

MORPHOLOGICAL STUDIES ON TRICHOME OF FAMILY ASTERACEAE

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ABSTRACT

Trichome morphology on the leaves of the 17 plant species belonging to family Asteraceae was investigated by light and scanning electron microscopy. Our data revealed that both eglandular and glandular trichomes were present in the taxa. Out of 17 species, 6 species showed glandular trichomes viz. *Pluchea arguta*, *Pluchea lanceolata*, *Pulicaria angustifolia*, *Tridax procumbens*, *Vernonia cinerascens* and *Pulicaria carnososa*; while 11 species showed eglandular trichomes viz. *Blainvillea latifolia*, *Blumea obliqua*, *Conyza bonariensis*, *Conyza canadensis*, *Dicoma schimperi*, *Dicoma tomentosa*, *Eclipta prostrata*, *Echinops echinatus*, *Erigeron Canadensis*, *Lactuca remotiflora* and *Vernonia cinerea*. Mostly trichomes were multicellular. The trichomes were usually conical in shape with pointed tips and distinct trichome bases. In few species trichomes base was indistinct. Cylindrical shape trichomes were also observed.

Key-words: Trichome, Asteraceae, eglandular trichomes, glandular trichomes,

INTRODUCTION

Asteraceae, the largest family of angiosperms, comprises of more or less 1535 genera and c. 23000 species distributed in 3 subfamilies and 17 tribes. The number of genera is rather increasing as more than 10 genera are described each year. It is also the largest plant family in Pakistan, represented by over 650 species distributed in 15 tribes (Rahman, 2009; Youngsheng and Anderberg, 2011). The members of the family are largely herbaceous, sometimes shrubs and a few are trees.

The term trichomes are applied to epidermal outgrowth of diverse forms, structures and functions (Esau, 1965). Trichomes can be formed on any part of the plant including stem, leaves, seeds etc. (Cutter, 1978). The abundance of particular trichome type may aid in taxonomic studies of genera, species and plant families (Metcalf and Chalk, 1950; Carpenter, 1999; Callow, 2000; Krak and Mraz, 2008; Hayat *et al.*, 2009). The hairs may consist, like root hairs, of only one cell or by the formation of dividing walls, they may come to be many celled. Unicellular or multicellular hairs may be branched or unbranched. The multicellular hairs may consist of one row of cells or many rows (Khan *et al.*, 2013).

Unicellular and multicellular hairs may be capable of secretion. Trichomes release some special chemical compounds for specialized functions. These trichomes are called secretory trichomes or glandular trichomes. Glandular trichomes are considered as important source of essential oils, which are pleasant smelling products that might have various important functions including compounds of biomedical importance. In plants these secretions perform various vital activities like protection from pathogenic organisms and grazing (Glas *et al.*, 2012). The most common glandular hairs are multicellular a number of cells forming a stalk and a head. The trichomes that do not secrete any kind of chemical are called eglandular trichomes (Wagner *et al.*, 2004). The object of the present study is to identify trichome diversity in Asteraceae with the help of simple and scanning electron microscope.

MATERIALS AND METHODS

Fresh plant material was obtained from the field or collected from the Karachi University and dried preserved plant material was obtained from Karachi University Herbarium (KUH), Center for Plant Conservation.

For study purpose peel-off method was used. In this method, the tape has been placed over the surface of leaf and after a while it is peeled off and pasted it on the glass slide. Then the slides were studied under the light microscope using different magnification.

For scanning microscopic studies material was mounted on metallic stubs, using double sided cellotape and coated with gold in sputtering chambers. The coating was restricted to 15 Å. The SEM examination was carried out on Jeol (JSM-6380LV) scanning electron microscope.

RESULTS

In total 17 plant species were selected for trichome morphology viz. *Blainvillea latifolia*, *Blumea obliqua*, *Conyza bonariensis*, *Conyza Canadensis*, *Dicoma schimperi*, *Dicoma tomentosa*, *Eclipta prostrata*, *Echinops*

echinatus, *Erigeron Canadensis*, *Lactuca remotiflora*, *Pluchea arguta*, *Pluchea lanceolata*, *Pulicaria angustifolia*, *Pulicaria carnososa*, *Tridax procumbens*, *Vernonia cinerea*, and *Vernonia cinerascens* (Table 1) belonging to tribes Heliantheae, Astereae, Mutisieae, Lactuceae, Plucheeae, Inuleae, Vernoniaeae and Cardueae.

Table 1. Morphology of Trichomes in various species of Asteraceae.

Name of Species	Vesture type	Gland type	Type of Trichome	Trichome Base
<i>Blainvillea latifolia</i>	Hirsute	Eglandular	Multicellular	Bulbous
<i>Blumea obliqua</i>	Puberulous	Eglandular	Multicellular	Bulbous
<i>Conyza bonariensis</i>	Strigose	Eglandular	Multicellular	Bulbous
<i>Conyza canadensis</i>	Long hairs	Eglandular	Multicellular	Flat
<i>Dicoma tomentosa</i>	Woolly	Eglandular	Multicellular	Indistinct
<i>Eclipta prostrata</i>	Strigose	Eglandular	Multicellular	Rounded and curly
<i>Echinops echinatus</i>	White tomentose	Eglandular	Multicellular	Rounded
<i>Erigeron canadensis</i>	Hirsute	Eglandular	Multicellular	Flat
<i>Dicoma schimperi</i>	Villous	Eglandular	Multicellular	Indistinct
<i>Lactuca remotiflora</i>	Simple	Eglandular	Unicellular	Flat
<i>Pluchea arguta</i>	Puberulous	Glandular	Multicellular	Rounded
<i>Pluchea lanceolata</i>	White pubescent	Glandular	Multicellular	Flat
<i>Pulicaria angustifolia</i>	Glaucous-pubescent.	Glandular	Multicellular	Swollen
<i>Pulicaria carnososa</i>	Simple	Glandular	Multicellular	Swollen
<i>Tridax procumbens</i>	Hirsute	Glandular	Multicellular	Swollen
<i>Vernonia cinerea</i>	Less hairy	Eglandular	Multicellular	Flat
<i>Vernonia cinerascens</i>	White tomentose	Glandular	Multicellular	Flat

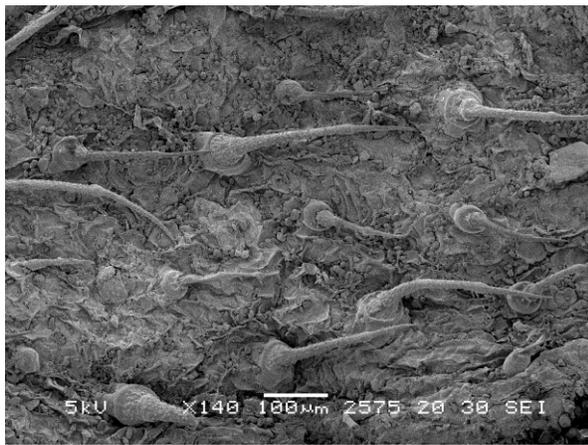
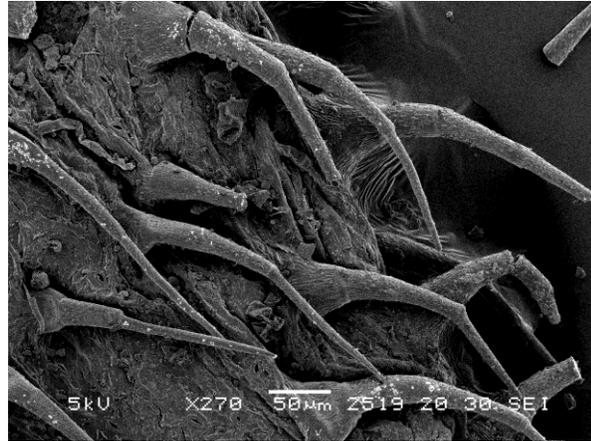
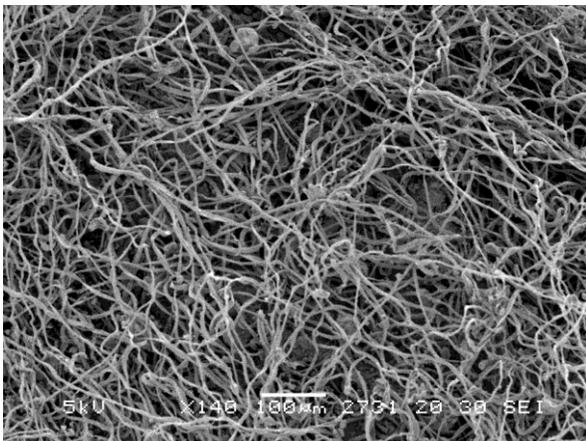
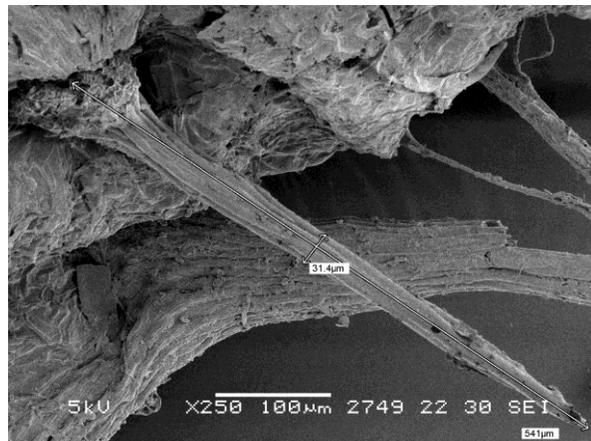
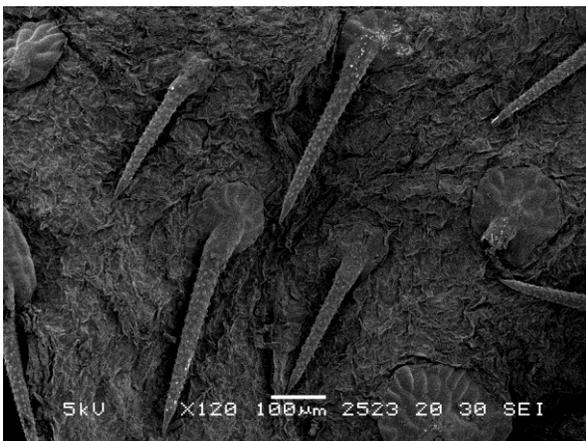
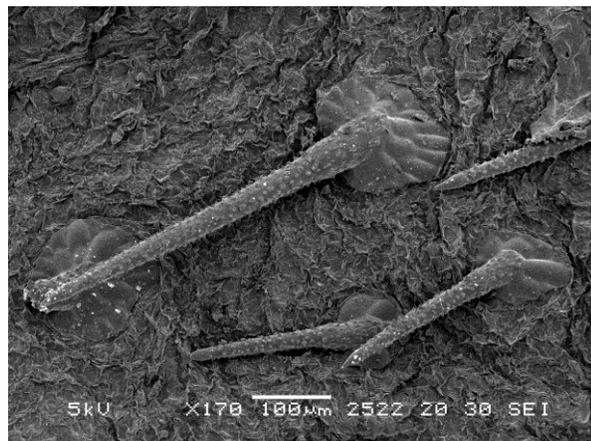


Fig. 1. Trichome of *Blainvillea latifolia*.



Fig. 2. Trichome of *Blumea obliqua*.

Fig. 3. Trichome of *Conyza bonariensis*.Fig. 4. Trichome of *Conyza bonariensis*.Fig. 5. Trichome of *Dicoma tomentosa*.Fig. 6. Trichome of *Echinops echinatus*.Fig. 7. Trichome of *Eclipta prostrate*.Fig. 8. Trichome of *Eclipta prostrate*.

Generally the trichomes of studied species of family Asteraceae were multicellular, glandular and eglandular. Trichomes were straight or curved. Unicellular trichomes were also found in some species. Base of trichomes were mostly swollen, rounded, flat and indistinct and blunt tip was also observed.

***Blainvillea latifolia* (L.f.) DC.**

The trichomes were eglandular, multicellular, having pointed and acute tip with bulbous base (Fig.1).

***Blumea obliqua* (L.) Druce.**

These trichomes were eglandular, multicellular, having blunt tip with swollen base (Fig. 2).

***Conyza bonariensis* (L.) Cronq.**

These trichomes were eglandular, multicellular, having blunt tip with swollen base (Fig. 3, 4).

***Conyza canadensis* (L.)**

These trichomes were eglandular, multicellular, having pointed tip with flat base.

***Dicoma tomentosa* Cass.**

These trichomes were eglandular and multicellular with dense woolly appearance and indistinct tip and base (Fig. 5).

***Echinops echinatus* DC.**

These trichomes were eglandular, multicellular, having rounded tip and base (Fig. 6).

***Eclipta prostrata* (L.) L.**

These trichomes were eglandular, multicellular, having pointed tip with rounded curly base (Fig. 7, 8).

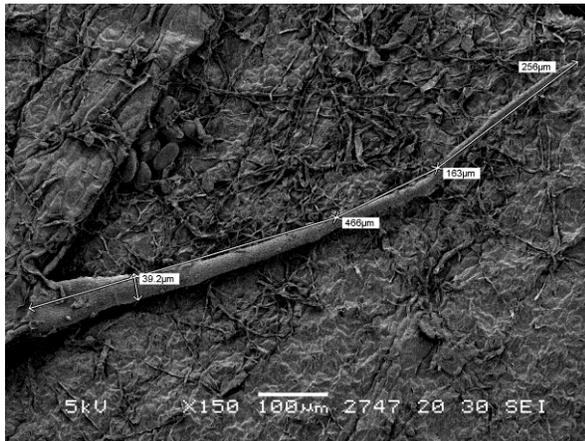


Fig. 9. Trichome of *Erigeron Canadensis*.

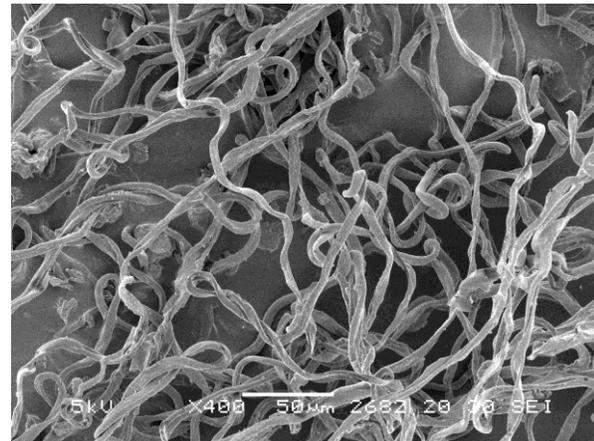


Fig.10 . Trichome of *Dicoma schimperi*.

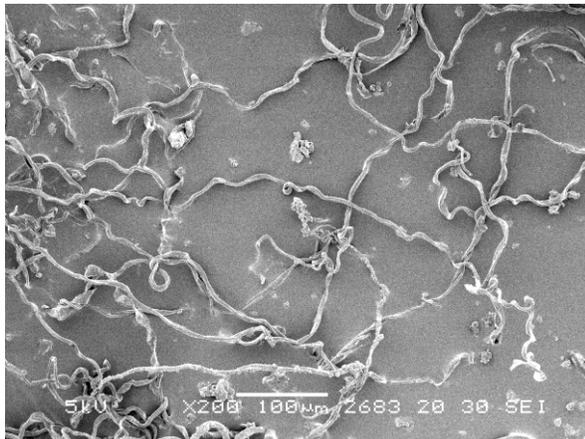


Fig. 11. Trichome of *Dicoma schimperi*.

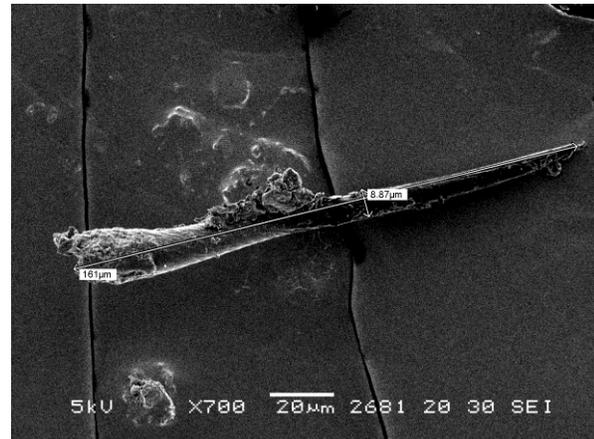


Fig. 12. Trichome of *Lactuca remotiflora*.

***Erigeron Canadensis* L.**

These trichomes were eglandular, multicellular, having rounded tip and base (Fig. 9).

***Dicoma schimperi* DC.**

These trichomes were eglandular, multicellular, woolly with indistinct tip and flat base (Fig. 10, 11).

***Lactuca remotiflora* DC.**

The trichomes were glandular, unicellular, having pointed tip and flat base (Fig. 12).

***Pluchea arguta* Boiss.**

The trichomes were glandular, multicellular, having globular or rounded tip and rounded base.

***Pluchea lanceolata* (DC.) Oliver & Hiern.**

The trichomes were glandular, multicellular, having globular or rounded tip and flat base.

***Pulicaria angustifolia* DC.**

The trichomes were glandular, multicellular, having globular or rounded tip and rounded base.

***Pulicaria carnosa* Boiss.**

The trichomes were glandular, multicellular, having globular or rounded tip and swollen.

***Tridax procumbens* L.**

These trichomes were glandular, multicellular, having swollen base.

***Vernonia cinerea* L.**

These trichomes were eglandular, multicellular, having pointed tip and flat base.

***Vernonia cinerascens* Sch. Bip.**

These trichomes were eglandular, multicellular, having blunt tip and rounded base.

DISCUSSION

In the present study trichome morphology of 17 plant species belonging to family Asteraceae were studied. Most of the plants having hairs on the outer surface termed trichomes, which is of greater importance. They differ in structure and vary from species to species. These characteristics can be used to classify the species. The role of trichomes is to avert animals from grazing, guide the path of pollinators or the rate of photosynthesis may be affected by the increased reflection which causes water loss and vary leaf temperature (Wagner, 1991).

Out of 17 species 6 species showed glandular trichome while 11 species had eglandular trichomes. More specialized trichomes i.e. glandular trichome whose main function may be to produce pest or pollinator-interactive chemicals which are deposited at the plant surface. The role of glandular secreting trichomes is to produce secretion that forms a continuous layer on the plant surface. This layer may increase light reflectance and thereby reduce leaf temperature (Dell and McComb, 1978). In the studied taxa *Lactuca remotiflora*, *Pluchea arguta*, *Pluchea lanceolata*, *Pulicaria angustifolia*, and *Pulicaria carnosa*, *Tridax procumbens* showed glandular trichomes. The mentioned species were also aromatic. Glandular trichomes had received considerable attention because of the capacity to synthesize, store and secrete secondary metabolites that help to protect plants against insect predation and other biotic challenges (Wagner, 1991; Ranger and Hower, 2001; Wagner *et al.*, 2004). On the other hand *Blainvillea latifolia*, *Blumea obliqua*, *Conyza bonariensis*, *Conyza canadensis*, *Dicoma schimperi*, *Dicoma tomentosa*, *Eclipta prostrata*, *Echinops echinatus*, *Erigeron Canadensis*, *Vernonia cinerea*, and *Vernonia cinerascens* had eglandular trichomes.

The multicellular trichomes were found in *Blainvillea latifolia*, *Eclipta prostrata*, *Tridax procumbens*, *Conyza bonariensis*, *Conyza Canadensis*, *Dicoma tomentosa*, *Dicoma schimperi*, *Lactuca remotiflora*, *Pluchea arguta*, *Pluchea lanceolata*, *Blumea obliqua*, *Pulicaria carnosa*, *Vernonia cinerea*, *Vernonia cinerascens* and *Echinops echinatus*. On the other hand, unicellular trichomes were observed in *Lactuca remotiflora*.

Microscopic observations show that the trichomes of *Conyza* are multicellular long hair like and unbranched (Shabeena *et al.*, 2014) and according to present study, the plant showed multicellular, long and strigose trichome.

Adedeji and Jewoola (2008) reported glandular and non-glandular trichomes in *Vernonia cinerea*. The researchers observed T-shaped trichomes. As in comparison to present work, the trichomes of *Vernonia cinerea* were also eglandular and multicellular. They also reported glandular and non-glandular trichomes in *Tridax procumbens* having capitate often with bicellular stalk and unicellular head. From our data, *Tridax procumbens* showed eglandular with swollen base.

In the presented data various types of trichomes have been reported showing significant morphological differences in structures. Study of trichome morphology would also aid in the identification of various taxa belonging to same family.

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