the green microalga *Chlorella zofingiensis* to the starvation of various nutrients for oil and astaxanthin production

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Abstract: *Chlorella zofingiensis* has been proposed as a potential producer of lipids and the high-value carotenoid astaxanthin. In this study, the responses of photoautotrophic *C. zofingiensis* with respect to growth, lipid profiles and astaxanthin accumulation were investigated upon the starvation of N (NS), P (PS) and S (SS). NS and SS stimulated triacylglycerol (TAG) accumulation, which reached 27% and 21% of dry weight (DW), respectively. Stresses also stimulated astaxanthin accumulation greatly, reaching 3.9 mg/g DW by NS. SS led to the highest TAG productivity (52.4 mg $L^{-1}d^{-1}$) while NS gave rise to the highest astaxanthin productivity (0.624 mg $L^{-1}d^{-1}$). In combination with transcriptional analysis, a working model for stress-associated TAG and astaxanthin biosynthesis was proposed. Taken together, these detailed data shed light on the elucidation of differential responses to nutrient stresses and may provide insights into future engineering of this promising alga for improving TAG and astaxanthin production.

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