MINI REVIEW

Seaweeds: Modern nutraceutical food

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ABSTRACT

Nutraceuticals are not foods or drugs, but rather supplements that are added to food to provide additional nutritional and physiological benefits. Though nutraceutical components have minor effects, their inclusion in the diet on a regular basis can have significant and long-term health advantages. A revived interest in seaweeds has resulted from a global desire for extra and sustainable biomass for the synthesis of key metabolites with nutraceutical potential. Seaweeds have been used in Asian locations since ancient times, and they have recently been shown to offer a variety of medicinal properties. Seaweeds are high in a variety of nutritious components as well as metabolites with medicinal capabilities. Total protein from terrestrial plants such as soybean and wheat has been shown to cause allergy reactions when consumed. As a result, seaweed proteins are a viable source for the food industry. Overall, seaweeds are high in polyunsaturated fatty acids (PUFAs), metabolites, proteins, sulfated polysaccharides, vitamins, and minerals, all of which are involved in various bioactivities.effects and minimal or no side effects. Nutraceutical with reference to functional food has a major market potential in health-related sector and acting against various diseases and treatments. It has emerged as an alternative to modern medicine maintaining quality of life.

Key Words: *Nutraceutical; Seaweeds; Polysaccharide; Bioactive components*

INTRODUCTION

A nutraceutical is described as any nutritional food product with additional health benefits; in other words, it is a nutrient-pharmaceutical combo [1]. Due to their many health-beneficial effects, researchers have focused their efforts in recent years on finding bioactive compounds [2]. Bioactive chemicals are components derived from natural or synthetic sources that are tested for therapeutic activity in a variety of areas. Bioactive chemicals have health-promoting properties, and it has been demonstrated that bioactive food molecules can alter a host's gene expression at the cellular level, so influencing health. Seaweeds are currently attracting a lot of attention as a natural source of bioactive chemicals that can help with the development of nutraceuticals. Seaweeds come in a wide variety of species, habitats, maturities, environmental conditions, and harvesting periods, but they are all great suppliers of various nutrients [3].

Rhodophyta (red), Phaeophyta (brown), and Chlorophyta (green) are the three groups of marine macroalgae. They're high in soluble dietary fibres, proteins, minerals, vitamins, antioxidants, phytochemicals, and polyunsaturated fatty acids, and they're low in calories. However, as with most flora, external factors such as geographic location, ambient conditions, season, and sampling conditions influence their nutrient content [4].

Nutritional composition and biological activity

Fresh sea algae have a high moisture content, accounting for up to 94 percent of the biomass. Though marine algae, like other plants, include nutritious elements such proteins, lipids, carbohydrates, vitamins, and minerals, the amount of these elements varies depending on the season and the producing location [5].

Polysaccharides, particularly cell wall structural polysaccharides, but also mycopolysaccharides and storage polysaccharides, are abundant in marine algae [6]. From a calorie standpoint, seaweeds are minimal in calories. The lipid content is low, and while the carbohydrate content is considerable, much of it is dietary fibres that the human body does not absorb. Dietary fibres, on the other hand, are beneficial to human health because they create a favourable gut environment [7].

Seaweeds are high in phytosterols, which are regarded an important component of "good" diets; they've also been shown to lower blood cholesterol and prevent the development of colon cancer [8].

Seaweeds have 10 to 100 times the amount of minerals and vitamins per unit dry mass as terrestrial plants or animal-derived meals. Essential minerals calcium, iron, iodine, magnesium, phosphorus,

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potassium, zinc, copper, manganese, selenium, and fluoride, as well as fat and water soluble vitamins A, D, E, K, C, B1, B2, B9, B12, and essential minerals calcium, iron, iodine, magnesium, phosphorus, potassium, zinc, copper, manganese, selenium, and fluoride [9].

Bioactive components

Laminarans, alginates, fucans, and cellulose make up the majority of dietary fibre (DF) in seaweeds. Reserve polysaccharides present in brown algae are known as laminarans composed of (1,3) - -D-glucose with certain (1,6)-linkages in which mannitol replaces some of the reducing ends. The gelling polyuronide alginate, which is composed of alternating sequences of -(1,4)-D-mannuronic acid, its C5 epimer -(1,4)-L-guluronic acid, and 20–30 units of uronic acids, is the primary matrix component of brown seaweeds. Sulfated galactans (carrageenans and agar), xylans, and mannans are the primary components of cellulose, which makes up the cell walls of brown and red algae. Starch, cellulose, xylans, mannans, and ionic polysaccharides with sulphate groups and uronic acids are all found in green seaweeds [10].

Consumption of seaweeds and their inclusion into low-dietary-fiber items might thus raise DF intake and reduce the prevalence of various chronic diseases linked with low-fiber diets, such as diabetes, obesity, heart disease, and cancer, notably in Western countries. Because seaweeds are high in fibre (33-50 g/100 g dry basis), especially soluble fractions (50−85 percent of total DF content), they can be used to boost the fibre content of foods that are typically deficient in this nutrient. For example, fishery and meat products, which are otherwise high in nutritious value, are low in fibre and would profit greatly from the addition of seaweeds. This would also allow the seaweed's functional qualities, such as water binding, gelling, Seaweed-based Functional Foods, and emulsifying abilities, to be used in the final goods [11].

Only brown seaweeds possess the key metabolites phlorotannins, which may have unique therapeutic potential. Food phenolics' antioxidant activities have nutritional appeal due to their prevention of diseases such as cancer, inflammation, and ischemia, and so they improve health and have a variety of medicinal and pharmacological capabilities. Brown seaweed's greenish-brown hue is primarily due to polyphenolic chemicals. Rutin and hesperidin, flavonoids from the red seaweed Gelidium elegans, have been shown to reduce ROS in 3T3-L1 and RAW264.7 cells. Polyphenols from Ecklonia cava have been demonstrated to raise glucose levels in 3T3-L1 cells and lower fasting blood glucose in C57BL/KsJ db/db mice (Lee et al., 2016). Phlorotannins from the edible seaweed E. cava have been found to exhibit sedative effect via modulating GABAA receptors in a positive allosteric manner [12].

CONCLUSION

Obesity and chronic metabolic illnesses have become more common as a result of changes in human lifestyle and eating habits (diabetes, heart disease, hypertension, hyperlipidaemia and cancer). Marine species, particularly seaweeds, offer a lot of potential as nutraceuticals because of their immense biodiversity. Seaweeds are a long-term source of bioactive chemicals that can be used in human health and functional food applications. The global burden of non-communicable, lifestyle-related diseases such type 2 diabetes, hypertension, obesity, cancer, antibiotic resistance, and heart disease puts a significant strain on health-care budgets and resources in affected countries. This could be mitigated by include seaweed and seaweed isolates in the diet as part of a healthier lifestyle.

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