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Macro Algae: Biodiversity, Usefulness to Humans and Spatial Study for Site Selection in Oceanic Farming

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Abstract

This minireview focuses on current understanding of the blue technology with special emphasis on algae products utilization. These relationships are discussed based on their economic value. The emerging antioxidant role for human health is highlight and the approach used to identify the oceanic parameters that are most suitable for the macro algae cultivation in Bidong Island, Redang Island, Perhentian Island and Setiu Wetland (Malaysia water) is reported.

Keywords: Blue economy; Oceanic farm; Seaweed; Antioxidant; Malaysia; Bidong island; Redang island; Perhentian island; Setiu wetland

Introduction

Increasing number of population, advanced technology and economics growth somehow has caused energy depletion and global climate change. It has been driving the seeking for blue-economy resource, challenges and opportunity in this new millennium [1]. The oceanic farms represent a new opportunity. Nowadays, to satisfy human needs, requires a global economy less dependent on fossil resources. So a transition onto a bio-based economy where raw materials are directly produced starting from soil and water, offers a way of energetic independence and a green economy. Many models for biomass production are based on culture of benthic marine algae. Seaweeds show a faster growth rate than land plants, and are more efficient in catching the carbon dioxide. Infact, algae are commercially cultivated for cosmetics, pharmaceuticals, nutraceuticals, and aquaculture purpose. Furthermore, they have been included in the food production of useful compounds; used as food supplement, as bio filters to remove nutrients and other pollutant from wastewaters; to record water quality, as indicators of environmental change; in space technology, and in laboratory and clinical research systems [2]. They also can be used to yield hydrogen, biodiesel and biobutanol which produce vastly superior amounts of vegetable oil, corn, sugarcane, wheat, and maize which higher productivity to compare terrestrial crops grown for same purpose [3]. The production of biodiesel via trans-esterification of algal oils and has similar properties as petro-diesel. Bio-butanol is a promising gasoline alternative that is being intensively studied while algae biofuel is relatively mature [4]. In this mini review we will summarize the astounding diversity of seaweed and their utilization, we will highlight one of the emerging value function and we will deal with all the parameters suitable for algae cultivation in many types of habitat in Malaysia such as Bidong island, Redang island, Perhentian island and Setiu wetland. At later stage, these data may become useful when constructing this new challenge and opportunity on blue economy.

Brief Characterization of the Seaweeds and their Economical Utilization

General seaweeds classification

A first classification of seaweeds is given by their ability to absorb light for the purpose of photosynthesis. They, therefore, based on this parameter, are grouped microalgae or marine macro algae (kelp or seaweed) in red algae (or rodophytae, rodophyicae), brown algae (or pheophytae, pheophycae) and green algae (or chlorophytes, chlorophycae) (Figures 1a-c). Red algae possess pigments as phycoethrinn, phycocyanin, carotenes and xanthophylls, which give them the peculiar shade of red; brown algae possess xanthophyllis and carotenes, which gives a dark shade, absorbing the rays of blue-green; green algae possess a and b chlorophyll and the way in which these organisms accumulate reserve substances in the form of starch, suggest the existence of a phylogenetic link with land plants [5]. Algae, living in all the seas in the world, show thousands of families and species, each with different characteristics and to recognize and distinguish them from one another often requires specialized investigations [6]. A basic difference lies in the coloring given by the various pigments blended with the chlorophyll [7] and more often by the depth where they live. Chlorophytes are found, usually, in the intertidal and infralitoral zone, up to a depth of about 10 meters, as they require a bright light. They are abundant in the warm seas and scarce in the Arctic. The brown algae are mostly found in the cold waters, although the so-called fucali like *Sargassum sp*, are observed in tropical and subtropical regions. Their main diffusion is observed up to about 20 meters deep, but the larger forms can exceed -30 m. The rodophyites live at greater depths. They have a wide distribution, but are particularly found in temperate seas. Usually they live in low light