



# Micromorphological Studies of *Tubinaria ornata* (Turner) J. Agardh Thallus (Phaeophyceae)

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## Abstract

Thallus of *Tubinaria* a marine alga belonging to Phaeophyceae was studied and detailed micromorphological evaluation was done. Morphology of the thallus has been studied to aid pharmacognostic and taxonomic species identification using photographs; parameters presented in this paper may be proposed to establish the authenticity of this plant and can possibly help differentiate the alga from its other species. The study revealed several interesting characters like funnel shaped terminal bodies and its cellular details.

## Subject Areas

Taxonomy

## Keywords

Alga, Anatomy, Marine, Micromorphological, Phaeophyceae, Tissue, *Tubinaria*

## 1. Introduction

India is one of the mega diversity countries in the world and medicinal plants form the backbone of traditional systems of medicine in India; thousands of tribal communities still use folklore medicinal plants for the cure of various diseases. Indian medicinal plants have been studied for potential source of bioactive compounds. The great interest in the use and importance of medicinal plants in many countries has led to intensified efforts on the documentation of ethno-medical data of medicinal plants [1]. The recent increase in compounds isolated from land plants, has open doors to the poorly exploited marine ecosystem which appears to be a good candidate of natural resource [2]. The aquatic ecosystem covers about 70% of the earth's surface and India has a vast coastline of

6100 km supporting a rich flora of marine plants such as seaweeds, mangroves and sea grasses [3]. Marine algae exhibit interesting nutritional properties in addition to their ecological properties. The results of the study suggest that the algae which are abundantly available in this ecosystem also have considerable potential of carbohydrates, amino acids, proteins, phenols and lipids for their use as food and pharmaceutical industry as a source in preparation of nutrient supplements, medicine and fine chemical synthesis.

## 2. Materials and Method

### 1) Collection of Specimens

The plant specimen for the proposed study was collected from Rameswaram, Tamil Nadu, India during the month of March authenticated by Dr. R. Thevanathan, Presidency College, Chennai. Care was taken to select healthy plants and normal organs. The required samples of different organs were cut and removed from the plant and fixed in FAA (4% Formalin Acetic Acid). After 24 hrs of fixing, the specimens were dehydrated with graded series of tertiary-Butyl alcohol (50% - 100%) as per the schedule given by [4]. Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58 C - 60 C) until TBA solution attained super saturation. The specimens were cast into paraffin blocks.

### 2) Sectioning

The paraffin embedded specimens were sectioned with the help of Rotary Microtome. The thickness of the sections was 10 - 12  $\mu\text{m}$ . Dewaxing of the sections was by customary procedure [5]. The sections were stained with Toluidine blue as per the method published by [6]. Since Toluidine blue is a polychromatic stain. The staining results were remarkably good; and some cytochemical reactions were also obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cells, dark green to suberin, violet to the mucilage, blue to the protein bodies.

### 3) Photomicrographs

Microscopic descriptions of tissues are supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon LabPhoto 2 microscopic Unit. For normal observations bright field was used. Magnifications of the figures are indicated by the scale-bars.

## 3. Results

### 1) Botanical Description

Plants erect and stiff, 2-20-(30) cm long when reproductive, usually isolated or in small groups, often rusty brown to dark brown; holdfast bearing one (or more) terete erect portion, basally a conical or irregular holdfast with several unbranched or dichotomously branched stolons, these often remaining when erect portion torn off, or appearing before erect portion formed. Juvenile plants with flattened blades can form new plants, become free-floating; larger plants with several orders of branching. Blades peltate, with "petiole" and double row

of stiff spines often with secondary branching from lower adaxial surface of blades; rarely irregularly triangular margin of leaves in apical view; petiole cylindrical near base, becoming triangularly compressed in distal portions; many plants with some leaves having hollow centers that function as floats. Receptacles develop into tightly branched clusters on adaxial side of leaf petiole near base, mostly cylindrical, to 1.5 cm long, with blunt apices.

#### 2) Macroscopical Characters

The plant body consists of branched cylindrical axis and terminal clusters of funnel shaped expanded bodies. The surface of the plant body is smooth and even (**Figure 1**).

#### 3) Microscopical Characters

The axis is broadly rectangular in cross sectional view (**Figure 2(a)-(1)**). The axis is 1.85 mm in diameter. It consists of thin layer of small thick walled darkly stained epidermis and parenchymatous ground tissue. The outer ground tissues include fairly thick walled smaller angular cells. The central ground tissue includes circular, slightly larger thin walled cells (**Figure 2(a)-(2)**).

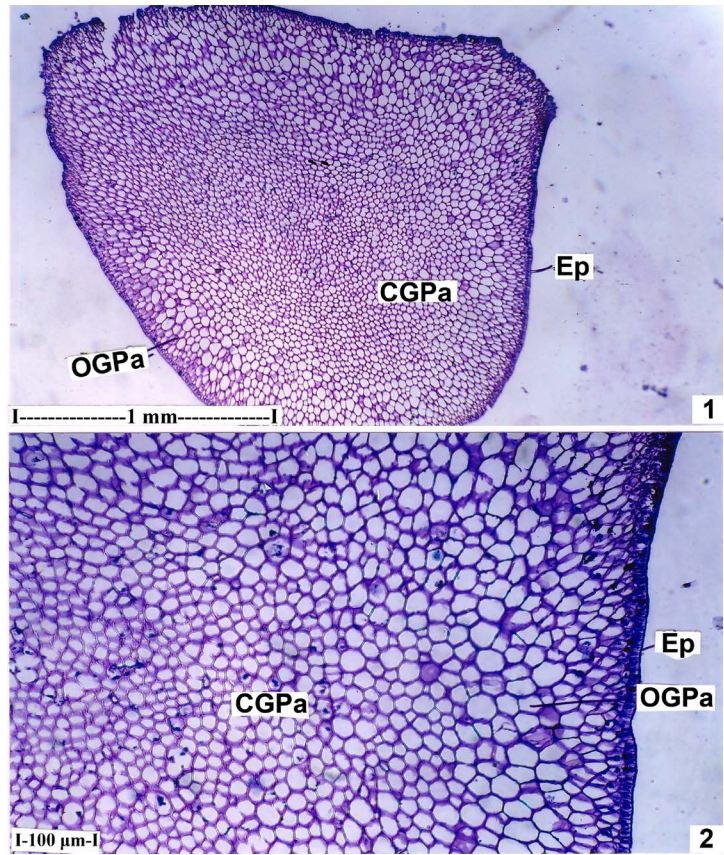
Funnel shaped terminal bodies have thick cylindrical stalk and widely expanded circular flat funnel (**Figure 2(b)**). The stalk portion is similar to the stem. The marginal portion of the funnel appears cylindrical while the terminal part is wide and semi circular. It is 950  $\mu\text{m}$  thick (**Figure 2(c)-(1)**). It has a small angular thick walled epidermal layer and thin walled sub epidermal layers. The ground parenchymatous cells are wide, angular thick walled and compact (**Figure 2(c)-(2)**).

### 4. Discussion

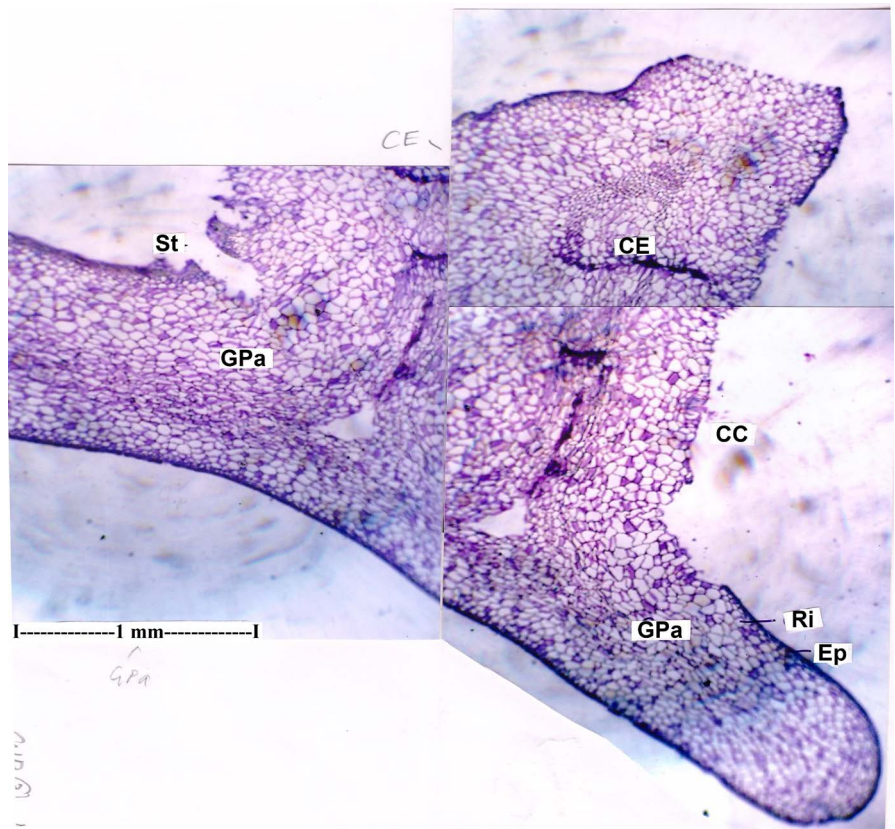
The above characters help in identification and authentication of the species as nearly four species of *Turbinaria* are common along the Tamil Nadu coastal shores. The anatomical details also confirmed the presence of various tissue sys-



**Figure 1.** The experimental plant.



(a)



(b)



**Figure 2.** Section of thallus. (a) 1: T.S. of axis; 2: T.S. of axis-a sector enlarged. [CGPa—Central Ground tissue Parenchymatous; Ep—Epidermis; OGPa—Outer Ground tissue Parenchymatous]. (b) L.S. of funnel shaped body. [CC—Central Cavity; Ep—Epidermis; GPa—Ground tissue Parenchymatous; St—Stalk; CE—Conducting Elements; Ri—Rim]. (c) 1: L.S. of rim of funnel shaped body; 2: Stalk portion of the funnel. [Cu—Cuticle; Ep—Epidermis; GPa—Ground tissue Parenchymatous; CPa—Central Parenchymatous tissue; OPa—Outer Parenchyma].

tems well differentiated into cortex and medulla. The above parameters help in identifying the species and establishing the authenticity of this seaweed and can possibly help differentiate it from its other adulterants.

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