

Algae used as Medicine and Food-A Short Review

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Abstract:

Algae are a very large and diverse group of autotrophic organisms which ranges from unicellular to multicellular forms. They are primary producers which is a source of many nutrients and it has high protein content. The most complex marine forms are called seaweeds. Blue green algae, red algae, green algae assigned higher contents of dietary fibres. Certain beverages are prepared from sea algae. Mainly marine algae have been used as food and medicine for many centuries. They are not only used as food but also used as extracts in food, dairy, cosmetics, and industrial uses. Algae is used as one of important medical source due to its antioxidant, anticancer, antiviral properties. Therapeutic properties of algae is used for promotion of health. Edible algae is recognized as complete foods which provides correct balance of proteins, carbohydrates, vitamins, and minerals.

Key words: autotrophic organisms, seaweeds, marine algae, therapeutic properties.

INTRODUCTION:

Algae are one of the primary producers it is the divisions of lower plants that contains chlorophyll in plant cells. They can be divided broadly into macro-algae (macroscopic algae) and microalgae (microscopic algae). [1]. Algae's are important producers of vitamins, minerals and proteins and fatty acids etc. [2]. Amidst all these facts the facts pertaining to algae are not concentrated and focussed to the level it has to be.[3]. Marine algae have been used as food, and medicine from centuries. The species of algae find its applications in food, dairy, pharmaceutical, cosmetic, and industry. Algae can be in the preparation of Biodiesel, Bioethanol, biobutanol and Hydrogen gases, [4].and could be used as antioxidants, antibiotics, and/or virostatic agents. Food products prepared from algae could involve positive negative or disputable effects in mammalian organism. Hence higher contents of toxic elements (e.g. cadmium) or fucotoxins (algal protective compounds against herbivore attack and pathogens) in algal food products are to be avoided. Thereby the digestibility and the contents of dietary fibre and bioactive compounds in algae play an important role in the evaluation of algal food quality. Digestibility is studied on the basis of nitrogen consumption before and after the process of digestion, using enzymes namely pepsin under *in vitro* conditions [5]. Several analytical methodologies are available for the study of bioactive compounds in algal material. [6]. This paper emphasis on the medicinal food values on algae in particular marine algae.

ANTIOXIDANT PROPERTY OF MARINE ALGAE:

Antioxidants play prominent role in the later stages of cancer development. The most powerful water soluble antioxidants found in algae are polyphenols, phycobiliproteins and vitamins [7]. Oxidative processes promote carcinogenesis. The antioxidants may be able to cause the regression of premalignant lesions and inhibit their development into cancer. It is found that, several algal species have prevented oxidative damage by scavenging free radicals and active oxygen and hence able to prevent the occurrence of cancer

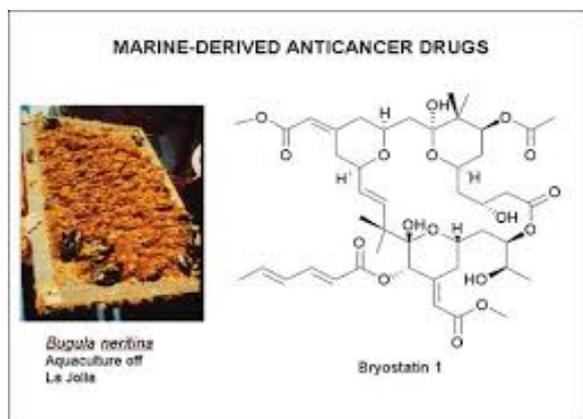
cell formation [8], these Antioxidants are considered key compounds to fight against various diseases (e.g. cancer, chronic inflammation, atherosclerosis and cardiovascular disorder) and ageing processes [9]. Polyphenols in marine brown algae are called phlorotannins and known to act as potential antioxidants. They are formed by the polymerization of phloroglucinol (1,3,5- trihydroxybenzene) monomer units and synthesized in the acetate malonate pathway in marine alga. The sulphated polysaccharides when isolated from marine alga exert radical scavenging activities *in vitro* and *in vivo*. However, biochemical scientists have several techniques to extract bioactive compounds from algal biomass [10]. Several herbs and spices including rosemary, sage, thyme, nutmeg, turmeric, white pepper, chilli, pepper, ginger, and plenty of other medicinal plants are reportedly exhibiting antioxidant activity.



ANTICANCER ACTIVITY OF MARINE ALGAE:

Marine macro-algae belongs to the most interesting algae group because of their wide range spectrum of biological activities such as antimicrobial [11], antiviral [12], antifungal[13], anti-allergic [14], anticoagulant [15], anticancer [16], antifouling and antioxidant activities [17]. They produce variety of chemically active metabolites in their surroundings as a weapon to protect themselves against other settling organisms [18]. There are lots of reports on macro-algae derived chemical compounds that possess ranges of biological activities, out of which some could be used in pharmaceutical industries. Many marine algae

produce antibiotic substances capable of inhibiting bacteria, viruses, fungi, and other organisms. The antibiotic characteristic is dependent on factors like that particular alga, the microorganisms, the season, and the growth conditions [19]. Preliminary studies have indicated that some antioxidants, particularly β -carotene, may be of benefit in the treatment of precancerous conditions such as oral leukoplakia, possibly a precursor of oral-cancer [20]. The development of marine floral compounds as therapeutic agents is still in its embryonic stage due to the fact of collecting the marine floral samples. Significant efforts have been made, by both pharmaceutical companies and academic institutions, to isolate and identify new marine-derived, natural products especially from faunal species. The marine floras are not explored significantly for promoting further research in this field. [21]



ANTIVIRAL PROPERTIES OF MARINE ALGAE:

Vaccines are very successful in controlling many viral diseases, yet some diseases are not controlled by vaccination. Some synthetic antiviral compounds were developed for treatment of active herpetic infections, were not effective for the treatment of latent infections [22]. It reported on severe side effects and development of some resistant mutations of this virus, especially during long term medication with antiviral drugs. Because of the toxicity of many of the earlier antiviral agents. The concept of antiviral compounds with pharmaceutical value could not be accepted easily. Some plants and algae extracts were tested on different viruses including the herpes viruses [23]. In some of these experiments different species of brown algae were tested for their antiviral activity. From the test report it has been found that these species contain antiviral property. The antiviral agent must have a wide spectrum of activity, inhibit the virus completely, to have favourable pharmacodynamics properties and not be immunosuppressive which is important, as there should be no suppression of the normal immune processes. [24]. The discovery of the role of the interferon as cellular antiviral systems and the elucidation of differences between normal cellular metabolism and viral replication have led to a renewed interest in antiviral chemotherapy.



ALGAL METABOLITES IN FOOD :

In current world people concentrates very much on diet. The diet of highly caloric and in combination with the modern style of life leads to health issues, such as obesity, heart diseases, diabetes, etc. Therefore, food products need to be concentrated to promote health by enriching the diet with vitamins, minerals, etc., and according to consumers using the natural forms of ingredients instead of the synthetically ones has become very essential.

The reports have suggested that there is significant improvement in the state of the health not only to algal proteins but also to therapeutic factors [25].

In coastal areas of all continents, sea-weeds are used in human and animal nutrition, so that they are widely cultivated algal crops. Consumers are fascinated towards species such as *Porphyra* sp., *Chondrus crispus*, *Himantalia elongata* and *Undaria pinnatifida* and also towards the food industry because of their low content in calories and high content in vitamins, minerals and dietetic fibre [26]. Micro-algal biomass is available in a form of powder, tablets, capsules, liquids and, also, it can be incorporated into different food products and the most important in human nutrition are *Spirulina* and *Chlorella* genera.



Bioactive compounds are to develop new drugs and health foods. Edible algae are producers of rich source of dietary fibre, minerals, and proteins [27]. Marine algae are also considered as rich source of antioxidants [28]. Some active antioxidant compounds from brown algae are as phylophoeophytin in *Eisenia bicyclis* (arame) [29] and fucoxanthine in *Hijikia fusiformis* (hijiki) [30].

The marine algae are boiled and steamed, dried and stored in process. [31] Then, these dried products are soaked with 20-40 time volumes of water before being consumed. Agars, extracted from red seaweeds such as *Gracilaria*, are used in

the food industry and in laboratory media culture. Carrageenans, the extraction from red seaweeds namely *Chondrus*, *Gymnogongrus*, and *Eucheuma*, are used to provide particular gel qualities. The incorporation of ingredients with the natural origin and functional properties in the traditional food is a way to design attractive and healthy new products, there are numerous combinations of microalgae or mixtures with other foods all over the world.[32]

CONCLUSION:

The marine algae are taxonomically diverse, largely productive, biologically active, and chemically unique offering a great scope for discovery of new anticancer drugs. The marine floras belonging to polyphenols and sulphated polysaccharides are rich in medicinally chemical potent predominantly. Since algae also represent an important source of vitamins, minerals, antioxidants and natural colorants, the incorporation of the whole biomass in food and feed could be used to provide the colour, increment nutritional value, and improve texture or resistance to oxidation. While a mixture of different species or combinations with other food opens up many possibilities, their use in feed can also compensate the usage of other foods which are in first position. The cultivation of algae population with so many medicinal benefits need to be promoted and improved using modern techniques.

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