ULTRASOUND AND MICROWAVE ASSISTED EXTRACTION OF DOCOSAHEXAENOIC ACID (DHA) FROM *CRYPTHECODINIUM COHNII* MICROALGA

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ABSTRACT

Crypthecodinium cohnii (*C. cohnii*) is a heterotrophic marine dinoflagellate and represents a major source of omega- 3 fatty acids, and especially docosahexaenoic acid (DHA)[1]. DHA is a long chain polyunsaturated fatty acid (PUFA) with significant health benefits and a wide range of applications in the nutrition industry, including dietary supplements for adults and improved infant nutrition. With the current increasing demand for oils rich in DHA from natural sources, attention has been focused on the cultivation and extraction of *C. cohnii*[2]. Thus, the development of efficient and environmentally sustainable extraction processes for the recovery of high-quality oil is an important challenge. Ultrasound and microwave assisted extractions represent improved "green" methods with reduced times, increased yields and negligible toxicity[3]. The objective of the present study was the recovery of DHA for food applications from *C. cohnii*. Therefore, non-polar, non-toxic and food grade solvents were used and the extraction conditions were gentle in order to protect the heat-sensitive components.

C. cohnii biomass, grown on acetic acid containing about 77% moisture, was freeze-dried in order to remove the contained water and avoid the microbial growth. Afterwards, the samples were extracted for a total duration of 10 min under ultrasounds operating at 25 kHz frequency, 250 W and 40°C or under microwaves operating at 250 W, 40°C with a stirrer speed of 200 rpm. The solvent to biomass ratio was 20 mL solvent per g dry weight. Hexane, hexane: isopropanol (2:3) and 2-butanol were tested to compare the influence of organic and food grade solvents on the DHA extraction. After the extraction and evaporation of the extracts, the extraction yields were calculated and the DHA content was evaluated through Gas chromatography.

The results showed that ultrasound assisted extraction (UAE) using hexane: isopropanol (2:3) was the best combination (reaching DHA content 370.5 μg/mL), followed by UAE with 2-butanol (337.9 μg DHA/mL extract). For this reason, these two systems were further examined, while changing: ▪ the extraction time: 5, 10 and 15 min ▪ the solvent/biomass ratio: 10, 20 and 30 and ▪the ultrasound power: 150, 450 and 750 W.

The results of the extraction parameters scanning demonstrated that the extraction power did not significantly affect the yield, ranging from 82.2 to 86.7%, while the extraction time and the solvent/biomass ratio were found to be more crucial parameters. Specifically, when the ratio was low (10), the solvent could not penetrate *C. cohnii* biomass and the minimum yield was obtained. The most effective solvent/biomass ratio was 20, while the best extraction time was 15 min. In conclusion, UAE using hexane: isopropanol with the suitable conditions significantly improved the yields and preserved the high quality of DHA.

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LITERATURE

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