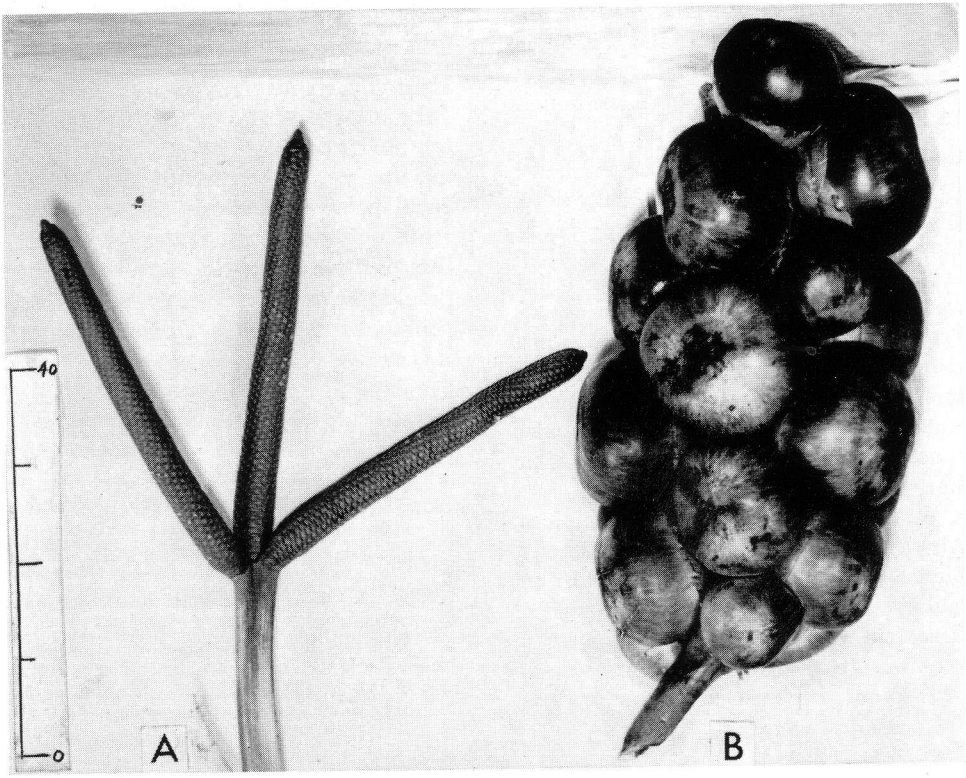
Hermaphroditism in Borassus flabellifer from South India

I. Henry Louis[1] and V. Eugene Mary[2]

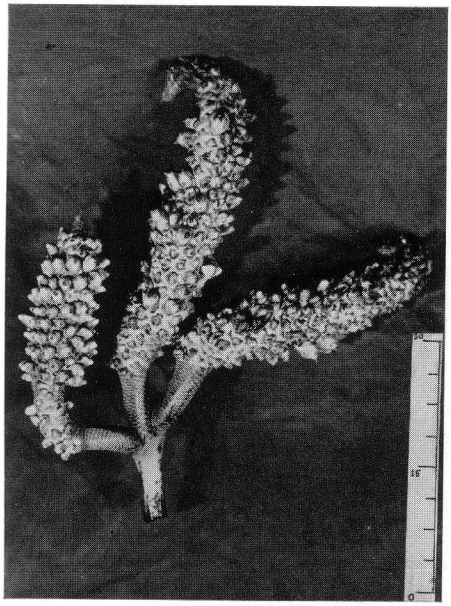
The authors have come across a palmyra palm (*Borassus flabellifer* L.) at Nagercoil, Kanyakumari District (Tamil Nadu), which exhibits hermaphroditism. The tree is 20 meters (more than 60 feet) high and is estimated to have an age of 40 years. It is tapped for sweet toddy by chopping the tender inflorescences regularly. Occasionally one or two inflorescences are left unchopped.

The palm produces spadices with branches which appear from a distance to be typical of a male tree of the usual *Borassus flabellifer* which is a dioecious palm. Hence the unusual nature of this tree escapes the notice of a casual observer from the ground. This apparently normal kind of inflorescence, coupled with the prevalent practice of

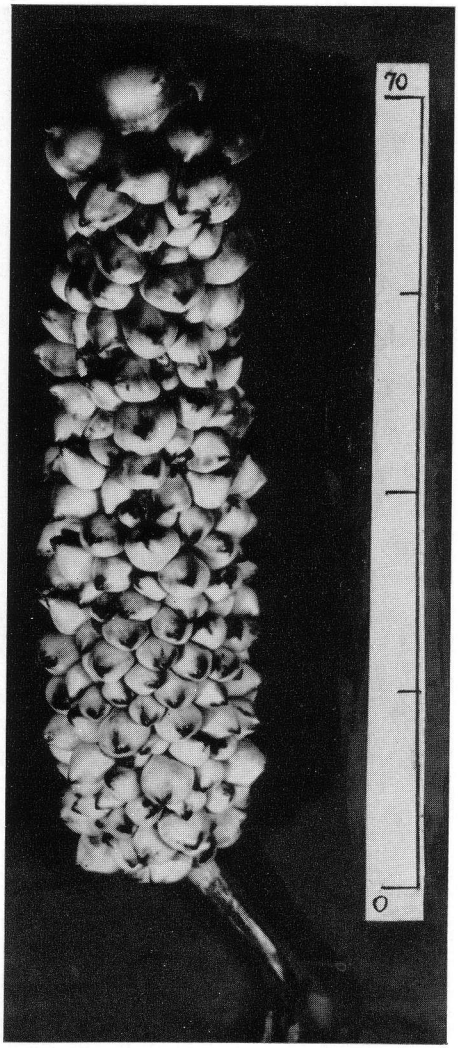
[1] Department of Agricultural Botany, Tamilnadu Agricultural University, Coimbatore—3.
[2] Department of Biology, St. John's College, Anchal, Kerala.



1. Normal inflorescence parts of *Borassus flabellifer*: male spikes (A) and a female spike in immature fruit (B).



2. Primary peduncle of a hermaphroditic individual having three spikes, each with a basal sterile portion.



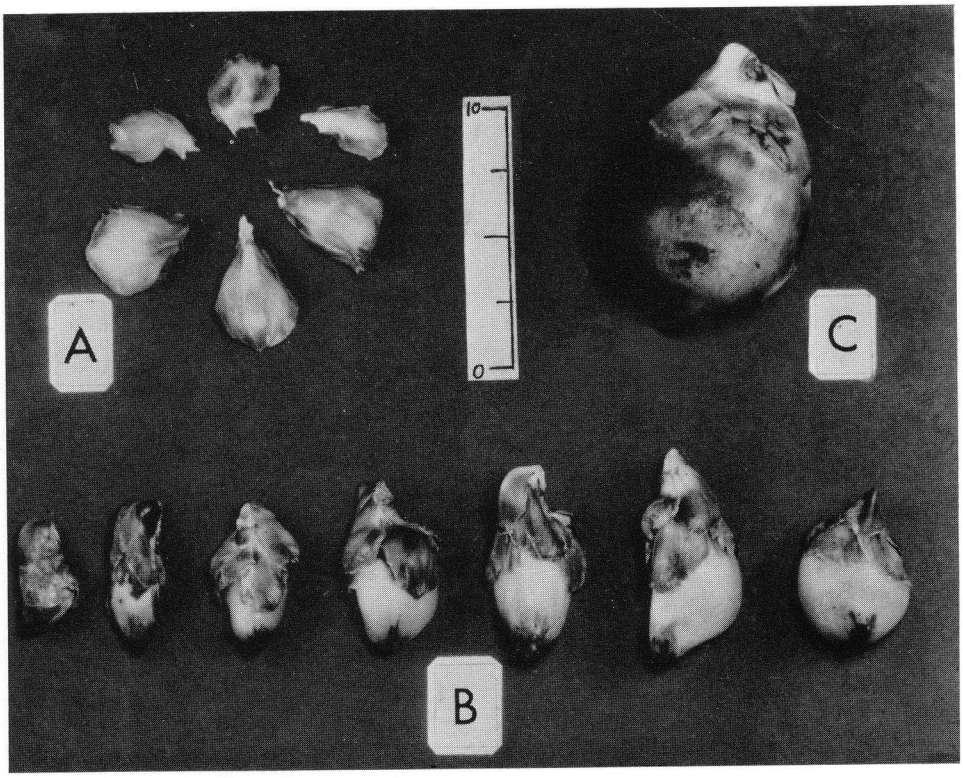
3. A primary peduncle of a hermaphroditic individual with a single spike of young fruits.

tapping, handicaps the observer looking for similar palms in other localities. However, intensive search is being made in the same district and also in other neighboring districts to see if there are other palms with hermaphroditic flowers.

Each primary spathe accommodates five to seven peduncles and each peduncle has a secondary spathe. Two or three (or sometimes only one) cylindrical spikes are borne digitately at the apex of the peduncle in a manner characteristic of the male inflorescence of a normal individual. The spikes are 30–40 cm. long and 2–3.5 cm. across, slightly tapering towards the apex. Flowers are embedded in concavities concealed by bracts.

A few days after opening of the spathe, the spikes swell slightly and minute conical bisexual flowers appear, pushing the bracts from the pits and commencing from the apex but later randomly throughout the spike. The bracts are auricular and persistent. Flowers are subsessile with a perianth of three sepals and three petals loosely imbricate and persistent around the ovary at its base.

It is interesting to note that flowers exhibit dimorphism in the development of stamens. Some stamens have long filaments and large anthers (about one-



4. Flowers and fruits from a hermaphroditic individual of *Borassus flabellifer*: perianth parts at A; flowers at different stages of development at B; immature fruit at C.

third of the total flower) and the rest have short filaments and small anthers. As a whole, the stamens are much longer than in the normal male flowers of the dioecious palm. Perianth segments are obovate, cuneate at the base, and only one-fifth as long as those of normal female flowers. Stamens are six with filaments broadened towards the base and touching the contiguous ones. Anthers are linear, bilocular, and longitudinally dehiscent. The gynoecium is syncarpous, formed of three or four carpels. The conical ovary has a very short style with stigmatic lobes.

The authors counted as many as 300–600 hermaphroditic flowers in different spikes in contrast to 50–70 female flowers of a normal pistillate inflorescence which is quite large and conspicuous and can be distinguished even before its emergence from the primary spathe. The normal female spike is solitary and the female buds, covered by large bracts, can be located many days before their emergence from the spathe by their enormous size. The hermaphroditic buds, as previously noted, are concealed by bracts and become visible only when they completely emerge.

Fruits on the hermaphroditic individual are numerous, congested, oblong to ovoid, about 8 cm. across, and with three or four seeds. These seeds germinate with ease and the seedlings, though small, are vigorous in growth.

Hermaphroditic inflorescences appear

regularly in this tree which seems to be good material for geneticists and taxonomists to explore further, hence worthy of immediate protection and propagation. The development of female floral organs apparently from the male spike is interesting from the point of view of evolution of sex differences in palms. The hermaphroditism observed here suggests a reversion to an ancestral stage in the evolution of the present-day dioecious palmyra palm. Cytological studies are being conducted to throw light on the taxonomic status of the new find. Similar but slightly modified cases of abnormal inflorescences have also been brought to the notice of the authors and they are being studied critically. It may be noted that in the coconut palm, *Cocos nucifera* L., male and female gametophytes are borne on the same sporophyte, but intermediates between hermaphroditism and monoecism, and again between monoecism and dioecism have been reported by various workers (Beven, 1891; Davis, Anandan and Menon, 1954; Gopal Rao, 1948; Jacob, 1941; John and Narayana, 1942).

Summary

The occurrence of hermaphroditism in *Borassus flabellifer*, normally a dioecious palm (Blatter, 1926; Chathukutty Nambiar, 1954), is reported for the first time. The hermaphroditic flowers are produced in spikes more comparable to the male spikes than to the female ones of normal unisexual individuals. The bisexual flowers produce fertile seeds from which seedlings have been raised.

Acknowledgments

The authors record their thanks to professors Sri P. V. Marappan and Sreerangaswamy, Tamilnadu Agricultural University, Coimbatore for encouragement, and to the Botanical Survey of India, Coimbatore for help in the critical study of the material and in the preparation of this note.

Literature Cited

B[even?]. 1891. Male and female coconut trees. Tropical Agriculturist 11: 58.

Blatter, E. 1926. The palms of British India and Ceylon. Humphrey Milford, Oxford University Press, London.

Chathukutty Nambiar, M. 1954. A note on the floral biology of palmyrah palm (*Borassus flabellifer*). Indian Coconut Journal 7: 61–70.

Davis, R. A., A. P. Anandan and K. P. V. Menon. 1954. Hermaphroditism in *Cocos nucifera* L. Indian Coconut Journal 7: 133–142.

Gopaul Rao, T. 1948. A note on the occurrence of a hermaphrodite flower in coconut (*Cocos nucifera* L.). Journal of the Indian Botanical Society 27: 208–211.

John, C. M. and G. V. Narayana. 1942. The male coconut tree. Madras Agricultural Journal 31: 75–77.

Jacob, K. C. 1941. A new variety of coconut palm (*Cocos nucifera* L. var. *spicata* K. C. Jacob). Journal of the Bombay Natural History Society 41: 906–907.