

Morphological and Anatomical Study of Cypsela in Astereae of the Family Compositae

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The detailed morphological and anatomical features of mature cypsela of *Erigeron annuus* was studied with the help of light microscopes. Special emphasises given to the surface configuration, structure of surface hairs, stylopodium, carpododium and pappus bristles of cypselas. The epicarpic cells of pericarp and the endosperm cells are not taxonomically significant. Structure and distribution of calcium oxalate crystals are specially valuable.

Keywords: Cypsela; Astereae; Compositae**Introduction**

The circumscription of the tribe Astereae has been slightly changed since the work of Bentham [1] and Hoffmann [2]. According to Nesom [3] Astereae comprise 14 subtribes, 189 genera and 320 species. He further considered that this tribe is morphologically the most conservative of the Tribes of Asteraceae. Grau [4] had also noted the distinctive external and internal characters of anthers, pollen grains, style and cypsela of Asterae; emphasis was given to the epidermis of testa of cypsela and the cell thickenings.

The tribe Astereae (sub-family Asteroideae) is firmly established as a monophyletic group [5].

Regarding the anatomical structure of cypsela, Bremer [5] stated that "Testa structures are potentially interesting and although Grau [6] described several types from the Mutisieae, we need further information from other tribes to make much use of the data".

A careful survey shows that the works on structure of cypsela of Astereae [3-5] are rather limited. Velez [7] has provided a detailed investigation of morphology of cypsela of the American genera of Astereae. Pandey, *et al.* [8] have elucidated the anatomy of cypsela of some Indian Astereae. According to Roth [9] "Not only is the external morphology of the achenium very characteristic, but also its sinner structures shows certain qualities which can be used taxonomically. The present study is aimed to supplement the previous works.

Materials and Methods

Dried mature cypselas were procured. Dry cypselas from each species were boiled in water to which few drops of any one compounds i.e. glycerol, tepol sodium-hypochlorite solution has been added, depending on the natures of pericarp. After that opened cypselas were stored in FAA. For each species atleast two mature cypselas were critically studied and all sections were taken usually from middle part of cypselas. FAA preserved cypselas were cleaned in 5-10% KOH solution and stained in a solution of 0.5% aqueous

safranin, for the proper identification of vascular bundles in the pericarp. For anatomical study, dry and FAA preserved cypselas were sectioned and were stained in safranin-fast green combination.

Specimens*Erigeron annuus* Pers. KAL- 1291**Observations****Cypselar morphology*****Erigeron annuus* Pers**

Cypselas homomorphic; 1.5 - 2.5 mm x 0.5 mm; dorsiventrally compressed with lateral ridges; bright yellowish brown; oblong - obovate; sparsely pubescent; hairs " twin " having nearly equal addressed arms; pappus of 10 - 12 uniseriate, unbranched, simple barbellate, white, glossy capillary, persistent bristles or hairs; carpododium with concave base, straight and ring like.

Figure 1: *Erigeron annuus* Pers. 1a: Cypsela (pappus detached); 1b: Cypsela with pappus; 1c: A small part of carpododial surface; 1d: Mid- part and apical part of pappus bristle; 1e: Cypselar hair; 1f: Cypselar t.s. (diagrammatic).

Cypselar Anatomy

Erigeron annuus Pers

Transection of cypsela reveals the shape of double convex lens; cotyledons plano-convex in outline; Pericarp uniseriate, parenchymatous with 2 lateral almost semi-circular sclerenchyma braces; parenchymatous layer consists of thick-walled rectangular cells with sparsely arranged 2-celled small hairs; sclerenchymatous cells of the braces heterocellular, polygonal and thick-walled. Testa is represented by uniseriate parenchyma with tangentially elongated rectangular cells. Endosperm uniseriate.

Figure 2: *Erigeron annuus Pers*. 2a: Cypselar t.s. (diagrammatic); 2b and 2c: Parts of cypselar t.s.

Results and Discussion

The circumscription of the tribe has been unchanged since the days of Bentham [1] and Hoffman [2]. Four characters mainly typify the tribe: (1) Style character; (2) Another character; (3) The pollen and (4) The anatomy of the fruit. Testa is typical and its epidermis seems to be constituted by a single layer of cells which are thickened on three sides (i.e. U-cells). Latest work on subtribal delimitations are highly artificial and much additional study is needed.

Cypselas are often pubescent with basically two types of hairs - typical twin hairs and hairs with few many-celled glands.

The usual pappus consists of several rows of shortly toothed bristles. It may exist as plumose bristles, short scales or reduced to a cartilaginous crown or absent.

The pappus has been used for subtribal recognition. Presence or absence of the pappus serves to distinguish the two subtribes Asterinae and Bellidinae but still the pappus character as the basis of delimitation of subtribes are confusing in some cases and need further and more investigation.

Studies on the cypselar morphology of this tribe is restricted to genera *Erigeron*. On the basis of cypselar morphology of the species and genera can be grouped mainly into two categories (1) Dorsiventrally compressed, homomorphic cypselas with pappus of simple, short, barbed, fine capillary bristles with pointed tips e.g. species of *Erigeron* studied; (2) Dorsiventrally compressed, homomorphic cypselas without pappus and with lateral protuberances.

In the first category e.g. *Erigeron*, the cypselar structure is more or less same, Cypselas are dorsiventrally compressed with lateral protuberances. Twin hairs are present on the cypselar surface and the carpodium is differentiated. In *Erigeron annuus*, the carpodial cells are rectangular.

The pappus bristles are fine, numerous, mostly basally connate and barbed. Number of cells of each bristle is two. Short herbs and apical cells of each bristle of *Erigeron* are pointed.

Cypselar morphology of *Erigeron* is practically same and no differentiating characters are noticed. So grouping of these genera in separate subtribes cannot be supported and it is clear that there is a transition from *Erigeron* to *Conyza* as suggested by Hoffman [2,10,11].

Conclusion

Based on the above observations, it can be concluded that the members of the tribe Heliantheae are with diverse macro as well as micromorphological features of cypselas. These characters are a mixture of both primitive and advanced features. However, their value as taxonomic criteria will be greatly increased in combination with other lines of evidence.

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