

# Terminal Flowering in *Daemonorops*

JOHN DRANSFIELD

*Royal Botanic Gardens, Kew, Richmond, Surrey, England*

Terminal (hapaxanthic) flowering is well known in the lepidocaryoid palms; all species of *Korthalsia*, *Plectocomia*, *Plectocomiopsis*, *Myrialepis*, *Ancistrophyllum*, *Oncocalamus*, *Eleiodoxa*, and *Eugeissona*, and apparently all species of *Raphia*, have this particular method of flowering in which axes develop through a vegetative phase and then pass into a flowering phase which terminates the growth of those axes. In *Metroxylon* all species but one flower hapaxanthically; *M. amicarum* (H. Wendl.) Becc., the exception, has pleoanthic flowering, the inflorescences being produced in the axils of the leaves until the axis dies of injury or old age. That the two effectively and markedly different methods of flowering can occur in the same genus has stimulated much speculation as to which flowering process is primitive and which advanced. Holtum (1955), Corner (1966), Hallé and Oldeman (1970), and Dransfield (1970) favour the idea that hapaxanthic flowering is basic whereas Moore (1969), at least in *Metroxylon*, and Moore and Uhl (1973), regard it as derived. Tomlinson and Moore (1968) regard the whole argument concerning which is primitive, hapaxanthic or pleoanthic, as being redundant. Like many evolutionary problems there are good arguments difficult to prove in favour of both views. Whatever the real answer may be, the situation is certainly an interesting one and it may be of importance to record the occurrence of hapaxanthic in a genus hitherto thought to be entirely pleoanthic.

Of the 115 species of *Daemonorops*, at least one species appears to have

hapaxanthic flowering. This is *Daemonorops calicarpa* (Griff.) Mart., an acaulescent forest undergrowth palm highly characteristic of forest bordering rivulets in nonswampy lowland and hill dipterocarp forest in the Malay Peninsula; in such a habitat it forms thickets, often in association with *Calamus castaneus* Griff. It also grows in North Sumatra in a small area of forest in the Langkat Nature Reserve which is remarkable for the large number of plants of Malayan distribution apparently not found elsewhere in Sumatra (e.g. *Calamus castaneus*, *C. insignis* Griff., and *Johannesteijsmannia altifrons* (Reichb. f. et Zoll.) H. E. Moore).

*Daemonorops calicarpa* produces sympodially suckering axes which are scarcely more than 30 cm. tall and bear large leaves often 3–5 m. tall with rusty brown sheaths having conspicuous oblique combs of pale brown spines. The pinnae are regular, fine, and densely crowded, and sometimes the leaf ends in a short vestigial cirrus. A clump will contain six or more axes of varying age. An axis of *D. calicarpa* in flower has a marvellous appearance; a large knob-kerry of flowers is found almost at ground level among the leaf bases. The flowering axis consists of very crowded internodes with short leaves ending in vestigial cirri and undulate, partially developed leaflets. These leaves become smaller and smaller distally. In the axis of them are the inflorescences which likewise decrease in size distally until the most distal ones are minute and contain no flowers. In all, about 25 inflorescences are produced from one axis, not apparently reaching anthesis



1. *Daemonorops calicarpa*. Flowering shoot showing the crowded mass of reduced leaves with short cirri and undulate leaflets and the mass of inflorescences. Note on the right a young sucker developing from the base of the terminated axis. (*J. Dransfield 1831*. Ulu Besitang, Langkat, N. Sumatra, August 1971.)

at the same time, but still produced over a very short period. In the staminate plant, these inflorescences open in an acropetal sequence and finally die and rot on the plant; suckering from the base of the flowered axis perpetuates the life of the plant. In the pistillate plant the inflorescence sequence is similar, but if pollination and fertilization take place, the inflorescences are much longer lived and produce a great bunch of infructescences. In either sex the individual clump will contain many old rotted inflorescences at the stem apices showing that growth does not continue after flowering and confirming the hapaxanthic behaviour of the palm.

*Daemonorops tabacina* Becc. in the same section (*Cymbospatha*) of the genus as *D. calicarpa* has possibly a similar method of flowering. One population from West Sumatra (represented in the Bogor Herbarium by Dransfield 4161) is probably referable to this species. It consisted of conspicuous rosettes with suckers very similar in armature to those of *Daemonorops calicarpa* but also producing an aerial axis about 4 m. in length, weakly climbing, terminating in reduced leaves and inflorescences decreasing in size distally. Though only one fresh specimen in flower was found, the abundance of dead stems in each clump seemed to suggest that flowering was as in *D. calicarpa*.

Cirri and flagella, the climbing organs of Asiatic rattans, are associated in rattans with the climbing phase. Most rattans pass through a rosette stage during their development from seeds and this rosette stage is usually without climbing organs; cirri develop gradually at the ends of successive leaves as an aerial stem is produced. Similarly, flagella appear from the leaf sheaths of certain *Calamus* species usually only when an aerial stem has been built up.

The presence of cirri in the acaulescent *Daemonorops calicarpa* may suggest that this species is either an intermediate in the evolution of the climbing habit from the acaulescent or else that it represents a reduction from the rattan habit. It is, however, much more reasonable to suggest that the cirri in the flowering system of *Daemonorops calicarpa* represent a vestigial state as they can have no adaptive significance for climbing. This very much suggests that the acaulescent habit in *Daemonorops calicarpa* is derived rather than primitive and also suggests by association that hapaxanthly in *Daemonorops* is derived. This is further suggested by the fact that the cymbospathe inflorescence of *D. calicarpa* represents a highly differentiated inflorescence when compared with the simple inflorescences of *D. longispatha* Becc. and its relatives where there is a gradual succession of bracts and branches of decreasing size.

This, however, is not to suggest that the acaulescent habit in rattan genera is always derived. In *Calamus*, the "acaulescent" *Calamus castaneus* with stocky short trunk, no sign of climbing organs, and very simple inflorescences with a gradual and decreasing succession of bracts could be regarded as basal in the genus *Calamus* whereas the acaulescent *Calamus lobbianus* Becc. with short vestigial flagella and highly condensed divaricating inflorescences may be regarded as derived from a climbing ancestor.

If indeed hapaxanthly in *Daemonorops calicarpa* is derived, it is possible that it may be an adaptation of some ecological significance, but what that may be is not known.

However convincing the arguments of Holttum, Corner, and Hallé and Oldeman may be for the primitive status of hapaxanthly, here is one example where

it is much more likely to represent a derivation from pleonanthy.

#### LITERATURE CITED

- CORNER, E. J. H. 1966. The Natural History of Palms. Weidenfeld and Nicolson, London.
- DRANSFIELD, J. 1970. Studies in the Malayan Palms *Eugeissona* and *Johannesteijsmania*. Ph.D. Thesis, Cambridge.
- HALLÉ, F. AND R. A. A. OLDEMAN. 1970. Essai sur l'architecture et la dynamique de croissance des arbres tropicaux. Masson et Cie, Paris.
- HOLTUM, R. E. 1955. Growth-habits of monocotyledons—variations on a theme. *Phytomorphology* 5: 399-413.
- MOORE, H. E., JR. 1969. A preliminary analysis of the palm flora of the Solomon Islands. *Phil. Trans. Roy. Soc. B*. 255: 589-593.
- MOORE, H. E., JR. AND N. W. UHL. 1973. The Monocotyledons: their evolution and comparative biology VI. Palms and the origin and evolution of monocotyledons. *Quart. Rev. Biol.* 48(3): 414-436.
- TOMLINSON, P. B. AND H. E. MOORE, JR. 1968. Inflorescence in *Nannorrhops richiana* (Palmae). *J. Arnold Arbor.* 49(1): 16-34.

## NEWS OF THE SOCIETY

As of this writing there are 1,015 members in The Palm Society. It has taken just 20½ years to achieve this goal, one that our founder, Dent Smith, said he felt would put the society on a sound financial basis. Our finances are sound and our members are enthusiastic, what more can we ask? So, congratulations to one and all, and many thanks to those of you who have worked so hard to help us grow—your efforts have paid off.

\* \* \*

The mighty state of Texas is bestirring itself and soon we will have one or several chapters of the society there too. Mrs. Virginia Masse called together a few members in Dallas—Gordon Hintz, Rosie Graham, Fred Meyer, and Lenny Goldstein—to spend a couple of hours getting acquainted and swapping information. Lenny continues: "A couple of things are fairly certain even for a small group, our interests are wide-ranging. Some of us have concentrated on the more exotic species, while others, notably Mr. Hintz, have devoted their efforts to cultivation of hardy species. In this context, we should all be able to contribute and learn a lot. Secondly,

it appears that Palm Society members in Texas are more likely to organize on a regional, rather than a statewide, basis. Distances—240 miles between Dallas and Houston, and over 500 miles between Dallas and the Valley—and climatic differences account for this observation. One statewide meeting a year is possible. I believe from talking to Jimmy Cain (in Houston) that this is also the sentiment of the Houston group. At any rate, the Dallas group is enthusiastic and we decided to meet again October 25 at Mr. Hintz's home. (As you know, he has had good success sowing seed directly into the ground in order to get them accustomed quickly to the cold spells and alkaline soils of Dallas.)"

The second meeting of the North Texas Chapter of The Palm Society was held in October at the home of Mr. Gordon Hintz. Members were able to view the 26 species of palms being grown out of doors in Dallas by Mr. Hintz. A viewing of slides provided by The Palm Society was held. Plans were made to exhibit palms at the North Dallas Garden Forum Show in November, the display to consist of potted palms and a photographic display of large outdoor palms growing in Dallas.