tall forest trees and so anchor the rattan as it hauls its slender stems into the forest canopy. No doubt other structural modifications have their direct usefulness but no example is more obvious than this.

The purpose of this essay has been merely to serve as a brief outline which will guide the beginner in understanding the complexity of the palm leaf. In spite of this complexity and of the great diversity in size and form, I have tried to show that palm leaves are fundamentally all alike. There is much that remains untold. If a short essay introducing the subject can reach the length of this present article, then a proper survey would produce a whole volume.

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Palms in the Royal Botanic Gardens, Peradeniya, Ceylon

D. M. A. JAYAWEERA

The Royal Botanic Gardens at Peradeniya, Ceylon, were founded in 1821 at the request of Sir Edward Barnes, the Lieutenant-Governor of Ceylon at the time, by his desire to see the cultivation of coffee in the colony. The site was earlier inspected and reported on favourably by Mr. Alexander Moon who was Superintendent of Calutara Garden near Colombo.

The Gardens occupy a horseshoe-shaped peninsula round which flows the chief river of Ceylon, the Mahaweli. The Gardens are situated 68 miles from Colombo, the chief port of Ceylon, along the Colombo-Kandy road; and 4 miles from Kandy, famous for its Temple of the Tooth wherein a tooth relic of Buddha is housed. The total area is 147 acres of beautifully undulating grounds 1550 feet above sea-level. The climate is hot, moist, and very equable. The mean temperature is about 76° F., and the rainfall averages 90 inches per year spread over about 170 days. January to April is the driest season of the year. The mornings are cool (the temperature in the early mornings in January and February is sometimes as low as 56°-58° F.). April is the hottest month though the mornings are fairly cool.

Mr. Alexander Moon was appointed the first Superintendent of Botanic Gardens in 1821, and he was responsible for moving the plants from the Calutara Garden to the present site. The first official plan of the Gardens appears to

Ed. Note. Additional photographs of palms at Peradeniya are to be seen in "Cultivated Palms," in *The American Horticultural Magazine* 40: pp. 52 (*Borassus flabellifer*), 69 (*Corypha umbraculifera*), 76 (*Hyphaene thebaica*), 83, 84 (*Lodoicea maldivica*), 108 (*Roystonea oleracea*).

22. An avenue of *Roystonea regia*, the royal palm, planted in 1950. Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.

have been made in 1843 and was subsequently developed to its present condition by the successive Directors and Superintendents. Moon compiled a catalogue of Ceylon plants (1824). Other Directors of note were G. H. K. Thwaites F.R.S. (from 1857 to 1880) the author of *Enumeratio Plantarum Zeylanicae* (1864); H. Trimen F. R. S. (1880-1896) author of *Handbook of the Flora of Ceylon and Hortus Zeylanicus;* J. C. Willis F. R. S. (1896-1912) who published a revision of the Podostemonaceae of India and Ceylon and dealt with problems of evolution and "Age and Area" theory; T. Petch (1913-1925) an authority on the Fungi of Ceylon and responsible for several publications dealing with this subject; and H. F. Macmillan (1912-1925), the author of *Tropical Planting and Gardening* (1949).

Visitors to the Gardens are struck particularly by the beautiful undulating lawns, the envy of all botanical gardens, and by the shadow effects of large trees on these lawns in the early hours of the sunny mornings and late evenings.

The living collection of plants in these Gardens includes over 3000 species of which the palms and bamboos are most impressive. The palms occupy the southern section of the Gardens covering an area of about three and three-quarter acres. One hundred and forty-three species of palms are represented in this collection and there are five avenues of palms in various parts of the Gardens. These avenues are planted with talipot palms *(Corypha umbraculifera)*, royal palms *(Roystonea regia)*, cabbage palms *(Roystonea oleracea)*, double-coconut palms *(Lodoicea maldivica)*, and palmyra palms *(Borassus flabellifer)*.

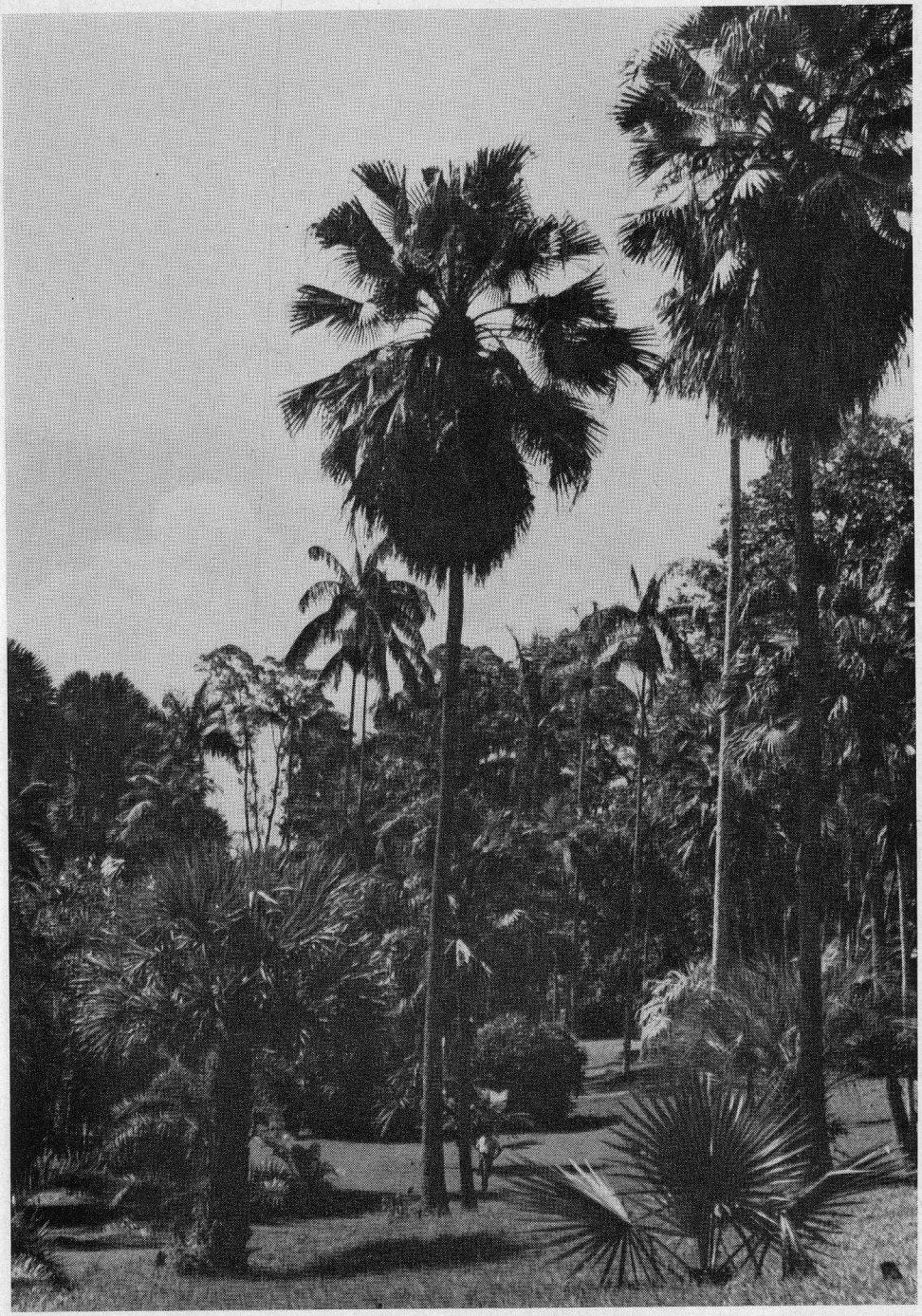
23. A view of the palmetum at Peradeniya. Left, *Raphia pedunculata;* center, *Calamus scipionum;* right, *Metroxylon Sagu.* Photograph by D. M. A. Jayaweera.

The talipot palm *(Corypha umbraculifera)* of Ceylon and South India, the chieftain of the palm tribe, is the largest of the palms and most majestic. It grows to a height of 60-80 feet with a straight cylindrical trunk 3-4 feet in diameter with a crown of immense fanlike leaves which are used for umbrellas, sunshades, etc. At the age of 30 to 40 years it produces an enormous pyramidal creamy white inflorescence 15-25 feet in height upon the summit of the stem above the crown of leaves. Each palm produces over 1,000,000 fruits of which about 50 per cent are viable. These fruits are dispersed by frugivorous bats. When the fruits are ripe the plant dies.

The double-coconut or coco-de-mer *(Lodoicea maldivica)* of the Seychelles Islands is a most remarkable palm especially for its longevity and its morphological peculiarities. A fine male specimen of over 100 years of age and a fruit-bearing female specimen 55 years old in addition to many younger ones are represented in the Avenue. The royal and cabbage palms grow into splendid specimens in these Gardens. The cabbage palms in the avenue average over 100 feet in height and are 53 years old while the royal palms have been recently planted and are still quite young.

The palmyra palm, *(Borassus flabellifer)*, a native of India and Ceylon, grows remarkably well towards the drier parts of the island. It attains a height of 45-60 feet. The male and female trees cannot be distinguished until they begin to flower when they are about 15 years old. The female inflorescence is tapped for sweet toddy from which jaggery, vinegar, and spirits are manufactured. The fruit is eaten when young and from the juicy mesocarp of

24. A large specimen of *Orbignya Cohune*. To the left is *Arikuryroba schizophylla*. Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.



25. A general view of a section of the palmetum of the Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.

the older ripe fruits an article of food called *punatoo* is prepared. After the extraction of *punatoo* the seeds are germinated and young 2-3-month-old seedlings are boiled and eaten or dried and stored for future use. The leaves are used for thatching houses and the timber for building purposes. The fresh toddy-juice of the plant is used medicinally as a stimulant and anti-phlegmatic. It is very useful for persons suffering from habitual constipation and is supposed to be a specific for amoebiasis. The tender terminal bud is a diuretic.

Other palms of economic and medicinal value that grow abundantly in Ceylon are *Cocos nucifera*, *Areca Catechu*, *Phoenix zeylanica*, *Caryota urens*, and *Nypa fruticans*. The economic value of coconut is well known. The fresh nut is much used for all culinary purposes and the older and dried nuts are converted into oil and cattle food. The young flower is tapped for coconut toddy from which jaggery, vinegar, and alcohol are prepared. The leaves are used for thatching houses; the husk of the drupe for making ropes, mats, baskets, brushes, etc.; the timber for building purposes and the activated charcoal from the endocarp of the fruit for gas masks. Medicinally the flowers are used in the treatment of diabetes, dysentery, leprosy and urinary diseases. The roots are astringent and diuretic and often employed along with other drugs for treating persons suffering from dysentery and other intestinal complaints. The young coconut water is a good substitute for saline and it contains traces of vitamins A, B and C.

Areca Catechu, the betel-nut palm, is a thin tall cylindrical palm bearing a crown of leaves at the summit of the stem and is much cultivated in village gardens. The nut is used as a masticatory. The dried young nut is a stimulant, astringent, and taeniafuge. The young shoot is an abortifacient in early pregnancy. The expressed juice of the pericarp is applied to the bites of tarantulas. The value of the nut as an anthelmintic is due to the presence of the alkaloid arecoline which occurs along with tannin and gallic acid.

The wild date of Ceylon, *Phoenix zeylanica*, is found abundantly on the southern coast and in the dry zone districts of Ceylon. The leaves are used for weaving mats and the cabbage is supposed to be an antidote against rat-bite poisoning.

The kitul palm, *Caryota urens*, grows naturally in the moist districts. It is much used as elephant food. The inflorescence is tapped for toddy as in the coconut, the fibre used for making ropes, brushes, etc., and the timber for building purposes. The pith of the mature trees yield starch which is used as a substitute for sago.

The water coconut, *Nypa fruticans*, grows along the mouths of rivers on southwest coast of Ceylon. The palm is not much used by the inhabitants. The juice of the young shoot is used medicinally for treatment of herpes.

There are only 21 species of palms in all growing wild in Ceylon. Of this number 12 are endemic species out of which 8 are in the genus *Calamus*. The *Calamus* species are all confined to the moist low country below 1000 feet elevation. Of these *C. radiatus* and *C. zeylanicus* are common, while *C. rivalis*, *C. delicatulus*, *C. pachystemonus*, *C. Thwaitesii*, *C. digitatus*, and *C. ovoideus* are rare. *Areca concinna* is also rare, being confined to the forests in the moist low country, while *Loxococcus rupicola* and *Oncosperma fasciculatum* are rather common and are found in moist forest regions below 5000 feet elevation.

Phoenix zeylanica is very common in the low country.

Native palms to be seen in the Garden include the above as well as the talipot and palmyra palms (already mentioned), coconut, betel-nut *(Areca Catechu)*, wild date *(Phoenix zeylanica)*, kitul palm *(Caryota urens)*, and water coconut *(Nypa fruticans)*.

Besides the palms mentioned above, there are a number of other notable species of interest growing in the Botanic Garden: African oil palm, *Elaeis guineensis;* ivory nut palm, *Phytelephas macrocarpa,* from Colombia; doum palm, *Hyphaene thebaica,* from the Sudan; carnauba wax palm, *Copernicia cerifera,* from Brazil; macaw palm, *Acrocomia sclerocarpa,* from tropical America; cohune palm, *Orbignya Cohune,* from Honduras; sealing wax palm, *Crytostachys Renda,* from Sumatra; sago palm, *Metroxylon Rumphii* from New Guinea and *Metroxylon Sagu* from Malaya. There are also several species of the following genera; *Aiphanes, Arenga, Attalea, Calamus, Latania, Licuala, Livistona, Phoenix, Ptychosperma, Sabal,* and *Thrinax.*

PALMS OF CUBA

BROTHER ALAIN
Herbario De La Salle, Vedado, Habana

It is always exciting and charming for the visitor in Cuba to contemplate the palm groves that may be seen in every part of the country. The first thing you notice as you travel along the central highway are the slim trunks of the royal palms, their heads high above the sugar cane plantations or mixed with other trees in the woody hills. You may see long rows of them along the roads and between fields in the *guardarrayas* separating one sugar cane field from another. This royal palm is well named as it may be considered the "King of the Palms," and even of the whole world of plants.

But as you drive out from Havana, you may reach places where even from your car you can observe different kinds of palms. There are more than 75 different species of palms in the island, and most of them are not to be found elsewhere. Some are quite rare while the ubiquitous royal palm is everywhere. This is quite unusual for a small area like Cuba to have such a large number of species of palms, and it offers an opportunity for the botanist and nature lover to study the different forms and adaptations of these remarkable plants.

The systematic study of the palms in Cuba began only some 30 years ago when the leading Cuban botanist of this century, Brother León (1871-1955), began collecting herbarium specimens in order to know each species and study them in his laboratory. From this long and difficult study came some 37 new species. To collect samples of palms for the herbarium is not so easy as for other plants. For example, if you want the leaves you have to find somebody to climb the tree, and this is not easy sometimes even if you want to pay for the services. The botanist does not want to cut down the palms, but he needs some parts that cannot be obtained unless you kill the plant. The material you have to take home is always bulky, and if you travel by the public means of transportation, somewhat embarrassing to take with you. For all these reasons, the palms of Cuba were little known, and the 38