



PRINCIPES

Journal of The Palm Society

April, 1964
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THE PALM SOCIETY

A non-profit corporation primarily engaged in the study of the palm family in all its aspects throughout the world. Membership is open to all persons interested in the family. Dues are \$10.00 per annum payable in May. Requests for information about membership or for general information about the Society should be addressed to the Secretary.

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JOURNAL OF THE PALM SOCIETY

An illustrated quarterly devoted to information about palms published in January, April, July, and October, and sent free to members of The Palm Society

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Cover Picture

Date palm (*Phoenix dactylifera*) in bas-relief on walls of terrace temple of Queen Hatshepsut (1515-1481 B. C.) at Deir el-Bahri, opposite Thebes, Egypt. It is one of the oldest pictorial renderings of a palm (about 3500 years old). Photograph by W. H. Hodge.

NEWS OF THE SOCIETY

Time is drawing near for the biennial convention, to be held on Saturday, April 11th, at the Los Angeles State and County Arboretum, Arcadia. This is the first time that a biennial meeting will be held in California, and members who have not been there before are looking forward to seeing many interesting sights, while those who have experienced the warm hospitality of the West are keen about a return visit. A highlight of these meetings is the opportunity members have to meet each other, exchange experiences and ideas, and make new friends. The tours of famous gardens and nurseries during the following week should prove most rewarding, also.

* * *

Orders for extra copies of Dr. Moore's "An Annotated Checklist of Cultivated Palms" have been coming in steadily. Many scientific libraries, as well as individuals, have ordered copies. Some of our members have ordered extra copies to present to their local libraries.

After finishing this valuable piece of research, Dr. Moore was able to find time for a seven-month trip to palm-rich areas of the world, and doubtless will return laden with information about little-known genera and species, which may eventually find their way into cultivation.

* * *

Visitors have been coming to the headquarters of the Society from far and near. Mr. Charles Honnold Crispin, of Sao Paulo, Brasil, was a visitor

in August. He is making a study of the feasibility of increasing the palm-oil industry in northeastern Brasil. Mr. Kan Yashiroda, of the Yashiroda Junkaen, Tonoshu - kyoku, Kagawa - ken, Japan, paused for two days on his return to Japan from an eight-week stay at the Brooklyn Botanic Garden, where he taught a course in Bonsai. Mr. and Mrs. Roland B. Queneau spent a week in Miami, coming from their home in St. Croix, U. S. Virgin Islands. They went home with many treasures for their garden on a hill-top at Christiansted. Mr. and Mrs. R. H. Fackelman, from Panama City, Florida, enjoyed a tour of some of our palm collections. Mr. and Mrs. R. G. Riggle of West Palm Beach also paid us a visit. We are always delighted to see and talk with members, and show them our sights as far as possible.

* * *

This summer should see *Chrysalidocarpus Cabadae* blooming for the first time in the United States. Plants raised from seeds brought back from the Atkins Garden of Harvard University, Soledad, Cuba, by Mr. Stanley Kiem, superintendent of Fairchild Tropical Garden, in 1952 and distributed to members of the Garden in March 1955, have now reached maturity and shown signs of blooming in the near future. It would be most interesting to know whose palm will be the first to bloom and fruit. If yours does, will you let me know? Thanks.

LUCITA H. WAIT

SATURDAY, APRIL 11, 1964

is the day of the

BIENNIAL MEETING

at the Los Angeles State and County Arboretum, Arcadia, California.

Have you made your reservations for the program to follow?

The Saw Palmetto—*Serenoa Repens*

JOHN K. SMALL

Reprinted without the footnotes, from Journal of the New York Botanical Garden 27:193-202, 1926.

When we consider the great abundance of the saw palmetto, and its wide geographic distribution—for it stands second among our palms in the extent of area it inhabits and first in abundance—it seems strange that the earliest botanical literature of America is so barren of references to it. The armament of its petioles, unique among our native palms, and the shape of the fruits particularly should have attracted the attention and interest of botanists and travelers. However this palm does receive notice in the annals of Florida as early as the end of the seventeenth century in a little book by Jonathan Dickenson. The following nine quoted paragraphs are from paragraph 5 of the preface and pages 6, 15, 16, 17, 37, 40, 46 and 79, respectively, of that work. There are, perhaps, references to the saw palmetto in early Spanish records to which we have not access.

"...Hunger had so far prevailed over them, that they could eat with an Appetite the Palmetto-Berries; the Taste whereof was once irksome, and ready to take away the breath;..."

"...but the Wilderness country looked very dismal, having no trees, but only Sand-hills covered with shrubby palmetto, the Stalks of which were prickly, so there was no walking amongst them;..."

"...After we had travelled about five miles along the deep Sand, ... on the other side whereof was the *Indian Town*, were little Wigwams made of small Poles stuck in the Ground, which they bend to one another, making an Arch, and covering them with Thatch of small *Palmetto Leaves*;..."

"...an *Indian* brought a Fish boiled, on a *Palmetto Leaf*, and set it down amongst us, making Signs for us to eat;..."

"The Cassekey [King] then went into his wigwam and seated himself on his Cabbin cross-legged, having a Basket of Palmetto Berries brought him, which he eat very greedily;..."

"About Noon some Fish were brought to us on small *Palmetto Leaves*, being boiled with Scales, Heads and Gills, and nothing taken from them but the Guts; but our Troubles and Exercises were such, that we cared not for Food?"

"...the *Cassekey* ordered the Master Joseph Kirle, Solomon Crosson, my Wife and me, to sit upon their Cabbin to eat our Fish, and they gave us some of their Berries to eat; we tasted them, but not one amongst us could suffer them to stay in our mouths, for we could compare the Taste of them to nothing else but rotten Cheese steep'd in Tobacco Juice."

"In some Time after we had been in the House came in *Indian Women*, loaded with Baskets of Berries, mostly of the *Palm*, some Sea-side *Coco Plums*, and Sea-side Grapes; Of the two latter we could eat, but of the *Palm Berries* we could not bear the Taste in our Mouthes..."

"...but having small *Palmetto*, which grew nigh, Joseph Kirle and I set to work and made a shelter..."

Sixty odd years later a book under the following title by William Stork was added to the annals of Florida

"AN ACCOUNT OF EAST FLORIDA; WITH A JOURNAL KEPT BY JOHN BARTRAM, OF PHILADELPHIA, BOTANIST TO HIS MAJESTY FOR THE FLORIDAS, UPON A JOURNEY FROM ST. AUGUSTINE UP THE RIVER ST. JOHNS. LONDON, 1765."

There it is recorded that:

"...the palmettos likewise grow pretty plentifully between these middle grounds and pinelands."

"...here was a patch of good swamp, but the pineland approached near the river, and generally a perch or more of Palmetto ground, gently rising between the swamp and pineland."

Although there was not very much written about the saw palmetto in the early days of exploration in the south, its botanical history did, however, begin shortly after the American Revolution. While the first description and naming of the species is usually attributed to André Michaux in 1803, it seems clear that in reality it should date from about a decade earlier. While William Bartram was on his way to Florida, he observed the palms growing on Saint Simon Island, Georgia. In his account of his observations on the island, he mentions four kinds of palms, all of them referred to under the genus *Corypha*—*Corypha palma* (cabbage tree), *Corypha pumila* (Dwarf palmetto), *Corypha repens*, with a description (Dwarf saw palmetto), and *Corypha obliqua*, with a description (saw palmetto). There are many forms of the saw palmetto. The plants vary much as a consequence of local conditions. Bartram evidently met with the two extreme forms growing in that region, just as may now be found on any of the sea islands along the coast.

The one is a small plant common in the poor soil of savannahs and low pine wood and growing closely appressed to the ground. The other grows in loose sand, is larger and the stem is often ascending or even erect.

There seems to be little doubt that all our forms of the saw palmetto will have to be grouped under the name *Serenoa repens* unless someone can prove that the assemblage really comprises more than a single species, which is unlikely.

In 1803 André Michaux described the same plant as *Chamaerops serrulata*, giving as its range the maritime parts of

Georgia and Florida. In 1817 William Baldwin, writing from Fernandina, Florida, said:

"Since I have mentioned some of the vegetable productions of this Island, and among others, the *Chamaerops serrulata*—I will make a few observations on this family of plants. Beside the one just mentioned I am acquainted with three others: viz., *Chamaerops Palmetto*, *C. hystrix*, and *C. acaulis*, Mx. which is the *Sabal minor* of Adanson... It is by no means generally known that the young shoots of the *Chamaerops serrulata* (Saw Palmetto) are also eatable—and are even more sweet and tender than the former [*Sabal Palmetto*]. My knowledge of this fact was derived from the late Mrs. Catherine Miller, of Dungeness on Cumberland Island. This is generally a humble plant, with a short, crooked, prostrate stem, from one to three feet in length: but in some situations—and particularly near the seashore—it attains to the height of 8 or 10 feet, and has an ornamental appearance. It is rarely found north of Savannah River."

The saw palmetto did not induce our early botanists to write as much concerning it as some of our other palms did. Perhaps this state of affairs is accounted for by the fact that the center of development of the species was inaccessible to these travelers. Most of them saw it only in the northern edge of its range. None of them saw it at its best.

The saw palmetto stands at the head of the list of our palms as far as abundance is concerned. It stands second in area of distribution. Its geographic range extends from extreme southern South Carolina to southern Florida and Mississippi. Like three of our other low growing palms—*Rhapidophyllum*, *Sabal Etonia*, *S. minor*—it is now endemic in the southeastern United States. What its prehistoric distribution was and whence it



18. Fruits of the saw palmetto, *Serenoa repens*, are about the size and shape of medium-large olives. In the illustration the lighter fruits are still green and hard, the darker ones fully ripe, at which time they are black, soft and very juicy. Photograph by Dent Smith.

came are mysteries that will remain unsolved. It has no close relatives and it is quite different in its characters from the other armed-petioled palms of Florida and the West Indies. It evidently, however, came directly or indirectly from the West Indies. If its ancestors were Antillean or Floridian, these are lost. Southern Florida was evidently its seat of origin or landing place, for northward and westward its growth, both individual and *en masse*, generally tapers off.

In the stiff soils towards the extremities of its geographic range, especially where fire is frequent, the plants are often puny and limited; in the sandy soils they are robust and prolific. This condition has led to the temporary recognition of more than one species.

The saw palmetto is typically a prostrate plant. Ages ago it may have been erect. In its early existence it may have been a more tender plant and then for

the purpose of self-preservation it may have come to lay its stem prostrate and anchor it with numerous roots so as to be more immune from fire and other destroying conditions, just as many other plants seem to have done, particularly in fire-swept regions.

As intimated above, its stems are not always prostrate. In localities protected from fire, such as stream banks and barren coastal sand dunes, one often finds groups and even groves of these palms with erect stems growing up to twenty-five or thirty feet tall.

The saw palmetto has several unexplained peculiarities of growth. It seems to grow best in loose sand seemingly devoid of nourishment. It prefers dry soil, but it does grow in marshes throughout its range and in wet sink-holes on the lower Florida Keys. Further, the saw palmetto abounds in pineland, on prairie and in hammock. In the latter, being protected, the plants are often erect and sometimes much branched. In the pine-woods the plants are usually quite evenly distributed; in the prairies they are collected into irregular or circular islands ranging from a few square feet to many acres in extent.

The plant is one of the two most characteristic and abundant vegetable elements of the "scrub," the other conspicuous plant there being the spruce pine (*Pinus clausa*). Along the eastern coast of Florida the saw palmetto has, usually, light gray or nearly white foliage and is very prominent among the other vegetation, especially in contrast with the pine trees and the deep green rosemary (*Ceratiola ericoides*).

Like the cabbage tree, the saw palmetto is amphibious, and it also thrives in the various kinds of water within its range, which are represented by soft and hard, acid and alkali, and fresh and salt.

Transplanting *Serenoa Repens* from the Wild

MULFORD B. FOSTER

It has been claimed that our native saw-palmetto, *Serenoa repens*, cannot be successfully transplanted. In fact, it has gained the reputation seldom equalled by any other Florida plant, that "the only way to kill it is to try and transplant it." My experience has been to the contrary, although it certainly is not the easiest palm to move.

During the last forty years I have moved many plants of *Serenoa repens*, but not all of the attempts have been as successful as was the first. The greatest success has been in moving individual young, upright clumps from full sun locations where soil is firm (not loose sand) and where it is near the water table. Old plants with prostrate trunks are much more difficult to move because it is not easy to include all of the vital small feeder roots when digging them. The percentage of losses on moving the older plants is much greater where sec-

tions of trunks must be severed from large clumps. Our greatest success has been when the palms were transplanted in spring or early summer and when they were given ample water, regularly, until established.

My first experience in transplanting these "common old scrub palms" was in 1927. My crew and I were transplanting some cabbage palms, *Sabal Palmetto*, from the Ft. Christmas area to Orlando. Here, fifteen miles inland from the ocean, we found a number of single clusters of the glaucous form of *Serenoa repens* whose known habitat had been thought to be only coastal. The distinguishing glaucous foliage of the coastal form made sharp color contrast as individual specimens were spotted here and there among the masses of the common green form. This was an unusual find and it did not take long to decide that for a trial we would attempt to move one in



19. Individual stems of *Serenoa repens* transplanted from the wild four years ago and now well established beside a roadside tavern near De Land, Florida. Photograph by Dent Smith.

spite of its negative reputation. Selecting a single clump about four feet high and three feet wide, we were able to hold a fair-sized ball of soil around it which was securely wrapped in burlap.

We established this palm in my Orlando garden where it was cared for as we would any other transplanted palm. In spite of assurances from several nurserymen that this plant would not survive transplanting, it suffered very little set-back. In fact, it has a remarkable transplanting history! Three years later it had to be moved again since I decided to build a greenhouse in the very spot where the palm was doing so well. It stood the second transplanting in a very satisfactory way and continued to thrive

in its new location west of the greenhouse.

About eight years later circumstances decided for me that the greenhouse needed expansion again, and unfortunately it had to be pushed out in the direction of the saw-palmetto, which was thriving. The palm had been moved already so many times that I now had no qualms about moving it again. So, we moved it out in front, close to the sidewalk where everyone who passed could see this "blue beauty." No greenhouse could demand this new location, I was sure. However, twenty years later, in 1955, widening of the street took a five-foot strip of frontage so close to the saw-palmetto that it had to be moved again!



20. The author standing beside his much-traveled saw palmetto at "Bromel-la," near Orlando, Florida. Photograph by Dent Smith.

It had grown so large that we had to pick it up with our palm-moving derrick. By this time we were developing our ten acres in the country where the much-travelled palmetto, at long last, found its final resting place. It now gracefully decorates our entrance driveway where we see it every day. The clump is nine feet high and thirty-five feet in circumference; the leaves retain that glaucous, bluish color which gives a pleasing contrast to the usual shades of green around it. Since this palm gives every indication that it likes the spot, it serves as a reminder that the "difficult" saw-palmetto can be successfully moved.

When one is well acquainted with these "scrubby" palms, one cannot help but admire them. Rarely do we find members of the plant world with the stamina that they exhibit. They are a hardy, noble palm for they are able to

withstand fire year after year, endure temperatures down to 10° F., as well as severe droughts. But come what may, the following spring they lift their palmate-leaved heads and send forth graceful sprays of delicate, fragrant, honey-laden flowers.

Even though this saw-palmetto, the commonest palm in Florida, still covers thousands of acres of land throughout the state, it is facing future extinction if developers continue to bulldoze it out in order to make way for subdivisions, orange groves and pasture lands. More of them should be used for beautification purposes. Since it is an intrinsic part of our native Florida landscape scene, it should become a part of our planned and more sophisticated picture. This planned Florida garden necessitates the careful moving of these so-called unmovable palms.

The Doum Palms in India

SESHAGIRI RAO ROLLA

Botanical Survey of India, Poona. Photographs by the Author.

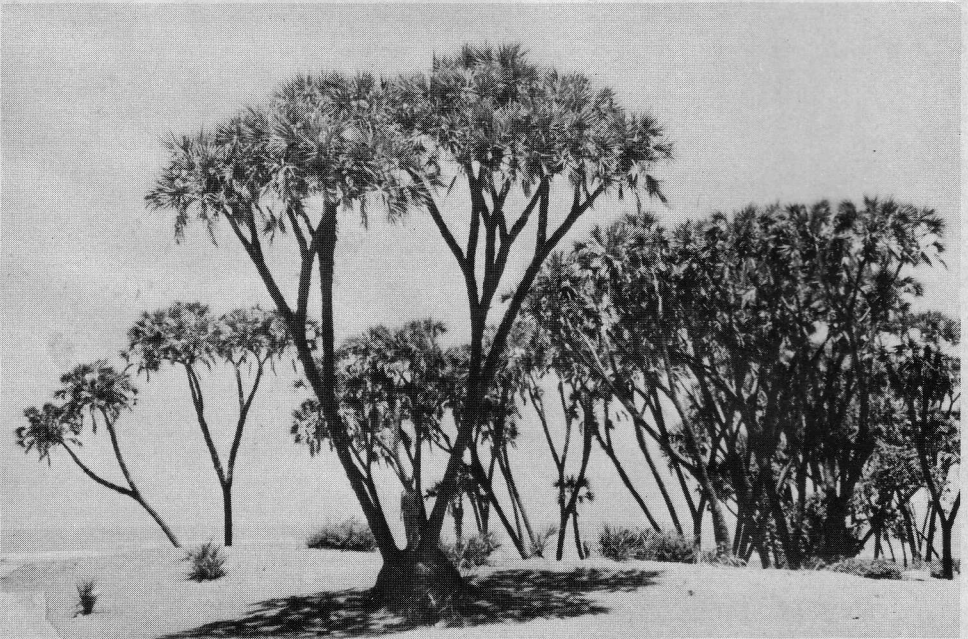
Hyphaene thebaica (Linn.) Mart., popularly called the Egyptian Doum Palm, grows along the valley of the Nile in middle and upper Egypt, which is evidently its original home and also along central and northern Sudan and Israel. This species was introduced during the last century to a few gardens in India, particularly to those along the west coast like Mazagaon Hill garden, Bombay-10, Public gardens, Baroda and also the Indian Botanic Garden, Calcutta. It is also recorded from Royal Botanical Gardens, Peradeniya, Ceylon, and Shaik Othman near Aden where it is evidently introduced, as there is no report of its distribution along the Persian and Arabian coast. It flourishes well in rich sandy loam and the palms seen in Bombay

(Fig. 21) and Calcutta gardens grow well, producing large fruits. Though the palm is propagated by seed, it is interesting to record that it has never spread so far in this period of more than half a century to the coastal area or any other suitable locality outside the garden either on the west coast or east coast. On the contrary, a very closely allied species, *Hyphaene indica* Becc., grows luxuriantly in wild condition at several places along the west coast only.

Hyphaene indica Becc. is a very distinct species, though it has been usually confused with the true Egyptian Doum Palm, *H. thebaica*. *H. indica* was first described by Beccari in his paper on the various African species of *Hyphaene* published in *L'Agricoltura Coloniale* ii,



21. Dichotomously branched upper portion of *H. thebaica* tree at Mazagaon Hill Garden, Bombay.



22. General view of a large grove of *H. indica* along the beach of Daman Grande with several seedlings of the palm along the sandy bed and the Arabian Sea in the background.

Florence, 1908, 137-183, on the basis of the specimens collected from Diu, the small erstwhile Portuguese colony of Saurashtra Coast and sent by Gammie from India. Since then, there seems to be no record of the occurrence of *H. indica* from other parts of the west coast. The author, during his studies on the flora of western India, has observed the luxuriant growth of this species, sometimes represented in considerably large numbers at some places along the northern part of the west coast of India, particularly between 18°-23° Lat., such as the coastal areas opposite Nagaon (on the way to Revdanda from Alibag), Shirgaon (beyond Palghar), Dahanu, Daman (Figs. 22 and 23), Okamundel, Diu (Saurashtra area). It is very likely that this species may occur along suitable sandy coastal areas in the range south of Alibag along the west coast, and also of Daman-Diu range of the Gujarat State (Fig. 24). It does not, however, grow along the rocky coastal belt where there is no sand cover. As such this species is not seen along the rocky coasts near Panjim and Marmagoa of Goa area. With the available data it is clear that it is restricted to the west coast only and that, on the basis of current available information, to the northern part. It would be of interest to record whether this species extends further south to Kerala State along suitable sandy coastal areas and also to Ceylon. Beccari, however, points out, on the basis of some imperfect material of *Hyphaene* collected from Jaffna, the northernmost point in Ceylon, that it differs very much from *H. indica*. It is, therefore, worthwhile to study the collections from Jaffna for proper understanding of the distribution of *H. indica*.

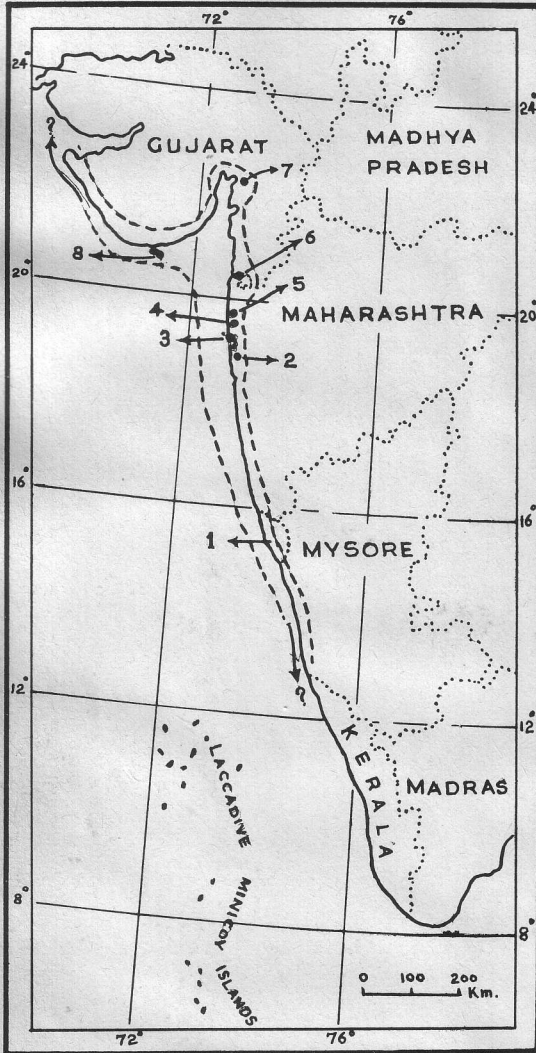
H. indica is locally called in the Shirgaon-Dahanu area "Ravana Tal" and in the Daman area "Makamberu." The name

"Ravana Tal" has an interesting relationship with the epic name Ravana, the ten-headed Demon King of Lanka, the Ceylon of the Indian epic "Ramayana." The name Tal only signifies the common Palmyra tree (*Borassus flabellifer* Linn.), with monopodial stem, and as *H. indica* has several branches, each with a crown of leaves, it is compared with the multi-headed and multi-handed Ravana with a single body.

There is a general belief that all the specimens of *Hyphaene* growing in the gardens of India belong to *H. thebaica*, an introduction from Egypt. But on examination of the specimens sent by Prof.



23. A lonely graceful tree of *H. indica* near the sea on the Daman (small) coast.



24. Map of western India showing the distribution of *Hyphaene indica* Becc. Index to localities: 1, Goa; 2, Nagaon; 3, Bombay; 4, Shirgaon; 5, Dahanu; 6, Daman; 7, Baroda; 8, Diu.

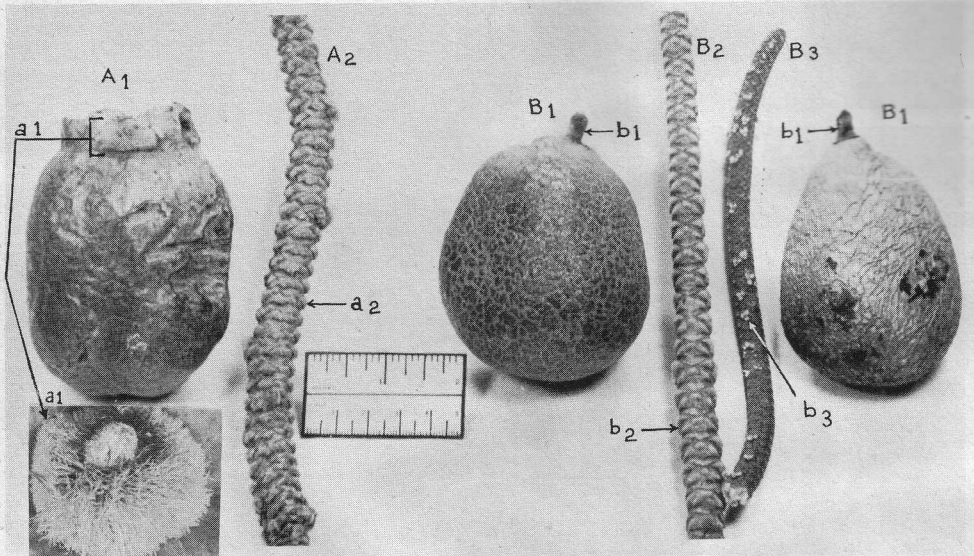
A. R. Chavan of M. S. University, Baroda, from trees growing in the Public Park, Baroda, it is evident that *H. indica* has also found a place in the gardens, possibly introduced inadvertently from the seed material of the palms growing along the Gujarat coast. Sim-

ilarly, the author's recent scrutiny of the young and old specimens of Doum Palms growing in the Indian Botanic Garden, Sibpur, Calcutta, brings out an interesting feature of the occurrence of three young trees of *H. indica* which have now started producing fruits. As the general record of the palm species in the Garden indicates *H. thebaica* only, which is represented by very old tall palms, it is quite possible that *H. indica* was introduced inadvertently from seeds obtained from the West Coast of India.

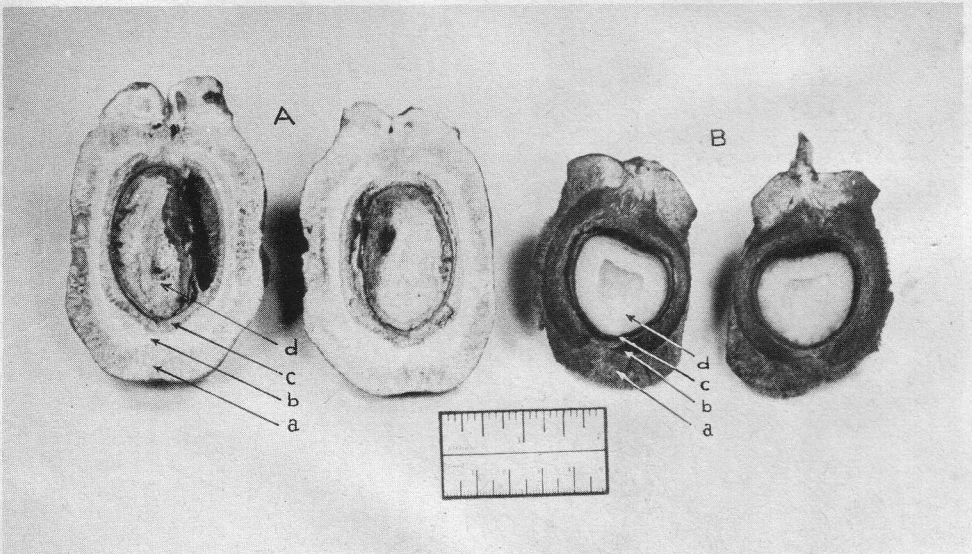
From the general habit of the palm it is quite difficult to distinguish the two species of *Hyphaene*. The fruits are, however, very distinct, particularly in the dried surface texture of the exocarp, which is smooth and shining in *H. thebaica* and rough and cracked in *H. indica*; and in the pedicel, which is indistinct and surrounded by a thick, bushy, hairy cushion, thus making it broader than high in the former, and distinct, elongate up to 10-15 mm., with short fine hairs, in the latter. The axis of the female inflorescence is also distinct, particularly in the hairy texture and the rhomboid tomentose cushion-like structures which are more in number in each spiral and distinctly protruding out more in the former than in the latter (Fig. 25). There is practically no difference in the internal structure of the fruit of either species (Fig. 26). Sometimes two carpels instead of one develop in *H. indica*, forming a two-seeded fruit, but this is mostly seen in young fruits only. Such a double fruit in a fully mature state has not been observed so far. Undeveloped fruits of varying sizes, which become shrivelled and fall off, show sufficiently long pedicels, even extending to 17 mm.

Economic Uses

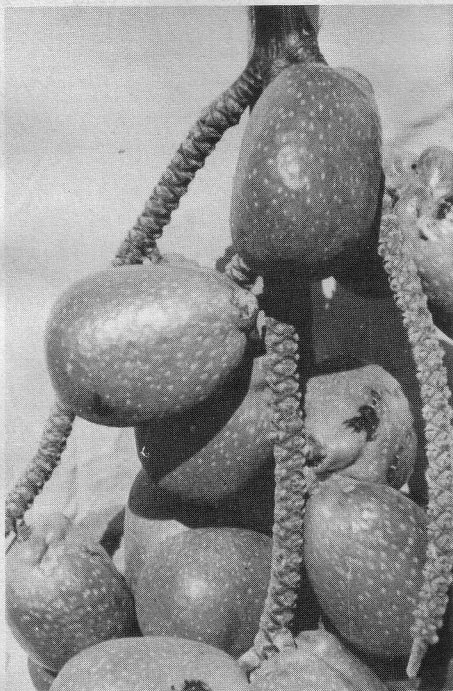
The fleshy, fibrous exocarp of the fruit of both species is somewhat sweet and bitter and is eaten by boys along the



25. Photo showing the fruit (A1) and female inflorescence axis (A2) of *Hyphaene thebaica* and those of *H. indica* (B1 and B2) and also male inflorescence axis (B3) with small male flowers (b3) of *H. indica* showing variation in pedicel (a1 and b1), surface texture of exocarp and the tomentose cushions (a2 and b2). Pedicel of *H. thebaica* (a1) is much enlarged, showing bushy hairy cushion around indistinct stalk in the middle.



26. Longitudinal section of the fruits of *H. thebaica* (A) and *H. indica* (B) showing fibrous exocarp (a), hard stony mesocarp (b) and soft endocarp (c) with white endosperm (d) in the innermost portion.



27. Fresh fruits of *H. indica* with shining spotted surface, attached to the axis by distinct stalks.

west coast of India and also in Egypt. This pulp is considered astringent and anthelmintic. The unripe kernel (endosperm) in both species is also edible. *H. indica*, however, produces fruits profusely in bunches (Fig. 27). The young leaves of *H. thebaica* are eaten by camels in Egypt.

The hard kernel from the mature, dry fruits of *H. thebaica* is used as vegetable ivory for making buttons and beads. As the nuts, the buttons and beads are some-

times attacked by scolytid beetles, *Coccotrypes dactyliperda* Fabr., treatment by boric acid 3% or zinc chloride 5% or copper sulphate 5% has been recommended as a preventive measure. Though it is considered that such buttons in India are made from the nuts of *H. thebaica* only, imported from Egypt, it is very likely that the nuts of *H. indica* also get mixed up for such work and may be considered as useful along with the vegetable ivory extracted from the talipot palm (*Corpyha umbraculifera* Linn.) for making buttons and beads as a profitable cottage industry.

Along the west coast where the plants are abundant, the leaves like those of many other palms are used for thatching. As the plants are always in limited number, they are never cut by the villagers, though the wood is useful for posts, beams, etc.

H. indica is also quite an attractive palm and though the young stems look rugged, covered by spiny-margined leaf bases and petioles, the cluster of leaves presents a graceful appearance. This species, which is propagated by seed, would be a good and interesting botanical acquisition if introduced in the botanical and public gardens and also palm gardens of tropical coastal parts of the world.

The author wishes to express his thanks to Prof. A. R. Chavan of Baroda for kindly sending the material from Baroda and to Dr. H. Santapau, Director, Botanical Survey of India, for facilities provided for this work.

A Strand Palm of Southeastern Brazil

W. H. HODGE

The sandy strands of southeastern Brazil, exemplified by world renowned Copacabana Beach at Rio de Janeiro, are famed for their innate beauty and striking setting on a coast that is full of spectacular natural scenery. Most visitors to these strands enjoy them more for their natatory offerings rather than for their vegetation or flora. The fun beaches of metropolitan Rio are now barren affairs, botanically speaking, having been cleared long since of the native beach plants that one time undoubtedly made verdant those stabilized stretches of sand lying above the line of wave action. However, one need drive only some ten miles or so southwards from Rio along the coast to find stretches of strand which still have their vegetation relatively undisturbed by man. These beaches form the so-called *restingas* of the Brazilians — narrow bands of sand probably built up by wave and current activity and associated often with lagoons, which lie behind the dunes separating them from the mountains in the background.

Such sandy *restingas* are the native haunts of one of Brazil's most unusual palms, *Allagoptera arenaria*, locally called "guriri" but which might better be called beach or *restinga* palm. This palm is unusual in the habitat niche that it occupies. Most palms are at home away from the seaside where siliceous sands, constant wind action, and noxious salt water or salt spray make conditions unbearable for all but the hardiest of plants, and these are seldom members of the palm family. But to *Allagoptera arenaria* salt spray and sand dunes at the seaside constitute this palm's own special heaven in which it seems to delight. Under such conditions it becomes the dom-

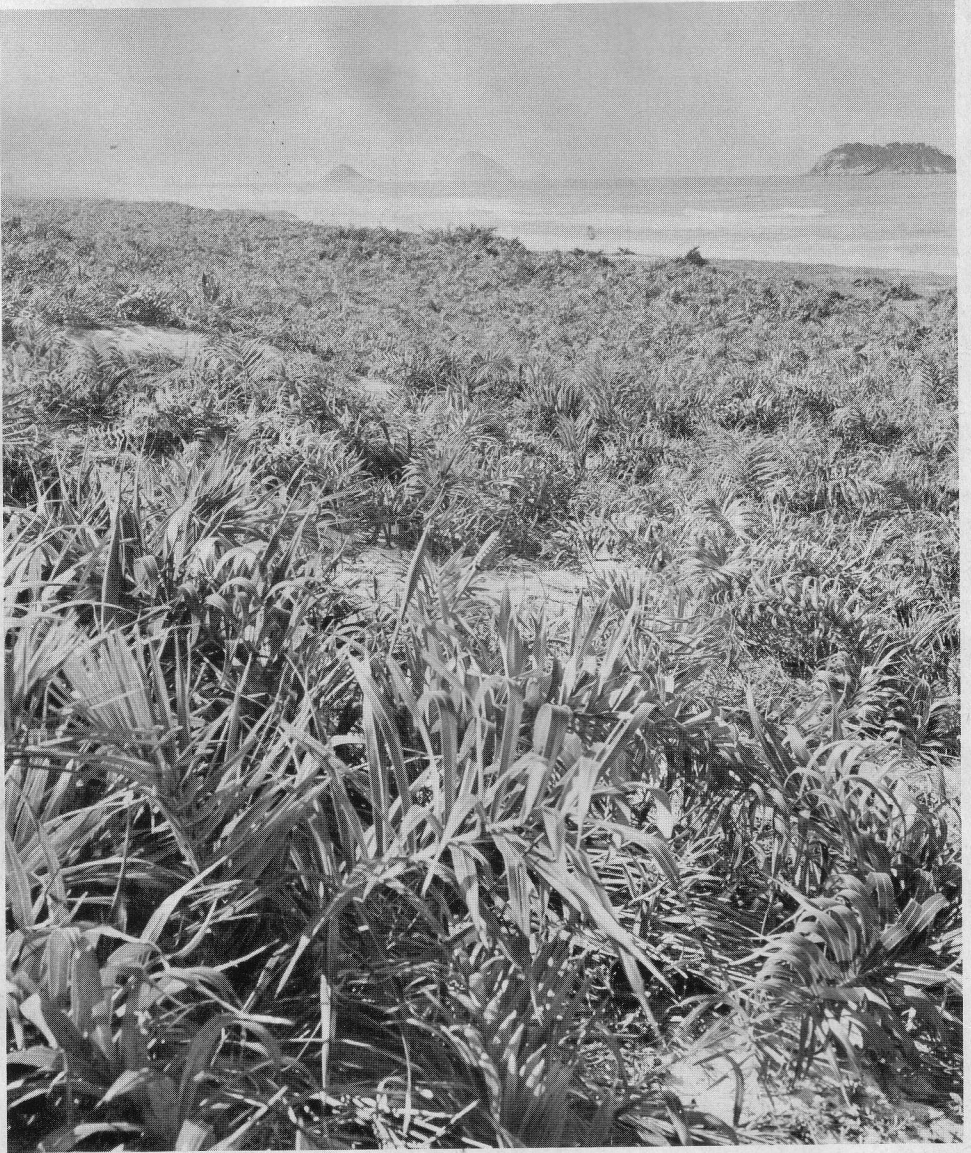
inant plant forming practically pure stands, its subterranean stems and roots anchoring and stabilizing the upper sands of beach dunes over many acres.

The rapidly expanding southern suburbs of Rio might eventually destroy these nearby stands of beach palms, but fortunately and with considerable foresight the state of Guanabara, through its Forest Services, established in 1951 a Forest Research Nature Conservation Center along with several extensive biological reserves on the coast just to the south of the city. One of these, the Jacarepaguá Biological Reserve, includes the Restinga Jacarepaguá, within whose boundaries the accompanying photographs were taken.

Allagoptera arenaria is a low trunkless palm with arching foliage standing on an average about a meter tall. The attractive pinnately-compound leaves radiate in all directions from the crown of the plant. The inflorescences, because of their stiffly erect nature, stand above the arching leaves. The spicate flower clusters are yellow and are associated with woody green spathes which sport colorful yellow inner surfaces. Flowering and fruiting are said to occur all year.

This species has been more generally known by the scientific name of *Diplazium maritimum*, a binomial first applied by Martius, the great student of Brazilian palms, nearly a century and a half ago. As has been shown by Moore (in *PRINCIPES* 6:37-39, 1962), an earlier name had been published which, under our international rules of nomenclature, gives priority to the generic name *Allagoptera*, which must now be used.

As an attractive stemless feather palm, *Allagoptera arenaria* has much to offer as a horticultural subject. It seems suited



28. *Allagoptera arenaria* dominating the sand dunes, Restinga of Jacarepaguá, near Rio de Janeiro, Brazil. Photograph by W. H. Hodge, April, 1962.

particularly for those special problem areas which involve gardens or plantings at sea beach margins where most plants find it difficult to become established because of predominance of pure sand, to say nothing of thriving under constant

exposure to sea breezes and the deleterious action of salt spray borne by them. The natural range of this palm in Brazil straddles the Tropic of Capricorn (23.5° south latitude). Its hardiness is probably similar to that of *Arecastrum Ro-*



29. *Allagoptera arenaria*, single plant on dune, Restinga of Jacarepaguá, near Rio de Janeiro, Brazil. Photograph by W. H. Hodge.

manzoffianum which occurs as a native palm, in different habitats, along the same coast. Since the corresponding Tropic of Cancer lies close to the southernmost tip of Florida, it is reasonable to expect that *Allagoptera arenaria* could

well be considered as an especially interesting garden subject for the grounds of beach homes in the southern part of the Peninsula State or for areas anywhere else where climatic and edaphic conditions are similar.

Palm Letters From Georgia

Excerpts from letters written by William D. Manley, between January, 1961, and December, 1963, concerning the joys and difficulties of palm culture in Atlanta. Mr. Manley is an organ builder, chiefly engaged in installing and repairing organs in churches; but his avocation as a palm gardener led him to the discovery of a palm grove which he was able to commercialize, together with his friend, Mr. G. R. Phillips, as a sort of paying hobby. Not since Don Quixote himself has anyone tilted at windmills with more gusto and spirit, the windmills in this case being palms called by that name. Photographs by the author.

1/27/61. After reading the American Horticultural Society special issue on palms and especially the article on cold tolerance of your palms in Daytona Beach I had to sit down and write about my palms here in Atlanta.

I first became interested in palms about 35 years ago, and finally obtained a catalog from Fruitland Nurseries in Augusta, Ga. They listed the windmill palm, *Trachycarpus Fortunei*, and I bought one eighteen inches high. I planted it about four feet from my house, where it did very well throughout the winter. Later on I bought from Glen St. Mary Nurseries a small needle palm, *Rhapidophyllum hystrix*, and set it out near the windmill palm. Both of these palms thrived and withstood any kind of cold experienced here in Atlanta. In November, 1952, we had a freeze down to 2° F. lasting three days and two nights, and these palms withstood it all without losing a leaf.

I had planted several other kinds of palms to test them, but they all "went" sooner or later. Two nice *Butia capitata* prospered for two winters and then were lost in a 9° freeze. Several more windmill palms were planted and all did well.

Three years ago the neighborhood started to deteriorate, so I sold out and built a new home on Peachtree Creek in north Atlanta. The first windmill palm planted at the old place had reached about 35 feet in height, and I was afraid

to make an attempt at moving it. I had two others with six-foot trunks which I did move to the new home and also the needle palm, which by this time weighed about a ton.

After going through the first winter here on the creek I found that I am in a frost pocket. Several *Trachycarpus* in the front yard facing the north have not done so well. Those that are only about three feet high get the full impact of the frost, the taller ones not so much.

There is a beautiful *Chamaerops humilis* here in Atlanta in an old lady's yard. She just calls it a palm and says she got it years ago. It is about ten feet tall, with three trunks, growing well away from the house and unprotected. There are two large *Butia capitata* in Atlanta also, but these are well protected, with shrubbery close about them. One man out in Decatur, a suburb of Atlanta, has gone crazier than we have and has an entire block (he owns a block of rented houses) of *Trachycarpus* lining the curb and the front yards. You can't walk for them.

A swank restaurant opened on Peachtree Road and planted seventeen large palmettoes (*Sabal Palmetto*) with about thirty feet of trunk. It seemed as if they were planted in cement on a high hill facing northwest. Sixteen of them already have been taken out, leaving only one which will probably be done in this winter. I have failed on about five tries



30. *Rapidophyllum hystrix*, the needle palm, at the author's home in Atlanta. Not injured by the record cold weather, minimum 6° below zero Fahr., during January, 1963.

to grow the *Sabal*. I have one now which had its leaves killed, but a new leaf is starting out nice and green, so it should make the grade at least this year.

Just about all the nurseries here stock the *Butia capitata* and don't even know its name. I stopped at one the other day and asked the name of it. The attendant told me it was a coconut palm.

One month ago I really had the surprise of my life. A friend called me and told me he had discovered some low-growing palms 62 miles south of Atlanta down in a swampy area. We went down with a truck and to my amazement there were thousands of beautiful *Sabal minor*. Less than 65 miles from Atlanta, so at first we could not believe our eyes. We each dug up six and brought them back and planted them. I plan to go back

and get at least two dozen for planting in my woods here.

I would list the needle palm, *Rapidophyllum hystrix*, as the hardiest and suppose that *Sabal minor* is in its class. Next is the windmill palm, *Trachycarpus Fortunei*. At least these are the three that are living here in Atlanta and doing well. I have several hundred windmills in pots for giving to friends who want them.

9/25/61. I was astounded last week to find one dozen *Chamaerops humilis* for sale at a nearby nursery. These were \$2.50 in 5-quart cans. I bought five and a friend of mine got the others. This palm should do just about as well as *Trachycarpus*.

Two *Acoelorrhaphe Wrightii* (*Paurotis Wrightii*) are growing in my court

and another close to the house on the southeast side. Also one *Thrinax parviflora* inside and one outside.

10/20/61. Several years ago I discovered in Hawkinsville, Georgia, about 130 miles south of Atlanta, a large grove of *Trachycarpus* in an old estate which was then in litigation. I had a letter a few days ago telling me that the church on the adjoining property had acquired the grove and that the palms would be for sale. I went through there last week for a better look. There was a high growth of weeds, briars and other underbrush. The palms now range in height from about 15 to 30 feet, and about 50 have small trunks.

The other day I went over to see Mr. Ortman, the city horticulturist, and he was surprised to know about palms growing here in Atlanta. Later on I gave him a dozen one-gallon *Trachycarpus Fortunei* which I had grown from seeds. He was completely taken, and promised to set them out in strategic places. Then he took me in the greenhouse and loaded me down with plants for my indoor court.

1/28/62. The *Trachycarpus* grove in Hawkinsville is really big. I counted over 200 palms last week, but couldn't make a complete count because they were too close together. Must be nearly 300 in all. Most are at least 15 feet and many 20 to 25 feet tall.

At my place in Atlanta we had five inches of snow three weeks ago. The temperature fell to 5° and never rose above 18° for three days running. I am in a terrific frost pocket and had my three-foot windmill palms covered, so they came through okay. The big ones showed no sign of damage. The needle palm showed no sign of damage and I am convinced that it is by far the hardest of all palms. Five small *Chamaerops humilis* came through fairly well.

I have lost many sabals (*Sabal Palm-etto*) here. Never have been able to get one to live through our winters. Bob Phillips, who is the only other member of The Palm Society here, has one at his place. It is doing well, but under a canopy of pines so gets no frost and the heat loss is not great at night.

2/25/62. The owners of the big grove of windmill palms at Hawkinsville took me up on my offer to buy them at \$10 apiece. Recently Bob Phillips and I rented a long truck with a lift gate and left here for there at 5 a. m. to bring back some palms. We rounded up a crew of five men and in six hours we had twelve windmills each weighing about 500 pounds loaded and ready to go. We never could have gotten them on the truck without that pneumatic tail gate lift. They were planted the next day. Eight were mine and four were planted at the Phillips home.

I thought I was through with moving palms, but last Monday the owner of my former home where I had left my big windmill palm — 25 years old and 30 feet tall — phoned to say that he was selling the place. There must have been over a hundred fronds on this palm. It had belonged to me and had been part of my life. So I rented a truck and hired nine negroes, dug and loaded the palm in the rain and hauled it six miles at five miles an hour to its new home. It makes the ones I got from Hawkinsville look small.

Finally it came to light how the large grove of *Trachycarpus* came about. It belonged to the old Richardson estate which was bought by the First Methodist Church. The story goes that Mrs. Richardson bought two windmill palms about 75 years ago, and every time she had a baby she would plant about twenty seed. She had eleven children, and has been dead now for about 25 years. Some of

the palms are now up to thirty feet tall and many others have grown from seed dropped twelve or more years ago. Actually, counting the little seedlings, there are thousands.

4/22/62. Now something that will take you right off your seat is that since my last letter, G. R. Phillips and I have bought the entire grove of *Trachycarpus* from the church. We had been buying them at \$10 each as we dug them and brought them to Atlanta for replanting. The chance to buy the whole grove was a challenge we couldn't pass up, for here was the only grove of *Trachycarpus*, I believe, in the United States. And out of one million people in the Atlanta area, only two, Bob Phillips and I, were the only ones with this obsession about palms.

Did I tell you about the alligator my friend Phillips has in his pond? About six years ago a friend gave his son an 8-inch gator. They tossed it in the pond, but thought it would not live through the winters here. Now the gator is about seven feet long and weighs 300 lbs. He gets under a bank in the winter and only comes out in the summer. I guess he feels at home with all the windmill palms lining the bank.

7/3/62. We have placed nine *Trachycarpus Fortunei* in the new and luxurious Americana Motel right in the heart of Atlanta. Seven were large ones and two were small. We had to plant them at night in order not to block traffic. The ones planted in front were at sidewalk level, but the ones planted around the pool had to be lifted with a derrick about 30 feet over the back wall.

This was our first experience at digging them with a large ball. We planted five some time ago at another motel and they sure took a beating. There was no rain for six weeks, a dry wind was blowing all the time and the palms began to

look dead. So we planted new ones free of charge but did not take up the first ones because the central shoot was nice and green. Those at the Americana were dug with a four-foot ball and trucked up here with polyethylene bonnets over the foliage of each palm. We had found that hauling them fast for 130 miles really dried out the leaves. We cut the leaves down to about five and now all these palms look like they had been growing there always. You have to have the right equipment, for these big balls of earth are impossible to lift with brute manpower. Not enough men can get around the ball to lift it.

We also sold two palms to the leading nurseries here, and they in turn have sold three for us. One customer lives just south of Atlanta on a beautiful 600-acre lake, and he wants a dozen.

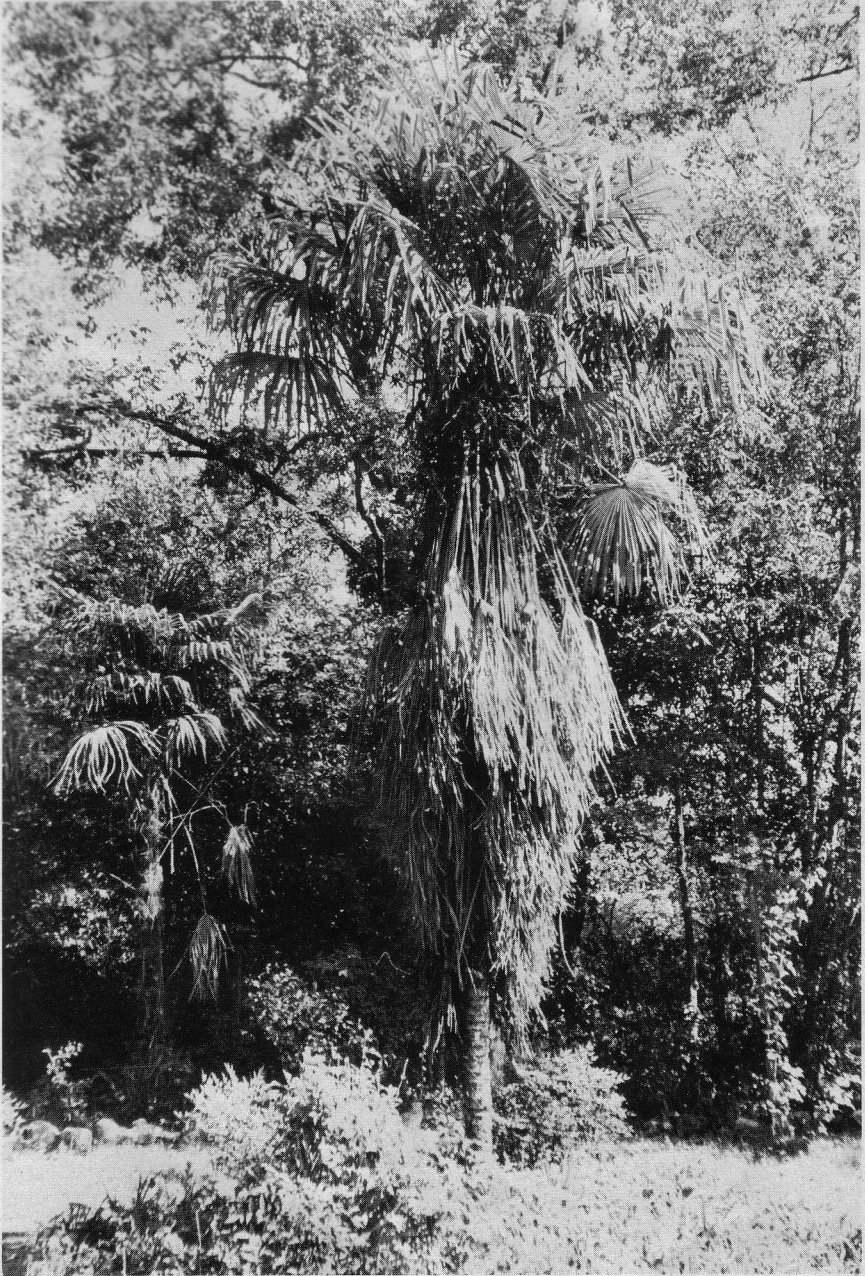
The day before we dig to fill an order, one of us — either Phillips or myself — goes down there to clean up the palms and soak them. It has been extremely dry this year and soaking beforehand seems to help them through the shock of transplanting. No one in that sleepy little town had ever noticed the palms there until we started digging them out, but now everybody wants one or more. I dug a little one with about six inches of trunk and sold it to a doctor for \$18. Then a man across the street wants a large one and three smaller ones, so we will take care of him on the next trip.

8/23/62. Many years ago my father-in-law, knowing I liked palms so much, shipped me from Miami four coconut palms. I put them in the yard and the first time an ice-wagon passed by, that was the end of them. Then and there I found out that just not any palm would grow in Atlanta.

We are now getting \$150 apiece for the windmill palms, planted and guaranteed. If the demand gets better the price



31. Part of a large grove of windmill palms, *Trachycarpus Fortunei*, planted many years ago at Hawkinsville, Georgia.



32. *Trachycarpus Fortunei* standing a little apart from the naturalistic grove pictured on the facing page.

will go up. I have succeeded in getting three nurseries here to stock the windmills, but they soon sold out and I hope will continue to stock them.

11/15/62. The *Trachycarpus* seed here will be ripe soon and I will have possibly a bushel to distribute to palm lovers around the world. Mrs. Wait has given me several names for sending these seed. One is in Japan. Ross Lafler wrote me that his nursery wanted \$20 worth. I will be happy to do this work and have the money go to The Palm Society.

12/19/62. I got back to Atlanta the night of the zero weather. Actually it got down to 4° below zero at my house. It was 6° above zero the night before, and that day it never got higher than

15°. My two butias look as though they have been through a forest fire and I believe they are goners. I have lost others in past years at 10°. My *Trachycarpus* palms are badly burned too.

1/2/63. I have been fooling around with palms for about 35 years and thought I knew everything there was to know. Now I realize that I could write a book about what I don't know. But I'm learning, or at least trying to.

I had always thought that *Butia capitata* was hardier than *Sabal Palmetto*. The day after Christmas I went to Columbia, S. C., to see how the palms had fared over there. Every *Butia* I saw looked dead, but there was no apparent damage to any *Sabal Palmetto*. So — another of my myths exploded.



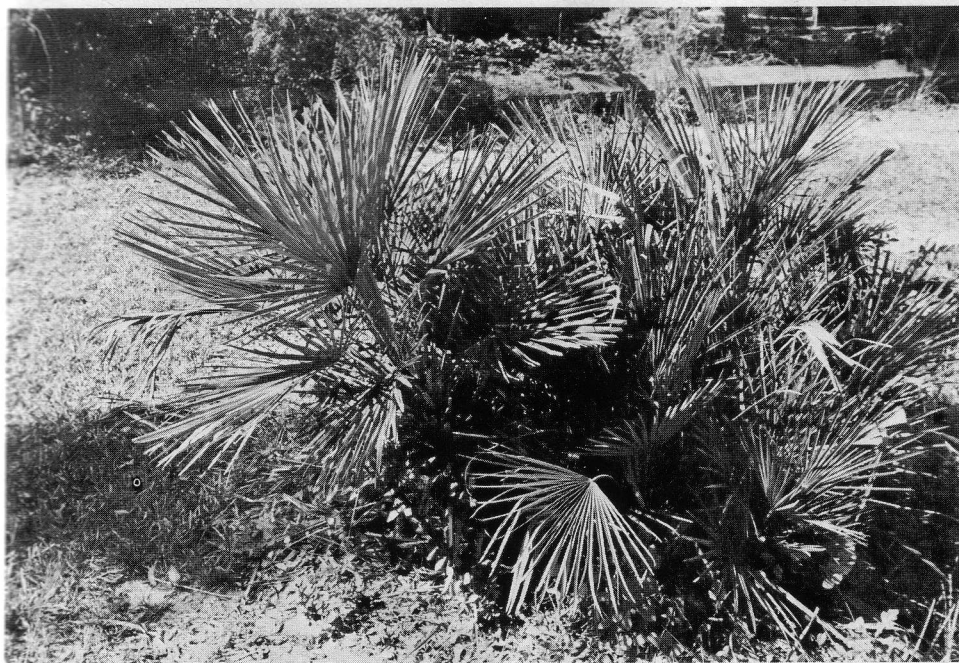
33. Another part of the old grove of *Trachycarpus Fortunei* at Hawkinsville, Ga. Note the young palms growing from dropped seed.

2/24/63. When we had the zero weather here this past December 13th we kidded ourselves in saying it would never happen again. About six weeks later it happened all over again, but worse, sliding down to 3° below zero in Atlanta. Actually it was 6° below at my place. I was in Greenville, S. C., at the time and saw the weather report. I phoned my wife and found she had been up most of the night trying to save the tropical plants in our court. The polyethylene which covers the open side had gotten so cold that it just cracked open like glass. She found some crocus sacks and stuffed them along with blankets into the holes, threw water on the marble floor, heated the court from the house and kept the temperature up to thirty

degrees. The 6° below here at my place showed that the *Sabal minor* did get some burn — not much — but the needle palm still did not show any damage.

4/21/63. I did lose all my *Trachycarpus* except the Old Master — the big one I raised from way back. It is now putting out leaves and spathes. Bob Phillips and I went down last Monday to the grove in Hawkinsville. All the palms were burned somewhat on the leaf tips, but no other damage. I think that being so close to each other saved the day. It got down to 1° below zero there last December. Both large *Chamaerops humilis* were burned badly, but now they are putting out fresh growth.

12/25/63. Christmas and a beautiful day here in Atlanta. Some snow and ice



34. *Chamaerops humilis* at Hawkinsville, Ga., recovering from damage suffered December 13, 1962, when the temperature fell to one degree below zero F.

still around, but the temperature is supposed to rise to 40°.

We have had some near-zeros here the past two weeks. It went down to 6° one night about two weeks ago. I am, however, better prepared this time, and besides I have been here while all this has taken place. None of my palms have shown any damage at all. I did throw a crocus sack over the *Chamaerops* and the *Serenoa*. Of course I had already built a small "sack house" over my prize, the *Paurotis Wrightii* (*Acoelorrhaphe Wrightii*), and with the help of a 100-watt light bulb this plant is green and pretty.

I woke up Monday morning about two o'clock with the rain on the roof,

got up, turned on all the back lights and it was freezing just as it hit. You should have seen all those needle palms I dug last spring, with the weight of the ice bearing the leaves right on down to the ground. The other needle palms, two large ones I have had for many years, stood straight up covered with ice and later on snow, but never bending. The windmill leaves were downed by the sides of the trunk.

Next morning it was a sight to behold. I let air out of my tires and drove over to a hardware store and bought a sled for my grandson. He and his parents live seven miles out, with long hills around, so he really had a time with that sled.

Date Culture in the United States

An abstract consisting of excerpts, some of which are condensed, from Agricultural Information Bulletin No. 207, GROWING DATES IN THE UNITED STATES, by ROY W. NIXON, Horticulturist at the Date Field Station of the U. S. Department of Agriculture, Indio, California. Not all the information contained in the fifty-page bulletin could be summarized below even in condensed form for lack of enough space, and thus the matter reproduced is only a sampling of its contents. It is no longer available from the Government Printing Office. The accompanying illustrations are reproduced by courtesy of the U. S. Department of Agriculture.

Dates are grown commercially in the desert sections of southern California and Arizona. Fruit production increased from 1 million pounds in 1926 to more than 48 million pounds in 1955. From 1949 to 1953 inclusive, importations of dates, mostly from Iraq, averaged approximately 40 million pounds annually.

In 1957 there were 4,808 acres of dates in California, distributed as follows: 4,850 in Riverside County (Coachella Valley), 151 in Imperial County (Imperial Valley and Yuma Valley, California side), 34 in San Diego County (Borego Valley), 35 in Inyo County (Death Valley), and 8 in San Bernardino County.

In addition there were approximately 350 acres of dates in Arizona. Of these, about 200 acres were in the Salt River Valley near Phoenix and about 65 acres in the Colorado River Valley near Yuma and the rest were scattered mostly in the Gila and upper Colorado River Valleys.

[Updating the above data on acreage: In 1962, the last year for which data have been published by the California Crop and Livestock Reporting Service, there were 4,543 acres of dates in California, 4,311 of which were in Riverside County (Coachella Valley). This represents a decrease of 260 acres from the total reported in 1957. No statistics are available for Arizona. See note in

brackets concerning acreage reduction at end of this article.]

Seedling date palms are found in Texas, principally in the lower Rio Grande Valley and in certain localities between Laredo and San Antonio. They are also found in the other Gulf States from Texas to Florida, but climatic conditions seldom permit the fruit to ripen.

The date is one of the oldest cultivated tree crops. The earliest known records in Iraq (Mesopotamia) show that its culture was probably already established as early as 3000 B.C. The date palm has also been in Egypt since prehistoric times, but its culture did not become important there until somewhat later than in Iraq. From western Iran (Persia) across Arabia and North Africa, dates have long been a staple food for the native populations.

The date palm was introduced into the Western Hemisphere by the early Spanish missionaries, who planted date seeds around many of their missions. A few of these original palms or their offshoot survivors, dating from plantings in the late 18th or early 19th century, are still to be found in southern California and below the Mexican border. However, the damp climate of the coast, where most of the early missions were located, is not favorable to fruit production. It was not until seedlings planted in the hot interior valleys of California and southern Arizona in the middle of the 19th century began to bear that attention was attracted to the commercial possibilities of date culture.

In 1890 the United States Department of Agriculture arranged through correspondence for a small importation of date offshoots, but these later proved to be inferior. It was not until 1900 and the years immediately following that offshoots of the better varieties were obtained by Department plant explorers,

who visited the date-growing regions of Algeria, Tunisia, Egypt and Iraq. The Department in cooperation with the State agricultural experiment stations made experimental plantings, first in the Salt River Valley, Ariz., and later in the Coachella Valley, Calif. These experiments attracted the attention of prospective date growers and led to several large commercial importations of offshoots during 1911-22 from Algeria, Iraq and Egypt, and acreage plantings were made possible.

The date palm is known botanically as *Phoenix dactylifera* L. The genus *Phoenix* is distinguished from other genera of pinnate-leaved palms by the upward and lengthwise folding of the pinnae and the peculiarly furrowed seeds. There are about 12 species, all native to tropical or subtropical parts of Africa or southern Asia. Several of these are fairly well known as ornamentals, the most highly valued being *P. canariensis* Chabaud, the Canary Island palm, extensively used along driveways and in parks across the extreme southern part of the United States. Another species, *P. sylvestris* (L.) Roxb., is cultivated in India as a source of sugar. *P. dactylifera* is distinguished from these two species by the production of offshoots, or suckers, and from other species by its tall, columnar, relatively thick trunk. Close relationship among the species is indicated by the ease of cross pollination and hybridization. All species are dioecious, male (staminate) and female (pistillate) flowers being produced in clusters on separate palms in the axils of leaves of the previous year's growth. Leaves of the date palm are 10 to 20 feet long and have a normal life of 3 to 7 years. Old or dead leaves are not shed, but are removed under cultivation.

For proper maturing of fruit, the

date requires prolonged summer heat without rain or high humidity during the ripening period. At Indio in the Coachella Valley, Calif., the maximum temperature frequently exceeds 110° F. and has been as high as 122°. Date leaves are injured by prolonged temperatures of 20° or below, but such temperatures are rare in the districts where dates are produced commercially in the United States.

Since rain at any time from early summer through the harvest season is likely to cause some damage to the fruit, commercial date culture has been developed only in districts where there is almost no rain during that part of the year. The amount of any particular rain is of less importance than the conditions under which it occurs. A light shower accompanied by prolonged periods of cloudy weather and high humidity may cause more damage than a heavy rain followed by clear weather and drying winds.

Dates are grown on a wide variety of soils. The maximum water-holding capacity consistent with good drainage is desirable. Coarse sand requires excessive fertilization and irrigation and permits rapid leaching of mineral nutrients unless underlain by more retentive soil of finer texture somewhere in the first 6 feet. On the other hand, good growth and production cannot be expected unless the soil takes water readily to a depth of 6 or 8 feet. Some of the finest date gardens in southern California are on deep sandy loams.

Dates may be grown either from seeds or from offshoots. When grown from seeds, approximately half of the palms will be male and produce only pollen. No two seedling palms are alike, and few of them are likely to produce fruit of good quality. However, when a seedling palm appears outstanding in any way, it can be propagated by its offshoots,

which will always reproduce the parent type. Then it becomes essentially a new variety or clone. Some new varieties originating in California and Arizona have been named, are being propagated and may have promise for the future, but it takes many years to prove their commercial value. In those parts of southern California and Arizona where the better imported varieties of dates can be grown, it is not desirable to plant seeds except for experimental purposes.

Where conditions are known to be unfavorable to fruit production, as in Florida and elsewhere around the Gulf of Mexico, the planting of date seeds of varieties more tolerant to rain is the most economical way of getting a few palms that may occasionally provide fruit for home use.

Date seeds usually grow readily when planted in well-aerated soil at a depth of 1 to 2 inches after the weather warms up in the spring. Seeds may be planted either in nursery rows or directly in permanent locations. To insure a good stand, two or three seeds may be placed in each permanent location and all but one of the seedlings removed later. Unless the young palms are grown in pots, where they can be handled without disturbance to the roots, it is better not to attempt to transplant them until after the second or third year. If the young palms are to be left in place until they can be culled out after flowering and fruiting, they should not be spaced closer than about 6 feet apart in the row. For best fruit production, each adult palm should be allowed a space equivalent to that used in commercial plantings, or about 30 by 30 feet.

A date variety, whether male or female, can be propagated only by offshoots, which develop from axillary buds on the trunk chiefly during the early life of the palm. When, after 3 to 5 years of



35. A commercial date garden in the Coachella Valley, Calif., consisting of Deglet Noor palms about 15 years old. Note the paper covers over the bunches to protect the fruit from rain and the high borders with irrigation water between.

attachment to the parent palm, these offshoots have produced roots and have started to produce a second generation of offshoots, they are then ready to be removed.

The cutting of a date offshoot from the parent palm requires care and skill, which can be acquired only by experience. Whenever possible the beginner

is advised to learn the technique by watching and assisting a skilled operator. The offshoot is cut from the parent palm by means of a specially designed chisel. [Illustrated in *Principes* 3: 136. 1959.] Two men are required for the cutting operation. A skilled workman handles the chisel, and under his direction a second man drives the chisel with

an 8- or 10-pound sledge hammer. The first cut is made to the side of the base of the offshoot close to the main trunk. The flat side of the chisel is put toward the offshoot and the beveled side toward the parent palm. This procedure will give a smooth cut on the offshoot and allow the beveled side to press away from the palm. A single cut may sometimes sever the connection. Usually one or more cuts from each side are necessary. No attempt to pry the offshoot from the palm should be made before the connection is severed.

Most varieties of dates are planted 30 by 30 feet apart. This spacing has generally given more satisfactory results than other spacings that have been tried. However a variety like Khadrawy, which grows slowly and makes a relatively small palm, can be planted 2 to 4 feet closer without undue crowding.

It is essential that the soil near the newly planted offshoot be kept moist at all times by light, frequent irrigations. Inspection should be made often during the first few weeks to see that the surface soil does not dry and shrink away from the offshoot. Irrigations every second or third day will not be too often on most soils, but on very heavy soils once a week may be sufficient.

Careful attention to irrigation in order to maintain good palm growth and high yields of fruit of the best quality cannot be stressed too much. Bearing gardens on the lighter soils are usually irrigated every 7 to 14 days during midsummer and every 20 to 30 days during winter. On the heavier soils irrigations are somewhat less frequent. In some localities where a permanent water table occurs at a depth of 6 to 8 feet, even as few as four to six irrigations a year appear to be adequate. In any case soils should be kept moist to a depth of 7 to 8 feet.

Experience in the Coachella Valley in-

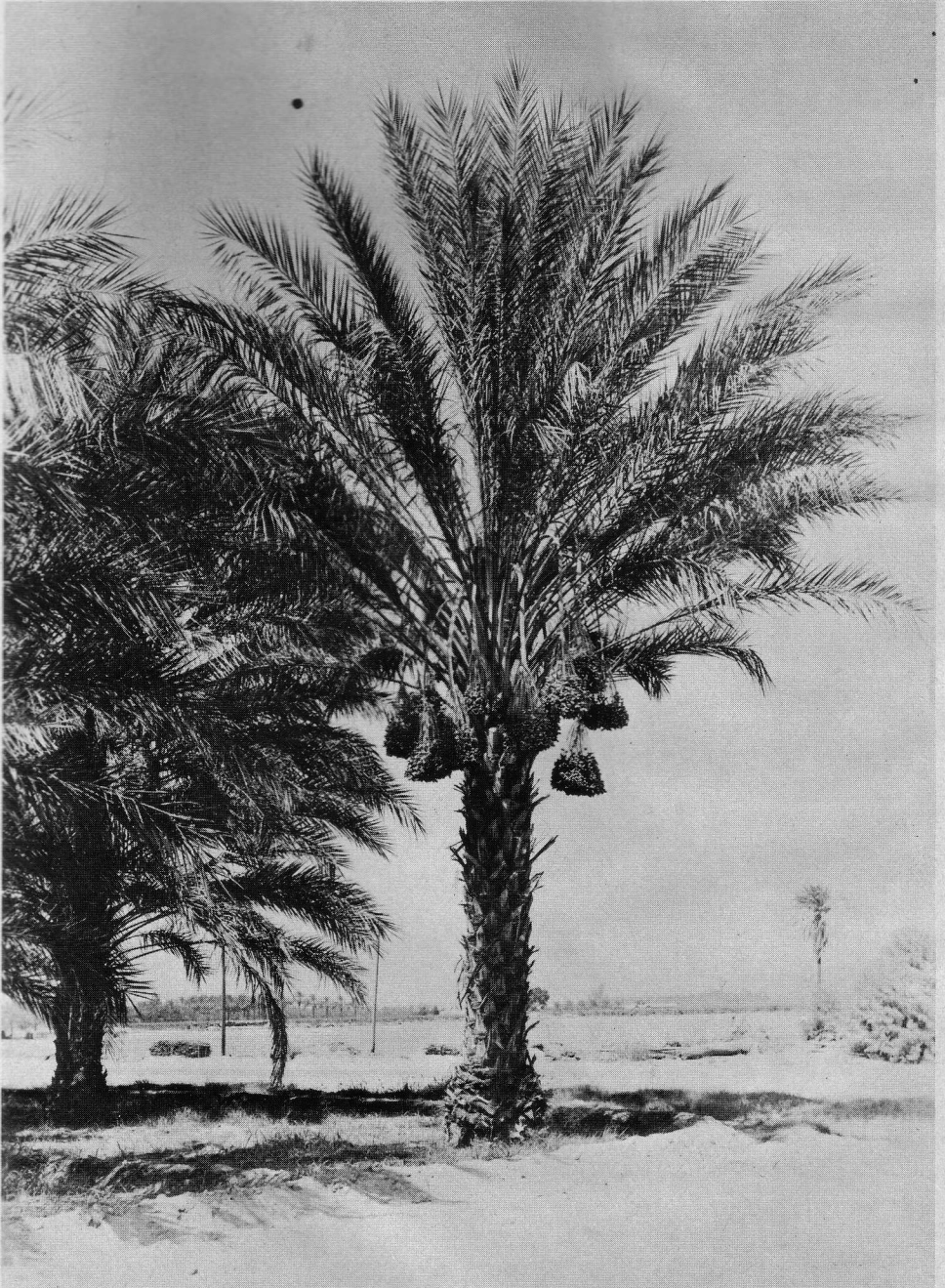
dicates that on light soils not less than 9 to 12 acre-feet of water per year is necessary for palms in full production and that from 12 to 18 acre-inches per month is required during the summer. On heavy soils in other districts half this amount may be enough.

Fertilization has generally been found necessary to maintain the quantity and quality of production, but there are few experimental data bearing on the kind and quantity of fertilizer or on the time of its application. Since a palm may make better growth in a good soil with little or no fertilization than in a poor soil with heavy fertilization, any program must be adapted to the soil type in each garden.

Animal manures are widely used in the better date gardens of the Middle East and North Africa. In California and Arizona barnyard manure is applied at the rate of 5 to 15 tons per acre. Inorganic nitrogen in its various forms is also often used in date gardens in California. The amount applied should be determined on the basis of whether it is used alone or in combination with manure or cover crops. Studies thus far indicate that the total application of 4 to 6 pounds of actual nitrogen per palm from all sources is adequate on most soils in the Coachella Valley.

Cultivation is commonly restricted to turning under cover crops or weeds and to preparing the land for irrigation.

Considerable evidence indicates that, other conditions being equal, the bearing capacity of a date palm is in proportion to the number of green leaves it carries, but removal of a few green leaves is justifiable under certain conditions. As many as 180 green leaves have been counted on a single palm unpruned for 6 years. With the Deglet Noor, which has long fruitstalks, removing the leaves up to about the point



36.A Deglet Noor palm at twelve years of age that had had 166 green leaves before the number was reduced to 88, as shown above, by pruning off enough to clear the tops of the fruit bunches. Such severe pruning tends to lower the bearing capacity and usually results in a light crop the following year unless the number of bunches is proportionately reduced.

where the lower ends of most fruit bunches are exposed has proved satisfactory on palms in full bearing. When Deglet Noor palms are over 20 years old, they seldom retain leaves below the mature fruit bunches; pruning should be confined to removing dead or dying leaves.

Occasionally during a severe freeze varying proportions of the green tissue on all the leaves on a palm may be killed. When the leaf area is drastically reduced in this way, it is desirable to retain all leaves with any remaining green tissue.

Sometime during the winter the spines are removed from all leaves of the previous year's growth to facilitate pollination and subsequent handling of fruit bunches. A sharp pruning knife with a long, curved blade mounted on a handle a foot or more in length is most frequently used for this work.

Date palms are dioecious; that is, the male flowers that produce the pollen and the female flowers that produce the fruit are borne on separate palms. For commercial fruit production the female flowers must be pollinated by hand. The most common method is to cut the strands of male flowers from a freshly opened inflorescence and invert two or three of them between the strands of the female flower cluster during the first 2 or 3 days after it has opened. Twine is tied around the pollinated cluster 2 or 3 inches from the outer end to hold the male flowers in place and prevent the strands of the female cluster from becoming entangled as the cluster pushes out between the leaves. To provide for expansion of the cluster as the fruit develops, the twine is commonly tied in a slip-knot with the free end long enough to permit later adjustment to the maximum size of the fruit bunch.

With most commercial varieties after the pollination season, the bunches are

pulled down through the leaves and the fruitstalk is tied to the midrib of one of the lower leaves. This prevents much scarring of the fruit and lessens the later danger of fruitstalk breakage by supporting the bunch as its weight increases. With young palms, bunches are held off the ground by attaching the fruitstalk to one end of a wooden stake.

With most varieties and in most districts it has been found desirable to protect the fruit from rain by covering the bunch during the ripening season. Paper bags or tubes attached to the fruitstalks immediately above the bunches, with the lower ends left open, are most extensively used. Covers are usually put on after the fruit begins to acquire its khalal color. Fruit enters the khalal stage when it has about reached its maximum size and the green of the growing period is replaced by a shade of red or yellow or a combination of the two colors characteristic of the particular variety at this time.

After the covers are attached, the sides may be turned under and rolled up so as to allow free air circulation about the fruit until rain threatens, at which time they should be pulled down. This is not often practicable on account of the labor involved, except with young palms or small plantings. The importance of bunch ventilation increases with the frequency of showers and periods of high humidity during the later stages of fruit growth and ripening. It may be necessary to protect the bunch beneath with a good grade of porous cloth or netting that will exclude birds and insects but at the same time not interfere seriously with ventilation. Bunch thinning promotes better aeration of fruit under covers, especially when most of the thinning is done by removing center strands.

As all dates on one bunch do not ripen at the same time, several pickings are

usually required to harvest the fruit during a season, which lasts from 3 to 4 weeks for early varieties to 2 or 3 months for late ones. The dates of a few varieties are not picked individually. Dry dates like Thoory are left until all the fruit is fully ripe, and then the entire bunch is cut. With the semidry variety Zahidi, entire bunches are also sometimes cut after all the fruit is ripe, and then the drier fruit is softened by hydration.

For picking soft dates, which require more care in handling than the firmer types, shallow trays should be used, and the fruit should be not more than two or three layers deep to avoid crushing and bruising. The firmer or semidry varieties may be put in deeper containers, buckets being commonly used.

Picking becomes somewhat of a problem as palms become older. Ladders of increasing length are used as the palms grow taller. Extension ladders of light weight metal are favored for palms over 25 or 30 feet high. Some growers simplify the problem of carrying very long ladders around to reach extra high palms by attaching a straight ladder permanently by the trunk to cover the 10 or 20 feet immediately below the crown.

Ripening Fruit at Home

In many localities from southern California to Florida there are a few date palms in the home garden or yard. The fruit from such palms may often be utilized, but it must be handled with improvised facilities at home. Outside the commercial date districts of California and Arizona these palms usually will be of seedling origin, and the owner should remember that the fruit will not be exactly like that of any other date palm. The best way of handling the fruit will have to be determined by experimenta-

tion and will depend to some extent on its texture, time of ripening, and reaction to rain and high humidity. Wherever and whenever the climate is warm and dry enough, the fruit should be left to complete ripening on the palm, as the best quality is obtained in this way and less labor is required. However, when showers are likely to occur during the ripening season or when fall temperatures become too low, it may not be ad-



37. Pollination of date flowers: *a*, strands of male flowers being placed in the center of the female cluster; *b*, freshly opened spathe ready for pollination; *c*, flower cluster after pollination. Twine is tied around the strands to hold the male flowers in place and to prevent tangling in the leaves. The tips of all strands in the female cluster were cut back at the time of pollinating as the first operation of fruit thinning.



38. Harvesting dates, showing picking belt in use.

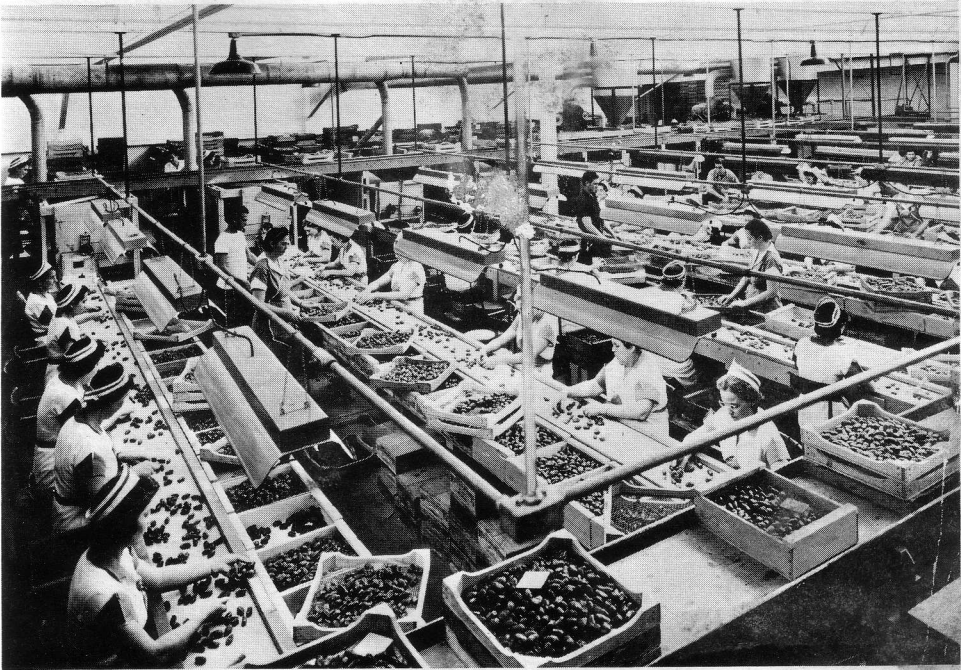
visible or possible to leave the fruit on the palm until it is fully ripe. The following suggestions are offered as a basis for experimentation.

Satisfactory results are sometimes obtained by cutting the entire bunch and hanging it in a relatively warm, ventilated room screened from insects and rodents. If as much as 10 percent of the fruit of certain types of dates has already ripened before the bunch is cut, a much larger proportion of the fruit will ripen later and can be picked as desired. This

procedure is often followed in southwestern Texas.

If the fruit cannot be handled by the bunch method, ripening may usually be completed off the palm if the dates are picked individually as they begin to soften at the tip. Small lots of such fruit may be completely ripened with a few days' exposure to the sun when they are placed either in glass jars with the lids loose or in trays screened to exclude insects.

For better control in handling, it may



39. Grading dates in a modern date packinghouse.

be desirable to construct a maturation box with glass or Cello-glass for the top and screened ventilators on the side to permit some regulation of the sun's heat. The fruit should be placed in shallow layers in screen-bottom trays which should be raised a little so as to permit circulation of air about the fruit. Until the fruit has completely softened, the humidity should be kept high by regulating the ventilators. If additional humidity is needed, it may be supplied by placing a shallow pan of water in the box, by hanging wet cloths near the fruit, or by adding water to the air with a hand sprayer. To ripen dates in this way may require from 1 to 8 days, depending on the maturity of the fruit at the beginning and on temperatures during treatment. If the temperature within the box during the day exceeds 120° F., partial shade with muslin cloth or similar material should be provided. An

old blanket placed over the box at night will help to retain the heat.

Controlled heat from any source may be used. Where electricity is available, maturation boxes or cabinets may be constructed so as to use the heat from either electric bulbs or small heating units, regulated to provide temperatures from 100° to 125°. The oven of an electric stove may be used if the temperatures are carefully watched and regulated. Unless there are accurate thermostat controls for maintaining temperatures below 125°, it is preferable to preheat the oven to a somewhat higher temperature, then turn off the heat, put the fruit in, and allow the oven to cool. Fruit should be placed in a single layer on wire trays or cooky sheets. If the flesh is not completely softened by the first heating, the trays should be removed, the oven preheated again, and the process repeated. Two or more treat-

ments may be required. A temperature of 200° or "low heat" is recommended for preheating in Arizona.

Small dehydrators have been designed for home use. They are very satisfactory and may be used for both maturation and dehydration by providing for increased humidity and temperatures before the fruit has softened. At the end of the dehydration process, if the fruit has not been previously fumigated, the temperature is sometimes raised to 150° for 1/2 to 1 1/2 hours to destroy any insects or their eggs that may be present. As temperatures above 150° are likely to affect the flavor adversely, it is well to use thermometers and check them from time to time.

In the United States there are no diseases or insect pests of the date palm that have reached serious proportions so far as the industry as a whole is concerned. [The Bulletin goes on to describe the diseases and pests that have been observed. It then describes seventeen varieties of dates. This is followed by a bibliography, or list of the literature cited, containing 110 titles.]

[Note on the reduction in date acreage since 1957: The principal reason for the reduction is the rapid increase in popula-

tion in California and Arizona and the mushrooming subdivisions springing up in the desert areas where dates have been planted. While dates have not proved to be as profitable as was anticipated fifty years ago, on good soil with good management in localities where the climate is favorable, returns during the past decade have been satisfactory and there is little doubt that the date industry is here to stay. An interesting result of recent development in the desert is the widespread use of date palms as ornamentals. Large palms are in demand for immediate effects in landscaping and those of any species grown in nurseries are expensive and in short supply. When a date garden is subdivided, about two-thirds of the palms must be removed, so are available for planting elsewhere. Of course special equipment is necessary for handling tall palms that weigh a good many tons. Many of these palms, 25 to 50 feet high, are being planted in groups on golf courses and in ornamental border or background arrangements. Some of these large date palms are actually being taken over the mountains for similar use around Riverside and even into some parts of Los Angeles and Orange counties.]

THE EDITOR'S CORNER

Those who make it to Indio in April, shortly after the Biennial Meeting, will find the date gardens extremely interesting if they have never visited them before. And the same thing goes for the whole story of date culture. The account of it in this issue of PRINCIPES should prepare visitors better to understand and appreciate what they may see in a date garden . . . When last heard from, our editor Dr. Moore was still on the other side of the planet — down in Australia, but up in northern Queensland, at Cairns, on the coast of the Coral Sea. From there he writes "It takes two sheets of paper to keep my arm from sticking to this page, such is the heat." Palmwise he says that "Australia has been rewarding in that I now have complete sets of material for *Carpentaria* and *Laccospadix*, which have not been well understood. It has been interesting to see the two species, *Ptychosperma elegans* and *Normanbya Normanbyi*, in their native habitat. Now off to Lord Howe Island where I hope my luck will continue for *Hedyscepe* and *Lepidorrhachis*."