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CARPOLOGICAL ANALYSIS OF THE SPECIES *ELEPHANTOPUS CAROLINIANUS* RAEUSCH. OF THE TRIBE MOQUINIEAE- ASTERACEAE

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ABSTRACT
The familyAsteraceae is one of the largest and highly evolved most successful families; consist of 5 sub family, 43 tribes, 1600 genera and 23000 species. Among the 43 tribes, Moquinieae is one. The detailed studies on mature cypsela of the species *Elephantopuscarolinianus*belonging to tribe Moqunieae have revealed the morphological and anatomical characters. Morphological features of the apical part, surface hairs, location of vascular trace, and structure of carpopodium and pappus bristles of cypsela are valuable taxonomically. Anatomically, testal feature is more important than the pericarp. In this species, U- shape testal layer present. It is a special anatomical character for this species. On the other hand, the structure of mesocarp also interesting.Mesocarp made up of compactely arranged, palisade parenchyma cells and 1-2 layer of parenchyma cells, just below the palisade parenchyma cell layer. Within the palisade cells, secretary duct present.

KEY WORDS: Carpological analysis, *Elephantopus carolinianus* Raeusch, Moquinieae- Asteraceae

INTRODUCTION

Moquinieae is a tribe of Asteraceae, consist of two genera originally placed in other tribes- *Moquinia* in Mutisieae, by Cabrera (1977) and *Pseudostifftia* in Vernonieae, by Robinson (1979). The two were placed together first by Gamerro (1990) in Vernonieae, and a separate tribe was established by Robinson (1994). Moquinieae differ from Mutiseae s. str. by the smaller and thinner anther appendage and the spinose pollen with simple tectum in the former. Cypsela densely setuliferous, 10–17 costate. The presence of triterpenoides and guaianolides has been reported by Bohlmann *et. al.* (1982). It is a new tribe. The available literature about this tribe is very few or absent on the basis of both morphologically and anatomically. The aim of this study is to discuss the morphology and anatomy of cypsela of *Elephantopuscarolinianus***,** ofthe tribe Moquinieae in details.

MATERIALS AND METHODS

Mature cypsela of *Elephantopus carolinianus* Raeusch, was collected from, Botanic Garden of the University of Copenhagen, Denmark ; Sender- Hans V. Hansen, lic. Scient., curator. Collection number is- 323 E2231-0003*A G. Randomly selecteddry cypselas from the procured mass were immersed in 5% NaOH solution for 2-3 days. After that, the cypselas were softened. The softened cypselas were stained in aqueous safranin solution (1%) and dissected the different parts of cypselas with the help of 2 sharp needles under dissecting microscope and stereo dissecting binocular microscope. For anatomical study, free hand cross sections were done preferably from the middle part of cypselas with the aid of sharp razor blade. Selected sections were stained in safranin- lightgreen combination following standard method of staining.

RESULTS

Elephantopuscarolinianus

Morphology (Figure 1 A-G, 2 A-D)

Cypsela homomorphic, 5 mm x 1 mm including awns, 3 mm x 1 mm excluding awns, brownish, striated, oblanciolate, upper part truncate whereas lower part tapered, straight, more or less elliptical in cross sectional configuration. Surface pubescent. Surface hair sericeous type, appraised- ascending in orientation with the surface, made up of body and basal cells. The tip portion of body cells arranged in different plain. Surface containing 9 ribs, alternating with furrow. Furrows wider than ribs. The distance between 2 ribs 0.01mm. At the upper part of cypsela, stylopodium present; unenlarged, partially immersed in the nectary. At the upper part of cypsela, 5 awns present, unequal, brownish, arranged in single circle, persistent. At the basal region of cypsela, carpopodium present, narrow than the base, symmetric, arranged in a ring. Carpopodial cells with thin-walled, cubical, not pitted, large, horizontally or tangentially placed, arranged in a single row.

Anatomy (Figure 3 A)

Cypsela more or less elliptic in cross section. Ribs present; 9 in numbers, conspicuous. Cypselarwall 0.02 mm and 0.04 mm wide at rib and furrow region respectively. Pericarp thick, on an average 0.03mm, differentiated into two zones- epicarp and mesocarp.Epicarpuniseriate, made up of thick - walled, cubical-rectangular, compactely arranged, parenchyma cells, provided with cuticle. Internal to the epicarp, mesocarp present; made up of horizontally placed, thick-walled, palisade parenchyma cells with secretary duct. Secretary duct present only below the rib region.

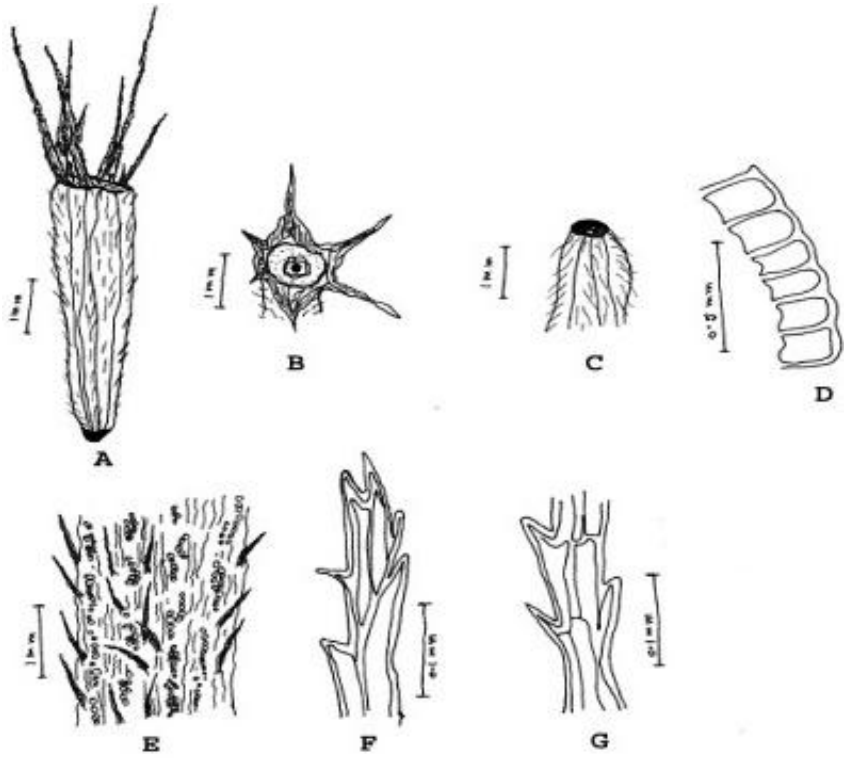

Figure 1. Morphology of Cypsela
A-G-*Elephantopus carolinianus*: A-Cypsela, B-Upperpart,C-Lower part, D-Carpopodial cells, E-Surface, F-Upper part of pappus bristles, G-Lowerpart of pappus bristles

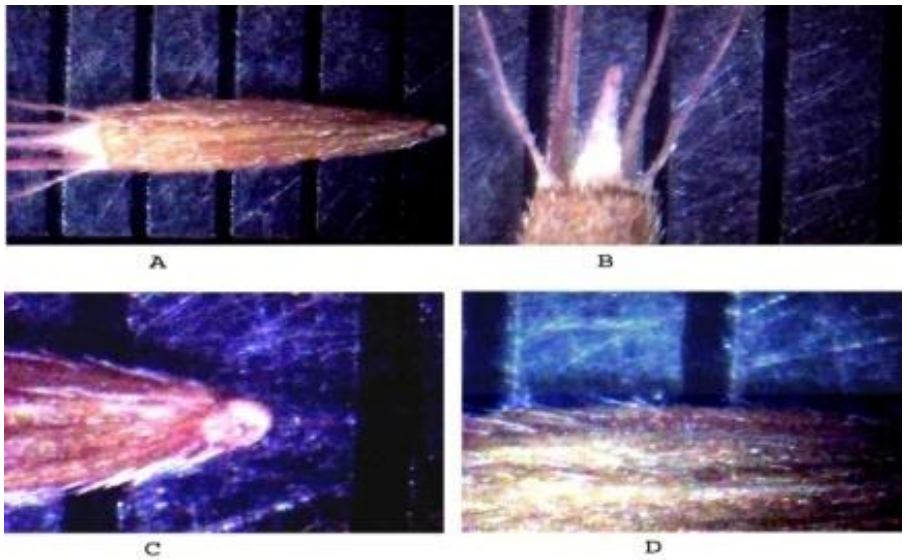

Figure 2. Cameraphotographs of different parts of Cypsela
A-cypsela, B-Upperpart,C-Lower part, D-Surface

Within the mesocarpic region, below the palisade cells; 1-2 layer, thin-walled, parenchyma cells present. Within the mesocarpic region, vascular trace present. Internal to the mesocarpic region, U- shape testal layer present, attached with cypselar wall, approximately 0.012 mm thick, parenchymatous, uni-seriately arranged. Endosperm persists in mature cypsela, biseriate. Both the layer made up of horizontally placed, parenchyma cells. Outer layer comparatively thin than inner layer. Mature embryo occupies a major part of the cypsela; cotyledons two in number, arranged at right angle to the axis of cypsela, containing 6 resin ducts(3 ducts in each cotyledon).

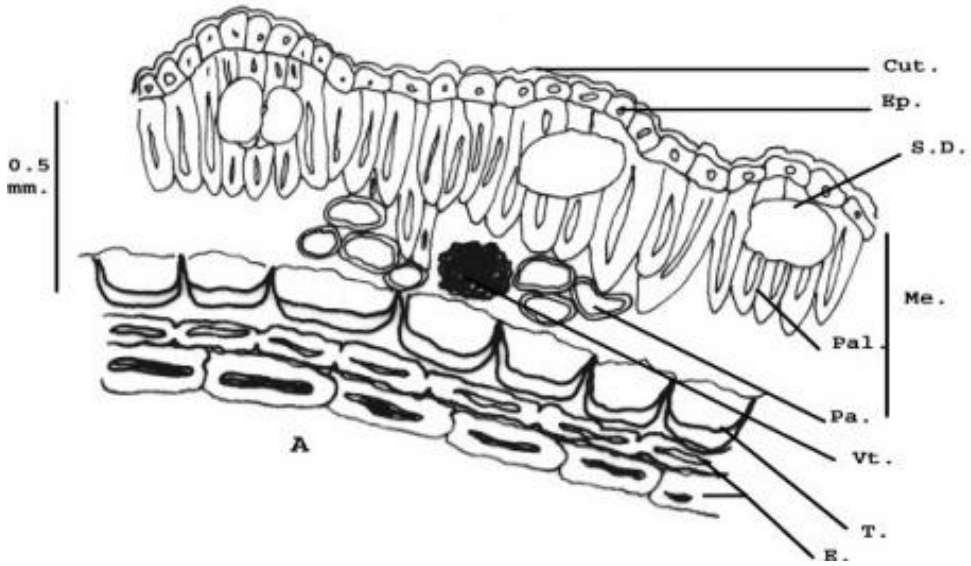

Figure 3A. Anatomy of cypsela

DISCUSSION

Only one species (*Elephantopus carolinianus*) of the tribe Moqunieaeis studied. It is a new tribe. The available literature about this tribe is minimum or absent. Moquinieae differ from Mutiseae s.str. by the smaller and thinner anther appendage and the spinose pollen with simple tectum in the former by John A.(1921). Relationship is not considered close. Moquineae are apparently close to Vernonieae, but differ by their thickened scabrid styles similar to those of Arctotideae, rather than these being thin with long sweeping hairs as found in Vernonieae. Cypsela homomorphic, brown in colour. Though, colour is not important for taxonomic classification. At the upper part of cypsela, stylopodium present; unenlarged, partially immersed in the nectary. A conical or disk-shaped enlargement at the base of the style in plants of the family Compositae, is stylopodium. Stylopodium also present in the family Umbellifereae. At the basal region of cypsela, carpopodium present. It is a meristematic tissue zone and varies from 1-many layers. It is also called as abscission zone. In the studied species, carpopodial cell arranged in single layer.Information about the different types of abscission zone of cypselas in Asteraceae has been presented in the work of Haque (1984). Carpopodial features have definite systematic value for characterization of taxa. Carpopodium in Heliantheaehave reported by Grau (1980).

Anatomically the pericarp is distinguishable into an outermost epicarp and an inner zone comprising mesocarpic tissues byPandeyetal (1982).In the studied species, epicarpuniseriately arranged. Mesocarpic region made up of palisade parenchyma and parenchyma cells. Within the mesocarpic region Secretary duct present. Presence of secretary duct bears some taxonomic features. Secretary duct also present in some species of the tribe Astereae byMukherjee S. K. andSarkar A. K.(2001). Secretary duct is absent in*A. amellus* of the tribe Astereae. In the studied species, testal feature also important. The shape of testa is U shape. U- shapetestal layer also present in some species of the tribe Astereae. Endosperm biseriately arranged, parenchymatous.

Moquinieae is a new tribe; we can identify this tribe with the help of morpho-anatomical study. Though available literature about this tribe is very minimum or absent. So, in this case we can identify this tribe by morpho-anatomical methods.

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