

Leaf epidermal studies of selected species of *Ipomoea* Linn.

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Abstract

Ipomoea is the largest genus of family Convolvulaceae which consist of nearly 1650 species among which 150 species are from India. They are herbs, shrubs or usually twinning. The present study is intended to analyze the leaf epidermal studies of five selected species of genus *Ipomoea* shows ecological variations. Epidermal characters are of great value in identification and classification of disputed taxa. Epidermal peels were taken mechanically from abaxial and adaxial surface of leaf. They were first washed in distilled water and stained 1% aqueous Safranin. The observation of the study revealed that the stomatal frequency and stomatal index of selected species varies from species to species. And also the stomatal size among the species shows remarkable variation. Presence of trichomes also varies from species to species.

The epidermal characters of Convolvulaceae are considered to be playing a role in taxonomic and phylogenetic significance. The epidermal studies provide additional data in ascertaining the systematic position of disputed taxa. During recent years, along with other anatomical characters, the features of epidermis especially stomata and trichome, their ontogeny as well as the nature and structure have also found utility. With this view a detailed study of the epidermal characters were taken into account for synthetic approach of taxonomy. Epidermal characters used in the identification or classification would entail a few advantage, it may be pointed out that wherever other characters could not show any differences, the epidermal characters may be of

some value in identification and classification. The study of the epidermal features of most of the living angiosperms has received little attention. There are only a few reports on the epidermal studies in this family, which is too confined to the development of stomata^{14,18}. The form and shape of the stomata and its associated epidermal cells, stomatal frequency, type of epidermal trichomes and pattern of distribution, are important sources of taxonomical consideration¹⁵.

The family Convolvulaceae consist of 55 genera and 1650 species, distributed in the both tropical and temperate region of the world. About 20 genera and over 150 species have been reported from India¹⁶. Convolvulaceae

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may be considered as family of twinning vines, erect herbs, shrubs or trees comprising the morning glory family and having alternate leaves and regular pentamerous flowers with plaited corolla¹⁷. The family is an important source of food, drugs and ornamentals¹⁶. The genus *Ipomoea* have approximately 500-600 species, comprises the large number of species³. The genus *Ipomoea* occurs in the tropic of world and some of the species also reach to temperate zone⁷. Over half of the species are concentrated in the America where the total 500 taxa mostly native are present and few are introduced. Although there are recent publications dealing with *Ipomoea* in the floras of several American countries^{2,4,12,21}. The present investigation tries to study the epidermal features of five selected species of genus *Ipomoea* which shows considerable variations among them.

Ipomoea is the largest genus of the family Convolvulaceae and consist of herbs, shrubs or usually twinning. The species such as *I. carnea*, *I. purpurea*, *I. hederacea*, *I. quamoclit* and *I. aquatica* shows ecological variations selected for the present investigation. For the epidermal studies epidermal peels were taken mechanically from abaxial and adaxial surface of leaf. They were first washed in distilled water and stained in 1% aqueous safranin. Again washed in distilled water and mounted in 50% glycerin and sealed with paraffin wax. Light microscope with camera was used for micro photographing. All measurement was taken from an average twenty readings. Stomatal frequency and indices were calculated by using the following formula
 Stomatal frequency (S.F) = $E/S \times 100$
 Stomatal Index (S. I) = $S/E + S \times 100$
 Where S' is the number of stomata per unit area and E' is the number of epidermal cells other than stomata in the same area.

The present study deals with the epidermal studies of five selected species of the genus *Ipomoea*. Stomatal and trichome features were observed. The significance of these epidermal studies helpful for establishing the phylogenetic relationship in future analysis. For epidermal studies plant leaf were collected from selected species. For stomatal analysis stomatal index, stomatal frequency and size of the stomata are studied. For trichome analysis type of the trichome, whether it present on abaxial or adaxial surface of the leaf, size of the trichomes were observed. Stomatal index and stomatal frequency of the leaf shows considerable variation between abaxial and adaxial surfaces. Stomatal index and stomatal frequency are more in abaxial surface of the leaf. *I. purpurea* shows comparatively high stomatal index at abaxial surface of the leaf (Table-1 & Figure 1 and 2). Also the size of the stomata shows remarkable variation within the species (Table-1). *I. aquatica* have smallest stomatal size compared to other species and *I. carnea* shows relatively large stomatal size. Presence of trichomes also varied from species to species (Table-2).

Abba *et al.*,¹ in their studies leaf epidermal microscopy of *I. carnea* was studied to investigate the structure of the stomata and epidermal features which may be used for delimitation of the species. Fresh leaves of *I. carnea* were obtained from five different LGAS in Gombe state Nigeria. The specimens were studied under light microscope to examine the stomatal features, epidermal cell shapes and Anticlinal cell-wall patterns. They concluded that the presence of paracytic type of stomata, with large stomatal sizes greatly helped in the delimitation of the plant and could also be used for classification/identification of the plant and some of the features such as trichomes could also be used for adaptation purpose. Bolarinwa *et al.*,⁵ studied leaf

Table-1. Stomatal features of selected species of *Ipomoea*

| Name of the species | Type of stomata | Size of the stomata(μm) (Mean) | Stomatal Index (Mean) | | Stomatal Frequency (Mean) | |
|------------------------------------|-----------------|---|-----------------------|---------|---------------------------|---------|
| | | | Adaxial | Abaxial | Adaxial | Abaxial |
| <i>Ipomoea carnea</i> Jacq. | Paracytic | 1238.50 | 10.8 | 27.5 | 12 | 38 |
| <i>Ipomoea quamoclit</i> L. | Paracytic | 971.87 | 22 | 22.6 | 28.1 | 29.2 |
| <i>Ipomoea purpurea</i> (L.) Roth. | Paracytic | 1053.19 | 16.9 | 27.7 | 20 | 38.46 |
| <i>Ipomoea aquatica</i> Forsk. | Paracytic | 31.59 | 19 | 22.9 | 23 | 29.7 |
| <i>Ipomoea hederacea</i> Jacq. | Paracytic | 925.15 | 20.5 | 26.4 | 25.2 | 32.6 |

Table - 2. Nature trichomes exhibited by *Ipomoea* species

| Name of the species | Features of trichomes | Length of trichomes (μm) (Mean) | Breadth of trichomes (μm) (Mean) |
|------------------------------------|------------------------|--|---|
| <i>Ipomoea carnea</i> Jacq. | Eglandular, unbranched | 60.04 | 3.51 |
| <i>Ipomoea quamoclit</i> L. | Eglandular, unbranched | 737.98 | 200.44 |
| <i>Ipomoea purpurea</i> (L.) Roth. | Eglandular, unbranched | 1449.38 | 365.20 |
| <i>Ipomoea aquatica</i> Forsk. | Eglandular, unbranched | 326.18 | 106.18 |
| <i>Ipomoea hederacea</i> Jacq. | Eglandular, unbranched | 1126.27 | 139.74 |

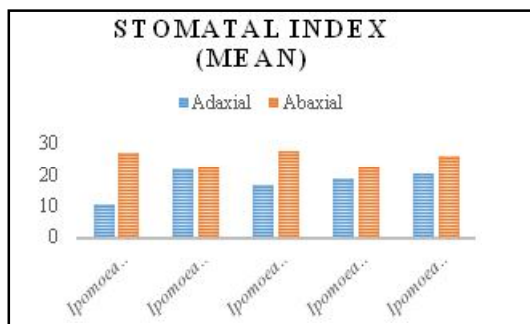
Figure-1 & 2. Showing the stomatal index and frequency of *Ipomoea* species

Figure:1

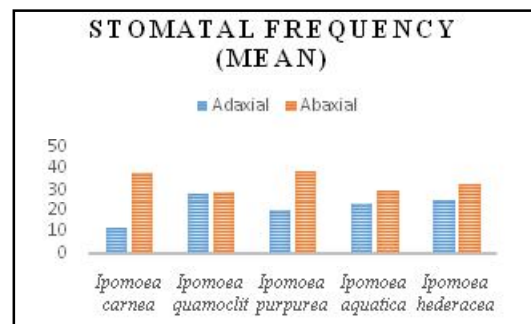


Figure: 2

epidermal morphology of eight species of *Ipomoea* found in Southern Nigeria, they reported stomatal complex is paracytic except in *I. asarifolia* (Desr.) Roem & Schult and *I. purpurea* where it is staurocytic, stomatal index is higher on the abaxial side while trichome is absent on the abaxial surface of *I. cairica* (L.) Sweet and *I. purpurea*. Kumar and Dhar¹⁰ conducted the epidermal studies in the selected genus *Ipomoea*, it has been

revealed that the leaves of all the species showed paracytic stomata, of the 16 species investigated 13 show eglandular and branched trichomes, whereas remaining species are completely devoid of these. Lowell and Lucansky¹¹ studied the vegetative anatomy and morphology of *I. quamoclit* and concluded that the paracytic stomata and multicellular, glandular and unicellular, eglandular trichomes occur on both the leaves and stem. Werker²⁰

and Navarro and Oualidi concluded in their studies that trichomes are one of the most important characters in taxonomy at the level of genus and species level. The study of trichome micromorphology permits a better understanding of the relationship between species. In most cases characters character combination could be used as a mean of taxonomic identification at different intra-generic level. Werker²⁰ reveals in his studies that at later stage of leaf epidermal, when the formation of the epidermis is completed, the functional role of the trichomes become less important and they often senesce and shed. In some cases, however trichomes remain viable and functional in mature leaves. In the present investigation, stomatal and trichome characters are varies among the five selected species. Stomatal frequency and stomatal index between abaxial and adaxial surface of the leaf shows remarkable variations. Stomatal index and stomatal frequency rate is high at abaxial surface in all the five selected species. Size of the stomata varies from species to species and also the size of the trichomes varies from species to species.

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