

Seaweeds: utilization and product applications

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Seaweeds have been used as food, medicine, fertilizer, soil conditioner, and source of salt. As food, seaweeds are made into salads, boiled as vegetables, mixed with various species, pickled, cooked with coconut milk, for soup thickening, pudding and sweetened jellies in Asia. Seaweeds contain vitamins, proteins, minerals and iodine although these vary depending on species.

To some extent, raw or dried seaweed are used as medicine. Several studies have been carried out to determine the nature of compounds that could be of medical or pharmaceutical use. It has been reported that Algasol, a compound in seaweed is useful for rheumatoid arthritis, bronchitis and emphysema. Its hypocholesterolemic activities lower blood pressure and blood cholesterol levels. They also possess anthelmintic as well as antihypertensive and anti-viral properties. The high iodine content is effective against goiter. It has also been reported to have use against cancer, fever, eczema, gall stone, gout, menstrual troubles, renal troubles, scabies, scofula, etc. Chemical properties of seaweeds, however, are said to vary from one species to another just like its nutritional values.

Basic chemical studies according to Cajipe (1990) have shown that seaweeds can be used as binders of heavy metal pollutants. Salt solutions from metals like lead, cadmium, copper, zinc, iron and mercury can be filtered by solution of pure seaweed polysaccharide or washed out through a column of ground dried seaweeds. Carrageenan and alginates reportedly exhibit a preferential affinity for lead and copper. *Sargassum* is being developed for this particular application.

For treatment of wastewater, Schramm (1991) suggested that seaweeds can be used



for biological removal of nitrogen and phosphorus in wastewater. They can take up ammonium, the prevalent nitrogen compound in domestic and urban sewage and agricultural and industrial water effluents. Chapman (1979) also noted its potential for water purification.

In agriculture, reports indicate that *Sargassum* contain auxin-like substances which are used as plant hormones and fertilizer. Indergaard & Ostgaard (1991) found that seaweeds are used not only as fodder for fur-producing mammals but also fish fodder for aquaculture. Seaweed meal treated with alkali is used as binder in moist fish feeds.

Realizing these potentials of seaweeds, research and development thrusts have been geared towards improving and developing its product applications. Today, various applications of seaweeds have been developed and improved. The polysaccharide extracts

of brown and red seaweeds are good sources of phycocolloids which are important in gel formation. Its gelling properties make it a very important component in different industries. The major success in the seaweed industry is the development of phycocolloids with the following specific applications:

Agar

Agar is extracted from *Gelidium*, *Pterocladia* and *Gracilaria*. Agar as an important product of red algae has a wide range of applications.

Food industry. Agar is used in cake toppings and icing, wafers, liquor, and salad dressing. Agar's good adherence to the base avoids cracks when applied to chocolates. It prevents dehydration in the preparation of jellies, marshmallows and candies or candy fillers in confectionery. They are good for clarifying coffee, beer, wine, juice and Japanese *sake*. Agars are good substitute for pectins requiring less sugar in making jams and maintains better consistency in yoghurts than casein. It serves as stabilizers or thickeners in sauces and allows sterilization without losing its viscosity or gelling power. A high concentration of agar added to glycerine or glycol provides a hard protective gel for food preparations.

Medicine and pharmaceuticals. Agar is used as laxative, stabilizer, and emulsifiers. When added to dietetic substances, it suppresses appetite by expanding within the stomach. They are expedient in many pharmaceutical preparations.

Agriculture. Agar is good in clone formation and propagation of orchids, ornamental plants, vegetables, fruit crops and other agricultural products. Seeds are pre-

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served from molds and bacteria.

Dentistry. Agar gel is used to make accurate dental casts and impression material in criminology, sculpture and tool making.

Other uses. Agars serve as lubricant in the processing of tungsten and tantalum. They prevent corrosion of aluminum and used as inhibitor in deep well cement and sulphur mining explosives. They are also used in the manufacture of ultra-sensitive photographic films and paint, batteries and graphite and glue preparation. They are used in the production of bacteriological plates (Blunden 1991; Chapman 1979) for identification of bacteria and fungi.

Carrageenans

Carrageenans are hydrophylic colloids (water-soluble gums) which occur as matrix material in numerous species of red seaweeds. There are at least three types of carrageenan -- kappa, iota, and lambda.

Obtained from red seaweed like *Kappaphycus* and *Eucheuma*, among others, carrageenan can be used as emulsion, cough syrup and toothpaste. Carrageenan is a regulated food additive and current concern focuses on its safe molecular weight when eaten. Its most innovative development, Bixler (1996) reports, was the introduction of a food grade version of lower cost natural grade carrageenan which was developed in the Philippines. Applications of carrageenans make use of both their hydrophylic and anionic properties. With potassium, it can also be used as a binding agent for tablets, in shaving creams and haircreams and as a blood anti-coagulant. It may also be used in providing growth of connective tissues and control of ulcers. Major uses are in food like dairy applications (ice cream, flavored and thickened milk, flans and milk puddings) and in meat and poultry (Bixler 1996).

Cajipe (1990) reported that

carrageenan processed from *Eucheuma* is used as a medium for the growth of a wide spectrum of microorganisms, bacteria, yeast and other fungi.

The carrageenan industry grows as introduction of more product applications continue to grow. Another product is the liquid diet (Metrocal, Cambridge and Slim Fast) and Mc Donald's Mclean hamburger. With carrageenan, a cheaper pet food can be produced. Its use in powder form spread beyond pet food to air fresheners.

Alginates

Alginates are phycocolloid extracts of brown algae like *Laminaria*. They are used as emulsifiers and emulsion stabilizers in creams and lotion. Alginates are protection against many kinds of metal poisoning due to their ability to bind certain atoms. They are excellent suspensory agent for drugs and in the manufacture of greaseless lubricating jellies. Alginates can form insoluble complexes with strontium. In cases when dairy products, cereals, or meat may be contaminated with strontium, the body uptake can be prevented by addition of alginate to the food. The strontium isotope is bound to the alginate and passes through the intestines without being absorbed into the body. If the body uptake is not prevented by alginates, the strontium is absorbed by the blood and deposited in the bone. This makes alginate both as a preventive and therapeutic measure.

Alginates are also recommended to inhibit absorption of lead and other contaminants like barium, cadmium and zinc contaminating food products which can raise blood lead level.

De Roeck-Holtzhauer (1991) suggested that a biomarine cosmetology can be developed using alginates. They are safe for use in skin applications. As a lubricating agent, they moisten and soften the hair and can easily be absorbed by the epidermis.

Seaweeds have slowly but definitely been becoming a major industry in the Asia-Pacific countries where they abundantly grow. In the Philippines, it ranks third among the export product after tuna and shrimp.

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