



Moving towards sustainable economy through production of omega-3 fatty acids in microalgae

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Abstract:

In food chain, long-chain omega-3 polyunsaturated fatty acids are being biosynthesized in planktons that find their way into fish and eventually fish oil. Thus, harboring phytoplankton as the first ring in the chain within custom-made photobioreactors or open ponds will promise the production of odorless and relatively pure omega-3 fatty acids. Since countries in Middle East and Central Asia are all importers of supplementary drugs including omega-3 soft gels, whomever produces first gets the benefit of branding its produce within the region. Here, focus is given to the production of long-chain omega-3 fatty acids and its role in bio-economy.

Introduction:

Supplements refer to classes of ingredients that human body fails to produce. Hence, compounds such as vitamins, minerals, essential amino acids and fatty acids should be supplied either through food and/or supplementary drugs. The current market size of supplements in the world is more than 150 billion US \$ annually, which will exceed \$ 200 billion by 2020. In Iran, more than 100 million US \$ spend for the imports of such goods per annum. Thus, it would be a smart move towards production of these supplements to minimize the import and hopefully in years to come be able to export to the neighboring countries. According to a 5-year survey, the best option to initiate a hub of supplementary drugs would be omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), with a value of 156.3 billion US \$ and 13.1 CGAR that mirrors a market value of 48.4 billion USD until 2020. Additionally, producing of omega-3 in an Islamic country holds the promise of exporting to 57 Muslim nations that makes the trade rather lucrative. So far, the main producers are limited to a few countries of North America, South East Asia and some nations in Europe.

The primary source of long chain omega-3 fatty acids is currently fish oil, however soft gels produced from microalgae have greater quality with no toxic heavy metals carry overs that allows to be consumed by pregnant women and infants. (1) Additionally, the omega-3 from microalgae can avoid EPA that is not suitable in some formula; being mostly DHA. (2, 3) Typically, fatty acids participate up to 40 percent of microalgae mass, and some of the fatty acids are unsaturated, including DHA, ARA, EPA, γ -linolenic acid (GLA), and linoleic acid (LA). Thus, algal oil can become the major segment of the omega-3 polyunsaturated fatty acid (PUFA) market in future generating a boutique market. (4) The popularity of DHA increased following research findings that many formula-fed infants have lower levels of DHA and arachidonic acid (ARA) as compared to breastfed infants. In 2012, the global market for microalgae based DHA oil was estimated to be around \$350 million from about 4,614 metric tons. Globally, the infant formula application represented about 48.9% of microalgae-based DHA, followed by dietary supplements with about 28.4%, and food and beverage were 19.4%. (5, 6)



Due to the increase of public awareness and greater demand for omega-3 fatty acids in one hand and the strategic position of Iran in the region, bordering high seas in south and the biggest lake at north, can be a push towards forming of an Algae Initiative to produce varieties of goods including supplementary foods and drugs. This allows to move towards a sustainable economy and greater future for all.

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