Experiments in Palm Growing in East Tennessee

JOEL F. LUBAR, PH.D.

University of Tennessee, Knoxville, Tennessee

Each year we discover instances of palms being grown further and further from their native habitat. It has now been clearly established that Mediterranean fan palms (*Chamaerops humilis*) are grown on the coast of Ireland, and even in Edinburgh, Scotland occasional palms are found. *Trachycarpus fortunei* has been grown successfully out of doors both in Kew Gardens near London, England and in British Columbia, Canada. Of course, Ireland, Scotland, England, and British Columbia all have relatively mild winter climates, although the summers are extremely cool.

During the past six years I have been experimenting with several species of palms in Tennessee (Knoxville). Previously a report that was published by Mr. Charles C. Cole of Quebeck, Tennessee (PRINCIPES Volume 17, No. 1, Jan. 1973) discussed his experiments in palm growing which were most dramatic. Before discussing the results of this project let me first describe in some detail the climate of the Knoxville, Tennessee region.

Knoxville, Tennessee lies in the intermountain valley between the Cumberland Mountains and the Smoky Mountains. We are relatively protected for this inland location from extreme variations in winter temperature so that unlike the midwest or more northerly states, where there are severe sudden drops in temperature following cold fronts, we experience a more gradual fall in temperature even when a very large mass of cold air has passed. This is primarily due to the shielding effect of the Cumberland Mountains. Nevertheless, we do experience some very severe winters. We average approximately 9 inches of snowfall each year. However, there have been several winters during the past 30 years in which the snowfall surpassed 25 inches. Unlike locations along the eastern Carolinas and in Georgia we rarely if ever experience damaging ice storms. Snow falls are generally light and rarely, about once every five years, is there a single snowfall over six inches in depth. During the past 100 years the coldest official recorded temperature in the Knoxville area was –16°F. Generally the temperature reaches an absolute minimum of 0°F or below approximately once every 5 years. However, there have been long periods ranging as much as 15 years in which zero temperatures were not reached; but occasionally zero temperatures have occurred several years in succession. We are technically listed in agricultural climate zone 7 and lie close to the junction of zones 7a and 7b. Depending on microclimate, certain parts of Knoxville are in 7b and others in 7a. This is due primarily to differences in elevation and closeness to the Tennessee river.

The weather during the past 6 years has been particularly noteworthy as it provided an acid test for palm growing. During the year of 1969–1970 there was a severe freeze beginning on January

6 and lasting to the 12th. Then there were 123 hours of continuous temperatures below 32°F and on two days, (January 8–9) the minimum temperature was –1°F and the maximum +11°F on the 8th, and on the 9th the minimum was –3°F and the maximum +12°F. In addition there were winds of 15 miles an hour. During the latter part of that January a second freeze occurred in which the minimum was 0°F and on the next day the maximum was only 19°F. A third freeze occurred in February of that same year with a minimum of –1°F. During the following year, 1970–71, a freeze occurred in which there were 32 hours of below 32°F weather. The low for that year was +3°F. During 1971–72, after a very abnormally warm December in which the average monthly temperature was 9° above normal, a severe January freeze brought the temperature down to 1°F. This freeze lasted for 60 consecutive hours. During 1972 there were long stretches of cold weather with a minimum low temperature of 10°F. During 1972–73 we had an unusual April freeze in which a low temperature of 28°F was recorded on April 10, doing considerable damage to leaves of many trees that had already fully opened. On May 18 an all time low of 38°F was recorded.

With respect to snowfall, in the winter of 69–70 there were more than 25 inches of snow. In the winter of 70–71 snowfall was light, however there was a 3-inch snow during the first week of April. During the winter of 71–72 there was a 6-inch snow fall on March 25, and during 72–73 there was an 8½-inch snow on March 7 and ½ inch of snow on March 21. One of the unusual fortunate aspects of Knoxville weather is that there is a very gradual fall in temperatures which begins in October and lasts through December. The date of the first average freeze is November 1. Temperatures below +15°F rarely occur before mid-December or early January. Severe long freezes occur between the end of January and the middle of February. The average date of the last freeze is April 1.

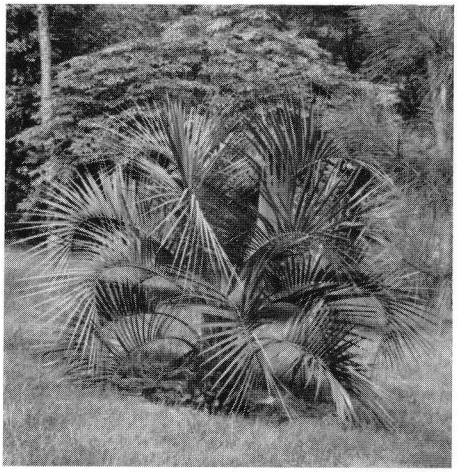
The average growing season here is only about 220 days. In a normal winter there are approximately 60 nights in which the temperature falls below freezing. Often there are several days each winter in which the maximum temperature does not even reach 32°F. In total then, Knoxville offers a very unlikely place for the growing of palms.

My own property is located in a very excellent microclimate. It is on the side of a very large hill at approximately 1100 feet above sea level. We are located halfway up the ridge. We are shielded by the ridge from the prevailing southwest, west and northwest winds so that the severe winds accompanying cold fronts are seen whistling through the trees on top of the ridge with relatively little movement in our location. Nevertheless we do have severe frost pockets and the absolute minimum temperature on my property is often the same as the officially recorded minimum temperature. I keep a very accurate temperature watch using maximum-minimum thermometers and several electronic thermometers located in different parts of the property.

The palm species that I have worked with are *Trachycarpus fortunei*, *Sabal minor*, *Rhapidophyllum hystrix*, *Nannorrhops ritchiana* and *Butia capitata*. Due to our extremely heavy annual rainfall (50 inches) and extraordinarily rich soil, palms grow quite fast in Knoxville. The following are some conclusions that I have reached as a result of six years of experimentation.

1. Author's largest *Trachycarpus fortunei* grown without protection except for the use of a heat lamp on rare occasions. This palm has withstood –6°F and many prolonged freezes.

First, the statement often seen in the palm literature that *Trachycarpus fortunei* is the hardiest palm in the world is *not* true for Tennessee. Probably *Rhapidophyllum hystrix* is the hardiest palm followed very closely by *Sabal minor*. I cannot yet make any statement about the hardiness of *Nannorrhops* since these seeds were only procured last year and still have a full winter ahead of them. Furthermore, these plants are extremely small seedlings at the present time. The largest *Trachycarpus* is planted in a gravel-mulched bed of rich earth next to the house. During the six years that I have had this palm it has grown from a seedling obtained in a one-gallon container to a large palm as pictured in Figure 1 now with fronds almost eight feet above ground. It has already more than four feet of trunk. This palm in the literature is listed as slow growing. This again is not true for our location. In a good summer when there is plentiful moisture, *Trachycarpus* often develops 20 complete fronds. I keep all of my palms heavily fertilized using a "palm special" mixture which can be obtained from Sears in Florida. This fertilizer contains liberal amounts of manganese sulfate. Fertilization is done twice a year: once in April and again in late June or early July. During the time that I have grown this and several other *Trachycarpus* specimens I have noted that *Trachycarpus* can withstand at least +10°F without any visible damage. With low temperatures the frond segments tend to fold up but no splitting occurs until the temperature drops below +5°F. At this point leaf splitting will occur on some of the outer leaves. At 0°F almost all of the leaves are severely damaged except for the central few and the bud is still protected. At –6°F I have lost one small *Trachycarpus*,



2. *Butia capitata* grown for four winters with protection. Specimen shown now has large fronds over six feet high. The tree in the background is the umbrella form of the chinaberry.

but the larger one survived. After the severe winter of 1970–71 I installed two heat lamps several feet above the large *Trachycarpus* for emergency use but these only give approximately 5° of protection for the upper fronds. This maneuver provides a microclimate about the same as Atlanta, Georgia, which averages approximately 5° warmer than Knoxville in winter. This is enough to pull this *Trachycarpus* through without any severe damage when the temperature goes to zero or below. This year the lights have been removed and the palm is on its own. Overall then, in Knoxville *Trachycarpus* should be grown very close to a house or wall and a minimum of protection may be needed. Perhaps with careful selection of seedlings hardier specimens might be found which will do better in a more exposed location.

As for *Butia capitata* it too grows very rapidly in Knoxville. The one pictured in Figure 2, was obtained 3 years ago. *Butia* cannot be grown without protection. In winter I erect a simple plastic framework over this palm and heat lamps, which can be activated through a thermostat, are placed under the framework. I have tested this particular palm's cold tolerance and found that at temperatures below 15°F damage sets in rapidly. Probably temperatures of zero would kill it. During the winter of 70-71 Columbia, South Carolina experienced an 8° above zero reading with two successive daytime highs during that particular January cold spell of less that 32°F. Many butias were killed but quite a few survived even with only the central bud intact. Nevertheless, since *Butia* is a slow-growing palm it is not hard to protect and it is so beautiful that it is worth the effort.

Rhapidophyllum hystrix is the palm of choice for Knoxville, Tennessee. My specimens were obtained through the generous help of Mr. William Manley of Atlanta, Georgia, who suggested I contact Southern States Nursery in MacClenny, Florida. These people have been very kind in providing at a low cost a small number of excellent needle palms. *Rhapidophyllum* is slow-growing, but since it is a suckering palm it puts out many fronds each year. It probably would take 10 years or more for this palm to become really gigantic. In Knoxville it starts growing very slowly in the month of March and begins to grow rapidly in late May, June, July and August. It slows down considerably by October. I have planted this palm as shown in Figure 3 in a completely open location with no protection whatsoever. This palm is completely hardy. It experiences no damage at any temperature thus far experienced in Knoxville including 6° below zero. In fact it is far hardier than many of the native Tennessee plants and broad leaf evergreens planted here. From the reports of Mr. Cole and also Mr. Paxson

3. *Rhapidophyllum* and to the right a small *Sabal minor*. Neither palm has ever been winter-protected and neither has shown any cold damage.

who lives in northern Arkansas it is probably true that *Rhapidophyllum* can withstand –10°F and perhaps even colder temperatures for short periods of time. I have complete confidence that this palm could be grown anywhere along the Eastern Seaboard up to New York City or Boston and perhaps inland to Roanoake, Virginia or in Louisville and Lexington, Kentucky. The latter viewpoint has been corroborated by Dr. J. Popenoe in a recent publication (1973). Furthermore, *Rhapidophyllum* is not bothered by snow, whereas snow can weigh down and damage the fronds of *Trachycarpus*. *Trachycarpus* should have snow brushed off the fronds for this reason. *Rhapidophyllum* sheds snow more readily.

Sabal minor is virtually unobtainable in any nursery. I don't know of any specimens that can be purchased. Mine were gathered from the wild in South Carolina where they can be seen growing in forests within 40 miles of Greenville. This palm has also been described by Mr. Manley as growing in the wild only 75 miles south of Atlanta, Georgia. *Sabal minor* is extremely slow-growing but it has several interesting properties. First, seeds of *Sabal minor* planted in the ground in Knoxville not only survive our winters, but then after a period of one or two years germinate. Seedlings grow to a size of three or four inches the first season and have been completely winter hardy. Thus far my *Sabal minor*, of which I now have many growing in the woods and various open spots on the property, have up to seven fronds and have experienced temperatures of 0°F. There is no significant damage at this temperature. The most that can be seen is some minor burn on the tip of some of the old fronds. This would lead me to estimate that the palm is probably hardy to around 5° below zero. Certainly it could be

grown in Knoxville, perhaps in a somewhat protected location without any special care whatsoever.

I have not tried *Sabal palmetto* since this palm has been known to freeze out in Atlanta, Georgia and occasionally they are damaged in Columbia, South Carolina. There is a large specimen of *Sabal palmetto* grown from a seedling located only 40 miles from the mountains of South Carolina in the town of Laurens, South Carolina. Perhaps genetically selected specimens could survive in Knoxville once they had achieved a large size. But even if placed in a very protected location *Sabal palmetto* would undoubtedly experience a great deal of damage in many of our winters.

Other plants that I have tried along with palms and which do extremely well and will grow to maturity in Knoxville include both southern live oak and *Quercus acuta*, the Japanese live oak. Slash pines also do very well here and I have grown two species of *Eucalyptus*, *Eucalyptus niphophilia* and *Eucalyptus gunni*, both of which seem to be adapted to this climate.

Currently at least one of the nurseries in Knoxville has taken a serious interest in my experimentation with my palms and other exotic subtropical plants and hopefully will consider supplying needle palms for interested buyers in the area. Every effort should be made to propagate and further test *Rhapidophyllum*. This palm is very showy and if obtained in the larger sizes could provide a striking addition to temperate and even many northern gardens.

LITERATURE CITED

POPENOE, J. The hardiest palms, *Fairchild Tropical Garden Bulletin*, *28*(2), April, 1973.

PALM QUESTIONS AND ANSWERS

Q. I have recently lost several palm seedlings. They were covered with small spider webs. What killed these and how can I prevent this in the future?

A. Your problem is spider mites or "red spiders" which are among the most common pests which attack palms. They are more closely related to spiders and ticks than to insects and thus require special miticides to control them. Remember they are not insects and in general cannot be controlled with regular insecticides.

Most seedling palms, like blades of grass, are especially susceptible to these mites, being very small and tender. The mites have needlelike piercing mouth parts which they use to puncture and suck the sap from the leaves and tender parts of the stem, causing them to become discolored, often stippled yellow, gray or brownish in appearance. This injury weakens the seedlings and heavy infestations may kill the young plants.

Certain palms, such as *Pigafetta*, are especially tender in the seedling stage and are highly susceptible to spider mites. Older plants, once established in the ground in South Florida, appear not to be as susceptible. Palm seedlings grown under glass, whether in Florida, California, northern cities in the United States or the true tropics, are often highly susceptible to spider mite injury.

Most spider mites spin, on the undersurface of the leaves, a fine silken web containing their eggs and are most damaging in hot, dry