date. One feature which is desirable is the bright striped petioles. Also, the flowers are larger than other *D. maculata* types and are capable of higher seed production.

Seedling Population "752"

The 6 seedlings from a cross of "007" with an inbred seedling from population "711" are also excellent pollen producers (only 3 have flowered at this time). One of the seedlings (752-2) is also an outstanding seed producer yielding 5 seed pods on 1 plant. Apparently, the high fertility of the "007" parent has been passed on to the offspring.

Seedling Population "751"

These are 29 seedlings from self pollinations of "007". In contrast to the above population "752", these seedlings have little fertility. Many plants have deformed flowers and have not produced any pollen, even when grown in the same greenhouse as the "752" seedlings. In this case, it seems that inbreeding was detrimental to fertility of the subsequent offspring.

The information presented above is preliminary and derived from only 1 season of pollinating dieffenbachias. As more is learned by working with these plants some of our thoughts and ideas will undoubtedly change. Suffice to say that there are readily apparent differences in plants' tendency to produce pollen or set seed. For now, plants with high fertility levels are being increased to ensure adequate seed production. In the future, more species will be collected and screened for their suitability in breeding.

Recent Acquisitions

The plants below have recently been added to our collection and have not flowered at this station.

Dieffenbachia Seguine irrorata—Beautiful 2 tone green coloration, large leaf size but leaves tend to be wrinkled after unfurling. Hopefully, it can be combined with the white variegation pattern of *D. maculata.*

Dieffenbachia Leopoldii Bull.—Already reported to have been hybridized with *D. maculata.* Has a stunning white midrib which appears to almost glow. Would also be desirable to combine with *D. Seguine irrorata.* A slow grower, but may be due to virus.

Dieffenbachia maculata cv. Jenmannii—Plants with oblong leaves with feathery ivory stripes. The plants tend to have weak stems and to be somewhat leggy. Would be a good plant to cross with *D. Seguine* for increased sturdiness and substance.

Dieffenbachia Oerstedii—A delicate smaller leaved plant which tends to be slow growing. A good plant to cross with *D. Seguine irrorata* to obtain a smaller leaved version with more color and possibly faster growth.

Dieffenbachia humilus—Very narrow leaves. May be possible to develop dieffenbachias which approach aglaonemas in appearance but would be more colorful and faster growing.

The above characteristics of these plants are all readily observable. Other hidden traits such as disease or pest resistance are also extremely important. In the future we will be screening species for potential resistance to common plant pathogens and pests. Undoubtedly, as our collection of dieffenbachias grows, the chances of finding such desirable traits will also grow.

Literature Cited

1. Conover, C. A., R. T. Poole, J. F. Knauss, R. A. Hamlen and R. W. Henley. 1973. Florida's changing foliage industry. *HortScience* 8(6): 462-464.
2. Graf, Alfred Byrd. 1970. Exotic Plant Manual. Roehrs Company, East Rutherford, New Jersey. 842 p.
3. Hartman, R. D., F. W. Zettler, J. F. Knauss and Eleanor M. Hawkins. 1972. Seed propagation of caladium and dieffenbachia. *Proc. Fla. State Hort. Soc.* 85:404-409.

Proc. Fla. State Hort. Soc. 90:96-98. 1977.

COLD DAMAGE TO CYCADS AND PALMS AT FAIRCHILD TROPICAL GARDEN RESULTING FROM THE JANUARY 1977 FREEZE

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Abstract. **Eight hours of freezing temperatures, falling to 26° and 25° F (–3 and –4° C), were recorded at Fairchild Tropical Garden and Montgomery Foundation Research Center on January 19th and 20th, 1977. About 56 species of cycads and 350 species of palms are planted outside at these two locations. Only a few of the species of cycads escaped frost burn to the foliage, but all had fully recovered by midsummer. By October, some 44 palms of 23 species had been lost from the effects of the cold. However, all plants of only one species were lost from the garden, and even that species survived on private property across the street from the garden. Widespread browning of the foliage of unprotected palms resulted from the freeze, but the high survival rate can be attributed largely to the practice of planting palms known to be cold sensitive under the protective canopy of live oaks and other tall trees.**

Freezing began by 8:00 p.m. and lasted 12 hours on the night of January 19-20, 1977, at Fairchild Tropical Garden (FTG) and at Montgomery Foundation (MF) Research Center and nursery which are a mile away. A low of 26° F (–3.3° C) was recorded at FTG and a low of 25° F (–3.9° C) at the nursery. These are the lowest temperatures recorded since the tropical garden was established in 1938 for the preservation of all the world's cycad species and for the collection of palms and other tropical plants.

Very rare cycads from hot, humid tropics—like *Zamia skinneri* and the epiphytic *Zamia pseudoparasitica*—are kept in the Rare Plant House where they have winter protection. Various other species are being raised in the nursery greenhouses and shade house. About 56 species can be found planted outside. Of these, Florida's native *Zamia* species, *Macrozamia moorei, Encephalartos lehmanii, Cycas revoluta,* and *Dioon edule* are the only fully exposed species observed not having the slightest cold damage. *Macrozamia lucida, M. communis, Dioon purpusii,* and *Ceratozamia mexicana* planted under loquats or other trees also escaped injury.

Cycas circinalis which is widely planted in the citrus areas of Florida had severe foliage burn at FTG.

At FTG browned cycad fronds were removed, and in 2 or 3 months starchy storage stems had pushed out a rosette of new leaves. Not a single cycad was lost because of the freeze. More cones than usual were produced in the months following the cold, with many plants producing cones for the first time. This response parallels that observed in the wild when cycads produce new fronds and cones following periodic fires.

Fairchild Tropical Garden has almost 500 species of palms. Many of these are in the nursery greenhouses or Rare Plant House. Palms that are known to be cold sensitive like the rattans (*Calamus* and *Desmoncus* spp.), *Reinhardtia* and *Licuala* species are planted in the rain forest where they can have overhead irrigation, or in other areas where heat rising from the earth on cold nights is blanketed by a canopy of tall trees. It was interesting to observe after the January freeze that *Licuala* plants under live oaks (but not under irrigation) showed no cold damage, while *Phoenix reclinata,* which survives Gainesville winters, sustained considerable burning to its unprotected crown of leaflets at FTG.

Florida's native palms showed a wide range in response to cold. *Sabal palmetto, Sabal minor, Serenoa repens,* and *Rhapidophyllum hystrix* range into North Florida, Georgia, and beyond, and were not hurt by the cold. (In fact, cultivated specimens of the needle palm, *Rhapidophyllum hystrix,* were reported surviving –20° F (–7° C) in Winslow, Arkansas last winter (1)).

The Everglades cluster palm, *Acoelorrhaphe wrightii,* had no damage at FTG, but the royal palm, *Roystonea elata,* also native to the Everglades, had leaflets browned about half way to the petiole. The petite silver thatch palm, *Coccothrinax argentata,* was not burned at FTG and only slightly in open areas around Homestead.

The natural range of *Thrinax radiata* and *Thrinax morrisii* is mostly south of the area hit by freezing temperatures, but in the open at FTG these species were severely browned by the freeze. *Pseudophoenix sargentii* has been found in the wild only on the Keys in Florida and was slowest of the native palms to recover from the affects of the freeze.

The only exotic palm species lost from FTG was *Pigafetta filaris* (3 plants). One was in the open. Two were surrounded by live oaks, but with open sky above. This "hole in the doughnut" or "hole in the blanket" situation has been observed in avocado and mango groves to leak warm air. Where a tree is missing in a grove, leaving a hole in the canopy, the trees surrounding that hole are more severely damaged by cold than other trees in the grove. The importance of microclimate is demonstrated by the fact that across the road from FTG, Paul Drummond has a *Pigafetta,* hard hit by the freeze, but making a robust recovery, and on Venetian Causeway where temps only approached freezing, Mrs. Teddy Buhler has a *Pigafetta* showing no ill effects of the cold.

Several palms of one species are usually planted in a group at FTG, yet the loss of an entire group was exceptional after this freeze. There was a group of 8 *Brassiophoenix schumanii* planted under the edge of a tall live oak. The one most distant from the overhanging branches of the tree died in September from the frost damage. There was a group of 3 *Veitchia joannis,* all with their crowns exposed, but 2 were growing out of a clump of *Rhapis excelsa* and very near other masses of plants. The 2 recovered vigorously, while the third, standing alone on the lawn, promptly died from cold injury. Most *Strongylocarium latius* were at least partially covered, but 4 of those most exposed died. One *Strongylocarium brassii* was also lost from the cold. The 44 palms lost represent 23 species. The only species lost from the grounds is still present in the greenhouse.

Of those plants under canopy, 1 of 3 *Pelagadoxa henyrana* died and 2 of 6 betel palms, *Areca catechu,* failed to sustain new growth. Two *Rehderophoenix* under cover were lost although sibs on either side came through well. Two very chlorotic and weak *Ptychococos* in the Rain Forest died after the freeze, and 2 declining *Drymophloeus* were finished by the freeze despite overhead protection.

Several unhealthy palms in exposed areas were finished by the cold. In the completely exposed Research Center parking lot, three *Coccothrinax argentea* (one healthy), one *Thrinax radiata,* and 2 clumps of *Chrysalidocarpus lutescens* were lost.

Young and newly transplanted palms were also very susceptible to freezing. We lost 3 *Thrinax* and 2 *Latania loddigesii* which had been planted out late in the fall. Two young, but well established *Archontophoenix alexandrae* were lost, but mature specimens a few feet away recovered.

In some cases well established healthy plants were lost. *Ptychosperma elegans* is widely planted in South Florida and comes through most winters without injury. FTG lost 2 fine specimens by May and another by October. Most *Heterospathe* survived well. Some under cover escaped injury entirely. However one 35 foot (10 m.) *Heterospathe elata,* with crown well above all other trees in the plot, was completely destroyed. A smaller *Heterospathe woodfordiana* under cover also died. At MF there were 5 11-year-old plants of *Carpentaria acuminata,* growing vigorously until January, that lost their crowns promptly after the freeze. This species has not shown cold damage in Florida before, but those surviving are very chlorotic at this time. *Pseudophoenix* seemed to look worse 9 months after the freeze than it did the first week afterwards. One plant of *P. vinifera* was lost in mid-summer.

Guassia attenuata, unlike most palms, dropped its dead brown leaflets promptly. All but one plant started new leaves. The tallest appeared dead until October when a green leaf emerged. However, by that time, one of those that had made initial new growth had dropped its head.

The nursery was protected by overhead irrigation. The only palm loss there was the entire inventory (90 plants) of *Siphokentia beguinii.* The parent trees in FTG recovered well under a live oak. Few of the palm species under the live oak turned brown, whereas most species in the open were browned.

Some palms are notable for their vigorous recovery despite loosing almost all of their leaves. The rare *Neoveitchia storckii* from Fiji is far from being what it was before the freeze, but from a leafless brown trunk it has produced half a dozen healthy leaves. The huge discs of *Thrinax excelsa* were browned, but its new leaves are full size and green. *Aiphanes erosa* was badly burned, but by October a full complement of deep green leaves and bright red fruit obscured any evidence of the freeze.

Residents of Central and North Florida can use the results of the South Florida freeze for selecting palms and cycads to test in those locales. In this particular freeze, half a dozen large, ornamental cycads, previously mentioned, were less affected than the popular sagopalm, *Cycas circinalis.* Of these, *Dioon edule, D. purpusii,* and *Ceratozamia mexicana* are available in a few Florida nurseries. *Macrozamia* species from Australia and *Encephalartos lehmanii* from South Africa are available to a limited extent from seed dealers in those countries and are expected to be available in Florida within a few years.

Many palm species that showed little or no cold damage

at FTG in 1977 are already grown in northern portions of the state, but we eagerly await seeds of other cold hardy species having outstanding qualities. *Nannorrhops ritchiana* from the the Himalays is not readily available in this country, but the blue-gray costapalmate leaves of this branching palm make it highly desirable for further testing in extremely cold areas. Blue-gray foliage can also be found in the California-Mexico palm, *Brahea armata.* Several species of *Brahea* from Northern Mexico are valuable ornamental plants with a high degree of cold tolerance. The Brazilian beach palm, *Allagoptera arenaria,* is both very cold tolerant and very salt tolerant. Most of the fishtail palms (*Caryota* spp.) at FTG were hit hard by the cold, but *Caryota ochlandra* from China had little browning. Two meter long strands of fruit cascading like heavy ropes of beads make this an especially regal palm.

South Florida is only marginally tropical, yet it is reassuring to know that so many species of tropical palms and cycads can make a rather quick recovery from an unusually severe winter. After 9 months, FTG is lush and green again, and few visitors will detect the fading evidence of the freeze.

Literature Cited

1. Paxson, Dillwyn, Rt. 2, Box 172, Winslow, Ark. 72959, reported in a letter to Mrs. Teddy Buhler, The Palm Society, 1320 Venetian Way, Miami.

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MINIATURE ROSES: PERENNIAL FLOWERING PLANTS

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Abstract. **Miniature roses are gaining in popularity each year with many new cultivars being introduced, most of which grow well in Florida. They are relatively easy to grow in ground beds, rock gardens, hedges, containers and hanging baskets. There are varied colors, flower shapes, and growth habits in miniature roses. They should be most favorably considered in landscape plantings where year around color is desired.**

In recent years the popularity of the miniature rose has increased rapidly, and perhaps one of the reasons is the increase in the number of introductions of new cultivars year by year. These cultivars have many unusual features such as the color and/or form of the flower, the size of the plant, the number of flowers that each plant will produce, and the freedom of the foliage from the predominant pests of roses. These plants are remarkable for small garden areas, rock gardens, regular sized pots, or hanging baskets. There are also climbing miniatures. Miniature roses range from the very small flower and plant size to that almost equal to the smaller polyanthas. There has been much discussion among rose hobbyists about the classification of some of these introductions.

Records indicate that the first named miniature propagated and cultivated was *Rosa rouletti.* There are many versions of the story as to how this rose was found and given generic status. It is believed that most of the miniature roses today have in their genetic background genes from *R. rouletti.* Since the 1930's the following hybridizers have bred miniature roses: Jan deVink, Señor Pedro Dot, M. Tantau, R. Kordes, Alain Meilland, all from European countries; while here in the United States, Ralph S. Moore of California began an intensive study and breeding program in 1936. (3) Since his work began, Moore has introduced a large number of miniature rose cultivars that have excellent qualities. In recent years other hybridizers have made introductions: Ernest Williams, E. M. Schwartz, Harmon Saville, and Sam McGredy.

Some of the first hybridized miniature rose introductions that followed the *R. rouletti* were 'Red Imp,' 'Pixie,' 'Bo-Peep,' 'Tom Thumb' (Peon), and 'Cinderella.' Of these, 'Cinderella' and 'Red Imp' are still among the favorites that are grown. There are probably over 200 patented and non-patented varieties today. Therefore, it is not possible to name all of the varieties that are better adapted to Florida conditions. Any introduction (usually) will grow in Florida, but like the other types of roses some will grow better than others because of soil and climatic conditions.

Of the many roses that have been rated according to form, color, and production of flowers as well as size and growth of the plants, the following are the top 12 that are being grown today:

Cultivar	Color Description
'Starina'	Coral-orange
'Beauty Secret'	Crimson red
'Cinderella'	White
'Toy Clown'	White, edges red
'Judy Fischer'	Deep rose pink
'Mary Marshall'	Orange blend
'Magic Carrousel'	White with red edge
'Starglo'	White
'Over the Rainbow'	Red and yellow
'Simplex'	Single white
'Chipper'	Pink
'Yellow Doll'	Clear yellow

All of these grow and flower beautifully in Florida. There are several others that should be named for the record that grow very well and are worth growing in Florida:

'Green Ice'	White (green with age)
'Kathy Robinson'	Pink blend
'Lavender Lace'	Mauve
'Janice'	Deep pink
'Red Imp'	Deep red

Miniature roses can be grown on their own root or grafted on various root stocks. Dr. Sam McFadden did a great deal of work with the miniature roses in the early fifties while he was developing the *Rosa fortuniana* as a possible rootstock for roses in Florida. He grafted miniatures on *R. fortuniana* at various heights from 12 to 36 inches. (1) Those on 12 inch and higher heights are called standards, or by some, tree roses; however the latter term is often used particularly when referring to the hybrid tea types.

The two-leaf graft (2) has been most successful as a means