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Feasibility of bioethanol production from microalgal biomass

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The potential use of microalgal biomass as a feedstock for bioethanol production has attracted great attention in recent years. Bioethanol from microalgae can be produced through two distinct pathways: direct dark fermentation or fermentation of saccharified biomass by yeast. The main objective of this work was to assess the influence of increasing glucose concentration derived from hydrolysed microalgal biomass on bioethanol production. The green microalga C. vulgaris (strain P12) was cultivated at room temperature during 15 days in 15-L flat plate photobioreactors. Illumination was provided by cool white fluorescent lamps at an irradiance level of 300 μmol photon m−2 s−1 and CO2-enriched air (6.5% v/v CO2) was supplied at an aeration rate of 0.1 vvm. Successive disruption of microalgal cells with 0.5M HCl at 121 ºC for 20 min was performed in order to obtain fermentation media with increasing carbohydrate contents (25, 50 and 75 g/L). Microalgal starch was saccharified into glucose by α-amylase at 60 ºC for 30 min and amyloglucosidase at 55 ºC for 90 min. Fermentations of microalgal starch hydrolysates by Saccharomyces cerevisiae were carried out at 30 ºC during 48 h. Results showed that bioethanol production was enhanced by using microalgal hydrolysates containing elevated glucose concentration. A maximum ethanol concentration of 28.69 ± 0.68 g/L was achieved at 75 g/L initial glucose. It was concluded that ethanol production can be improved by increasing the glucose content in the fermentation medium, which can be attained by successive hydrolyses of microalgae.