



CMFRI newsletter

Number 7

October 1977 - March 1978

ALL SEaweEDS ARE NOT WEEDS



The gulf weed, *sargassum*

THE word weed, which carries often a derogative sense, means an economically useless plant (now animal too!) growing wild at the expense or to the detriment of a useful one that is or has been under cultivation. In this sense, the weed is worth only to be weeded out. But, with man's slowly growing wiser by discovering the benefits many of these discarded plants can confer, more and more of the so-called weeds are stripping this cloak of ignominy and are gradually entering into his realm of domestication. No plant can be quoted as a better example of having adopted and raised to the status of cultivated plant, in the course of man's incessant search for more food and more industrial raw material, than the once-despised seaweeds. With land masses for cultivation getting scarce day by day, the promise of this humble denizen of the sea is by far greater for future, as it requires no land but the largely available wastewaters of the coasts for its raising.

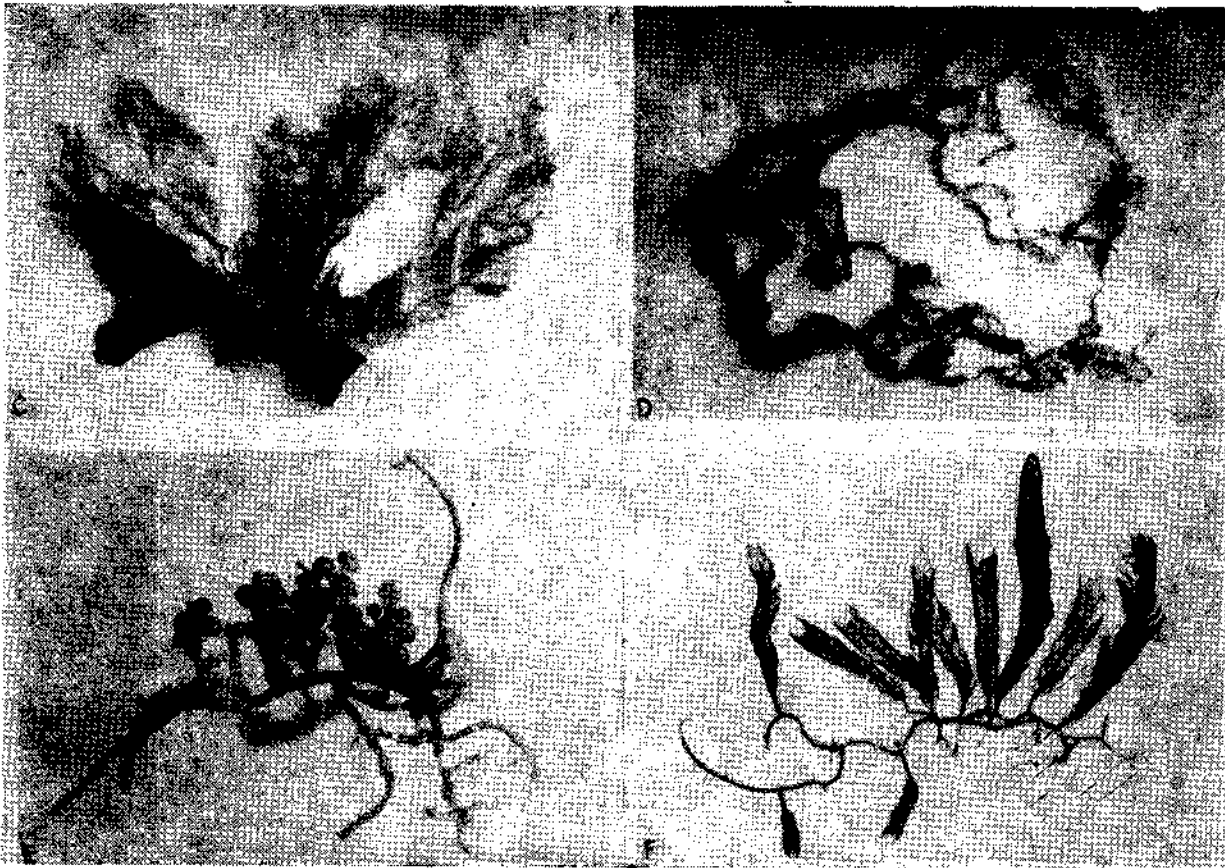
Seaweeds include all algae (plants with neither true leaves, stems, roots or vascular system, nor specialised sex organs as in the case of higher

plants) growing in the oceans and in brackish coastal waters, comprising from single-celled organisms to massive 'kelps' which are comparable in size to the flowering plants. Many of these marine algae, unlike their freshwater kins, are visible to the naked eye and are readily recognisable when

ies harvested by man, particularly in Japan and China, for local use as manure, medicine and even food. In these countries, of late, large industries have been developed to cultivate and process many of these seaweeds. It is nevertheless true that some members of the marine algae are look-

the fishery adversely. But this disrepute is not with the larger algae which, on the other hand, are useful to man in many ways. The great reputation enjoyed by the red alga, *Porphyra*, which largely goes in the making of soups and other condiments in developed countries, is well-known. Ja-

Some of our economic seaweeds



C. *Ulva lactuca*;
E. *Caulerpa racemosa*;

D. *Ulva reticulata*
F. *Caulerpa sertularioides*

found growing or cast ashore on the beach. Apart from being primary producers—fixers of solar energy—and therefore, invaluable as sustainers of the food cycle of the sea, marine algae—of course, the larger ones—were for centur-

ed down on as pollutants. This is largely due to certain species of blue-greens and dinoflagellates which thrive in the inshore waters and emanate a disagreeable odour (and is 'fishy' to taste) when grow in profuse. They also then affect

pan, the country which produces most of it, earns millions of dollars by the industry on this alga alone.

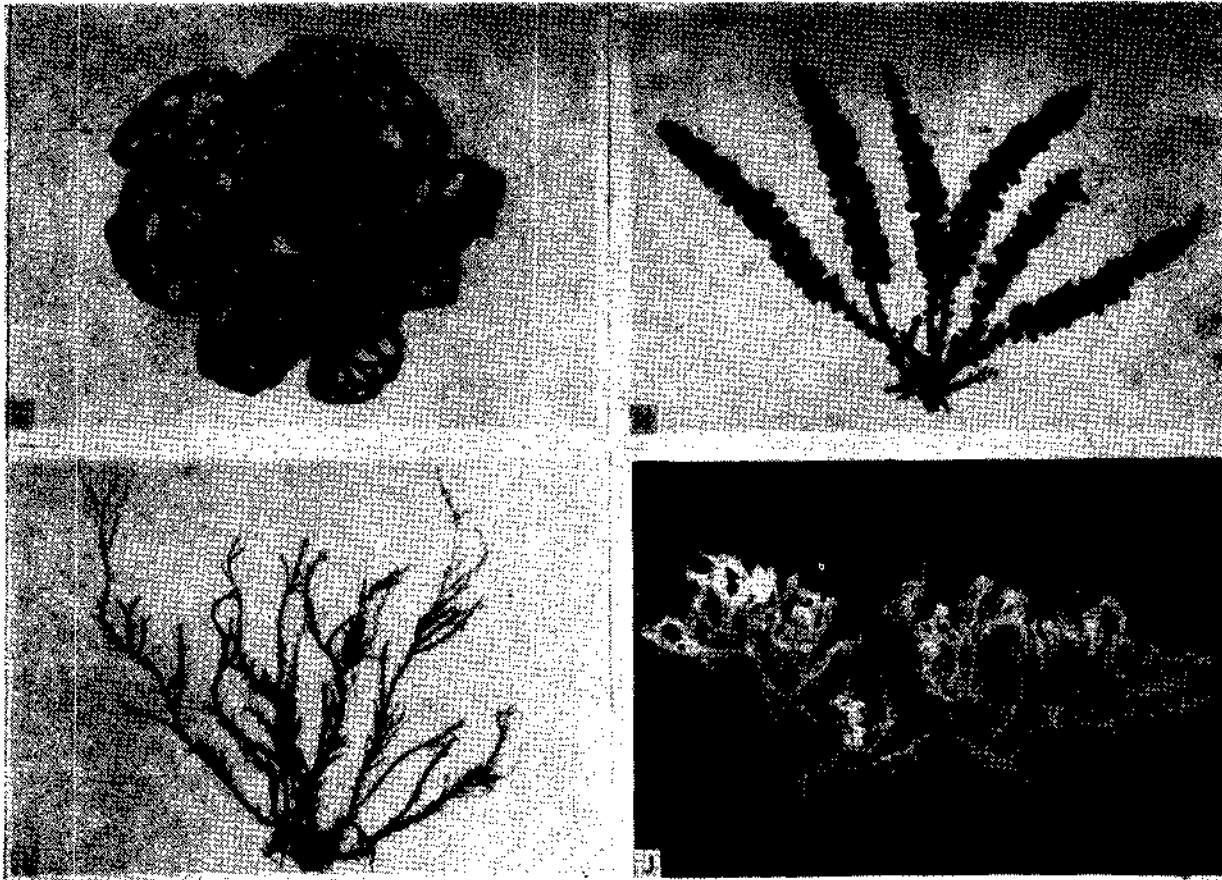
The marine algae are broadly grouped based on their pigmentation as: Green algae;

Brown algae: Red algae; and Blue-green algae.

The uses which the different products of marine algae are put to are legion. The quantity of iodine and potassium contained in the common kelp is large, and attempts have successfully been made to extract

them with a much involved process, is unparalleled in the diversity of its uses. It is extensively used in the making of food and medicines, and as an industrial raw material. Most of the agar consumed in the world market today comes from Japan, where many an industry flourishes in its manu-

facture. The best-known use of agar is as a solidifying agent in media used in the bacteriological culture. It is also used as a stiffening agent in a number of food products, as a sizing material, mucilage, and in clarifying liquids. With its quality of keeping substances in suspension it goes in the manufacture of various pharmaceutical preparations, photographic-film coatings and paints. Brewers use this to clarify and give body to beer. It is employed in canning meat and poultry, in laxative preparations, as a constituent of



G. *Hydroclathrus clathrus*;
I. *Acanthophora spicifera*;

H. *Laurencia papillosa*
J. *Caulerpa serrulata*

them. But, the discovery of mineral deposits containing these elements made their recovery from these algae unprofitable.

AGAR, or agar-agar, the gelatinous substance obtained from the red algae like *Geli-*

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ALGIN is a colloidal substance obtained from the brown weeds, or kelps, of the

orders Laminariales and Fucales (which are also called alginophytes). (Our best-known genus is the gulf weed, *Sargassum*, of the family Sargassaceae in the order Fucales, characterized by branching thalli—the algal body, because of the peculiarity of its structure is called not stem, but thallus—with lateral outgrowths; they develop along shores, then break away to drift in the ocean. We have mainly 5 species of *Sargassum* growing in abundance particularly in the reef regions of Mandapam in the east coast. They are: *S. myriocystum*, *S. illicifolium*, *S. wightii*, *S. plagiophyllum* and *S. tenerrimum*). Algin is hard when dry and absorbent when moist. It too is equally extensively used in the preparation of various pharmaceutical products, food products, rubber products (such as, natural and synthetic latex creaming and thickening, finished articles, automobile carpetting, electrical insulations, babies' rubber pants, foam cushions and rubber coating on tyres), textile products (size compound for cotton and rayon, textile print pastes and plastic laundry starch), adhesives (for wall boards, paper bags, shipping containers, gummed tapes), paper products (food packages, pharmaceutical and detergent packages, milk containers, butter cartons, frozen-food packages, insulation boards, food wrappers, grease-proof paper, and acoustical tiles), and miscellaneous products (paints, ceramic glazes, porcelain wares, leather-finishes, autopolishes, welding-rod coatings, boiler compounds, battery-plate separators, wall-board-joint cement, beet-sugar processing and wax emulsions)

MANNITOL, a straight-chain alcohol, a white water-soluble crystalline powder, is another product which can be extracted from brown algae. This can be utilised as a substitute to glycerine in many places with better results. This too has a wide-spread use in pharmaceuticals, paints, leather, and in the preparation of lacquers. The plastic products derived with it are said to be better than that obtained with glycerine. Mannitol can also be nitrated to form nitro-mannite, a powerful explosive like nitro-glycerine. Manna sugar is a common name for mannitol because it is used as a dietary supplement.

VISUALIZING the role the seaweed could play in our coastal economy, the CMFR Institute from its inception has been much involved in investigation on methods of utilising the different species of seaweeds that grow along our many coasts. Various methods of extracting agar from our

common red algae were evolved and tested, and so were with the algin and mannitol from brown algae. The results of these investigations have since been published through various scientific and semiscientific articles. With the recent trend of focussing our research toward mariculture, efforts were considerably intensified to study this rather important resource more closely. Team of scientists were entrusted with the difficult task of carrying out surveys of seaweed beds all along our coasts and mapping them out in a manner at once comprehensible to the layman. This was a preliminary to venturing into a more complicated project of selecting suitable species and culturing them first in an experimental stage and then in a more broad-based pilot stage. Such experiments naturally included the more thorough study not only of the life-cycle of the various species, with all the numerous biological and ecological studies it entails, but

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Culture of the red alga, *Gracilaria edulis*, on coir webs: The apical portion of the thallus is carefully inserted close together between the twists of the coir and left in the shallow water. With proper monitoring the alga grows to the harvestable size in about 60-80 days.

of the different products that could be obtained from each species and the probable uses they could be put to.

At present, the seaweeds (chiefly, the agarophytes) are collected on commercial scale from the neighbouring villages of Mandapam, namely, Vedalai, Pamban, Keelakarai, Periyapatinam, Pudumadom and Ervadi, and are sent mainly to the Cellulose Products of India, Ahmedabad. As estimated by the scientists at Mandapam, Shri. V. S. Krishnamoorthy Chennubhotla and colleagues, who are presently involved in the projects relating to the seaweed investigations, 20 to 25 thousand tonnes of fresh seaweed are harvested annually from this region. Fortunately, as the harvesting has strictly been seasonal, and as nature has more or less been favourable for the past few years, there is no need of apprehen-

sion of an immediate overexploitation. But, the nature could just as easily turn against us; and may be, the need might go up—there are visible signs of a growing interest for seaweed-based industries—then the only way to meet the demand would be by culture methods.

The culture experiments carried out so far, in both Palk Bay and Gulf of Mannar sides of Mandapam, yielded good results: on low-cost indigenous infrastructure, under properly monitored conditions, different species have grown to harvestable size in considerably less time than they would normally take in their natural habitats. Encouraged by these results, a pilot project has already been initiated and is presently well under way, to farm intensively the chosen species in larger areas.