

The Possibility of Mycorrhizae in Palms

DAVID BARRY, JR.

In 1935 I secured seeds of *Pinanga Elmeri* from Baguio, Island of Luzon, Philippines, through the cooperation of their Department of Agriculture and Commerce. I had sought this palm because Baguio is semi-tropical. It has pine trees and occasional frosts. I had hoped to find another exotic palm that would live in the semi-tropical climate of Southern California. The seeds produced about twenty plants which died as soon as the endosperm in each seed became exhausted, in spite of every cultural effort known to me.

In 1957 I went up from Manila to Baguio to see this palm. It is pinnate, with a smooth green trunk about one and one-half inches in diameter. The leaves are attached to the trunk with wide spacing, giving the plant an open, scraggly appearance.

About twenty-five years ago I secured seeds of the "Robinson Crusoe Palm," *Juania australis*, from the islands of Juan Fernandez, 365 miles off the coast of Chile. It was on one of these islands that Alexander Selkirk, reputed hero of Defoe's romance, was put ashore in 1704 and taken off in 1709.

Again my objective was to find a new palm for the coastal belt of Southern California. In the case of this species, the prospect of success seemed good, as the Juan Fernandez Islands are in 30° South Latitude, and are bathed in the cold Humboldt Current. Much to my delight, the seeds germinated readily. They were about the size of the seeds of *Archontophoenix*, and the development of the seedlings was in the same manner as in that palm. Martius called the palm *Ceroxylon australe*.

When the third leaf began to emerge, and when the endosperm in the seed was consumed, the plantlets died. I tried in vain a series of different potting mixtures in an attempt to save some of the plantlets.

I had sent some of the seeds to Julien Marnier-Lapostolle, a skilled horticulturist of St. Jean Cap-Ferrat on the French Riviera. After good germination he lost his seedlings.

From time to time during the last twenty-five years I have had good success in germinating seeds of several species of *Ceroxylon*, the South American wax palms native to the mountains of Venezuela, Colombia, Ecuador, and Peru. In one experience the plantlets died as described above. In others, the plants were grown large enough to transfer to gallon containers. Some of the plants were distributed and further experience with them is not known. No plants remain on hand, as all gradually declined and died.

These and other palms are a great challenge to any one working in the field of palm introduction. Dr. Miriam L. Bomhard, in *The Wax Palms* (*Smithsonian Publication* 3429, 1937), designated species for different areas along the Pacific coast from Washington to San Diego.

Her enthusiasm for these palms was without limit. She wrote, "... the wax palms... are not only beautiful columnar trees but are probably the most remarkable palms in the world. They far exceed the most hopeful anticipations of the palm enthusiast; they are the princes of the 'Principes'!" Perhaps her predictions of establishing these palms will

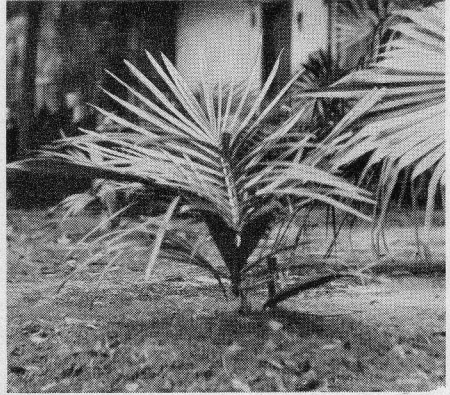
some day come true when the problems involved are better understood.

The failures described above were taken more or less in stride, with the run of luck that is part of plant introduction. However, a recent adventure has about changed my attitude toward such losses. Perhaps they may be prevented.

Last year I secured from Nairobi several hundred seeds of *Colvillea racemosa*, a close and attractive relative of *Poinciana regia*, and also native to Madagascar. The leguminous, hard seeds were scored with the sharp edge of a three corner file before being placed in a seed bed. Germination was quick and uniform. The plantlets reached a height of five inches, consumed the endosperm, and died. However, this story does not end here. I was then offered some seeds by a Japanese seed house, bought them, planted in the same manner as the first lot, and in the same propagating house. These plantlets did not die. The reason that the second lot of plantlets went on to live may be that a certain fungus accompanied the seeds from the Japanese source, whereas the seeds from Nairobi were free of the fungus. In both seed lots the seeds were clean to the eye, and had been removed from the pods.

The experience with the first lot of *Colvillea* seeds was similar to my failures with the palm seeds. The success with the second lot suggested that I might have succeeded with the palm seeds if I had found a favorable condition, or had supplied some missing element.

The conclusion, or conjecture, at this writing is the possibility in some palms of the existence of a mycorrhiza, a fungus which lives in close relationship with their roots. It is known that certain



50. A young plant of *Ceroxylon* sp. at the Riverside home of J. Harrison Wright about 1917.

trees introduced from certain parts of the world must be accompanied by a certain fungus that does not exist in the new area.

Other palm growers have tried to introduce *Ceroxylon* to California. According to an historical account in *Southern California Gardens*, by Victoria Padilla, Francesco Franceschi, of Santa Barbara, the proprietor of the Southern California Acclimatizing Association, introduced *Ceroxylon alpinum* (*C. andicola*) in 1908. He maintained that this introduction was one of his greatest triumphs. None of his plants is known to have survived. One echo remains. Franceschi's friend, J. Harrison Wright, of Riverside, an ardent and successful worker in palm introduction, grew a *Ceroxylon* species outdoors from 1909 to 1917. ⁽¹⁾ The accompanying photograph of this plant was given to me by Mr. Wright who stated that it died during a period of excessive heat in the summer. It can be presumed that this plant was one of Franceschi's, for Mr. Wright bought plants from him.

How did this palm live for eight years without its essential fungus? The answer

⁽¹⁾ This incident referred to in a footnote by Bomhard in "The Wax Palms."

is that it probably had its fungus. The Plant Quarantine Act was not passed until 1912, with the resulting practice of seed-cleaning and fumigation. Franceschi grew the palm in 1908. It is likely that the seeds sent to him were picked up from the ground around the parent plant or plants where they had been inoculated with the fungus. The alternative for the seed collector would have been to fell the tree. If Mr. Wright's palm had been planted in the coastal belt, and not in an interior valley of hot summers, it might be alive today.

There is much to be done in the world wide distribution and dissemination of palms. The introduction and establishment of such palms as *Ceroxylon* to the coastal area of the Pacific states is a very small part of the whole. Overcoming the apparent problems related to *Ceroxylon* may point the way toward solving problems that relate to palm introduction in general.

Dr. Edward HacsKaylo, Plant Physiologist, Division of Forest Management Research, to whom this subject was referred, states that he has "no definite information regarding the essentiality of mycorrhizae in the survival of palms. We have no record of such studies having been made anywhere." He suggests that a method of "inoculating seedlings is by introduction of small quantities of the soil from beneath a native stand of the host tree." Dr. HacsKaylo does not know whether the fleshy or fibrous seed coats would carry the desired organisms. Although this method has been often suggested, it is probably not very sure.

As a condition of entry of palm seeds into the United States, and into many other countries, the fibrous or fleshy coverings of palm seeds and all soil must be removed. However, from information furnished by F. A. Johnston, Chief, Technical Services, United

States Department of Agriculture, Plant Quarantine Division, permits will be issued for the entry and clearance of mycorrhizal fungi and soil samples containing fungi, humus, leaves, plant litter and other organic matter. His department will provide an application form for such permits, entitled "Application for Permit to Move Living Plant Pests." Shipment under such permits could accompany the shipment of seeds with the permits regularly used for seed importations.

The routine fumigation of palm seeds as a condition of entry would destroy any accompanying essential fungus. Mr. Johnston added the information that his department would be agreeable to the proposal that small quantities of palm seeds and their seed coverings which were separated from the seeds before shipment, be released without fumigation of the seed coverings if a thorough inspection should reveal no injurious pests.

Through such cooperation experiments are now possible. It would be evident to the experimenter that the seed beds should be inoculated with the fungus-carrying soil, seed coverings, or litter.

It is possible that I have been confusing the lack of trace elements in the soil with the lack of fungus. However, within the last three years the application of trace elements to *Ceroxylon* plants did not appear to help them, so I am inclined to discount this possibility.

Dr. HacsKaylo, in an article on mycorrhizae that appeared in *The National Horticultural Magazine*, July, 1958, stated that, "Mycorrhizae of trees develop most extensively in acid soils, probably because the fungi, at least those studied so far, all require an acid medium. It has frequently been postulated that the acid soil requirements of

many species of plants, such as azaleas and rhododendrons, are really the requirements of their mycorrhizal fungi." This statement should influence the grower to use an acid medium.

I hope that the problems involved will be a ready challenge to fellow palm growers, and that our society will be a clearing house for the reporting of their experiences.

Exotic Palms in the Western World II

ARECA LANGLOISIANA

HAROLD E. MOORE, JR.

An account of some palms introduced into cultivation by the Fairchild Tropical Garden Expedition of 1940 appeared in *Gentes Herbarum* 8: 295-315, 1953, wherein *Drymophloeus* and *Siphokentia* were considered. Another handsome palm collected on the expedition (Number 208) and successfully grown by Mr. and Mrs. A. C. Langlois at "The Retreat," Nassau, Bahama Islands, has recently been described as a new species by Dr. Eva Potzta of the Botanical Museum at Berlin-Dahlem, Germany, under the name *Areca Langloisiana* (*Willdenowia* 2: 628, 1960). Specimens for Dr. Potzta's study were provided by Mr. Langlois from the plant in his garden at Nassau. Apart from one plant on the grounds of Mrs. Archbold's estate at Nassau, no other survivors from the original lot of seed, sent also to Florida and the Philippines, are known to exist, but offspring from the Langlois' plant are now grown elsewhere.

Seed of *Areca Langloisiana* was collected by Hugo Curran and Edward P. Beckwith in February, 1940, on the slopes of the volcano Sapoetan above a rest-house at Noongan back of Manado on the Minahassa Peninsula of Celebes Island (Sulawesi), Indonesia. Dr. David Fairchild described the event on page 105 of his delightful book *Garden Islands of the Great East* (Charles Scribner's Sons, 1943) as follows: "Hugo and Ned set off up the slopes of Sapoetan with cameras . . . Quite unexpectedly

they discovered three other very handsome palms; one an *Areca* with lacquered sheaths, reminding me of the famous "lacquer palm," *Cyrtostachys lakka*, rare even in botanic gardens. This is a larger palm with stilt roots and large fruits an inch long, a beautiful red in color like the stem on which they are borne."

From the time I first saw *Areca Langloisiana* at The Retreat in 1951, I have been perplexed by the difference in color between the lacquer-red sheaths described by Dr. Fairchild and the orange sheaths of the cultivated *Areca* "208" as it has been called. A very pleasant afternoon spent with Mr. Beckwith at his home in Garrison, New York, in early June of this year has answered my questions at least in part. He not only gave me his account of the day when 208 was collected from memory and his journal, but had set up projectors for color transparencies and for movies in color.

Mr. Beckwith recalled the day as a rainy one when he and Hugo Curran set out. On the way, they added to the party two local helpers who assisted in clearing the dense undergrowth to make photography possible. A color transparency was obtained of the red-sheathed *Areca*, and a handsome tree it must have been. In addition, both a color transparency and movies were obtained of a second *Areca* not mentioned by Dr. Fairchild which had taller, slender, clus-