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MICROMORPHOLOGY OF CYPSELA IN THE TRIBE PLUCHEEAE FROM PAKISTAN

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Abstract

Micromorphological characters of 4 genera (*Doellia* Sch.-Bip., *Laggera* Sch.-Bip. ex C. Koch, *Pluchea* Cass. *and Pseudoconyza* Cuatrec.) and 7 specific and infra specific taxa in the tribe Plucheeae were examined from Pakistan by light and scanning electron microscopes. Cypsela characters support the taxonomic decisions, as all the taxa are clearly segregated on the basis of their distinguishable characters except that of the two subspecies of *Pluchea arguta*.

Introduction

Tribe Plucheeae of the family Asteraceae is represented in Pakistan by 5 genera (*Laggera* Sch.-Bip. ex C. Koch, *Pseudoconyza* Cuatrec., *Blumeopsis* Gagnep., *Doellia* Sch.-Bip. and *Pluchea* Cass.) and 9 specific and infraspecific taxa (Qaiser & Abid, 2003).

The use of cypsela micromorphological characters has played an important role in the taxonomy for the various groups of the family Asteraceae such as Dittrich (1968) studied cypsela morphology of the subtribe Cardueae-Centaureinae and emphasized the importance of hilum shape and indumentum. Kynclova (1970) examined 15 species of various genera of the tribe Anthemideae and found that appearance, number and position of ribs and length of cypselas were diagnostic character for generic delimitation. In relation to cypsela morphology attention has also been paid to the structure of abscission zone (Carapopodium) (Haque & Godward, 1984). Mateu & Guemes (1993) distinguished the European species of *Launaea* Cass., on the basis of cypsela morphology. Abid & Qaiser (2002) studied the cypsela morphology of *Inula* L. (s.str.) and its allied genera and concluded that these micromorphological characters support the taxonomic decisions. Similarly, Ritter & Miotlo (2006) studied the fruit surfaces in the genus *Mikania* Willd., and the species were separated into four groups according to surface pattern. Considerable attention has been given to cypsela characters in the family Asteraceae except that of the tribe Plucheeae. Cypsela characters in this tribe have not received due attention (Anderberg, 1991; Qaiser & Abid, 2003). Studies were therefore carried out to assess the cypsela morphological characters in order to strengthen the recognition of taxa belonging to the tribe Plucheeae from Pakistan.

Materials and Methods

Seven taxa of 4 genera viz. *Doellia* Sch.-Bip., *Laggera* Sch.-Bip. ex C.Koch, *Pluchea* Cass. and *Pseudoconyza* Cuatrec., belonging to the tribe Plucheeae were examined for cypsela morphological characters under stereo (Nikon XN Model)/compound (Nikon type 102) and scanning electron microscopes (Joel JSM-6380 LV). For scanning microscopic studies, mature cypselas were mounted on a metallic stub with the help of double adhesive tape and coated with gold for a period of 6 minutes in sputtering chamber and observed under SEM.

The following characters were studied under light microscope

Cypsela: 1. Shape, 2. Colour, 3. Size, 4. Surface, 5. Number of ribs.

Pappus: 1. Series, 2. Number, 3. Colour, 4. Size.

Carpopodium: Shape and position of carpopodium were studied by SEM. For diameter of carpopodium and its foramen, carpopodium was detached and measurements were recorded in μm under compound microscope.

Observations

General characters of Plucheeae: Cypsela oblong, ellipsoid or oblong-ellipsoid, 0.5-1.5 x 0.25-0.5 mm, colour varies from yellowish to brown or reddish brown, ribbed or non-ribbed, glabrous or sparsely pubescent, with or without red resin ducts. Pappus uniseriate, bristly, white, dirty white, cream or pale in colour, bristle 6-24 in number, 3-7 mm long.Carpopodium angular or circular, broad disc like without any interruption,basal-subbasal in position,142-164μm in diameter. Foramen of carpopodium 43-78μm in diameter.

Key to the genera

1. \+ Cypsela obscurely ribbed or unribbed ...……...…….. 2
   – Cypsela with prominent ribs ……...……. *Pluchea*

2. \+ Cypsela oblong, somewhat angular, 0.5-0.75mm long with longitudinal red resin ducts. Pappus bristles 3-3.5mm long, dirty white ...…….…… *Doellia*
   – Cypsela oblong-ellipsoid or ellipsoid, non-angular, 1.0mm long without longitudinal red resin ducts. Pappus bristles 4-7mm long, white-pale ...…… 3

3. \+ Cypsela ellipsoid, pappus bristles 4-5mm long. Corpopodium 164μm. Foramen of carpopodium 52μm in diameter ……...…….. *Pseudoconyza*
   – Cypsela oblong-ellipsoid. Pappus bristles 6-7mm long. Carpopodium 149μm in diameter. Foramen of carpopodium c. 43μm in diameter ...…… *Laggera*

Doellia Sch. Bip.

It is represented by a single species i.e., *D. bovei* (DC.) Anderberg

Cypsela oblong, somewhat angular, 0.5-0.75 x 0.5 mm, brown, non-ribbed, sparsely pubescent, with red resin ducts.Pappus uniseriate, bristly, dirty white, bristle 8-12 in number, 3-3.5 mm long. Carpopodium broad disc like circle without any interruption, basal-subbasal in position, 156μm in diameter. Foramen of carpopodium 55μm in diameter (Table 1; Fig. 1A, B).

Laggera Sch.-Bip.ex C.Koch

It is represented by a single species viz., *L. alata* (D. Don) Oliver

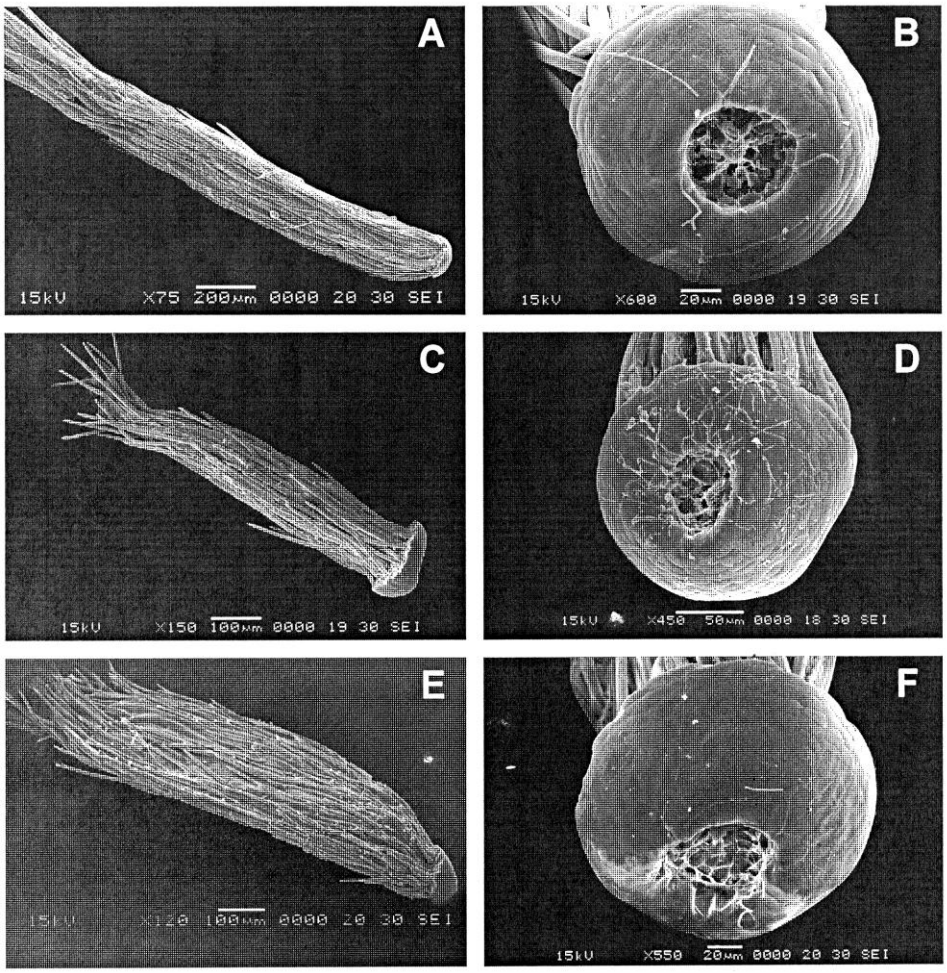

Fig. 1. Scanning Electron micrographs. *Doellia bovei*: A, cypsela, B, carpopodium; *Laggera alata*: C, cypsela, D, carpopodium; *Pseudoconyza viscosa*: E, cypsela, F, carpopodium.

Cypsela oblong-ellipsoid, non-angular, 1.0 x 0.5 mm, brown, non-ribbed, sparsely pubescent, without red resin ducts. Pappus uniseriate, bristly, pale white, bristle 10-14 in number, 6-7 mm long. Carpopodium broad disc like circle without any interruption, basal-subbasal in position, 149µm in diameter. Foramen of carpopodium c.43µm in diameter (Table 1; Fig. 1C, D).

Pluchea Cass.

It is represented by 4 specific and infra specific taxa viz., *Pluchea arguta* Boiss. subsp. *arguta*, *P .arguta* Boiss. subsp. *glabra* Qaiser, *P. lanceolata* (DC.) C.B. Clarke and *P. wallichiana* DC.

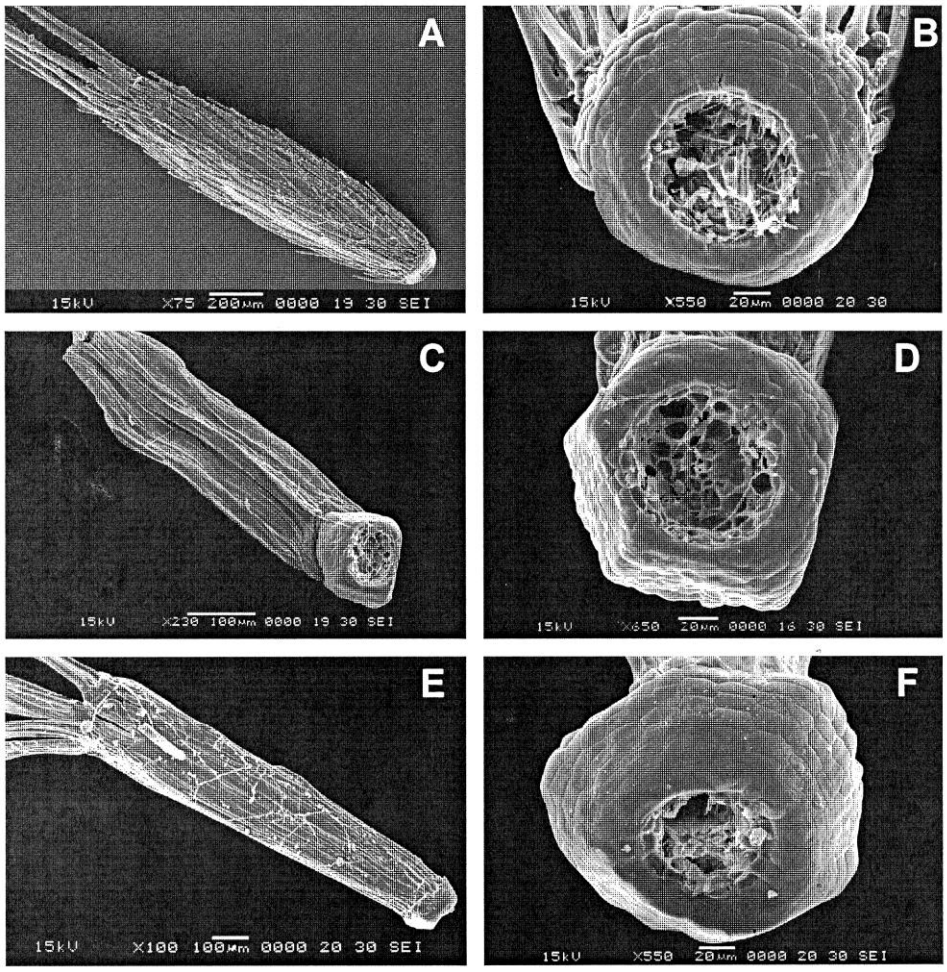

Fig. 2. Scanning Electron micrographs. *Pluchea arguta* Boiss. subsp. *arguta*: A, cypsela, B, carpopodium; *P. lanceolata*: C, cypsela, D, carpopodium; *P. wallichiana*: E, cypsela, F, carpopodium.

Cypsela oblong or ellipsoid, angular or non-angular, 0.75-1.5 x 0.25-0.5 mm, yellow-brown, 6-8 ribbed, glabrous or sparsely pubescent, without red resin ducts. Pappus uniseriate, bristly, white-cream or yellowish, bristle 6-24 in number, 4-6 mm long. Carpopodium broad disc like angular or circular without any interruption, basal-subbasal in position, 142-164µm in diameter. Foramen of carpopodium 63-78µm in diameter (Table 1; Fig. 2A-F).

Pseudoconyza Cuatrec.

It is also represented by a single species viz., *P. viscosa* (Mill.) D' Arcy.

Cypsela ellipsoid, non-angular, 1.0x0.5mm, reddish brown, obscurely ribbed, sparsely pubescent, without red resin ducts. Pappus uniseriate, bristly, white, bristle 10-12 in number, 4-5 mm long. Carpopodium broad disc like circle without any interruption, basal-subbasal in position, 164μm in diameter. Foramen of carpopodium 52μm in diameter (Table 1; Fig. 1E, F).

Key to the species of *Pluchea*

1. + Cypsela angular, glabrous.Pappus bristles 14-24 in number …….. 2
   – Cypsela non angular, hairy. Pappus bristles 6-8 in number …….. …….. *P. arguta* subsp. *arguta* & subsp. *glabra*

2. + Pappus bristles 14-18 in number.Foramen of carpopodium 63μm in diameter …… …… *P. wallichiana*
   − Pappus bristles 20-24 in number. Foramen of carpopodium 76μm in diameter ..… …….. *P. lanceolata*

Results and Discussion

Asteraceae is a natural family and there are a number of binding characters. The morphology of cypsela is no way different from the rest of the family and it does not support the delimitation at tribal level. Most of the tribes have overlapping cypsela characters except that of the tribes Heliantheae and Eupatorieae which are distinguished from the rest of the tribes due to the presence of black (carbonized) cypselas (Bremer, 1994; Qaiser & Abid, 2003). Although in the tribe Plucheeae cypsela features are not characterstic but found useful to support the recognition of 4 genera and 6 species from Pakistan. Very little information on cypsela morphology in this tribe is available (Anderberg, 1991; Qaiser & Abid, 2003) and to some extent their finding are also in accordance to the present findings where the genus *Pluchea* Cass., can easily be distinguished by the presence of prominent ribs on cypsela while in rest of the genera either the ribs are totally absent or inconspicuous. *Doellia* Sch.-Bip., is delimited from *Pseudoconyza* Cuatrec., and *Laggera* Sch. Bip. ex C. Koch, due to red resin ducts on somewhat angular and oblong cypsela. *Pseudoconyza* is separated from *Laggera* by the presence of ellipsoid cypsela and 4-5mm long pappus bristles, while in *Laggera*, cypsela is oblong-ellipsoid and bristles are 6-7mm in length. Likewise, the species of *Pluchea* are also separated from each other, such as *P. arguta* Boiss., is delimited from the rest of the species due to the presence of hairy and non angular cypsela with 6-8 pappus bristles. While in *P. lanceolata* (DC.) C.B. Clarke and *P. wallichiana* DC., cypselas are angular and glabrous, pappus bristle varies from 14-24 in number. Further more, both the species can also be delimited as in *P. wallichiana* pappus bristles are 14-18 in number and foramen of carpopodium is 63μm in diameter. While, in *P. lanceolata*, pappus bristles are 20-24 in number and foramen of carpopodium is 76 μm in diameter. It is also noteworthy that both the subspecies of *P. arguta* Boiss., i.e. *P. arguta* Boiss., subspecies *arguta* and subspecies *glabra* Qaiser, can not be separated micromorphologically as they share all the similar characters of cypsela. It is evident that the micromorphological characters of cypsela have proved to be very rewarding not for only generic delimitation but also for specific

delimitation.

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