

VEGETATIVE HABIT IN THE GENUS *EULOPHIA* (Orchidaceae).

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SUMMARY.

The vegetative habit of the genus *Eulophia* is described, with particular reference to *E. bicarinata*.

The genus *Eulophia* (including *Lissochilus*) comprises some 300 species distributed throughout the warmer parts of the Old World, mainly in Africa. My acquaintance with it is limited to the six species occurring in the Malay Peninsula, of which five are widely distributed, two with a range from India to Australia. One of these species, which thus connects Malaya and Queensland, has only recently been found for the first time in Malaya; it is *E. bicarinata* (also known as *E. venosa*). In vegetative form it is different from the others, and appears to be of considerable interest. It has also a connection with the late Mr. C. T. White, and the last letter he wrote me was about a drawing of this *Eulophia* which he made many years ago.

In the various descriptions of the African species of *Eulophia* which have been brought into cultivation, there is little definite information about the way in which the rhizome and pseudobulbs develop. The best source of information about vegetative structure is Pantling's beautiful plates of Sikkim orchids (King and Pantling, 1898). These drawings show the great variety of vegetative habit in the Sikkim species. Some indication of development is given, though this is not discussed in the text. These plates include the best illustration of *E. bicarinata* that I have seen.

The origin of my interest in this matter was the receipt of an inflorescence of a *Eulophia* I had not previously known. It was sent by Mr. H. J. Vallender who found plants growing near Batang Malaka in Negri Sembilan. He reported that he had seen the leaves, that they were plicate like those of *Spathoglottis* but much narrower, and that the leaves died before the flowers appeared. I found that the flowers agreed with descriptions cited by J. J. Smith under *E. bicarinata* in his enumeration of Sumatran orchids.

Wishing to prepare a description of *E. bicarinata* for my manuscript on orchids of the Malay Peninsula, I looked up the descriptions cited by J. J. Smith (they did not include Pantling's drawing) to discover details of stem and leaf, but found no such information. The original description of *E. venosa* (one of the synonyms, based on a Queensland specimen) called the plant a leafless herb. It was this that led me to write for further information from Australian botanists. I had seen the rather " sketchy " line-drawing of *E. venosa* in Bailey's Catalogue. This showed no leaf but it showed a curious prostrate tuber-like rhizome very different from any other *Eulophia* I knew. I did not realize that this was an early drawing by C. T. White, and I questioned its accuracy. Mr. White replied that he believed it was accurate, but that he had not seen a living plant of the species for many years.

Soon afterwards, Mr. Vallender sent two pieces of resting rhizome which were clearly of the same nature as that shown in White's drawing. They were whitish, tapered to both ends, and bore ring-shaped bases of decayed scale-leaves. It appeared that they grew horizontally, and they were slightly flattened. The remains of former inflorescences were not clearly distinguishable.

The two pieces of rhizome were planted in pots, and after some weeks each produced a slender erect shoot which at first consisted only of purplish sheaths. Later, foliage-leaves appeared from within the sheaths, and their development is not yet completed. The first leaf on the larger plant grew to a length of 35 cm. above the protecting sheaths, with a maximum width of 15 mm. The second leaf grew much longer though no wider, and had a distinct stalk. Both leaves were so weak that they drooped and later became folded across the middle.

At this stage I removed the larger plant from the pot and washed it carefully. The leafy shoot had arisen from a bud in the axil of one of the scale-leaves on the old rhizome; the shoot grew straight upwards and had only a slightly swollen base which bore a few roots. The old rhizome was slightly shrunken. Directly beneath the erect leaf-shoot, and growing *downwards*, was a new fleshy organ, more or less ovoid, with a broadly rounded apex; its surface was covered with colourless scale-leaves.

The habit thus appears to be a sympodium consisting of alternate very unequal elements, contrasting with the sympodium of equal elements in the other species of *Eulophia* in Malaya. In *E. graminea*, for example, there is a succession of equal ovoid pseudobulbs, each arising from the base of the previous one, each bearing a few narrow leaves on its upper part, and each later bearing a few inflorescences from its lower part after the leaves have withered. In *E. bicarinata* there appears to be first a short erect non-pseudobulbous leaf-bearing stem with adventitious roots at its base, and then a tuberous rhizome (covered with scale-leaves) which rests after the foliage-leaves have gone and can later bear a new leaf-shoot. I have not been able to investigate the origin of the tuberous organ; presumably it arises in the axil of one of the basal sheaths of the leaf-bearing shoot. It seems that the tuberous rhizome begins growth downwards and continues horizontally; whether it ends in an inflorescence-bearing part is not clear. There is the further possibility that the rhizome can bear foliage leaves near its apex, that it normally does so after resting, and that in the specimen seen by me a lateral bud developed because the terminal leaf-bearing part had been injured. Until I have had a plant under observation for some time longer, I cannot give a final answer to these questions. I write this note however in the hope that some other observers may be able to study a living plant in its natural habitat and report on its way of life.

Looking over taxonomic descriptions of many tropical monocotyledons of various families, I am impressed by the very cursory references to the subterranean parts. The variety of vegetative habit is one of the most astonishing features of monocotyledons. It is no doubt connected with their lack of a cambium, which prevents their assuming the tree-form and necessitates the development of adventitious roots. The shape of the successive parts of the stem, and their relation to one another in monocotyledons which have sympodial growth, and especially in those which form resting or storage organs, is extremely varied. A most remarkable series of examples are found within the genus *Dioscorea* as described in

various works by Burkill. These examples show a great plasticity in vegetative form, the ability to change readily in adaptation to new conditions of growth owing to climatic or other habitat differences. We see this plasticity also in the genus *Eulophia*, though on a much smaller scale than in *Dioscorea*.

There are doubtless many similar curious facts hidden under such statements as "rootstock tuberous," or "roots fibrous" in our older taxonomic works, and the student of tropical plants may find much of interest in the investigation of plants so described.

The wide geographic distribution of most of the Indo-Malaysian species of *Eulophia* is no doubt to be explained by the fact that they are plants of open places, not of moist shady forest. The fact too that they are mostly seasonal in growth and flowering makes them unsuited to the very uniform climate of Malaya in which dry seasons are neither long enough nor regular enough to induce regular periods of rest. Many such widely distributed species of seasonal habit do not occur in southern Malaya though it falls within their geographic range.

I conclude with a statement of the synonymy of *Eulophia bicarinata*, as given by J. J. Smith, with the additional references to illustrations.

Eulophia bicarinata (Lindl.) Hook. fil. Fl. Brit. Ind. **6** : 6 (1890) ; King & Pantl. in Ann. R. Bot. Gard. Calc. **8** : 180, t. 244 (1898).

Cyrtopera bicarinata Lindl. Gen. et Sp. Orch. 190 (1833).

Eulophia venosa Rchb. fil. in Benth. Fl. Austr. **6** : 300 (1873) ; Bailey Compreh. Cat. Queensl. Pl. 529, fig. 515 bis (1913).

Cyrtopera papuana Kranzl. in Notizbl. Bot. Gart. Berlin **2** : 104 (1898).

Eulophia venosa var. *papuana* Schltr. Orch. D. N. Guin. 416 tab. 145, no. 545 (1912).

E. versteegii J.J.S. in Bull. Dep. Ag. Ind. Néerl. **19** : 24 (1908) ; Nova Guinea **8** : 25, t. **9**, 5 (1908).

E. neo-pommeranica J.J.S. in Nova Guinea l.c., 26.

Cyrtopodium parkinsonii F. Muell. et Kranzl. in Oesterr. Bot. Zeitschr. **44** : 256 (1894).



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