



Foliar Trichomes in some Species of Convolvulaceae

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ABSTRACT

The paper deals with form, structure and distribution of foliar trichomes in 11 species belonging to 6 genera of the Convolvulaceae. They are generally distributed on both foliar surface in intercostal and on and/or along the midveins and veinlets. They are unicellular or multicellular and belong to six small categories viz., unicellular cylindrical, unicellular conical, unicellular filiform, two-armed and unicellular three-armed, multicellular peltate scales. All are eglandular. Trichome stomata relationship and frequency are also given. The paper also sheds light on trichome types in the allied families of the Convolvulaceae and discusses their taxonomic significance in the alliance.

KEYWORDS : Foliar, Trichomes, Convolvulaceae.

MATERIALS AND METHODS:

The fresh, preserved and herbarium materials were used. In case of herbarium materials, the leaves were boiled in water for about 5 to 10 minutes. The chemical method was followed for separation of peels. Diluted nitric acid and chromic acid (5 to 10 %) were used in different proportions. Epidermal peels were stained in safranin (1%). In case of exceptionally hairy leaves, the hairs were removed prior to separation of epidermal peels by covering the leaf surface with 'Stick Fast' (Enelbee Company, Jogeshwar, Mumbai) and gently peeling off the gum when dried. In some cases, the process was repeated for 2 to 3 times (Ahmad, 1962). In some cases Fevicol (Pidillite Industries, Mumbai) was gently applied on the leaf surface and allowed to dry for 2 to 3 minutes and gently peeled off the Fevicol film (Nayeem and Dalvi 1989.)

The line and cellular sketches were drawn using a prism type camera lucida. Stomata and trichome relationship are decided after Rajagopal and Pochaiah (1983). The terms for trichomes are those of Ramayya (1962, 1972).

INTRODUCTION:

The family Convolvulaceae consists of about 50 genera 1200 species (Lawrence, 1951) and is widely distributed in tropical and temperate regions of the world. A literature survey suggests that studies on foliar trichomes are relatively few and far between. The present study is aimed at presenting form, structure and distribution of foliar appendages in detail in the taxa investigated.

OBSERVATIONS:

1) *Argyria onilahiensis* Deroin. : Leaf adaxial and abaxial (Fig.1)

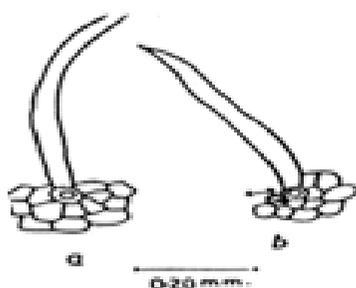


Fig 1

Unicellular cylindrical trichome :

Trichomes non-glandular, unicellular; distributed more on laminar region, few on mid-vein and veinlet. Foot one celled, broad, thick and wide. Body one celled, straight, longer, apex pointed, lateral walls thin.

2) *Argyria nervosa* (Burm.f.)Boj. : Leaf adaxial and abaxial (Fig.2)

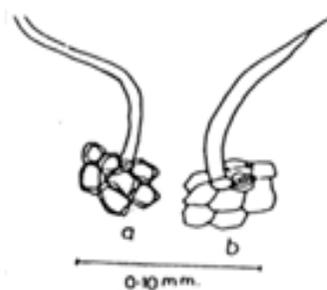


Fig.2

Unicellular simple filiform trichome :

Trichomes non-glandular; unicellular, simple filiform; distributed mostly on laminar region, on abaxial more in number. Foot one celled, rounded, thick. Body one celled, very long, tapering at the apex, apex pointed, lateral walls thick.

3) *Argyria sericea* Dalz. : Leaf adaxial and abaxial (Fig.3)

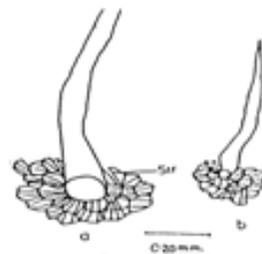


Fig.3

Unicellular cylindrical trichome :

Trichomes non-glandular, distributed more on laminar region, on abaxial more in number, few on mid-vein and veinlets. Foot one celled, big rounded, somewhat oval, very thick, uneven in size. Body one celled, near the foot cell broader, tapering towards the apex, apex pointed, lateral walls thin.

4) *Argyreia splendens* (Roxb.) Sweet. : Leaf adaxial and abaxial (Fig.4)

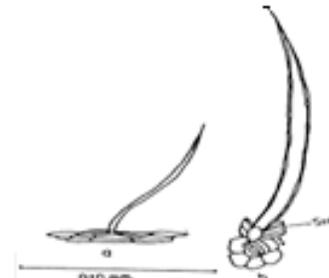


Fig.4

Unicellular simple filiform trichome :

Trichomes non-glandular, unicellular, simple filiform; distributed on and around mid-vein and veinlets on adaxial surface, all over the surface, large in number on abaxial surface. Foot one celled, thick, wide. Body one celled, long, cylindrical, narrow towards the apex, apex acute, lateral walls thick.

5) *Calystegia affinis* Endl. : Leaf adaxial and abaxial (Fig.5)

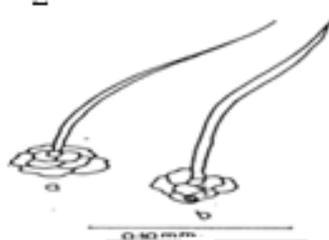


Fig.5

Unicellular simple filiform trichome :

Trichomes non-glandular, unicellular, simple filiform; distributed mostly on mid-vein adaxially, all over the surface abaxially. Foot one celled, rounded, thick. Body one celled, long, tapering at the apex, apex pointed, lateral walls thick.

6) *Cressa cretica* L. : Leaf adaxial and abaxial (Fig.6)

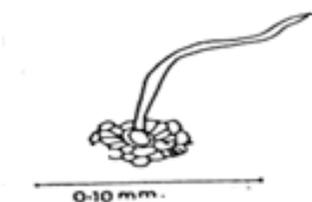


Fig.6

Unicellular simple filiform trichome :

Trichomes non-glandular, unicellular, simple filiform; distributed all over the surface. Foot one celled, narrow. Body one celled, long, narrow at apex, apex pointed, lateral walls thick.

7) *Evolvulus alsinoides* L. : Leaf adaxial and abaxial (Fig.7 a to c)



Fig.7a

Unicellular cylindrical trichome :

Trichomes non-glandular, unicellular, cylindrical; distributed mostly on laminar region, mid-vein and veinlets. Foot one celled, wide, thick. Body one celled, gradually attenuating towards the apex, apex pointed, lateral walls thick. (Fig. a).

Leaf-abaxial :

Two types of trichomes observed.

i) Unicellular cylindrical trichome:

Trichomes non-glandular, unicellular, cylindrical; distributed on laminar region, mid-vein and veinlets. Foot one celled, rounded, thick. Body one celled, gradually tapering at apex, apex pointed, lateral walls thick. (Fig. b).

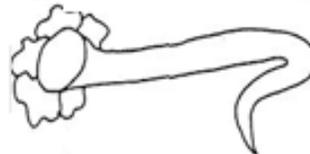


Fig.7b

ii) Unicellular two-armed trichome:

Trichomes non-glandular, unicellular, two-armed; distributed mostly on lamina, rarely on mid-vein and veinlets. Foot one celled, wide, broad. Body one celled, broader, gradually tapering towards the apex, apex dome shaped of small arm and pointed of long arm, lateral walls thick. (Fig. c).

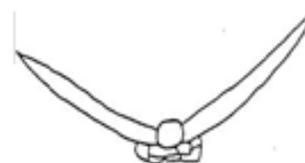


Fig.7c

8) *Hildebrandtia valo* (L.f.)O.Ktze. : Leaf adaxial and abaxial (Fig.8)

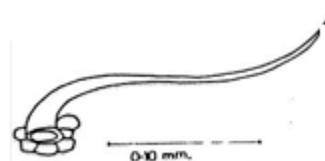


Fig.8

Unicellular trichome :

Trichomes non-glandular, unicellular; distributed mostly on lamina and mid-vein. Foot one celled, wide. Body one celled, long narrow, tapering towards the apex, apex pointed, lateral walls thick.

9) *Ipomoea clarkei* Hook. : Leaf adaxial and abaxial (Fig.09)

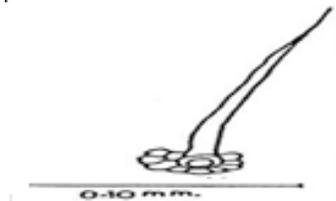


Fig.9

Unicellular conical trichome :

Trichomes non-glandular, unicellular conical; distributed all over the surface of leaf, sparsely on mid-vein and veinlets. Foot one celled, thick. Body one celled, long, tubular, apex acute, lateral walls thin.

Peltate scales: (Fig.22) Multicellular, peltate, non-glandular scales present on adaxial surface.

10) *Ipomoea illustris*(Clarke) Prain. : (Fig.10)

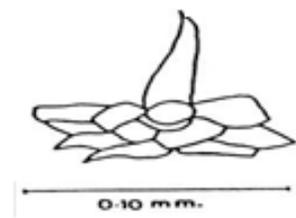


Fig 10

Unicellular simple trichome :

Trichomes non-glandular, unicellular simple; distributed on and around mid-vein and veinlet. Foot one celled, circular, thick. Body one celled, long, cylindrical, narrow towards the apex, apex pointed, lateral walls thick.

11) *Ipomoea triloba* L. : (Fig.11)

Leaf abaxial :

Unicellular filiform trichome :

Trichomes non-glandular, unicellular, filiform; distributed on lamina. Body one celled, circular, thick. Body one celled, long, narrow at apex, apex pointed, lateral walls thick.

DISCUSSION :

Trichomes are found generally on both laminar sides of leaves. They are distributed in intercostal region and on and/or along the midveins and veinlets. Trichomes surveyed on both foliar sides in the family fall in to six categories viz., 1) unicellular cylindrical, 2) unicellular conical, 3) unicellular filiform, 4) unicellular two armed, 5) unicellular three-armed, 6) multicellular peltate scales are also observed in few taxa such as *I. clarkei*, *I. mauritiana* and *I. illustris*. Trichomes as well as the peltate scales presently observed are non glandular. All the categories are unicellular; however, the peltate scales are multicellular ones. The trichomes generally comprise a basal foot cell and upper body cell of the trichomes. The foot cell is generally embedded in the epidermis. The body of the trichomes is not usually striated. They are mostly smooth, except *Argyreia nervosa*, *A. sericea* and *A. onilahiensis* wherein they are punctate. The lateral walls are generally thin; however, they are relatively thicker in few taxa such as *Argyreia splendens* and *Porana paniculata*. Apices of these trichomes are generally acute. The unicellular trichomes also exhibit different

structures. They are two-armed and have been noted in case of *Evolvulus alsinoides*. Metcalfe and Chalk (1950) also mentioned all these types. However, he also noted glandular types in the members of the family Convolvulaceae.

It appears pertinent to comment upon the armed trichomes observed by the present investigators and those from the past literature. There are two-armed, three armed or multi-armed (described as branched form by Metcalfe and Chalk, 1950). The two-armed forms show variations in respect of length of the two arms. They are equal in length or unequal. Both forms are also reported by Metcalfe and Chalk (*loc.cit.*). These trichome types indicate series of reduction from multi-armed to equal two armed to unequal two armed. This may probably lead to the unicellular types after reduction of the shorter arm. However, observations on more number of species in this group of plants are obviously necessary. Their ontogeny may also reflect the facts in this regard.

Rajagopal and Pochaiiah (1983) proposed three categories of spatial relationship between trichome and stoma. These categories are based on the distance *inter se*. All these three categories are recorded in the species investigated. Categories 1 and 2 are more prevalent in this family. However, the category 3 is observed only in the species of *Argyreia*. The highest trichome frequency (per sq. cm.) 15.7 are recorded abaxially in *Argyreia splendens* and it is also the highest 4.3 on adaxial side in *Argyreia onilahiensis*. It is the lowest on abaxial 0.5 in *Calystegia affinis* and *Merremia dissecta* and it is also the lowest 0.5 on adaxial side in *Argyreia splendens*, and *Ipomoea triloba*. (Table No. 1)

Table-1: Trichome Frequency (per.sq.cm.)

Sr.No.	Name of Plants	Upper Epidermis	Lower Epidermis
1	<i>Argyreia onilahiensis</i> Deroin.	4.3	9.0
2	<i>Argyreia nervosa</i> (Burn.f.) Boj.	1.3	4.0
3	<i>Argyreia sericea</i> Dalz.	0.8	3.0
4	<i>Argyreia splendens</i> (Roxb.) Sweet.	0.5	15.7
5	<i>Calystegia affinis</i> Endl.	0.6	0.5
6	<i>Cressa cretica</i> L.	2.1	3.0
7	<i>Evolvulus alsinoides</i> L.	1.5	1.4
8	<i>Hildebrandtia valo</i> Deroin.	2.1	2.5
9	<i>Ipomoea clarkei</i> Hook.	0.6	0.8
10	<i>Ipomoea illustris</i> (Clarke) Prain.	1.0	0.8
11	<i>Ipomoea triloba</i> L.	0.5	0.7

* The figures relate to a mean of ten counts.

Apart from the trichomes, peltate scales are recorded in some angiospermic taxa. Their occurrence in the present family appears noteworthy. They are mostly associated with xeric plant species. One is hard put to explain the occurrence of these scales in the present mesophytic predominantly herbaceous group of plants. However, they can be conveniently employed in taxonomic delineations in this alliance.

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REFERENCES:

- Ahmad, K. J. 1962. Cuticular striations of *Cestrum*. *Curr. Sci.* 31:51 - 60
- Inamdar J. A. and R. C. Patel. 1973. Structure, ontogeny and classification of trichomes in some Polemoniales. *Feddes Repert Z. Bot. Taxon Geobot.* 83 (7/8) : 473 - 488
- Lawrence H. M. 1951 *Taxonomy Of Vascular Plants*. Oxford and IBH publishing Co. Pvt Ltd. New Delhi.
- Lowell, C. and T. W. Lucansky. 1986. Vegetative anatomy and morphology of *Ipomoea hederifolia* (Convolvulaceae). *Bull. Torrey . Bot. Club.* 113 (4) 382 - 397
- Metcalfe, C. R and L. Chalk. 1950. *Anatomy Of Dicotyledons Vol. II* Clarendon press, Oxford, England,
- Nayeem, K. A. and D. G. Dalvi. 1989. A rapid techniques for obtaining leaf prints for stomatal counts with Fevicol. *Curr. Sci.*, 5 : 58. 11.
- Rajagopal, T. and Y. Pochaiiah. 1983. On spatial relationship between trichomes and stomata.

Indian J. Bot. 6 (1) : - 37 - 39

Ramayya, N. 1962. Studies on the trichomes of some Compositae I. General structure. Bull. Bot. Surv. India. 4: 177 - 188.

Ramayya, N. 1972. Classification and phylogeny of trichomes of angiosperm. In: Research trends in plant anatomy. 91 - 102. Tata McGraw Hill Pub. Co. Ltd., New Delhi.