


The background is a solid blue color. At the top, there are several wavy, overlapping lines in shades of blue and teal, creating a sense of movement and depth.

SEAWEED

INTRODUCTION

- Seaweed is a loose colloquial term encompassing macroscopic, multicellular, benthic marine algae. The term includes some members of the red, brown and green algae.
- The multifaceted uses of these plants in food, chemical and textile industries, agriculture, pharmaceuticals and medicine have been well recognized.
- seaweed species belonging to Chlorophyta, Phaeophyta, and Rhodophyta. Seaweeds are found in the coastal region between high tide to low tide
- sub-tidal region up to a depth where 0.01 % photosynthetic light is available



The important criteria used to distinguish the different algal groups based on the recent biochemical, physiological and electron microscopic studies are

- a) photosynthetic pigments,
- b) storage food products,
- c) cell wall component,
- d) fine structure of the cell and
- e) flagella.

GREEN ALGAE (CHLOROPHYTA)

MORPHOLOGY

- They are found in the fresh and marine habitats.
- They range from unicellular to multi-cellular, microscopic to macroscopic forms.
- Their thalli vary from free filaments to definitely shaped forms.
- The photosynthetic portion of the thalli may be moderately to highly calcified appearing in variety of forms as fan shaped segments, feather like or star-shaped branches with teeth or pinnules, clavate or globose branchlets.

PIGMENTS

- They possess photosynthetic pigments such as Chlorophyll a & b, contained in the special cell structure known as chromatophores.
- The cell wall of this group composed of an outer layer of pectin and an inner layer of cellulose.
- The photosynthetic product of this group is starch.

REPRODUCTION

- Green algae can produce sexually and asexually by forming flagellate spores and sometimes non-flagellate spores.
- The vegetative propagation is achieved through fragmentation. Alternation of gametophyte and saprophytic generation occurs in this group.

BROWN ALGAE (PHAEOPHYTA)

MORPHOLOGY

- Brown algae are exclusively marine forms. They have different forms from simple, freely branched filaments to highly differentiated forms.
- They can be distinguished into blades, stipes and holdfast.

PIGMENTS

- Photosynthetic pigments of the brown algae are Chlorophyll a & c, carotene, xanthophylls and fucoxanthin (pigment responsible for brown colour).
- The cell wall composed of an outer layer of algin and an inner layer of cellulose.
- The photosynthetic products of the brown algae are Laminarian and Manitol.

REPRODUCTION

- This group reproduces sexually and asexually.
- Several species of this group reproduce vegetatively by fragmentation.
- Members of this group produce biflagellate neutral spores found with in one celled or many celled reproductive organs.
- The sexual reproduction is through union of flagellated male and female gametes or union of flagellated male and large non-flagellated female gametes.
- Alternation of gametophytic and sporophytic generations occur in this group except in the members of Fucales.

RED ALGAE (RHODOPHYTA)

MORPHOLOGY

- Except for few species they are exclusively marine. They vary in size and shape.
- They are either epiphytes, grows as crust on the rocks or shells as a large fleshy, branched or blade like thalli.

PIGMENTS

- They contain chlorophyll a & b, carotene, (pigment responsible for red colour).
- The cell wall of this group composed of an outer layer of pectin and an inner layer of cellulose.
- The photosynthetic product of this group is Floridian starch.

REPRODUCTION

- This group seldom reproduces asexually. All the members of this group produce one or more kinds of non-flagellated spores that are either sexual or asexual in nature.
- Sexual reproduction is very complicated involving several structures after fusion of gametes.
- Some members of this group exhibit biphasic alternation of generation in which sexual generation (gametophyte) alternates with asexual (tetrasporophyte) generation.
- others are triphasic with three generation or somatic phases (gamatophtye, caropsporophyte , tetrasporophyte) successively following one another.

Marine algae along the Indian coast

Algae	Order	Family	Genus	Species variation	Total
Chlorophyta	7	19	43	179 + 37	216
Phaeophyta	6	13	37	159 + 32	197
Rhodophyta	16	36	136	406 + 28	434
Xanthophyta	1	1	1	3 + 1	3
Total	30	69	217	746 + 97	844

	Chlorophyta	Phaeophyta	Rhodophyta	Total
Gujarat	64	70	113	247
Maharashtra	52	47	99	197
Goa	22	29	32	83
Karnataka	13	20	23	56
Kerala	23	12	39	74
Lakshadweep	40	24	58	122
Total	214	202	363	779

USES OF SEAWEEDS

- The present uses of seaweeds are as human foods, cosmetics, fertilisers, and for the extraction of industrial gums and chemicals.

AS FOOD :The sea weeds are also used as food in the regions of Far East and Australia.

- The indigenous people of Chile use large quantities of *Durvillea antarctica* and some species of *Ulva*.
- The most important food species in Japan are Nori (*Porphyra* species), Kombu (*Laminaria* species)
- In japan *porphyra tenera* is one of the most important edible algae

- The main species used is *Laminaria japonica* (Laminariales), but 8-11 other species are used also, mainly in Japan.
- In Japan, kombu is used in the preparation of fish, meat dishes, soups and also as a vegetable with rice.
- Powdered kombu is employed either in sauces and soups or is added to rice in the same way as curry.
- The harvested algae are dried after washing in freshwater. After resoaking the plant material is used as an additive to soups

- Nori is a red alga, *Porphyra* spp. (Bangiophyceae). Nori is sold in sheets that may be toasted to give a green colour and then flaked and added to sauces, soups and broths.
- Small, dry nori sheets are used to wrap cold rice balls, which make a popular lunch-time snack for Japanese children.
- The food value of nori lies in its high protein content (25-35% of dry weight), vitamins and mineral salts, especially iodine.
- Its vitamin C content is about 1.5 times that of oranges and 75% of the protein and carbohydrates are digestible by humans, which is very high for seaweeds.

AS A SOURCE OF VITAMINS: Seaweeds are the richest source of vitamins.

- The vitamins A, B and E are found abundantly in seaweeds.
- The vitamin B essentially required for the development of human body is found in great abundance in almost all phaeophyceae.
- Vitamin E is equally important for human beings which is found in many seaweeds.
- Several vitamins except ascorbic acid have been reported from Chlorella.
- The vitamins found in Chlorella are thiamin, niacin, pyridoxine, pantothenic acid, chlorine, biotin, vitamin B and lipoic acid.

AS A SOURCE OF AGAR: The best agar is manufactured from Gelidium of Rhodophyceae.

- It produces 95% of the world production.
- Agar is also obtained from several other marine algae
- e.g. Sarconema, Hypnea and Gracilaria .
- It is employed in the preparation of ice cream, jellies, desserts etc., in sizing the textiles and clearing many liquids.
- It is also used in preparing shaving creams, cosmetics and shoe polishes.
- The agar has constantly been used in biological laboratories for media preparation.

MEDICINEAL PROPERTIES :

- Algae rich in iodine such as *Asparagopsis taxiformis*, *Sarconema* spp. can be used for controlling goitre disease caused by enlargement of thyroid glands.
- Many bioactive compounds can be obtained from seaweeds.
- Several diseases caused by vitamin deficiency such as vitex, asthma, tooth decay etc., may be eradicated, if flour of the sea weeds is added to the food.
- Sea weeds are the best source of iodine for human beings.
- An antibiotic drug Chlorellum is also obtained from algae.

- The alginic acid is manufactured from the cell wall of phaeophyceae.
- Sodium alginate is used in sizing material for water proof material, dyes, buttons, handles, combs and many of such things.
- The algin is found in the form of calcium alginate and alginic acid. The fucaceae are the chief source of algin in India.

COSMETICS

- The use of seaweed extract in cosmetics is a major international trend at present.
- The elements contained in seaweeds act in harmony with the human body, helping to achieve, beauty and relaxation.
- In cosmetology, it is important to know the biochemical composition and potential use of cosmetics.

USED AS FERTILIZERS

- The presence of potassium chloride (KCl) in sea weeds, they are used as fertilizers in many countries.
- Seaweeds are used in different parts of the world as fertilizer for various land crops.
- In India, freshly collected and cast ashore seaweeds are used as manure for coconut plantation either directly or in the form of compost in coastal areas of Tamil Nadu and Kerala.
- Seaweed manure has been found superior to farm yard manure.

- Seaweed manure seems to increase resistance to disease.
- sea weed manure holds water and air at the same time and improves the soil in both respects.
- Like other manures sea weeds have a similar role but also contribute the required potassium, sulphur, phosphorus and calcium.
- The liquid seaweed fertilizer obtained from seaweed extract is used as foliar spray for inducing faster growth and yield in leafy and fleshy vegetables, fruits, orchards and horticultural plants.