

MORPHOLOGICAL AND ANATOMICAL STUDIES IN *OBERONIA TENUIS* LINDL.

L Jose and Arjun Thomas

Department of Botany, St. Albert's College, Ernakulum, Cochin- 682 018, Kerala, India

Abstract

The present paper deals with morphological and anatomical studies in *Oberonia tenuis*, collected from Kerala. During the present study, micro-morphology of the flower was investigated. Observations on the occurrence of tuberculate glands on the lip and presence of calcium oxalate crystals and silica bodies in the leaf and roots were made.

Introduction

THE GENUS *Oberonia* was first established by Lindley (1830-40). Ansari and Balakrishnan (1990) in their studies included 41 species of *Oberonia* from India and this remains as one of the authentic works, from this region. *Oberonia tenuis* was presently collected from Vagamon of Idukki district in Kerala state, India. Perusal of literature on anatomical studies (Baruah, 2017; Chattopadhyay *et al.*, 2014; Kaushik, 1983; Mohana Rao and Khasim, 1986, 1987a,b; Ramudu *et al.*, 2012; Vij *et al.*, 1991) in some indian orchid species advocates their taxonomic significance. Hence, presently an attempt was made to study leaf and root morphological and anatomical features, in *Oberonia tenuis*.

Material and Methods

The plant was collected from Pasupara, a small village near Elappara in Idukki district of Kerala state, India, which is about 12 km from Elappara, 12 km from Vagamon and 9 km from Kottamala. Live specimens were used for morphological studies using 'Leica M 205 A' microscope and photographs were taken using 'Leica DMC 2900' camera. Hand sections of roots and leaves were taken and stained using safranin, mounted on glass slides and observed under microscope. The characteristics of roots such as velamen, cortex, and stele were studied and characteristics of leaves such as epidermis and mesophyll were studied and photographs were taken using Catcam microscopic camera.

Results

Systematic Account

Oberonia tenuis Lindl. Fol. Orch. *Oberonia*, 3.1859.
Malaxis tenuis Reichb. f., *Iridorchis tenuis* (Lindl.) O. Kuntze. (Figs. 1 A-C, 2A; 3 A-C).

Plant found as epiphyte on trees usually towards the lower side of trunk. *Leaves* 0.3-7.0 × 0.2-0.9 cm, succulent, reddish brown to pale green, linear lanceolate, slightly falcate, 4-7 nerved, acuminate or with a short bristle at apex. *Inflorescence* up to 5.5 cm long, adnate to the uppermost sub falcate leaf and subtended by a fleshy linear, pale yellow, hair-tipped bract. *Floral bracts* 2-4 mm, linear lanceolate or filiform equalling the minute flowers, yellow, nerveless and gland dotted. *Flowers* about 3 mm long, bracteate, shortly pedicellate, pale yellow or brownish yellow loosely imbricated on a slightly arcuated raceme. *Flowers* opening towards the peduncle. *Dorsal sepal* 1×0.5 mm, pale brown ovate acuminate, gland dotted, slightly longer than the laterals. *Lateral sepals* under 1 mm long, orbicular, concave, gland dotted, acute at the apex. *Veins* not clear. *Petals* equalling the sepals in length but narrower, sub falcate, gland dotted, obtuse at apex; veins not clear. *Lip* three lobed, inferior, basal lobe with tuberculate glands, side lobes linear or filiform, erect, surrounding the *column* and meeting above, margin aristate, acute at apex. Mid lobe obscurely three lobulated, lateral lobules semi-lunar, erect and folded upwards with the side lobes. *Column* short, anther terminal, 2 celled, *pollinia* 4. *Ovary* about 1 mm long, capsule less than 4 mm long, distinctly stalked, brownish yellow, 6 ribbed, gland dotted.

Flowering and Fruiting

January-February.

Leaf Anatomy

The outline of the leaf was elongated and flattened (Fig. 2B). Cuticle present on both the surfaces. Epidermal cells were polygonal in shape, convexly domed. Mesophyll was not differentiated into palisade and spongy parenchyma. Mesophyll consisted of thin walled small and large polygonal cells. Some of the mesophyll cells were packed with bunch of raphide crystals

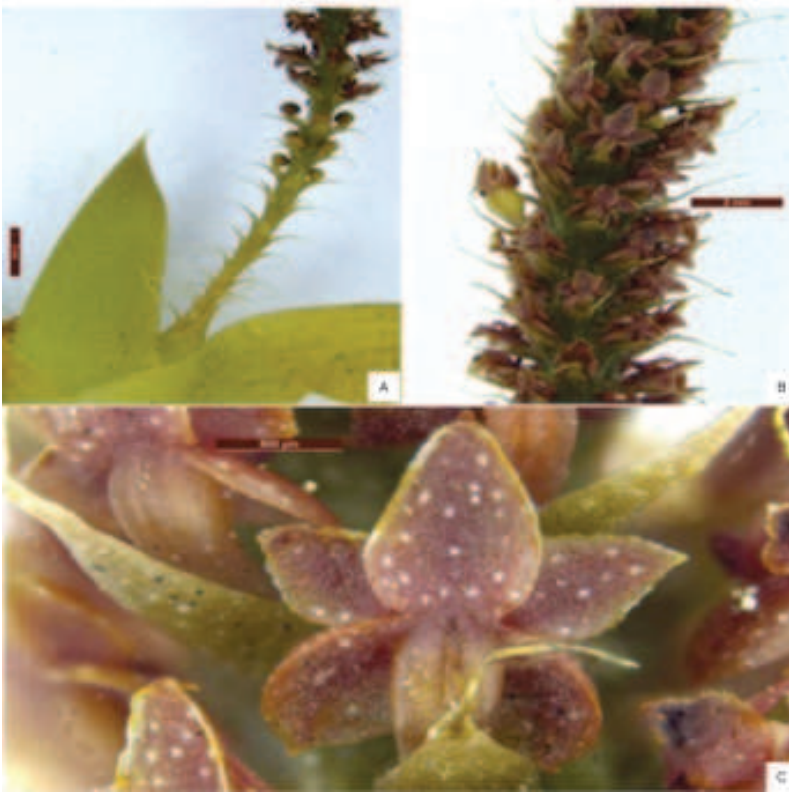


Fig. 1. A-C. *Oberonia tenuis*: A, Plant with inflorescence; B, Enlarged view of the inflorescence; C, Magnified flower.

measuring 20×1.3 microns (Fig. 2C). Spherical silica bodies were found among the mesophyll cells. Vascular bundles were weakly developed.

Root Anatomy

The outline of the root was circular (Fig. 2D). Velamen comprised of 3 layers; cells showed spiral thickenings. Exodermis was observed with U-shaped thickenings. Cortex was 6-7 layered; cells were almost of same size and isodiametric. Spherical silica bodies were abundant. Endodermis was followed by vascular elements and pith cells appeared to be thick walled.

Discussion

Earlier, Ansari and Balakrishnan (1990) after examining various specimens opined that *Oberonia bicornis* and *O. tenuis* are same species and can be treated as *Oberonia bicornis*. Manilal and Kumar (1983) reported and described these two species and treated them under two different species based on clear demarcated characters like long floral bracts, red colour of flowers and shape of

the lip. But later reports (Plant list and world checklist of orchids) have not considered the treatment of the species of Ansari and Balakrishnan (1990) and hence, the species entity of *O. tenuis* stands valid. The present study also validates the specific characters, described earlier for the species and therefore, provides substantiating evidence for the findings.

Epiphytic orchids are with some specialised vegetative characters related to storage of water and minerals, which are scarce and transitory in such habitat. Stern and Carlsward (2004) discussed the useful anatomical characters (such as the presence and distribution of fibre bundles and sclerenchyma in leaves, configuration of mesophyll, cell wall banding and idioblasts in mesophyll), in orchid taxa. Presence and distribution of water storage cells and the presence, position and forms of hair in leaves etc. are taxonomic characters of interest for species classification (Angela *et al.*, 2015; Chattopadhyay *et al.*, 2014; Kumar *et al.*, 2014). In the present study, such useful anatomical characters like epidermis, exodermis, water storage cells and idioblasts cells were also observed. The presence of

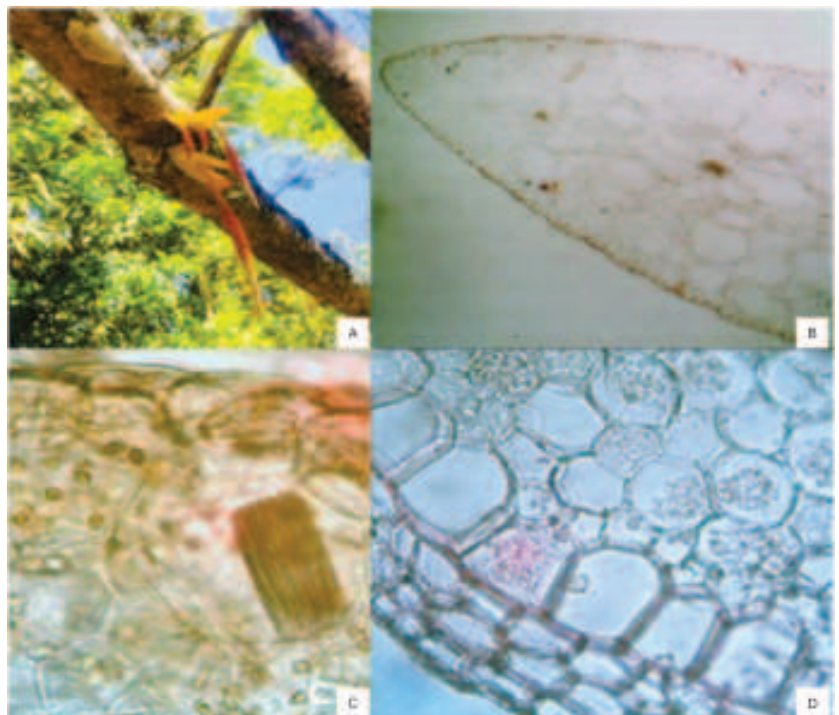


Fig. 2. A-D. *Oberonia tenuis*: A, Plant growing on branch of the host tree; B-C, Part of the transverse section of leaf; D, Part of the transverse section of the root.

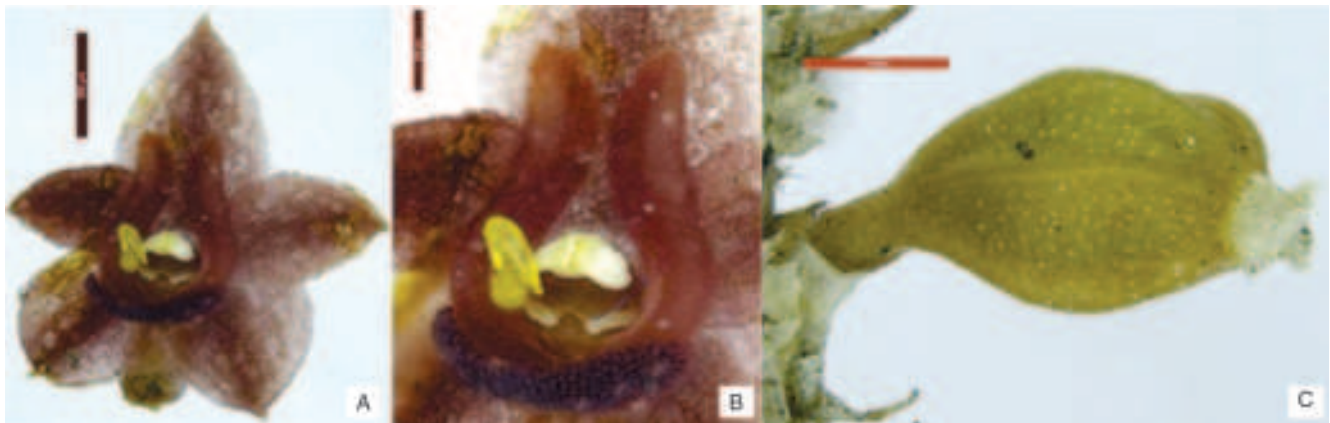


Fig. 3. A-C. *Oberonia tenuis*: A-B, Magnified view of the flowers; C, Capsule.

raphide bundles during the present study may indicate as defence against herbivory and these may also provide mechanical strength.

The orchid root exhibits more morphological, anatomical and physiological adaptations than the leaf or stem. The absorptive roots of most epiphytes are bound externally by specialized epidermis of 1-20 cell layers, termed as velamen. Inside to that is the cortex, the outermost layer of which is exodermis and innermost layer is endodermis. Innermost stele comprises of pericycle, primary xylem and phloem. Porembski and Barthlott (1988) concluded that some species of *Oberonia* has a multi-layered velamen that does not fit into any type of *Malaxis* type of velamen (cells lacking helical thickenings) suggesting thereby their polyphyletic origin. In the present study, a three layered velamen with spiral thickenings was observed.

References

- Angela, Nengpilhing, H. Bishwajit Sharma, Krishna Chowlu, and N. Nageswara Rao. 2015. Foliar anatomy in some species of *Bulbophyllum* Thou. *J. Orchid Soc. India*, **29**: 67-74.
- Ansari, R. and R. Balakrishnan. 1990. A revision of the Indian species of *Oberonia* (Orchidaceae). *Orchid Monographs* – Vol. 4. 82 S. 41 Zeichnungen, 3 Farbtafeln, Leiden: Rijksherbarium/Hortus Botanicus.
- Baruah, A. 2017. Peduncle, pedicel, and capsule epidermal characters of certain orchid species from NorthEast India. *J. Orchid Soc. India*, **31**: 65-69.
- Chattopadhyay, A., Promila Pathak, and K. C. Mahant. 2014. Foliar features in some Indian orchids: Subtribe Habenariinae (Orchideae, Orchidoideae). *J. Orchid Soc. India*, **28**: 47-59.
- Kaushik, P. 1983. *Ecological and Anatomical Marvels of the Himalayan Orchids*. Today and Tomorrow's Printers and Publishers, New Delhi, India.
- Kumar, H. G. Prashanta and K. Krishnaswamy. 2014. Preliminary leaf epidermal studies in a few epiphytic orchids. *J. Orchid Soc. India*, **28**: 91-97.
- Lindley, J. 1830-40. *Genera and Species of Orchidaceous Plants*. Ridgways, London.
- Manilal, K. S. and C. S. Kumar. 1983. Two new records of *Oberonias* from Kerala. *J. Econ. Tax. Bot.*, **4**: 987.
- Mohana Rao, P. R. and S. M. Khasim. 1986. Leaf anatomy of three species of *Bulbophyllum* (Orchidaceae) with comments on their ecological adaptability and taxonomy. *Proc. Indian Acad. Sci. (Plant Sci.)*, **91**: 391-97.
- Mohana Rao, P. R. and S. M. Khasim. 1987a. Anatomy of some members of Coelogyninae (Orchidaceae). *Phytomorphology*, **37**: 191-99.
- Mohana Rao, P. R. and S. M. Khasim. 1987b. Anatomical studies in some species of *Bulbophyllum* (Orchidaceae) and their ecological and taxonomic significance. *Proc. Indian Acad. Sci. (Plant Sci.)*, **97**: 391-97.
- Porembski, S. and W. Barthlott. 1988. Velamen radicum micromorphology and classification of Orchidaceae. *Nordic J. Bot.*, **8**: 117-37.
- Ramudu, J., G. Ramesh, and S. M. Khasim. 2012. Molecular and morphological studies in *Coelogyne nervosa* A. Rich., an endemic orchid from South India. *J. Orchid Soc. India*, **26**(1-2): 53-58.
- Stern, W. L. and B. Carlsward. 2004. Vegetative constants in the anatomy of epiphytic orchids. *Orchid Rev.*, **112**: 119-22.
- Vij, S. P., P. S. Kaushal, and P. Kaur. 1991. Observations on leaf epidermal features in some Indian orchids: Taxonomic and ecological implications. *J. Orchid Soc. India*, **5**: 43-53.