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Review Paper

A Brief Review on Seaweed Culture

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ABSTRACT

In global terms, cultivation of macro algae is the fastest growing sector within aquaculture, but despite good natural conditions (cold, nutrient-rich waters), it is relatively under developed in India. Aqua Agri is seeking to identify how to develop sustainable large-scale cultivation of macro algae in India .Cultivation of macro algae has many advantages over land- based biomass production. Macro algae grow faster than terrestrial plants and are therefore more efficient at capturing carbon dioxide. In addition, cultivation in these does not require fertilizer, pesticides or irrigation and does not occupy valuable arable land. Instead, the nutrients in coastal waters are utilized and by using macro algae for food feed and fertilizer, a link to agriculture can be established.

1. Introduction

The Seaweeds are macrophytic algae, a primitive type of plants lacking true roots, stems and leaves. Seaweeds grow in the shallow waters, and lack root system and conducting tissues like land plants. Four groups of seaweeds are recognized according to their pigments that absorb light of particular wave lengths and give them their colors of Chlorophyceae (green), Cynophyceae (blue green), Pheophyceae (brown) and Rhodophyceae (red). The greatest variety of red seaweeds is found in sub tropical and tropical waters, while brown seaweeds are more common in cooler and temperate waters. Seaweeds provide valuable source of raw material for industries like health food, medicines, pharmaceuticals, textiles, fertilizers and animal feed. Seaweeds is also used for production of Agar, Alginates and Carrageenan. Chemicals from brown seaweeds such as alginic acid, mannitol, laminarin, fucoidin and iodine are extracted on a commercial basis.

As a staple food in Japan and China, Seaweeds are rich in minerals, vitamins, trace elements and bio active substances, and are called medical food of the 21st century. Seaweeds are cultivated for supply of raw materials to the seaweed industries and for their use as human food. In India, seaweeds collected from wild are used raw material for the production of agar and alginate. Nearly 25 agar and 10 algal industries are functioning at different places in maritime states such as Tamil Nadu, Kerala and Karnataka. Annually about 5000 tons (dry wt) of alginophytes, *Sargassum* spp., *Turbinaria* spp. and *Cystoseiratrinodis* and so many tonnes of agarophytes *Gelidiella acerosa*, *Gracilaria edulis*, *G.crassa* and *G. foliifera* exploited from the natural seaweed. beds mostly from south Tamil Nadu coast, are used as raw materials by these industries. These quantities, particularly agar yielding seaweeds, are inadequate to meet the raw material requirements of Indian seaweed industries. As a number of seaweed industries are coming up every year, there is an increasing demand for the raw materials which the existing resource cannot meet [1- 4]. Hence, commercial scale cultivation of seaweeds is necessary for uninterrupted supply of raw material to industries.

There are several advantages in the culture of seaweeds. In additions to continuous supply of alga, crop of single species could be maintained continuously. By adopting scientific breeding and other modern techniques of crop improvement the yield and quality of seaweeds could be improved, Further, if seaweed culture is carried out on large

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scale, natural beds could be conserved purely for obtaining seed materials.

2. Major Advantages of seaweed cultivation

Remedy for non-availability of required quantity of seaweeds for various uses.

- Provide occupation for the coastal people.
- Provide continues supply of raw material for seaweed based industry.
- Provide seaweeds of uniform quality for use in industry.
- Conserve natural populations of concerned seaweeds.
- Seaweed farming is an eco friendly activity.
- Major tool to treat coastal pollution in the sea and reduce CO_2 in global warming.

There are two methods two methods of seaweed cultivation

- Vegetative propagation method
- Reproductive method

2.1 Vegetative Propagation Method

In the vegetative propagation method, the fragments are inserted in the twists of ropes, tied to nylon twine or polypropylene straw and cultured in the near shore area of the sea. The fragments are also cultured by broadcasting them in outdoor ponds and on shore tanks. The fragment culture method is a simple one and gives quick results. Different culture techniques such as fixed off bottom culture, floating raft cage culture, bottom culture, raceways culture and tissue culture are adopted for cultivation of various economically important seaweeds in different countries by vegetative propagation method [5-8].

2.2 Reproductive Method

In this method, healthy reproductive plants collected from wild are transported to the laboratory nursery and different types of spores such as swarmers, zoospores, tetra spores carpospores and mono spores are collected on various substrata like nylon rope, synthetic rope, coir rope, plastic strips (polypropylene straw/ raffia), Bamboo splint ladder, cement blocks and coral stones [18-22]. The spores on the substrata are culture into spore lings in the culture room/ hatchery by manipulation of temperature light and providing nutrient culture media. Then the sub strates containing sporelings / germlings are transferred to the suitable culture areas in the sea for their further growth to harvestable size plants. This method is followed for the commercial scale cultivation of edible red alga Porphyra and green algae enteromorpha and monostroma; agar yielding red algae *Gracilariacyl indrica* and align yielding brown algae *Laminariua, Udaria* and *Marocystis* in foreign countries such as Japan, China, Korea, Taiwan, Malaysia and U.S.A [9-12]. In this method the spores take more periods for their development to harvestable size plants when compared with the growth of fragments in the vegetative propagation method [13-17].

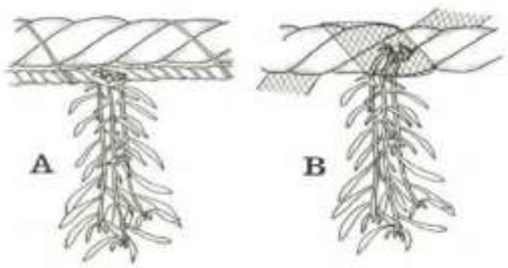

Fig 1. Vegetative propagation method

So far in India, only experimental scale cultivation of commercially important seaweeds such as *Gelidiella acerosa, Gracilaria edulis, Hypnea musciform, Acanthophora spicifera* and *Saragassum* species at different field environments using various culture techniques of vegetative propagation method.

Sargassum plagiophyllum,Enteroporphaflexuosa,Ulva fasciata and *Gracilaria edulis* by reproductive method using spores were carried out successfully. Only in recent years pilot scale culture of *Kappaphycus alvarezii* being carried out by Pepsi Co., in Mandapam area. The various biotechnological aspects is being applied for large scale cultivation of Porphyra (Japan, Korea, Taiwan), Undaira (Japan, Korea), Laminaria (China, Japan), by reproductive propagation method and Eucheuma and Kappaphycus (Philippines), Gracilaria (Taiwan), Hypnea (Philippines), Chondrus and Gigartina Florida and Caulerpa (Philippines)by vegetative propagation method can be adopted for the production of commercially important seaweeds on large scale to meet the raw material need of Indian seaweed industries and to conserve the natural seaweed resources of Indian waters for using as seed material for commercial scale cultivation [23–24]. Seaweed cultivation on large scale could not only augment supply of raw material to the net seaweed based industries, but it would also provide employment to the net seaweed based industries, but it would also provide employment to the people living in the coastal areas of mainland, Lakshadweep and Andaman-Nicobar islands. This would help in improving their economic status and thus help in rural up liftmen.

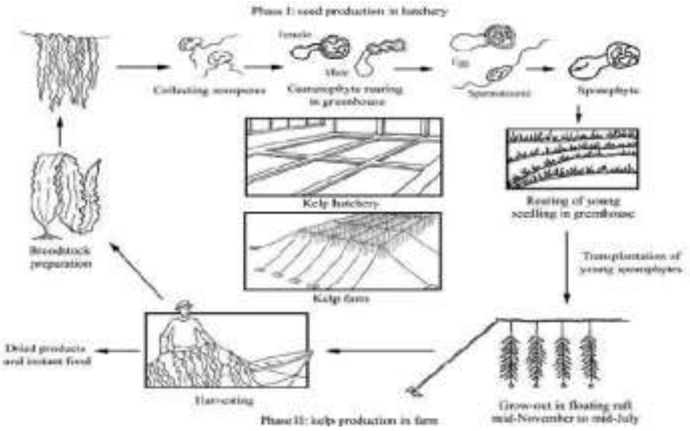

Fig 2. Diagrammatical Representation of Reproductive Method

3. Conclusion

Seaweed culture, a sustainable aquaculture practice, offers significant ecological and economic benefits. It contributes to marine biodiversity, improves water quality, and provides a renewable source of food, bioactive compounds, and biofuels. This review highlights the advancements in cultivation techniques, including site selection, farming methods, and post-harvest processing, emphasizing the need for integrated multi-trophic aquaculture systems. Challenges such as disease management, climate change impacts, and market development require ongoing research and policy support. Overall, seaweed culture presents a promising avenue for sustainable development, aligning with global environmental and economic goals.

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