

Various Aspects of Algae as a source of food and food supplement

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Abstract - Plants are everywhere and they are primary producers which is a source of many nutrients. Algae are a group of relatively simple plant like organisms, most of which are capable of photosynthesis. There is growing interest in algae as production organisms. Algae contain lipids, oil, proteins and carbohydrates, and especially marine Algae have been used as a food and feed for centuries. Commercial farming of sea weeds has a long history sea weeds traditionally used in human and animal nutrition. Globally, the demand for Algae are growing and increasing for consumption because of its functional benefits beyond the traditional considerations of nutrition and health. Algal species with a very high protein content, Algae are also important producers of vitamins, minerals and fatty acids. Now a days Algae is not only used as food but also used as extracts in food, dairy, and industrial uses. Edible algae are recognized as complete food which provide complete balance of proteins, carbohydrates, vitamins and minerals. Algae sps contain some antioxidant, anti cancer, anti viral properties which are used as medical resources. The use of Algae for the food and as food supplement is increasingly relevant as the components of micro Algae have the potential to be competitive with the same components from others sources. Importance of algal species as a used for human food, and as food supplement are discussed in this paper.

Key words : Food , Algae, supplement, sea weeds, nutrient.

Introduction : Algae are a very diverse group of generally simple unicellular or multi cellular eukaryotic organism's plant like species. Algae are of excellent nutritional value since they contain complete proteins, fiber and high level of omega-3 fatty acids, vitamins and minerals. Algae is becoming be one of the most promising and long term source of food, animal feed, medicines and other co-products. A wide variety of benefits are associated with them which make them so attractive. Some micro Algae increasingly are being marketed as a food supplements that benefit health beyond the role of basic nutrition. Energy in Algae is stored in form of oils and carbohydrates which when multiplied with its number give us a very large amount. The wide spread interest in algal foods and their use as a food supplement is evident in numerous recent reviews (Cornish *et al.* 2015). Sea weeds can contain high amounts of carbohydrates, proteins and minerals also they are a rich source of minerals especially macro and micro nutrients necessary for human nutrition. Human kind is no strangers to the use of Algae as a food source even if sea weeds have been used as a human food since ancient time. Sea weeds can be collected from the wild but is now increasingly cultivated. It falls into three broad groups based on pigmentation ; brown, red and green sea weed.

Edible Algae species : Algae contain several high value molecules, such as lipids, oils, proteins and carbohydrates and protein, for this reason there is a growing interest in algae as production organism. Algae, especially marine Algae, have been already used as food, feed and fertilizers for centuries, and now a days approximately 200 species are used worldwide in different sectors. Recently, Algae have been used for the production of ethanol or bio diesel and research is on going on genetic engineering of micro Algae, especially for the production of pharmaceutical and cosmetics.

1. Laminaria : Kombu is the Japanese name for dried sea weed that is derived from a mixture of laminaria species. These include *L. longissima*, *L. Japonica*, *L. angustata*, *L. Coriacea* and *L. ochotensis*. These are all harvested from natural sources. The first three of the above are main components of the harvest. The plants grow on rocks and reefs in the sublittoral zone, Laminaria species contain about 10 % protein, 2 % fat and useful amount of minerals and vitamins though generally lower than those found in nori (Red sea weed). For example, it has one tenth the amounts of vitamins and niacin, half the amount of B₁ but three times the

amount of iron compared with Nori. Brown sea weeds also contain iodine, which is lacking in Nori and other Red Sea weeds.

2. Chlorella : Chlorella is a green Algae . It is nutritional value is comparable to that of a mixture of soya bean and spinach. They can be cultured easily in presence of light, CO₂ and mineral nutrients. They grow rapidly hence many crops can be obtained in a limited period. Several species of chlorella are high producers of lipid and proteins. It contains about 30% carbohydrates, 30% proteins and 15% lipids chlorella is another popular micro Algae, it has similar nutritional value to spirulina. Chlorella is very popular in Japan, it is also use as Nutritional supplement with possible effects on metabolic rates. Some species of chlorella can reduce mercury level in humans supposedly by chelation of the mercury to the cell wall of organism.

3. Porphyra spp. (Nori or purple laver) : This is the purplish black sea weed often seen wrapped around a small hand full of rice in sushi. It comes largely from cultivation in Japan, The Republic of Korea and China. In Japan's list of products from marine culture, nori has the highest production. Porphyra columbina the red edible sea weed had considerable protein content, better chemical score than cereals and protein digestibility similar to that, of plant foods, P. columbina has bioactive compounds, which are good electron donors and could act as a antioxidant. This fact and high dietary fiber level make P. columbina a healthy low fat food. nori is among the most nutritious sea weeds, with a protein content of 30-50% and about 75% of that is digestible. Sugars are low and vitamin content very high, with significant amounts of vitamin A, C, Niacin and folic acid. The characteristic taste of nori is caused by the large amount of three amino acids ; alanine, glutamine acid and glycine. This is perhaps the most widely domesticated marine sea weeds.

4. Spirulina A Super Algae Food : Spirulina is a microscopic blue green algae is one of such functional food and food supplement which is 100% , natural product with all the good qualities that nature lives in warm fresh water bodies. Spirulina is almost complete functional food and dietary supplement, it contain almost all vital nutrients that are required by our body for it is health and fitness. Spirulina is a long history as a food source in east Africa and Mexico. The algae was Spirulina because of it is spiral filament like appearance under microscope, it is one of the most concentrated natural source of nutrition known it contains all the essential amino acids. In India, at CFTRI, Mysore, research is being conducted on the use of blue green algae, Spirulina as a supplement to diet. The algae is cultured, dried, powdered and then used in the form of tablets. It contains 60% protein, essential vitamins and unsaturated fatty acids.

Nutritional value of algae as a food : For the last couple of decades, nutritionists and food scientists have given much more concentrations on nutritional evaluation of edible sea weeds. Most of the research were focused on red sea weeds due to their higher nutritional value compared to other edible sea weeds have been using as a part of human diet. In China, Japan, Thailand and South Korea for many years depends on species, some sea weeds are generally suitable for making cool Gelatinous dishes or concoctions. In general sea weeds are considered as low calorie food item, but rich in vitamin, minerals and dietary fibre. Sea weeds are also utilized as animal feed ingredient, raw material for fertilizers and as well as various industrial applications.

Some sea weed used in preparing creams, puddings, beers, wines and canned fishes etc. Several studies showed that sea weeds are valuable sources of dietary protein, lipid, fiber, vitamin and some essential minerals. Several studies showed that red sea weed contains higher amount of protein and dietary fiber than that of some of other green and brown algae. Porphyra is red algae which grows in shallow sea water, it is very rich in protein (30-35%) and carbohydrates (40-45%) it is also good source of vitamin B and C food obtained by *laminaria saccharina* is known as Kombu, it is highly rich in carbohydrates (57%).

Algae as food supplement : Traditionally, micro algae such as Spirulina and Chlorella are directly sold as food and dietary supplements, without any kind of processing except drying. The development of these products is relatively mature and they are produced by relatively large number of producers. Spirulina production is concentrated in Asia and USA, chlorella mostly in Asia. Although both are also produced in a small number of other countries with warm climate. Besides the sales of the whole dried algae, now a days also specific high value components from micro algae are being produced. In general micro algae based molecules are less competitive than standard synthetic and traditional alternatives. However, some micro algae based molecule have specific advantages over their conventional alternatives which make their use commercially viable. For example Astaxanthin from dried *haematococcus plavialis* is the most developed product in this domain. Astaxanthin is either available as food supplement or as a food additive.

Benefits of algae as a source of food : Sea weeds are edible algae that have been used for centuries as food all over the world. Algae are excellent nutritional value since they contain complete protein, fiber and high level of omega-3 fatty acids. Algae are also rich in many vitamins, such as A, C, B1, B2, B3 and B6 as well as minerals, such as iodine, calcium, potassium, magnesium and iron. Spirulina benefits are so amazing that when taken on a daily basis they could restore and revitalize health. Spirulina as a super food is a plant that can nourish the body by providing most of the protein required by the body. Reinforce the immune systems, helps to control high blood pressure and cholesterol and helps to protect against cancer. It also helpful in detoxification of heavy metals especially Arsenic. Other benefits of Spirulina use the body reducing the inflammation.

Conclusion : In this article we mainly emphasizes the relevance of algae as a source of food and use of algae as a food supplement, which is not known by some countries due to ignorance despite the abundance of the edible algae species. Even though Spirulina is entirely natural and generally considered a healthy food, there are some contradictions to be aware of such as allergy to seafood or iodine. Spirulina is generally considered safe for human consumption supported by its long history of use as food source quality control in the growth and process of spirulina to avoid contamination is mandatory to guarantee the safety of the products. The use of algae should be encouraged because it will help solve so many environmental problems like purification of water and change usage of barren land.

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