

A Coconut Palm Producing Pigmy-Size Barren Fruits

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Abstract

One palm in Car Nicobar Island was found to produce only sterile male and female flowers with no button shedding. The pigmy-size barren fruits attained a maximum size of 9×5 cm, and a volume of 115 cc after 12 months of growth. All the fruits possessed two internal supernumerary whorls of three alternating carpels each, and the embryo sac was under-developed. The male flowers also had three whorls of alternating supernumerary boat-like fleshy sepals, the anthers dehisced normally, but were mostly devoid of pollen.

Introduction

Several abnormalities on vegetative parts, inflorescence, flowers, fruits, and sex of the coconut palm have been reported from 1901 (Kupfer, 1901). Menon and Pandalai (1960) and Davis (1966) have summarized these. Production of barren fruits in bunches is a common feature in all coconut growing areas. The barrenness may be partial or complete. It is estimated to be about 3% of the gross annual yield (Gangolly and Nambiar, 1953; Mathew, 1976). At the same time, the occurrence of sterile palms is a rare phenomenon.

During a survey of coconut plantations in Andaman and Nicobar Islands, one sterile palm was seen in Car Nicobar. The tree was normal in all respects, excepting for the production of sterile flowers which produced only pigmy-size fruits.

Materials and Methods

Observations were taken on the nature of different plant parts including emergence of inflorescences, behaviour of male and female flowers, etc. Morphological and anatomical observations were conducted on freshly collected flowers and fruits in different stages of maturity.

TABLE 1. Characteristics of the fruit of the sterile coconut palm

Whorl of carpels	Size at the respective stage (L×B; cm)	Size on maturity (L×B; cm)	Shape	Volume on maturity (cc)	Thickness at maturity (cc)	Description
I. Outer	3.4×2.7	7.5×5.0	Boat-like	88.0	1.6	Carpels hard and differentiated into layers of exocarp, mesocarp, and endocarp, endocarp at the stigmatic and slightly lignified and extending towards the stalk and (as opposed to normal ones); this whorl encircling fully the middle and inner whorls.
II. Middle	1.5×1.0	5.5×1.7	Elongated spire-like and 3-edged tapering (towards the stigma)	5.0	0.8	Carpels free during early stages of development and later adhering together, hard and fibrous and differentiated into three layers; endocarp lignified from stigmatic end, extending downwards; this whorl enclosing fully the inner whorl.
III. Inner	0.6×0.35	1.7×0.6	Conical tapering towards the stigma	0.8	0.3	Carpels free in early stages and pressed together later on freshly and less hard and fibrous than the other whorls; differentiation of tissues into different layers not prominent; this whorl arches embryo sac.

Results and Discussion

Female flowers. The juvenile flowers appeared normal. One peculiarity noticed in the development of the ovary was that the outer three carpels were completely free during the early stages of development, but later on, they united together at the base and remained more or less free beyond the three pores of the septal nectaries alternating with the stigma. The growth of the fruit appeared normal during the first 3-4 months and was slow thereafter. After full maturity, the fruits shed as usual. By this time, the maximum size of the fruit was only 9 cm × 5 cm with a volume of 115 cc. The number of fruits per bunch varied from 20 to 50. The palm did not show shedding of buttons or immature fruits. The pericarp of mature fruits was hard and stony.

All the female flowers and fruits in a bunch were barren and possessed two internal super-numerary whorls of three carpels each. The whorls alternated each other; the outer whorl, which constituted the ovary, was the largest of the lot, and enclosed the other two smaller supernumerary whorls one after the other; the embryo sac was under-developed. Some of the other details recorded from the fruits are given in Table 1.

Male flowers. They were conspicuous (average size 12 mm × 7 mm) and appeared normal. The six anthers dehisced normally, but were mostly devoid of pollen. An abnormality noticed was the presence of three whorls of three alternating supernumerary boat-like fleshy petals in the centre of the flower. The outer whorl of petals had a mean length of 9 mm while the inner ones measured 7, 6, and 5 mm in a few cases; the petals were formed into one or two stamens in the outer whorl.

These findings have shown that this palm is unique in respect of (1) total spirality of male and female flowers; (2) possession of supernumerary carpels and petals in female and male flowers; (3) absence of shedding of buttons and fruits. It does not come within any of the five groups of barrenness and other abnormalities described by earlier workers.

References

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 Kupfer, E. M. (1901). Imperfect coconuts. *Ann. New York Bot. Gard.* 11 : 67-71.
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Discussion

Venkateswaran : You have said that the female flowers are sterile. What, according to you, could be the mechanism of fruit development in this situation ?

Nair : Vivipary or parthenogenesis.