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A Review

Functional properties of edible seaweeds and its use for value addition of foods

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■ **ABSTRACT :** Seaweeds, one of the important marine living resources could be termed as the futuristically promising plants. These plants have been a source of food, feed and medicine in the orient as well as in the west, since ancient times. Although, seaweeds in India are used for industrial production of agar and alginate and as a fertilizer, it is yet to be utilized on a large scale for various purposes, which is not being done, due to lack of its awareness among the Indian populace. In order to harness the rich potential of seaweeds in India, the present limited use needs to be diversified into other contemporary areas of application. Being a plant of unique structure and biochemical composition, seaweed could be exploited for its multi-functional properties in the form of food, energy, medicine and cosmetics. In addition to the comprehensive view on its uses, the article also calls for the need to implement biotechnological tools for sustainable management of seaweed resources. All in all, an attempt has been made to highlight the prospects of seaweed in India in the modern context.

■ **KEY WORDS:** Edible seaweed, Value addition, Functional properties

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Within the traditional Japanese diet, seaweeds are commonly used as sushi wrappings, seasonings, condiments and vegetables and can thus constitute between 10 per cent and 25 per cent of food intake of most Japanese (Ortiz *et al.*, 2006). Marine macroalgae, or seaweeds as they are more commonly known, are one of the nature's most biologically active resources. It is commonly classified into three main groups based on their pigmentation such as Phaeophyta (brown seaweeds), Chlorophyta (green seaweeds) and Rhodophyta (red seaweeds). According to Khan and Satam (2003) the production of total seaweeds in India in 2000 was approximately 600,000 tons (wet weight). Every year about 7.5–8 million tons of wet seaweeds are being produced along the coastal regions world wide, the values of which was not realised in the past (Rao and Mantri, 2006).

They possess a wealth of bioactive compounds. In fact, seaweeds have been aptly called the medicinal food of 21st century. Seaweeds are nature's most complete and balanced nutrient food source. The compounds isolated from marine macroalgae have demonstrated various biological activities, such as antibacterial activity, antioxidant potential, anti-inflammatory properties, anti-coagulant activity, anti-viral activity and apoptotic activity. As a result, seaweeds-derived

compounds have important applications in a range of products in food and pharmaceuticals.

Macroalgae are a rich source of dietary fibre (25–75% dry weight). The lipid content is low, and even though the carbohydrate content is high, most of this is dietary fibres and not taken up by the human body (Mouritsen, 2009). They are rich in minerals, vitamins, trace elements and nutrients which are in organic form that humans can readily utilize. Seaweeds have higher antioxidative activity due to a higher content of various nonenzymatic antioxidant components (Chiwu *et al*., 2010).

There are opportunities to develop new organic product ranges and considerable R&D effort will be required to take advantage of the large potential of seaweed as a raw material base for the development of further functional and therapeutic foods. Innovative technologies for value addition of seaweeds should be identified (The Hindu, 2011). Brownlee and Pearson (2010) have found that seaweed dietary fibre in one of the world's largest commercially-used seaweed which could reduce the amount of fat absorbed by the body by around 75 per cent (Science Daily, 2010). Seaweeds can be screened for medicinal properties to determine which species are most effective for different conditions; at what concentration or frequency (Novaczek, 2003).

Farm lands across the world are losing their fertility and food production levels are hitting a plateau; against this background seaweeds are fast emerging as a viable alternative for ensuring food and nutritional security. With their excellent nutritive value and production potential, seaweeds become capable of meeting both domestic and international demands. The need of the present hour is to identify appropriate technology in processing of seaweeds and protect the coastal regions (Prayukth, 2005).

By 2020, the seaweed sector will have evolved from the current hybrid of declining wild harvest and fledgling aquaculture production into a sector with seaweed from aquaculture production forming the basis for downstream processing of value added biopharma and nutraceutical products and regular use of seaweed in biotechnology (National Seaweed Forum, 2000).

Many chronic diseases will resolve simply by adding seaweeds to the diet. Eating sea vegetables regularly can facilitate the excretion of heavy metals and radioactive elements from our bodies and promote a healthy immune system (Jungwirth, 2010). Since it requires low inputs and provides good returns and can employ many people, seaweed culture is a good industry for coastal communities. Seaweed utilization through product and process development could help in meeting the food and nutritional security of Indian population as well as augmenting the value of total seaweeds export. Seaweed has a very important role towards betterment of coastal communities and as a valuable foreign exchange earner (India Together, 2005).

Work done :

The Japanese people's remarkable longevity and extremely low incidence of cardiovascular disease, thyroid disease, breast cancer and prostate cancer may largely be due to the fact that they have the world's highest per capita seaweeds consumption (Jungwirth, 2010). Frestedt *et al*. (2009) reported that mineral supplement made out of seaweed may increase the range of movement and walking distances in subjects with osteoarthritis of the knee. (Maeda *et al*., 2008) stated that fucoxanthin in seaweed reduced the risk of many diseases. Devi *et al.*, (2008) reported that, the seaweeds extract (*G. acerosa*) possesse high antioxidant activity which might be helpful in preventing or slowing the progress of various oxidative stress related disorders.

Work yet to be done :

Attempts need to be made to develop functional or therapeutic products suitable for people and to popularize the same amongst public. Sullivan *et al*. (2010) found that seaweeds-derived polysaccharides may have prebiotic activity. Considering the prophylactic properties of seaweeds it is essential to popularise its use as a component of the staple diet. Incorporation of seaweeds in common foods need to be standardised. Also the study on glycemic and lipidemic effect of seaweeds will enhance its use in combating many life style disorders.

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