

## Comparative study of cypselas in three common species of Asteraceae

Tulika Talukdar and Sobhan Kr. Mukherjee\*

Department of Botany, Krishnagar Govt. College, Krishnagar, 741101, Nadia, West Bengal, India

\*Corresponding author: Department of Botany, University of Kalyani, Kalyani, 741235, Nadia, West Bengal, India

Email: [sobhankr@yahoo.com](mailto:sobhankr@yahoo.com)

### Abstract

Morpho-anatomical characters of two species - *Ageratum houstonianum* Mill. and *Mikania cordata* (Burm.f.) Robinson, belonging to the tribe Eupatorieae and one species - *Vernonia cinerea* Less., belonging to the tribe Vernonieae have been studied in detail. Cypselar shape, type of surface hair, form of pappus, nature of carpopodium, phytomelanin deposition, cellular nature of pericarp etc. are taken into consideration for distinguishing the taxa.

**Keywords:** Cypselas, Morphology, Anatomy, Anthemideae, Eupatorieae

### INTRODUCTION

The cypselas of Asteraceae are key instrument for the success of the family. It is evident from the literature that the cypselar features have not been paid its due attention. The importance of cypselar features in the classification of the tribe Anthemideae in Asteraceae was first recognized by Schultz Bipontinus (1844). Since then, carpological features have played a major role in the classification and relationship of different taxa of Asteraceae. The objective of the present study is three-fold: (i) to describe the detailed morpho-anatomical features of cypselas; (ii) for better understanding of the different taxa; and (iii) to expand our knowledge of the comparative morpho-anatomy of cypselas ultimately leading to a better classification.

### MATERIALS AND METHODS

Dried, identified, mature cypselas of three species namely *Ageratum houstonianum* Miller, *Mikania micrantha* Kunth [= *M. cordata* (Burm.f.) Robinson] and *Cyanthillium cinereum* (L.) Robinson [= *Vernonia cinerea* (L.) Lessing] from two different tribes were procured from their wild habitat in Kalyani.

Randomly selected five dry cypselas were studied for each species. For morphological study, dry mature and softened cypselas were studied under stereo dissected microscope and light compound microscope. Cypselas were softened following Mukherjee & Sarkar (1994). Cross-section from each cypselas was taken from the middle part. Sections were stained with safranin-fast green combination and mounted in Canada balsam (Johansen 1940). Terminology was adopted from Kynclova (1970) and Mukherjee (1991).

### OBSERVATION AND DISCUSSION

**Cypselar Morphology:** In *Ageratum houstonianum* and *Mikania micrantha* of the tribe Eupatorieae cypselas are homomorphic, straight, five-ribbed, oblong to oblanceolate. In *Mikania micrantha* surface glossy, ribs papillate, while in *Ageratum* twin hairs restricted at corners of cypselas. After clearing

surface shows many bordered pit like phytomelanin braces in several vertical rows (Table 1). Usually phytomelanin is thought to be of hypodermal origin (Vries 1948; Pullaiah 1981 and Pandey 1989) whereas Stuessy & Liu (1983) have suggested that phytomelanin is excreted from the underlying fiber zone or from both sides of deposition.

Carpopodium symmetric or asymmetric, diameter identical with the base of the cypselas. Haque & Godward (1984) have reported the presence of complete ring like carpodia in other species in Eupatorieae.

In *Mikania*, pappus bristle numerous, barbellate, persistent, connate at the base into a ring, whereas in *Ageratum* pappus represented by five unequal serrated scales. In *Cyanthillium cinereum* of Vernoniae, cypselas homomorphic, straight, oblong, round in transverse section; surface bears many twin hairs. Narayana (1979) reported three types of trichomes from 15 species of *Vernonia* in South India and designated 'twin' hair as "Achenial hair". Numerous glossy rounded vesicular bodies are found to be arranged in several vertical rows; carpodium symmetric, complete, ring like; pappus represented by numerous, free, persistent, barbellate bristles.

**Cypselar Anatomy:** (Table 2) In *Mikania* and *Ageratum* of Eupatorieae cypselas pentagonal with five prominent ribs in cross section. Pericarp differentiated into outer uniseriate epidermis, a continuous phytomelanin layer and sclerenchymatous zone. Sclerenchymatous zone is three to four seriate in *Mikania* but uniseriate in *Ageratum*. Testa is constituted by compressed parenchyma in *Mikania* but absent in *Ageratum*. Sclerenchymatous braces and vascular traces present at corners of each rib. Pericarp and testa are devoid of crystals as mentioned by Robinson & King (1977).

In *Cyanthillium cinereum* of Vernoniae, cypselas circular in cross section. Pericarp differentiated into outer uniseriate epidermis, middle uniseriate sclerenchymatous zone and inner uniseriate parenchymatous zone. Epicarpic cells are large. Testa is represented by collapsed parenchymatous cells. Endosperm uniseriate. Each cotyledon contains three resin ducts. Phytomelanin layer of pericarp is absent.

From this study it is obvious that cypselar features are diagnostic at least in some taxa. Their value as a taxonomic criterion will be greatly increased in combination with other lines of evidence. Such features may also yield a comprehensive picture for a thorough classification and characterization of taxa.

#### LITERATURE CITED

- Haque, M.Z. & Godward, M.B.E. 1984. New records of the carpodium in Compositae and its taxonomic use. *Bot. J. Linn. Soc.*, 89(4): 321 – 340.
- Johansen, D.A. 1940. *Plant Microtechnique*. Mc. Graw Hill. New York.
- Kynclova, M. 1970. Comparative morphology of achenes of the tribe Anthemideae Cass. (Asteraceae) and its taxonomic significance. *Preslia* 42: 33 – 35.
- Mukherjee, S.K. 1991. *Carpological studies in Compositae*. Ph.D. thesis, Kalyani University, India.
- Mukherjee, S.K. & Sarkar, A.K. 1994. Morpho-anatomical studies of cypselas in some members of the tribe Inuleae (Asteraceae) with the help of SEM. *J. Natl. Bot. Soc.* 48: 19 – 39.
- Narayana, B.M. 1979. Taxonomic value of trichomes in *Vernonia* Schreb. (Asteraceae). *Procd. Indian Acad. Sci., Plant Sci.* 88B(5): 347 – 357.

- Pandey, A.K. 1989. Phytomelanin- Heliantheae, Asteraceae. *Proc. 87<sup>th</sup> Ind. Sci. Cong. (Sect. Bot. Soc.)* 68: 5.
- Pullaiah, T. 1981. Studies in the embryology of Heliantheae (Compositae). *Pl. Syst. Evol.* 137: 203 – 214.
- Robinson, H. & King, R.M. 1977. Eupatorieae-systematic review. In: Heywood, V. H., Harborne, J.B. & Turner, B.L.(eds.), *The Biology and Chemistry of the Compositae*, vol.1: pp. 437-485. Academic Press, London.
- Sahu, T.R. 1984. Taxonomic implications of complements to *Vernonia* (Compositae) in India. *Feddes Repert.* 95(4): 237 – 240.
- Schultz Bipontinus, C. H. 1844 . “ Ueber die Tanacetee “. Neustadt an der Hddrtd .
- Stuessy, T.F. & Liu, H. 1983. Anatomy of pericarp of *Clibadium*, *Desmanthodium* and *Ichthyothera* (Compositae, Heliantheae) and systematic implications. *Rhodora* 85: 213 – 277.
- Vries, M.A. de 1948. *Oder dvorning van phytomelan bij Tagetes patula L. en enige andere Composieten.* H. Buurman, Leiden.