

STUDIES ON DERMAL ANATOMY OF THREE CORTICOLOUS ORCHIDS FROM INDIA.

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Key words : Paracytic, Corticolous, Orchid.

In present investigation it has been observed that stomata are paracytic. Stomata are slightly raised in *Dendrobium transparens* Wall. ex. Lindl; and *Vanda tessallata* (Roxb) Hook, f. ex. G. Don but flushed in *Cottonia peduncularis* (Lindl). Reich. f. Hypostomatic condition has been observed in *Dendrobium transparens* Wall. ex. Lindl; and *Cottonia peduncularis* (Lindl). Whereas amphistomatic condition has been observed in *Vanda tessallata* (Roxb).

INTRODUCTION

Habitat of the orchids varies from terrestrial, corticolous well as saxicolous and some of these also possess lignicolous habitat. Depending upon the morphological characters, taxonomic treatment was proposed by researchers namely Dressler and Dodson, 1960 etc. Several taxonomic parameters must be considered along with morphological characters to rectify the position of the debated taxa. The commonly applied parameters are cytogenetical, embryological, phytochemical, phytogeographical as well as palynological studies under SEM. Study of dermal characters of leaves was based on distribution and frequency of stomata. (Kaushik, 1983). Dermal anatomy of Western Himalayan Orchids is also well studied. (Vij and Kaur, 1991). Hence the orchid systematics needs a thorough revision using parameters other than morphotaxonomy. Therefore preliminary attempt was made on the study of stomata and related features of leaf epidermis in three corticolous taxa namely *Dendrobium transparens* Wall. Ex. Lindl; *Vanda tessallata* (Roxb). Hook f. ex. G. Don and *Cottonia peduncularis*. (Lindl) Reich. f.

MATERIAL AND METHODS

The material was collected from various

localities in India. *Dendrobium transparens* Wall. ex. Lindl; was collected from Sikkim, *Vanda tessallata* (Roxb). Hook f. ex. G. Don was collected from Castle rock (at altitude of 900 mts) near Goa. *Cottonia peduncularis* (Lindl). Rich F., was collected from Yevoor of Thane (at altitude 333.3 mts) in Maharashtra.

Material related to the study of stomata was studied by peeling method of leaves. Mature leaves were used to study the dermal characters. The method suggested for grasses by Metcalfe (1960) and for Orchids by Williams (1975), was adopted in present investigation.

OBSERVATIONS

Dendrobium transparens Wall. ex. Lindl. This corticolous ash coloured orchid possess slender, pendant stem. Leaves 7.5 cms in length, 2.5 cms in width, lanceolate in shape. Hypostomatic, DERMAL ANATOMY - Epidermal cells polygonal with thin and non-sinuous walls (Fig. I-A) 35.3-85.6 μm x 35.3 - 71.3 μm . Trichomes absent; stomata slightly raised oriented in different direction, paracytic, elliptic. 37.5 x 10 μm in diameter, guard cells kidney shaped, stomatal opening 17.5 x 7.5 μm is diameter (Fig II C) Stomatal frequency 72.9/mm²/Stomatal Index : 09.

Vanda tessellata (Roxb). Hook f. ex G. Don. Stem woody, 30-40 cms high, 1 cm across. Strap shaped leaves, stiff, leathery, 15-20 cm in length, 1.5 cm wide, the apex irregularly prae-morse with usually two unequal rounded lobes and an acute one in between. DERMAL ANATOMY - Epidermal cells rectangular with thin non-sinuous walls, 25-50 μm x 20 μm , trichomes absent, stomata slightly raised, longitudinally placed, paracytic elliptic, 50 x 12.5 μm in diameter, guard cells kidney - shaped, stomatal opening 25 x 20 μm in diameter. (Fig. III-C) Stomatal frequency : 19.55 / mm^2 Abaxial side. 6.3 / mm^2 Adaxial side. Stomatal Index : .17 abaxial side. .008 Adaxial side.

Cottonia peduncularis (Lindl). Reich.f. - Stem of this corticolous orchids is woody, 20-30 cm long, scrambling. Leaves linear, 15 cms in length, 2.5 cms in breadth, coriaceous, keeled on the underside and abruptly ending in 2 unequal round lobes with a broad acute sinus in between DERMAL ANATOMY - Epidermal cells rectangular with thin non-sinuous walls, 50-100 x 40 μm , trichomes absent, stomata flushed, paracytic, elliptic, 50 x 7.5 μm in diameter, guard cells kidney - shaped, placed longitudinally, stomatal opening 48 x 25 μm in diameter. (Fig. III-F) Stomatal frequency : 19.25 / μm^2 Stomatal Index : .05

DISCUSSION

The character of epidermal cells can be considered as a parameter in taxonomy of the orchids. They were very large sized in *Cottonia peduncularis* (Lindl) Reich. f., (50 -100 x 40 μm) medium sized in *Dendrobium transparens* Wall. ex. Lindl (35.3 - 85.6 x 35.3 - 71.3 mm) and comparatively small in *Vanda tessellata* (Roxb) Hook. f. ex. G. Don. (25-50 x 20 mm). Epidermal cells were polygonal, thin with non-sinuous walls *Dendrobium transparens* Wall. ex. Lindl and were rectangular in *Vanda tessellata* (Roxb). Hook f. ex. G. Don and *Cottonia peduncularis* (Lindl.) Reich.f. Hypostomatic conditions was observed in *Dendrobium transparens* Wall. ex. Lindl. and *Cottonia peduncularis* whereas amphistomatic condition was observed in *Vanda tessellata* (Roxb). Hook. f. ex. G. Don The leaves are hypostomatic in most of the orchids. (Singh, 1981, Avadhani et. al.; 1982). Hypostomy is frequently observed in the mesophytic orchids and amphistomy dominates in those of dry and

humid habitats. The association on amphistomy with more or less vertically oriented leaves like *Vanda tessellata* (Roxb). Hook. f. ex. G. Don. confirms similar findings in several orchid species. (Rasmussen, 1987). The thick leaves generally associated with Crassulacean acid metabolism, have been considered an additional factor promoting amphistomy in orchids. (Rasmussen, 1987). Stomata in all the three taxa were paracytic. Stomata were slightly raised than the epidermis in *Dendrobium transparens* Wall. ex. Lindl. and *Vanda tessellata* (Roxb). Hook. f. ex. G. Don. and were flushed with the epidermis in *Cottonia peduncularis* (Lindl). Reich. f. The stomatal frequency in the present taxa were ranging between 19.25, 27.9 / mm^2 on abaxial side. It compares fairly well with those reported earlier in this group of plants. (Singh and Singh, 1974; Avadhani et. al., 1982; Vij. et. al., 1991) Lowest stomatal frequency was observed in thick fleshy leaves of *Cottonia peduncularis* and highest stomatal frequency in thin and membranous leaves of *Dendrobium transparens*. Similar observations were made by Vij. et al. (1991). Highest stomatal index was presently observed in *Dendrobium transparens* were as lowest in *Vanda tessellata*. A direct and positive co-relation of light intensity with the stomatal index in orchids was also indicated. (Lyge, 1930 in Rasmussen, 1987).

Acknowledgments

Thanks are due to Prof. S. P. Vij for the encouragement and support. I thank and appreciate Mr. Shrikant Ingahalikar for his help.

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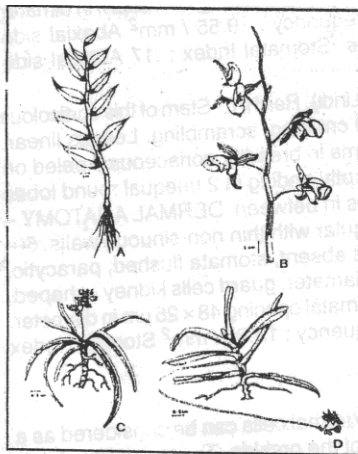


Fig 1 A-D - A *Dendrobium transparens* wall. ex. Lindl. Habit of the plant. B. Inflorescence. C. *Vanda tessallata* (Roxb) Hook. f. ex. G. Don. Habit of plant D. *Cottonia peduncularis* (Lindl.) Habit of a plant.

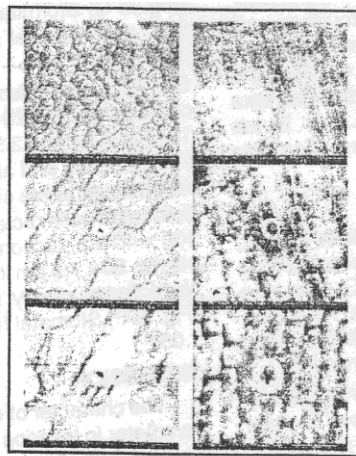


Fig 2 A-F - A *Dendrobium transparens* wall. ex. Lindl. Abaxial side of a leaf showing slightly raised stomata, Oriented In different directions. (x 500) B. Stomatoparacytic (x 1000) C. *Vanda tessallata* (Roxb) Hook. f. ex. G. Don. Adaxial side of a leaf with slightly raised, longitudinally placed stomata. (x 500). E. Stomata paracytic (x 1000) F. Kidney shaped guard cells with clear stomatal opening (x 1500)

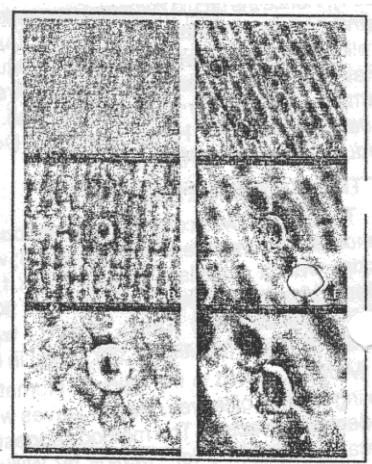


Fig 3 A-F - A *Vanda tessallata* (Roxb). Hook. f. ex. G. Don. Abaxial side of a leaf showing longitudinally placed Stomata (x 500). B. S. omata-paracytic (x 1000). C. Stomata with sratac aperture (x 1500) D. *Cottonia peduncularis* (Lindl). Reich. f. Abaxial side of a leaf showing longitudinally placed stomata (x 500) E. Stomata-paracytic (x 1000). F. Kidney shaped guard cells with clear stomatal opening (x 1500).