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***Review Article***

# Advances in microalgae cultivation and extraction for sustainable omega-3 oil production: A review on EPA and DHA sourcing

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*ABSTRACT*

These are nutrients that must be derived from dietary sources since the human body lacks some enzymes that are necessary for the synthesis of long-chain fatty acids with more than 18 carbons. These can be acquired from microalgae—a rich source reservoir of bioactive compounds, mainly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which play very important roles in maintaining human health and preventing chronic diseases. The paper reviews different methods or strategies to ensure the stability or optimization of microalgae cultures for the extraction of high-value, long-chain lipids. According to various studies, microalgae have emerged as one promising source for the production of omega-3 fatty acids in a very sustainable and efficient manner, hence prospectively assuring positive yields at both the research and industrial levels. The current review describes the recent advances made in the production of PUFAs from microalgae, including their extraction, based on economic and scalable cultivation techniques. Further, the effect of environmental variables, such as temperature, light, salinity, and nutrients, on the production of lipids from microalgae, is discussed. In this review, state-of-the-art upstream and downstream processes regarding oleaginous microalgae are presented, jointly with innovative extraction methods able to overcome their environmental concerns. This review therefore provides critical analysis necessary to bridge the gap between research and industrial application and also gives insight into how microalgae can be sustainably exploited for nutritional and pharmaceutical purposes.

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