Palm oil mill effluent (POME) cultured marine microalgae as supplementary diet for rotifer culture

Abstract

Malaysia is the world's leading producer of palm oil products that contribute US$ 7.5 billion in export revenues. Like any other agro-based industries, it generates waste that could be utilized as a source of organic nutrients for microalgae culture. Present investigation delves upon Isochrysis sp. culture in POME modified medium and its utilization as a supplement to Nanochloropsis sp. in rotifer cultures. The culture conditions were optimized using a 1 L photobioreactor (Temp: 23A degrees C, illumination: 180 aEuro parts per thousand 200 mu mol photons m(-2)s(-1), n = 6) and scaled up to 10 L outdoor system (Temp: 26-29A degrees C, illumination: 50 aEuro parts per thousand 180 mu mol photons m(-2)s(-1), n = 3). Algal growth rate in photobioreactor (mu = 0.0363 h(-1)) was 55% higher compared to outdoor culture (mu = 0.0163 h(-1)), but biomass production was 1.3 times higher in outdoor culture (Outdoor = 91.7 mg m(-2)d(-1); Photobioreactor = 69 mg m(-2)d(-1)). Outdoor culture produced 18% higher lipid; while total fatty acids (FA) was not significantly affected by the change in culture systems as both cultures yield almost similar concentrations of fatty acids per gram of sample (photobioreactor = 119.17 mg g(-1); outdoor culture = 104.50 mg g(-1)); however, outdoor cultured Isochrysis sp. had 26% more polyunsaturated fatty acids (PUFAs). Rotifers cultured in Isochrysis sp./ Nanochloropsis sp. (1:1, v/v) mixture gave similar growth rate as 100% Nanochoropsis sp. culture (mu = 0.40 d(-1)), but had 45% higher counts of rotifers with eggs (t = 7, maximum). The Isochrysis sp. culture successfully lowered the nitrate (46%) and orthophosphate (83%) during outdoor culture.