



Comparative analysis of novel MBN medium for *Chlorella vulgaris* cultivation: Growth dynamics and fatty acid profiles

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ABSTRACT

Microalgae cultivation underpins various commercial applications, yet studies exploring media composition that provides a balanced growth and lipid composition scarcely appear in the literature. This study evaluated a novel low-cost medium (MBN, molasses, baker's yeast and NPK fertilizer) at three strengths against standard algal medium (Chu-10, BG-11 and additive-free water) for the cultivation of *Chlorella vulgaris*. The algal culture in 1 L cylinders was tracked for cell density, for over eight weeks. The composition of lipids and relevant molecules in the algal biomass was also monitored by GC-MS. The highest algal dry weight (697.8 mg) and productivity (155% L⁻¹ day⁻¹) were obtained in MBN2 (0.2x strength). This medium sustained proliferation to 1.18 x 10⁶ cells mL⁻¹ by week 6 and maintained the highest density (1.105 x 10⁶ cells mL⁻¹). In contrast, MBN3 (0.3x) showed early expansion of algal cell density that remained stagnant. Final chlorophyll content reached to 27.87 mg mL⁻¹ in MBN2 and 28.54 mg mL⁻¹ in BG-11 with area under-curve ranking favoring MBN2. The analysis of lipids showed that in additive-free water, *C. vulgaris* produced a simplified lipid profile (dominated by C14:0) indicated about stressed growth. While MBN3 promoted a diversified lipid profile (20 different compounds) and induced unsaturated fatty acids