



## RESEARCH ARTICLE

### TRICHOMES STUDY OF *ALTERNANTHERA TENELLA* COLLA

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#### ABSTRACT

*Alternantheratenella* Colla (Amaranthaceae), commonly called "Joy weed". They are use as food and medicinal properties by folk and ethnic communities. The correct identity of aerial parts of the plants plays a pivotal role in the stability of herbal preparation. The epidermal trichomes act as a marker and taxonomic significance of plant identification. They exhibit more diversity of their distribution, type, form, size, structure and function. Through themicroscopic and powder microscopic studies, the trichome types are observed, which believed to enrich the literature on the systematic anatomy.

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## INTRODUCTION

The epidermal trichomes are of much taxonomic significance because they exhibit great diversity of their distribution, type, form, size, structure and function. They help in the identification of plants even in vegetable state (Esau, 1965). They may be classified into glandular and non-glandular, unicellular, multicellular, uniseriate, multiseriate, stalked or sessile types. They occur in various locations. They have several morphological features and their mode of secretion (Werker, 2000). The non-glandular trichomes are covered the aerial surface of all parts. They serve various functions in plants: to reduce the heat load, reflectance of UV light, increase tolerance to freezing, maintain water balance in leaves, provides protection from insects and herbivores (Werker, 2000; Mauricio and Rausher, 1997; Liakoura *et al.*, 1997). They may be simple, which deter herbivores, guide the path of pollinators, affects photosynthesis, protect against direct sun exposure, insulate the plant from wind, leaf temperature or water loss through increased light reflectance as in desert species, prevent small animals and insects from reaching the plant surface (Graham *et al.*, 2006).

The unique hygroscopic hairs of the seed of some species are well known and documented (Balkwill and Getliff Norris, 1988). The glandular trichomes secrete essential oils or oleo-resins. They associated with the production of chemical provide defence against herbivores and pathogens. Trichome density more on the leaf veins and apex commonly seen in angiosperms (Oppenheimer, 1959). *Alternantheratenella* Colla belong to Amaranthaceae family. It is semi-aquatic weed grows along canals, ditches, fallow fields and barren land. It is a decumbent perennial herb. Inflorescence is globose head. The flowers are small, greenish, hermaphroditic monochlamydous. Each flower has five equal tepals, two persistent bracteoles and membranous bract. The flower tepals are tri-nerved, membranous and spiny. The present study is undertaken to microscopic and powder microscopic studies of various trichomes present in *Alternanthera. tenella*.

## MATERIALS AND METHODS

### Plant collection

*Alternantheratenella* Colla plant collected from Thiruneermalai area, Chennai (Fig.1).

### Microscopy

Healthy plants were collected. The leaves, stem, petiole, flower, fruit and seed organs were excised from the plant and fixed in FAA for 24 hours.

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Fig.1. Plant twig

After fixing, the specimens were dehydrated with graded series of TBA as per schedule given by Sass (1940). Infiltration of the specimens was carried out by gradual addition of paraffin wax (melting point 56-58°C) until TBA solution attained super saturation. The specimens were then casted into paraffin blocks. The paraffin embedded specimens sectioned with the help of Rotary Microtome. The thickness of the sections adjusted to 10-12 µm. De-waxing of the sections carried out by procedure (Johansen, 1940). The sections stained with Toluidine blue as per the method of O'Brien *et al.* (1964). DPX used as the mounting medium. Photographs with different magnifications were taken using Nikon Microscope and Digital Prime Microscope WESWOX optix. For the study of crystals under normal bright field light was employed. The magnifications of the figures were indicated by the scale-bars.

**Powder Microscopy**

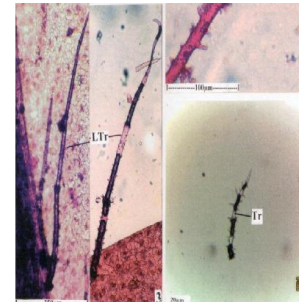
Healthy fresh plants collected and their parts were separated. Then, shade dried at room temperature for two weeks, ground into fine powder and stored at room temperature. After staining, the powder cleared with sodium hydroxide and mounted in glycerine medium. Different cell components measured using eye piece micrometer.

**RESULTS**

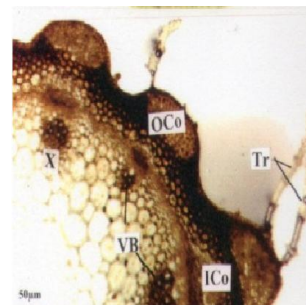
Trichome characteristics and their types were observed. The glandular trichomes are capitate type (Fig. 2). They are unicellular or multicellular types. The unicellular trichomes are on abaxial surface of leaf lamina (Fig. 2.1). They consist of one basal cell, a short stalk cell and a two cellular head. The gland is short, rectangular or hemispherical in shape. Trichome cells with dark inclusions. The multicellular trichomes are straight, short cylindrical, 4 or 5 short rectangular cells with ellipsoidal head observed on leaf and stem surfaces (Fig. 2.2). Their gland appears circular with central stalk on stem surface (Fig. 2.3).



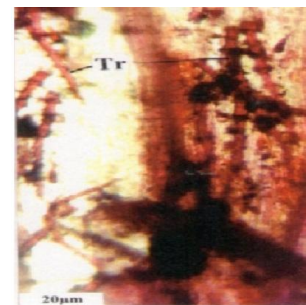
Fig.3. Leaf epidermal surface



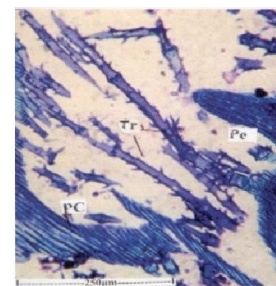
1. Leaf surface



2. Stem T. S.



3. Flower surface



4. Seed T. S.

Note: STr-Smooth Trichome; LTr-Long Trichome; Tr-Trichome; PC-Periderm cell

Fig.4. Non-glandular-Long trichomes

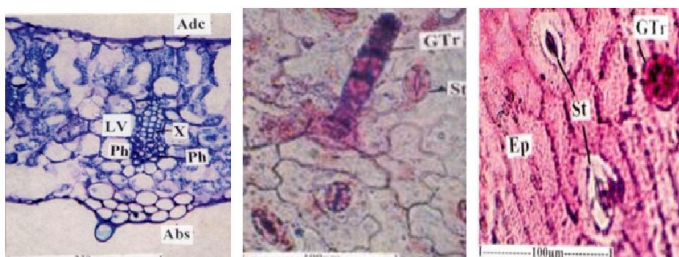


Fig. 2. Glandular trichomes

### Leaf T.S.2. Leaf epidermal surface3. Stem epidermal surface

The non-glandular trichomes are unicellular or multicellular. The unicellular trichomes are short, cell with pointed end (Fig. 3). The multicellular trichomes are short or long, unbranched, uniformly thick, attached on the epidermal layer of the leaves (Fig. 1), stem (Fig. 2), flower (Fig. 3), fruit wall and seed (Fig. 5). They consist of several short basal cells, four or more vertical elongated narrow cylindrical terminal cells with pointed end. Their surface has minute spiny cuticle outgrowths.

They may be long, multicellular, unbranched and noded along with fairly thick cross walls. They produce upwardly directed thick conical spines with fine tips. Their cells are long, narrow and vertical. They produce thick curved lateral spines. They are more abundant on the vein and marginal regions.

### DISCUSSION

*Alternanthera tenella* aerial parts are used as salad, soups and fodder and also as a tribal medicine administered both internally as well as applied externally in the form of dried powder, paste, drops, infusion and honey syrup to treat different ailments. The correct identity of plant played a pivotal role in the stability of herbal preparations (WHO, 1991). Trichome characters and their types vary in Amaranthaceae members. The glandular trichomes are capitate type. They are associated with the production of chemicals that provide defence against herbivores and pathogens. The non-glandular trichomes are unicellular or multicellular types. The unicellular trichomes are either smooth or papillose, short or long, branched or unbranched (Seubert, 1904). The short branched dendritic trichomes are reported in *Alternanthera stellata* (Metcalf and Chalk, 1988). The multicellular types are candelabra type. They are restricted to *Alternanthera* genus (Metcalf and Chalk 1950). They insulate the plant from changes in the external environment and help to reduce the rate of transpiration. The numerous curved cuticular spines arise from the trichome surface and played an important role in leaf protection during the early stages of leaf development (Werker 2000). In glandular trichomes, both unicellular and multicellular are observed. In non-glandular trichomes, unicellular such as smooth, unbranched and multicellular like short or long types are observed. They added support to the morphological and anatomical structure of *Alternanthera tenella*.

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