Production of EPA and DHA with fungi

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ABSTRACT

This research studied the production of EPA and DHA using the following high DHA content fungal strains: Schizochytrium sp. ATCC 20889, Schizochytrium goldstein S-3 ATCC 26185, Schizochytrium aggregatum ATCC 28209, Traustochytrium roseum goldstein ATcc 28210. Operation variables such as the types and concentrations of carbon and nitrogen sources, amount of yeast extract, temperature and incubation time were investigated. In order to find the optimal combination for the fermentation, one variablae was changed at a time in the first phase of investigation. Results showed that for T. roseum, soluble starch was the best carbon source, on the other hand, glucose was best for the 3 strains of Schizochytrium. Optimal sugar levels was 15 g/L for S. goldstein S-3 ATCC 26185 and S. aggregatum ATCC 28209; and 30 g/L for Schizochytrium sp. ATCC 20889 and T. roseum ATCC28210. Peptone showed to be the best nitrogen source for all the strains studied, while, its optimal dosage was 8 g/L. Optimal level of yeast extract added was 5 g/L. Highest productivities of 1121.4 mg/L and 495.4 mg/L were obtained at 20°C after 7 days of incubation for Schizochytrium sp. and S. goldstein S-3 respectively. The strain T. roseum ATCC 28210 produced 397.07 mg/L of the polyunsaturated fatty acid at 25°Cafter 7 days, and S. aggregatum ATCC 28209 produced 179.1 mg/L at 15°Cafter 7 days. Comparing product concentration, our candidates narrowed down to Schizochytrium sp. ATCC 20889 and S. goldstein S-3 ATCC 26185. In the second phase, the 2 strains were used for the Optimization of production using response surface method. After positive correlations between glucose, peptone, yeast extract, incubation time and DHA production were identified by full factorial design, optimal combinztion, using the method of steepest, was located as follows. For Schizochytrium sp. ATCC 20889 maximum DHA production of 1204.23 mg/L was obtained at 31 g/L glucose, 12.4 g/L peptone, 5.35 g/L yeast extract after 9 days of incubation. For S. goldstein S-3, maximum DHA production of 754.9 mg/Lwas achieved at 21.9 g/L glucose, 8.15 g/L peptone, 6.05 g/L yeast extract after 7 daysof incubation. According to central composite design and SAS analysis, maximum productivity of 1133.6 mg/L, for Schizochytrium sp. ATCC 20889 occurred at 30.1 g/L glucose, 13.4 g/L peptone, 4.55 g/L yeast extract after 9 days of incubation, while, for S. goldstein S-3 ATCC 26185, a Saddle point of 1554.7 mg/L productivity occurred at 19.2 g/L glucose, 8.6 g/L peptone, 4.84 g/L yeast extract after 7 days of incubation.

Keywords : Fungi ; Eicosapentaenoic acid ; Docosahexaenoic acid ; Response surface method

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