

MORPHOLOGY OF MELOCALAMUS COMPACTIFLORUS

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Vegetative and floral morphologies of the monotypic genus *Melocalamus compactiflorus* (Kurz) Benth. have been described. Detailed morphology of the fruit and seed has also been investigated. Its relationship with *Melocanna* Trin. and *Dinochloa* Buse has been established as proposed by Dransfield (1981).

INTRODUCTION

To the taxonomist, bamboos pose special difficulties in identification. Rarity of flowering frequency is one of them. Suppressed vegetative activity during flowering in some species usually results in the death of the plant. Holttum (1958) and McClure (1966), therefore, emphasised the use of all vegetative parts for identifying and classifying bamboos.

Melocalamus Benth. is represented by *M. compactiflorus* (Kurz) Benth. and occur in Burma, Bangladesh, India and Indo-China. The genus is characterized by its two flowered spikelets and relatively large fruit. Even though the genus was established much earlier (Bentham 1881, Bentham 1883), little is known about its vegetative and floral morphology and fruit structure. Diagnostic value of different vegetative and floral characters and the details of the fruit have been studied in this work which has not been done before.

MATERIALS AND METHODS

Most of the vegetative characters were studied from the fresh materials obtained from the Bamboo Arboretum of the Forest Research Institute, Chittagong. The floral parts investigated were received from the herbaria of the Royal Botanic Gardens, Kew and the Forest Research Institute, Chittagong. Fresh fruits collected in spirit were obtained from the arboretum of the Forest Research Institute, Dehra Dun, India and dried fruits were procured from the carpological collections at Kew Herbarium.

As the dried fruit was woody and hard, it was boiled at 100°C for about 20 hours to soften. Vertical sections were then made to study the embryo and the internal structure.

FINDINGS AND DISCUSSION

Culm habit : Bamboo culms are either produced laterally or apically from the rhizome. In habit *Melocalamus* is semi

scandant to climbing and spreading, 3–8 m tall, diameter 1–4 cm at base and culm is slender towards the top.

Internodes and nodes : Generally the culm is solid but towards the tip the internodes are fistular. However, in all cases, the lumen is very narrow. Young culm blackish, covered with silvery pubescence ; mature culm dull green to yellowish green ; the portion covered by the culm-sheath yellow ; surface rough, glabrous ; pubescent with fine whitish brown hair towards the base. Generally the fourth and fifth internodes are the longest ; average length 30–40 cm ; nodes comparatively greater in diameter than the internodes ; surrounded by the sheath-girdle ; below the girdle there is a circular band of white velvety pubescence c. 1 cm wide. Half of the nodal zone is also covered by a circular band of velvety pubescence. Some of the upper nodes produce obtuse angles with the preceding internodes.

Culm-sheath : The culm-sheath is comprised of sheath-proper, blade, auricles and ligule. The base of mid culm-sheath consists of or is inserted upon a conspicuous horizontal band of tissues, distinct in structure from that of the rest of the sheath proper. This was termed as sheath-girdle by McClure (1966). Culm-sheath is green when young, gradually turning yellow. Mature sheaths are brown. Sheath proper is 9–13 cm long, narrowing towards the apex ; bases hard, coarse ; the portion covering the bud is swollen, 4–8 cm broad at the base ; young sheath covered with white or silky fine pubescence on the adaxial surface. Mature sheath glabrous, margin finely ciliated when still attached to the culm but cilia fall off later. Tip obliquely truncated ; ligule narrow, generally entire but sometimes broken ;

auricles 2, black, continuous with blade, crescent-shaped, fringed with deciduous white bristles when young ; blade 2.5–5.5 x 0.5–1.5 cm, reflexed, lanceolate, tip acuminate. Adaxial surface covered with brown to black pubescence, abaxial surface glabrous, gibbous at the base on the adaxial surface (Fig. 1).

Branching : Holtum (1958) and Dransfield (1981) reported the importance of branching in bamboo taxonomy. In *M. compactiflorus* there is a single oval branch bud at each node covered by the base of culm-sheath. The bud is covered by a single semicircular and open prophyllum which is attached towards the base and slightly keeled towards the apex. The prophyllum covers the inner imbricating free scales. Each bud has a branch primordium which develops into a primary branch. From the base of the primary branch the secondary branches develop. The internodes of secondary branch primordia are so suppressed that they appear to originate from a single point. The branch apex, at their initial stage, is directed downwards but when mature becomes perpendicular to the node. The branches help in climbing. They develop from all the nodes except some of the lower and upper ones. In *Melocalamus* the primary branch bud remains dormant but towards the top the buds develop into branches. In *Dinochloa* the dormant buds develop into branches when the tip of the culm is chopped (Dransfield 1981). In *Melocalamus*, if the top is cut off some but not all the buds develop into branches (Fig. 1. J, K, L, M).

Flowering branches : In *Melocalamus* flowering branches are generally thicker than the main culm supporting them. Spikelets are borne on the leafless pubescent primary

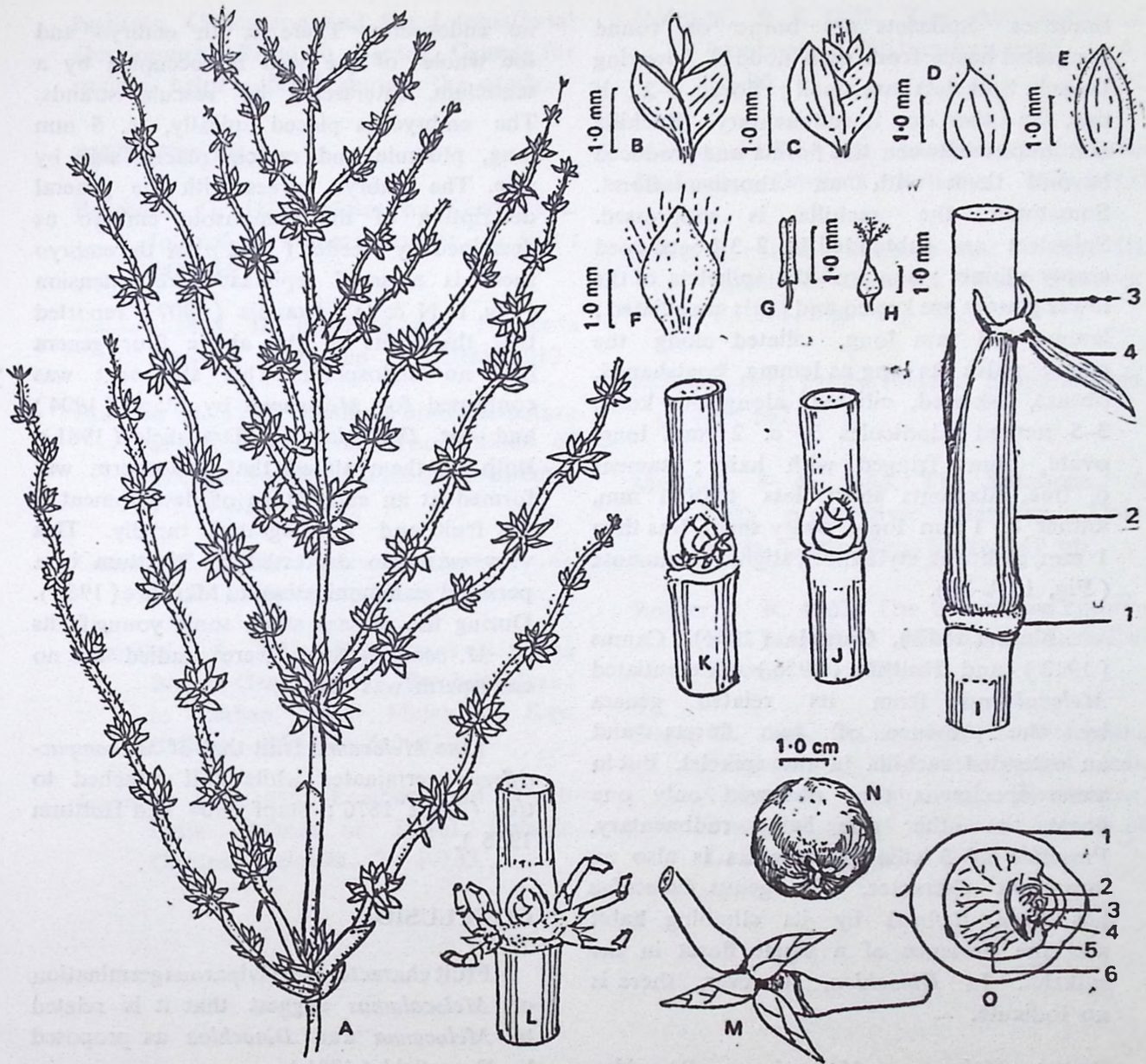


Fig. 1. Morphology of *Melocalamus compactiflorus*

A. Flowering branch, B. Spikelet with two fertile florets, C. Spikelet, with one rudimentary floret, D. Lemma, E. Palea, F. Lodicule, G. Stamen, H. Carpel, I. Internode with culm-sheath : 1 Sheath-girdle, 2. Sheath-proper, 3. Auricle, 4. Blade, J. A node showing branch bud, K. Development of branches, L. A mid-culm node showing branch complement, M. A node with developing branches from top culm, N. Fruit, O. Vertical section of the fruit : 1. Pericarp, 2. Plumule, 3. Radicle, 4. "Epiblast" like extension, 5. Scutellium 6. Vascular strands.

branches. Spikelets are borne on round congested heads from each node of flowering branch. Spikelets are small; florets 1-2; if one, the other one is rudimentary. Rachilla continuous between the florets and produced beyond them with an abortive floret. Sometimes the rachilla is suppressed. Spikelets are subtended by 2-3 boatshaped empty glumes; some of the spikelets of the lower glumes are keeled and keels are ciliated; lemma 2-3 mm long, ciliated along the edge; palea as long as lemma, boatshaped, obtuse, 2-keeled, ciliated along the keels, 3-5 nerved; lodicules 3, c. 2 mm long, ovate, blunt fringed with hairs; stamens 6, free, filaments short, less than 1 mm, anther c. 1 mm long, ovary small, less than 1 mm, glabrous, style short, stigma 3, plumose (Fig. 1. A-H).

Kurz (1877), Gamble (1896), Camus (1913) and Holttum (1956) differentiated *Melocalamus* from its related genera by the presence of two florets and an extended rachilla in the spikelet. But in some specimens they observed only one floret, the other one being rudimentary. Presence of 3 ciliated lodicules is also an important character. The genus *Dinochloa* has been defined by its climbing habit and the presence of a single floret in the spikelet. In *Dinochloa*, however, there is no lodicule.

Fruit: *Melocanna*, *Melocalamus* *Dinochloa* and *Ochlandra* are characterized by their large fleshy fruits. In *M. compactiflorus* the mature fruit is ovoid, berry like, upto 3 cm in diameter, supported by the persistent glumes. The young fruit is glossy green but the mature ones are brown. When young the pericarp is fleshy, becoming hard as it matures. In the mature fruit there is

no endosperm. There is an embryo and the whole of the seed is occupied by a scutellum, intersected by vascular strands. The embryo is placed apically, c. 5 mm long, plumule and radicle placed side by side. The embryo agrees with the general description of the bambusoid embryo as described by Reeder (1962). In the embryo there is a small 'epiblast' like extension (Fig. 1, N & O). Brandis (1907) reported that the fruits of the above four genera had no endosperm. This statement was confirmed for *Melocanna* by Stapf (1904) and for *Dinochloa* by Dransfield (1981). Both of them stated that endosperm was formed at an early stage of development of the fruit and disintegrated rapidly. This view was also expressed by Holttum in a personal communication to McClure (1966). During the present study some young fruits of *M. compactiflorus* were studied but no endosperm was seen.

Like *Melocanna* fruit that of *M. compactiflorus* germinates while still attached to tree (Kurz 1876; Stapf 1904 and Holttum 1956).

CONCLUSION

Fruit character and viviparous germination of *Melocalamus* suggest that it is related to *Melocanna* and *Dinochloa* as proposed by Dransfield (1981).

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