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Cold-Weather Experience in South Florida

LEONARD GOLDSTEIN
8101 S.W. 72nd Avenue, #313-W, Miami, FL 33143

Anyone who had to nurse tropical plants through the winter of 1984–85 in South Florida is not likely soon to forget the experience. It was one of those unintended cold-hardiness tests that everyone can do without, and palm fanciers aren't likely to complain if the testing skips a few years.

But at least there were useful lessons to be learned about cold tolerance in palms. Probably the best source of data is the collection of South Florida Chapter member Erik Beers. His property, located in western Broward County about 18 miles from the Atlantic Ocean, has relatively rough winters for a South Florida site. Low and open to the wind and somewhat removed from the influence of the Gulf Stream, the area is subject to cold weather of an intensity and duration historically unlikely to occur elsewhere in the region.

At the peak of the 1985 cold invasion, the night of January 21–22, temperatures in western Broward County were under freezing for more than 12 hours. The minimum was no higher than 26° F (−3.3° C) and possibly as low as 22° F (−5.6° C). Under those circumstances, palms which survived the freeze in western Broward are good candidates to do well in climates like that found in the more densely populated, warmer areas of South Florida closer to the ocean.

The chart that follows shows progress over time of a large selection of the palms growing at the Beers property. The data reflect subjective observations made about two weeks after the freeze and again on August 25, 1985. The key below should indicate what most of the entries signify, and further explanation is provided beneath Table 1.

Some observations merit special mention:

1. Although specimens of both *Thrinax* and *Coccothrinax* recovered very well, those of the latter recovered more rapidly.

2. A specimen of *Pritchardia beccariana* outperformed the locally common *Chrysalidocarpus lutescens.* The *Pritchardia* recovered completely, while two large clumps of *Chrysalidocarpus* were devastated, losing most major stems.

3. *Livistona* species were virtually unfazed by the cold, even young plants 18″ high, fully exposed to the wind. Consequently, most species of *Livistona* should come to occupy a special niche in the colder areas of South Florida.

4. Despite the record cold, there were very few total losses. Even where clumping palms were badly burned, by the time of the second inspection, almost all exhibited viable lower stems and suckers. So optimism is a major lesson learned from the great cold-hardiness test. Don't rush to remove badly damaged palms.

5. Easily the most significant result observed is the benefit of icing palms down. All of Beers' containerized material was under irrigation, and the insulating value of ice is obvious from the survey data.

Optimally, irrigation heads or sprinklers should be positioned for overhead watering. But, in any event, the key to success in this endeavor is to delay the start of irrigation until just before frost begins to form and then to leave it on until the temperature rises above freezing. This tactic will ice over and insulate the plant. But an interruption in irrigation, such as a selective "brownout" by the electric power company, can be disastrous, so do not

Table 1. Observations on cold hardiness.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
1. *Aceolorraphe wrightii*	(M)	2′	S	O	ND	R
2. *Archontophoenix alexandrae* var. *beatricae*	(M)	2′	S	O	ND	R
3. *Arenga pinnata*	(M)	3½′	S	O	ND	R
4. *Syagrus schizophylla*	(M)	2–4′	S	O	ND	R
5. *Carpentaria acuminata*	(M)	2½′	S	O	ND	R
6. *Coccothrinax crinita*	(M)	2′	S	O	ND	R
7. *Coccothrinax barbadensis*	(M)	1½–2′	S	O	ND	R
8. *Hyophorbe lagenicaulis*	(M)	2′	S	O	ND	R
9. *Livistona drudei*	(M)	6′	S	O	ND	R
10. *Livistona rotundifolia*	(M)	1½′	S	O	Minor burn	R
11. *Livistona* sp. "*tardom*"	(M)	3′	S	O	ND	R
12. *Livistona woodfordiana*	(M)	2½′	S	O	ND	R
13. *Neodypsis decaryi*	(M)	2–6′	S	O	ND	R
14. *Phoenix roebelenii*	(M)	1–3′	S	O	ND	R
15. *Sabal bermudana*	(M)	4′	S	O	ND	R
16. *Sabal causiarum*	(M)	2½′	S	O	ND	R
17. *Sabal minor*	(M)	2′	S	O	ND	R
18. *Syagrus coronata*	(M)	2½′	S	O	ND	r, stunted leaves
19. *Trachycarpus martiana*	(M)	1–2½′	S	O	ND	R
20. *Veitchia montgomeryana*	(M)	3½′	S	O	ND	R
21. *Zombia antillarum*	(M)	2′	S	O	ND	R
22. *Phoenix roebelenii*		9′	NS	O	25%	R
23. *Syagrus romanzoffiana*	(2)	18–25′	NS	O	30%	r
24. *Archontophoenix alexandrae* var. *beatricae*	(6)	20–25′	NS	O	50–100%	1 dead, 1 r, 4 R
25. *Roystonea* sp.		40′	NS	O	75%	R(6)
26. *Livistona chinensis*		18′	NS	O	ND	R
27. *Latania lontaroides*		10′	PS	O	100% burn except for lower leaves reached by sprinkler	R(5)
28. *Archontophoenix alexandrae* var. *beatricae*	(5+)	20–25′	NS	O	50%	R(5–6)
29. *Syagrus romanzoffiana*		20′	NS	O	ND	R
30. *Chrysalidocarpus lutescens*		12′	NS	O	95%	Most major stems dead, suckers R
31. *Chrysalidocarpus lutescens*		25′	NS	O	100%	2 major stems dead, 3 major stems alive

Table 1. Continued.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
32. *Arenga pinnata*		20′	NS	O	85%	R(4)
33. *Bismarckia nobilis*		7′	NS	O	60%	R(5)
34. *Corypha umbraculifera*		12′	NS	O	100%, heart OK	R(3)
35. *Borassodendron* sp.		8′	NS	O	80%	R(4)
36. *Licuala muelleri*	(M)	2–4½′	NS	P	25%	R
37. *Coccothrinax* spp., including *barbadensis*	(M)	7–15′	NS	O	25%	R
38. *Caryota mitis*	(M)	30′	NS	O	85%, suckers less	⅓ stems survived, 2 flowered, suckers R
39. *Caryota* sp. (single trunk)		35′	NS	O	100%	R(3)
40. *Aiphanes* sp.	(6)	15–25′	NS	P	100%	r(3)
41. *Livistona rotundifolia*		30′	NS	O	90%	R(8)
42. *Carpentaria acuminata*	(2)	40′	NS	O	100%	r(3)
43. *Carpentaria acuminata*		20′	NS	O	30%	r, fungus
44. Oil palms, unidentified	(M)	30′	NS	O	90%	r(3), scaly, weak
45. *Zombia antillarum*	(2)	2½′	NS	P	25%	R
46. *Licuala grandis*		4½′	NS	P	Minor burn	R
47. *Latania loddigesii*	(2)	18–20′	NS	O	70–90%	R(8)
48. *Licuala spinosa*	(2)	9′	NS	P	80% upper leaves, less lower	R
49. *Neodypsis decaryi*		20′	NS	O	90%	r(4)
50. *Chamaedorea cataractarum*	(2)	6′	NS	P	90% upper leaves	R
51. *Pinanga* sp. (ivory crownshaft)		12′	NS	P	100% except suckers	All major stems dead suckers r
52. *Howea forsteriana*	(M)	4½–10′	NS	P	50%	R
53. *Rhapidophyllum hystrix*		10′	NS	O	ND	R
54. *Roystonea* sp.	(2)	25–30′	NS	SP	90%	R(4)
55. *Archontophoenix cunninghamiana*		35′	NS	SP	10%	R(8)
56. *Cocos nucifera* 'Red Panama Tall'		25′	NS	O	100%	r(3), weak
57. *Cocos nucifera* 'Red Panama Tall'		15′	NS	O	80%	r(3)
58. *Chrysalidocarpus cabadae*		20′	NS	O	100% except suckers	All major stems dead, suckers R
59. *Hyophorbe lagenicaulis*	(3)	3–15′	NS	O	95%	R(3)
60. *Wallichia disticha*	(2)	18′	NS	O	15%	R(4, 10)
61. *Livistona saribus*	(4)	18′	NS	O	Tip burn	R
62. *Copernicia baileyana*	(5)	3–7′	NS	O	40%	R

Table 1. Continued.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
63. *Borassus* sp.		20′	NS	O	30% upper leaves	R
64. *Chrysalidocarpus madagascariensis*		12′ hedge	NS	O	100%	All stems dead,
65. *Veitchia montgomeryana*		50′	NS	O	100%	R(3)
66. *Thrinax* sp.	(2)	20–25′	NS	O	ND	R
67. *Arenga* sp. (clustering)		12′	NS	O	100% except small suckers	R(2)
68. *Allagoptera arenaria*		2½′	NS	O	10%	R
69. *Coccothrinax* sp.	(2)	20′	NS	O	90%	R
70. *Licuala spinosa*		8′	NS	P	100% except suckers	R
71. *Sabal mauritiiformis*		30′	NS	O	25%	R(7)
72. *Ptychosperma* sp. (clustering)		20′	NS	O	100%	Dead
73. *Hyphaene* sp.		10′	NS	O	15%	R
74. *Acoelorraphe wrightii*	(Many clumps)	20′	NS	O	ND	R
75. *Ptychosperma microcarpum*		20′	NS	O	100% except small suckers	All stems dead, suckers R
76. *Licuala spinosa*		3′	NS	O	50% upper leaves, 20% lower leaves	R
77. *Pritchardia beccariana*		10′	NS	P	70%	R(7)
78. *Rhapis excelsa*		5½′ hedge	NS	P	ND	R
79. *Archontophoenix alexandrae* var. *beatricae*	(14)	25–40′	NS	O	50%	R
80. *Syagrus schizophylla*	(3)	3–5′	NS	O	100%	r, scaly
81. *Pseudophoenix sargentii*		5′	NS	O	90%	r, stunted leaves
82. *Bactris* sp.		7′	NS	O	90%	suckers R
83. *Chamaerops humilis*		5′	NS	O	ND	R
84. *Bismarckia nobilis*	(6)	4–6′	NS	O	60%	R
85. *Astrocaryum mexicanum*		7′	NS	O	100%	r, stunted leaves
86. *Syagrus* sp. (small fruit)		20′	NS	O	98%	R(3½)
87. *Syagrus* sp. (large fruit)		25′	NS	O	50% (outer portions)	R
88. *Dictyosperma album*	(2)	6–25′	NS	O	100%	r, weak
89. *Cryosophila* sp.	(2)	5–6′	NS	O	100%	R
90. *Coccothrinax* sp.	(3)	4–15′	NS	O	80–90%	R
91. *Trithrinax campestris*		6′	NS	O	ND	R
92. *Copernicia macroglossa*		5′	NS	O	30% (outer portions)	R
93. *Livistona australis*	(5)	1½–3′	NS	O	ND	R
94. *Livistona drudei*	(3)	5′	NS	O	ND	R
95. *Butia capitata*		3′	NS	O	ND	R

Table 1. Continued.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
96. *Zombia antillarum*		6′	NS	O	100% except suckers	R
97. *Scheelea* sp.		20′	NS	O	50%	R
98. *Syagrus* sp.		18′	NS	O	90%	R
99. *Coccothrinax crinita*	(2)	15′	NS	O	90%	R
100. *Coccothrinax crinita*		5′	NS	P	5%	R
101. *Copernicia alba*	(3)	1½–2′	NS	O	Minor burn	1 dead (bud rot), 2 R

Alphabetized entries, Nos. 1-21, represent containerized palms. All others are in the ground. In many cases, more than a single plant of a species is present in one location. Such plants are indicated in the 'HEIGHT' column by either the letter M or the actual quantity in parentheses. 'EXP' indicates whether the palm was open to the sky and thus to more rapid radiant cooling. It does not indicate whether the palm was shielded by other plants from exposure to desiccating winds. Under 'CONDITION 2ND OBSERVATION', figures in parentheses show the number of new leaves that had emerged since the freeze. Species listed more than once in the survey are found in separate plantings on the property, which covers about five acres.

Key: IRR—irrigation, EXP—exposed, M—multiple specimens, S—under sprinkler, PS—partly under sprinkler, NS—not under sprinkler, O—open, P—protected, SP—semi-protected, ND—no damage, %—percentage of leaf surfaces burned, R—recovered, r—recovering.

attempt icing unless you can guarantee that sprinkling will be maintained throughout the frost period.

This survey should help you choose palm species which will thrive in climates where frost occasionally occurs. Remember, though, that the list is limited to palms growing on the Beers property; doubtless there are others which would perform quite well under the same conditions. Intentionally some of the common cold-hardy palms are not mentioned here.

One essential element that remains to be addressed is the type of weather preceding a frost or freeze and how it affects damage to palms. In most areas of the continental United States where palms can be grown outdoors, conventional wisdom teaches that a freeze following warm weather will do more harm than a freeze following an extended period of cool weather. However, South Florida (roughly the region south of a Fort Pierce–Fort Myers line) seems to fall into a unique category in this regard, to the extent that many palms here are more tolerant of a sudden freeze following normal weather than following a prolonged cool period. In fact, some palms fare worse as a consequence of protracted subnormal temperatures even without a frost event.

While superficially controversial, this statement makes sense when key words "warm" and "hardening off" are defined in South Florida terms. The daily average temperature in Miami in the statistically coldest period of the year is 67° F (19.4° C), representing a diurnal range of about 58°–76° F (14.4°–24.4° C). Consequently the typical winter day in South Florida is warmer than any place in the palm-growing states along the Atlantic Ocean, the Gulf of Mexico, and the southwestern border. To compare further, the average winter day in South Florida is generally as warm as the average *summer* day along the coastal fringes of California. Clearly, a normal winter day in South Florida is balmier than any other mainland U.S. site without being abnormally warm.

With respect to the other continental U.S. palm-growing areas, the term "hardening off" refers to a process by which a plant adjusts to increasingly colder weather with the grower's knowledge and expectation that inevitably frost and occasionally hard freezes will follow. In South Florida, on the other hand, hardening is a subtly different process that consists of the almost immediate cessation of "tropical" rainfall and high humidity at the end of October. During the six dry months that follow, only 25% of the average annual rainfall of about 60 inches (1,524 mm) occurs. At the same time, however, the temperature decreases only gradually from the daily average of 75° F (23.9° C) at the end of the rainy season. Soil temperatures and tap water thus remain rather warm. Regular frosts and freezes are not part of the South Florida picture, particularly in the southeastern portion of the region.

Because the typical winter season here is warm but for a relatively few days, hobbyists are inclined to gamble on raising a large number of palm species outdoors. Many of these plants are highly tropical in origin; they have a chance to succeed in South Florida only because of the long tropic-like growing season. It is some of these exotics which appear ironically to be more successful at surviving a frost during an otherwise standard South Florida winter than surviving an abnormally cool, but frostless, winter.

A brief look at statistics may support the point. In 1977, the year of the Miami snowfall (snowfall in the sense that flakes could almost be counted individually), tender palms were assaulted on a couple of fronts. Not only was there a hard freeze—the USDA Plant Introduction Station at Chapman Field recorded lows of 29° F (−1.7° C) and 25° F (−3.9° C) on consecutive nights in mid-January—but there was also prolonged cool weather preceding the freeze. The last 15 days of December 1976 were 3.1° F (1.7° C) below normal, and the mean January temperature departed from the 67.2° F (19.6° C) daily norm by 6.1° F (3.4° C).

By contrast, the Broward County January 1985 freeze surveyed in this article occurred during a month when daily temperatures were 3.3° F (1.8° C) below average. December 1984 had actually been 2.6° F (1.4° C) above normal. As seen from the chart, many tender palms survived these conditions.

Surprisingly, though, many hobbyists consider the winter of 1980–81 to have been harder on palms than the freeze of January 1985. The last seven days of December 1980 were a whopping 10° F (5.6° C) below normal, and January 1981 was 7.5° F (4.2° C) under the historical average. Thus the period was significantly cooler than the cold spells of 1984–85 and even 1976–77! Yet, in contrast to those times, there was no freeze in January 1981. (Though a reading of 32° F [0° C] was officially recorded briefly one night, wind speeds no lower than 11 knots [12.65 mph] precluded frost.)

By conventional standards, the cool temperatures of winter 1980–81 should have hardened off and protected palms, minimizing damage. But, on the contrary, significant losses occurred. Many of the highly tropical palm species appeared to survive the nadir of the subnormal winter, only to die in early spring. Why? Most likely, day after day of cool weather imposed excessive stress, and cold soil left roots incapable of providing nutrients to the buds of sensitive palms. Plants were thus rendered vulnerable to pathogen invasion, and by the advent of spring weather, buds of many tender palms simply collapsed, having succumbed to secondary infections encouraged by the cool weather weeks before.

It therefore appears that in South Florida many highly tropical palm species can better handle a sudden frost or freeze than an extended cool spell. For at least those palms, cold damage is cumulative and not a result predictable from the one-dimensional measurement of a thermometer reading. The search for dependable indicators, however, is frustrating, for each frost or freeze appears to leave a unique set of results. But, to define the problem simplistically, it may be said that occasional subnormal winter temperatures keep *Areca triandra* from lining the streets of Miami for the same reason that long-term cool weather keeps *Roystonea elata* from lining the streets of Beverly Hills.

Nonetheless, tender palms can be helped to survive a rough winter of any sort in South Florida. When temperatures drop, foliar applications of trace elements can provide nourishment that cold roots cannot. After extended cool spells or frost or freeze episodes, even those tender palms that appear undamaged should be sprayed with a fungicide to help fend off potentially lethal secondary infections. Many commercial fungicides are helpful, but it has been found in many trials that Kocide and Manzate, applied together at the same rate as if used alone, have a synergistic, or enhanced, effect. Treatments should be administered in strict compliance with the instructions for use and with recognition that no fungicide is capable of eliminating all pathogens. Until and unless the dynamics of cold weather in tissue damage is better understood, maintaining a sharp eye and employing an ounce or two of prevention may be your best allies in keeping a palm healthy through and following atypical cold weather.

Principes, 33(2), 1989, p. 62

LETTERS

Dear Dr. Uhl:

We are studying fruit-seed morphology at the family level.

As part of this study we would like to ask readers of *Principes* to help us obtain fruits of the palm genera listed. . . . unlisted generic names have accessions in the U.S. National Seed Herbarium. Usually any species of a listed genus will do, and the seeds need not be viable. For the most part, 5–10 fruits per sample will be sufficient.

Anyone contributing fruits to this study will receive a letter of acknowledgement from the Agricultural Research Service and will be acknowledged in our publication and receive a copy of the publication.

CHARLES R. GUNN
Curator, U.S. National Seed Herbarium
USDA/ARS/PSI/SBM7NL
Bldg 265, BARC-EAST
Beltsville, MD 20705 USA
301-344-4695

Actinokentia
Alloschmidia
Alsmithia
Ammandra
Asterogyne
Balaka
Barcella
Basselinia
Borassodendron
Brassiophoenix
Brongniartikentia
Burretiokentia
Calospatha
Campecarpus
Carpoxylon
Chambeyronia
Chuniophoenix
Clinosperma
Cyphokentia
Cyphophoenix
Cyphosperma
Eleiodoxa
Gastrococos
Goniocladus
Gronophyllum
Guihaia
Gulubia
Halmoorea
Hyospathe
Iguanura
Iriartella
Itaya
Kerriodoxa
Laccospadix
Laccosperma
Lavoixia
Lepidocaryum
Lepidorrhachis
Lytocaryum
Mackeea
Masoala
Maxburretia
Moratia
Nannorrhops
Oraniopsis
Palandra
Pholidostachys
Physokentia
Plectocomiopsis
Podococcus
Pogonotium
Pritchardiopsis
Retispatha
Satakentia
Sclerosperma
Siphokentia
Sommieria
Tectiphiala
Veillonia
Welfia
Wendlandiella
Wodyetia