'Maxim Mix' was the best mixed color entry; however, it had uneven plant size as the primary fault. Plant habit varied slightly. While most color selections of 'Maxim' were more lateral, the rust with gold bicolor was obviously more upright. There was a favorable matching among 'Maxim' color selections for flower size and flower number. 'Spring Magic Orange with Blotch' produced bushy, vigorous plants with good flower presentation. The dark orange flowers had a small dark blotch and were upturned for good display. 'Beacon Bicolor' had very dark blue lower petals capped with bluish-white upper petals. Plants were bushy, lush and vigorous. 'Imperial Orange' produced a shaded, clear orange flower where the lower petals were darker than the upper and lines in the lip petals were occasional. 'Imberial Orange' produced vigorous, fairly uniform plants. 'Waterford Yellow' was very floriferous and produced very showy plants; some lines in the lip were occasionally seen.

Unfavorable traits were found in the following: 'Spring Magic Ultra Violet' had an erratic halo flower marking. Plants were very large in the fall and became unkempt looking. 'Icequeen' was very late to flower and flowering was very sparse and irregular. 'Springtime Lemon Splash' produced cream colored flowers with a very dark blotch. This was distinctly different than the color observed in a trial at this location in fall, 1987 (2), at that time the color was a light yellow with a medium purple blotch.

Literature Cited

1. Anonymous. 1989. Florida Agriculture. Foliage, floriculture and cut greens. Florida Agricultural Statistics Service, Orlando, FL April, 1989.
2. Howe, T. K. and W. E. Waters. 1988. Observations of flowering bedding plants. Spring and fall 1987. Bradenton GCREC Research Report BRA1988-12.
3. Stanley, C. D. 1988. Temperature and rainfall report for 1987. Bradenton GCREC Research Report BRA1988-11.
4. Voight, A. O. 1989. Prices strengthen in '88 bedding plant season—'89 production prospects bright but maturing. PPGA News, Vol. 20, No. 1.

Proc. Fla. State Hort. Soc. 102:101-106. 1989.

THE MEXICAN WASHINGTON PALM IS NOT AN ASSET IN FLORIDA LANDSCAPING

JULIA F. MORTON
Morton Collectanea
University of Miami
Coral Gables, FL 33124

Additional index words. Washingtonia robusta, W. filifera, California fan palm, desert palm.

Abstract. **South Florida is burdened by a plethora of exotic trees and other plants which have been introduced as useful species but have proven to be not only undesirable but also rampant weeds. We now need to be concerned about the increased planting of the Mexican Washington palm (*Washingtonia robusta* H. Wendl.). It appears attractive when young; grows rapidly; has a skirt of dead leaves the first few years, becomes nude with age, when the slender trunk, ultimately too tall for a hurricane area, looks like a telegraph pole with a small tuft of leaves at the summit; and it has become a weed. Seeds sprout in any nook, beside steps, in planters, and hedges. I have seen such volunteers disrupt masonry and threaten the roof overhang. Unfortunately, some landscaping contractors are misled by the specific epithet *"robusta"* and believe they are planting the thicker-trunked, more leafy, shorter, slower-growing and hardier desert fan palm, *W. filifera* (L. Linden) H. Wendl., of California, northern Baja California and Arizona.**

South Florida's loss of thousands of "Jamaica Tall' coconut palms from lethal yellowing disease has stimulated a demand for other tall palms. Besides disease-resistant hybrid coconuts (now in short supply), more than a dozen other species have been adopted by wholesale producers over the past few years (32).

Fast-growing palms are preferred and, unfortunately, one that is becoming planted in large numbers is the Mexican Washington palm (*Washingtonia robusta* H. Wendl.), which was first brought to Florida in the 1920's by boxcar loads (41). One of the reasons for the present popularity of this palm with landscape contractors is that many of them, especially those from out-of-state, are misled by the specific name, *robusta* and believe it to be the stout-trunked *Washingtonia* so commonly grown and admired in California. It is necessary, therefore, to explain the differences between the two species of this genus which have been the subject of much botanical confusion and even believed to represent at least 4 different species instead of the actual two (25). One must beware of the older literature (2, 3, 6, 20, 31, 39).

California Fan Palm

Washingtonia filifera (L. Linden) H. Wendl., the California fan palm, desert palm (or hula palm in Hawaii) (30), casually noticed by surveyors for the Pacific Railroad and the Mexican Boundary Survey (1849-1853), was not recorded by a botanist until 1861 and then given only a speculative name, *Brahea*?. Not until 1879 did some young seedlings growing in a Belgian greenhouse attract the attention of the palm specialist, Dr. H. Wendland, who bestowed upon them the generic name in honor of George Washington (though this had previously been applied to *Sequoia* species). There still remains utter confusion as to the source of the seeds. *Neowashingtonia* superseded *Washingtonia* in 1897 but was not widely accepted and soon was abandoned (31).

The specific name, *filifera* (at first, *filamentosa*), refers to the numerous, threadlike filaments dangling from the deep divisions of the circular, gray-green, rigid, leaf blade which may be 4-6 ft across and dies after 1 yr (3). Another distinguishing feature is that the long (4-6 1/2 ft) petiole bears spines only on the lower half and is green except for

Fig. 1. The Mexican Washington palm is often confused with the hardier, thicker-trunked California fan palm, or desert palm, which is slower-growing and normally retains its skirt of old leaves from the ground up. (Photo by Julia Morton).

its red-brown base. Most importantly, the trunk can be 3 1/2 ft in diameter (10); if unmolested, retains its "petticoat" of old leaves indefinitely from the ground up (27). One experimenter found them still firmly attached after 25 yr (3). The flower stalk may be 9-12 ft long (39, 40), bearing numerous small, white flowers which contain copious nectar and exude a heavy, orange-blossom odor, disagreeable at close range (31). Brown or black fruits, 1/4-1/3 in long (21), in compound clusters (17) weighing up to 10 lb each (24), ripen in fall (as early as September) and winter (18, 34). The fruiting sprays hang down below the leaves and eventually blend in with the old leaves (21). This palm usually attains only 50-70 (occasionally up to 80-90) ft in height (10, 11, 21, 28). It grows wild in northern Baja California (27), and around water sources in canyons of the Colorado Desert in California, and in southwestern Arizona (31). It does poorly in the San Francisco Bay area and in moist land generally; may die from too much water. It is a hardy palm but young specimens are "burned" below 25° F (29).

The California fan palm was first cultivated by the Jesuits around their missions (3). It is much planted in Palm Springs, California (34) and lines the streets of Phoenix, Arizona (29). It is commonly grown along the dry Gulf Coast; frequently in Argentina, Colombia, Costa Rica and Guatemala (14, 33, 38, 40). Though rarely seen in Florida (36), it has been grown as far north as Daytona Beach. The seeds germinate within 2 months (21) and the palm grows at the rate of 1 ft per year (29). It is often planted in containers but must be removed when it outgrows its space. In desert regions, seedlings spring up freely in any moist compost heap or garden (29). In Guatemala, volunteers are often found arising from accidental, or possibly bird, seed dispersal (40).

Mexican Washington Palm

When specimens of the Mexican Washington palm appeared in European collections, it was at first classed as a botanical variety of *W. filifera* or given quite different names—*W. gracilis* and *W. sonorae*. Ultimately, because of its extreme, "robust", height (up to 100 ft or more—140 at Los Angeles State and County Arboretum) it was designated *W. robusta* (after being temporarily known as *Pritchardia robusta*) (25, 31). The bright-green and glossy leaf blades are smaller than those of *W. filifera*, and are not so deeply cut. The drooping segments of mature leaves bear few or no filaments though there may be many on young leaves (19). Wholly red-brown, the thick petioles, 2-4 ft long, are armed with spines for their entire length. The trunk is thickened at the base but soon becomes very slim. *W. robusta* grows faster than *W. filifera*—at least 2 ft per yr. If heavily watered, with perfect drainage, it can be induced to grow 6 ft in one year (29). This palm gradually sheds all of its old leaves, the trunk becoming completely bare except for a small crown at the summit. Because of its height and "telegraph pole" aspect when mature, it is called "skyduster" in Hawaii (30) and California, and often scornfully referred to as "dirty flagpole" in San Diego (12). The crown is unattractively ragged or shaggy in appearance when the palm is in bloom and in fruit. The fruits are seldom more than 3/8 in long (26).

W. robusta grows wild only in Mexico—the southern 3/4 of Baja California (27) and in Sonora—and is planted in

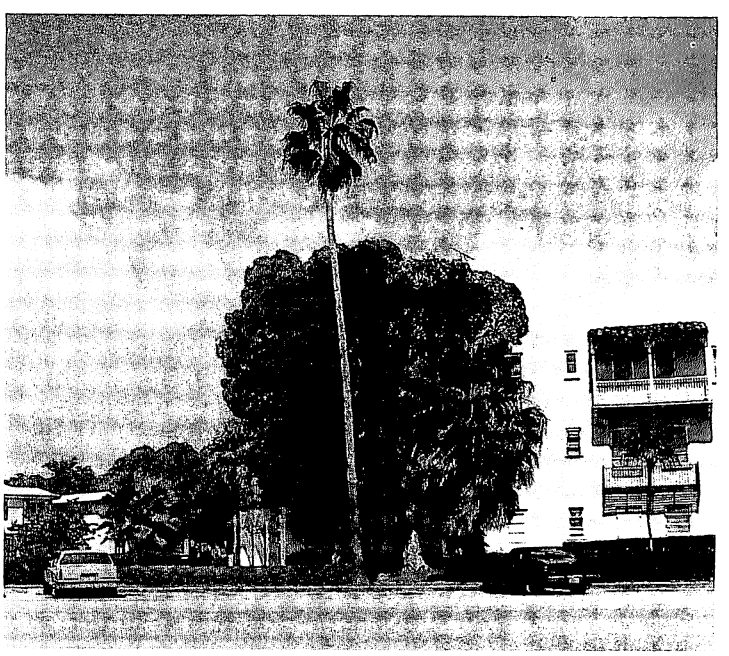

Fig. 2. *Washingtonia robusta* commonly occurs as a "weed" in southern Florida. This mature specimen is flanked by a volunteer seedling 2 stories high on the right (in front of a melaleuca tree), and another, 1 story high, on the left, each having arisen from a seed that germinated in the hedge at its base. (Photo by Julia Morton)

many parks and gardens in that country (20). It is commonly grown in San Diego and Los Angeles, California (some say because it is fast-growing and cheap) and also in Las Vegas, Nevada (27, 28) and is found in Mediterranean-type climates abroad. For example, it is the principal one of the 3 palm species most often seen along the streets of Harare, Zimbabwe (37). Being more tender than *W. filifera*, it can tolerate temperatures down to only 15° F. Many specimens died in Houston, Texas, in the winter of 1950 while few of *W. filifera* were damaged (21). In 1983, 75-85% of the Mexican Washington palms were freeze-killed in New Orleans (9). All were lost at Houston in the winter of 1984-5 (1). This palm is killed by only a few degrees of frost in England because of the damp climate (5). It survives only in sheltered locations or with protection at Columbia, South Carolina (12). The leaves are often subject to winter injury in northern and northwestern Florida (7). The palm is well adapted to coastal situations (34), being uninjured by salt-spray in the second line of exposure (15, 44).

Hybrids

W. filifera and *W. robusta* readily hybridize without human assistance, producing palms with trunk of intermediate girth and with a larger crown than that of the normal *W. robusta*, many leaf filaments like *W. filifera*, and with fruit and seed larger than in either parent (29). Hertrich (11) shows a photo of tall hybrids on Hilliard Street in San Marino, California.

Sundry Econonomic Uses of Washingtonia Palms

The ripe fruits are eaten by birds and other animals. In California, orioles make their nests in the masses of old leaves. The trunks were sometimes used by the Indians for construction of storage places for keeping all kinds of food seeds (31), though the wood is light and soft (3). The Indians used the leaves of *W. filifera* for thatching huts and making sandals (27) and employed the filaments for cordage and for weaving baskets (8, 39, 43). Dry petioles were used as tools and the old floral branches were rubbed together to make fire by friction (27).

The terminal bud, or "cabbage", was roasted and eaten though, of course, its removal killed the tree (39, 43, 45). The thin layer of sweetish, rather dry pulp surrounding the relatively large seed was valued as food, fresh or dried (35, 39, 42). To obtain it in quantity, the whole fruits would be mashed and the seeds separated. The pulp would then be thickened by adding seeds of "chia" (*Salvia columbariae* Benth.), or grass seed or pine nuts (piñones) (31). The seeds were dried and ground into an edible meal (17, 24).

Negative Aspects of the Persistent Leaves

The blanket of old, dry leaves clothing *Washingtonia* trunks is variously referred to as the petticoat, skirt, thatch, shag, or mane. It is highly flammable and California fan palms in the wild are frequently found scorched (but seldom killed) by accidental fires or by the Indian custom of burning off the thatch to facilitate gathering the fruits and, in their belief, to promote a more abundant crop (3, 29, 31). In cultivation, the thatch is often removed to improve the appearance of the palms in formal surroundings or to

Fig. 3 A stray Mexican Washington Palm that sprang up in an adobe planter against a home on San Marino Island, Miami Beach, putting pressure on the roof. (Photo by Julia Morton)

eliminate a fire hazard (18), or because it is known to harbor "scorpions and other vermin" (29) and it is declared to be a breeding place for rats. Some California communities require removal (44). Muirhead (29) tells of a "man being suffocated when an entire skirt slipped down the trunk and enveloped him when he was attempting to prune it". To avoid such tragedies, the thatch should be pruned annually.

In the 1940's, a row of *W. robusta* stood along the south side of highway U.S. #1 going through South Miami. Pranksters often set fire to the thatch and consequently the palms were removed as a fire hazard. There were rows of *W. robusta* on both sides of a long stretch of Segovia Street in Coral Gables in the 1950's. They were old and bare-trunked and were taken out by the City as having become too tall for a hurricane-prone area. Even though the palms might not fall, the old leaves are easily blown off by high winds. Always, after heavy rains, the old leaves of *Washingtonia* palms litter the streets.

Misuse of *Washingtonia robusta* in Florida landscaping

The Mexican Washington palm is not an asset in Florida landscaping. It is being planted, not by homeowners, but by developers and commercial landscape architects because it is attractive when young and, as stated, many of them believe it to be the heavy-trunked California fan palm. Nurserymen favor it for its fast growth. Few consumers know what it will look like in the future. For multistory buildings, contractors will even search throughout Florida for old specimens on private properties to transplant (32), and few novices recognize the palm for what it is, a poor substitute for a more expensive and appropriate palm.

The Mexican Washington palm is also being unscrupulously placed in planters which it will soon outgrow and rupture, and have to be replaced by some appropriate plant, at great expense to the property owner.

In addition to its undesirable features, *W. robusta* has become a "weed" palm in southern Florida, probably aided by seed distribution by exotic parrots or parakeets. Seedlings spring up in foundation boxes, in crevices beside steps, along curbs, and anywhere a sheltered area provides a good nook for germination. One stray in an adobe planter against a home on San Marino Island, Miami Beach, remained unnoticed by the owner until I pointed out the loose bricks and the fact that the crown was pushing against the roof overhang. Another, on the edge of a median strip of a street in Coral Gables, was ignored and allowed to grow even after it reached the power lines overhead (Figs. 4-7). People seem oblivious of such tramps until the consequences are unavoidably apparent. After Hurricane "Donna" in 1960, many Mexican Washington palms sprang up in the lowlands of Fairchild Tropical Garden, apparently from seeds washed in on the tide from McArthur Causeway or Miami Beach.

Pests and Diseases

Vigorous as they are, *Washingtonia* palms are not immune to natural enemies. In California, *W. filifera* is attacked by a Bostrychid beetle, *Dinapate wrightii* Horn., 2 in long. The female oviposits at the base of the living leaves and larvae bore down through the trunk for 3-4 yr. They leave through holes in the dead trunk (4).

W filifera is attacked by phytophthora trunk rot in California, believed to be caused by *Phytophthora parasitica*, a water mold. The roots are not affected. In Arizona, there is a distinct root rot for which the cause is unknown. It makes the leaves turn brown from the lower tiers upward and then the terminal bud dies (22). This palm is also highly susceptible to a fungus disease called pink bud rot, caused by *Gliocladium vermoeseni* (syn. *Penicillium vermoeseni*) (12) which is often fatal in coastal areas of California (29). *W. robusta* is less frequently attacked by this organism (13). The disease was first described in Belgium in 1923, then reported in California in 1938, and in Florida in 1964 (23).

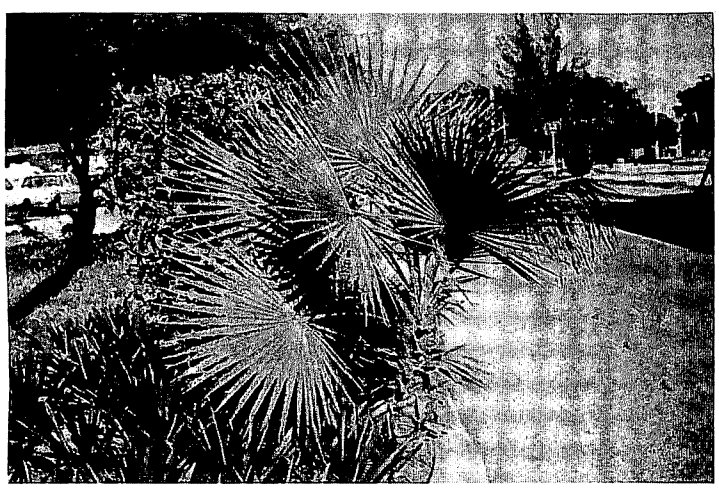

Fig. 4. A Mexican washington palm volunteer that sprang up in the crevice between the curb and the sod of a median strip of a Coral Gables street. It was only 5 ft tall in 1975. (Photo by Julia Morton)

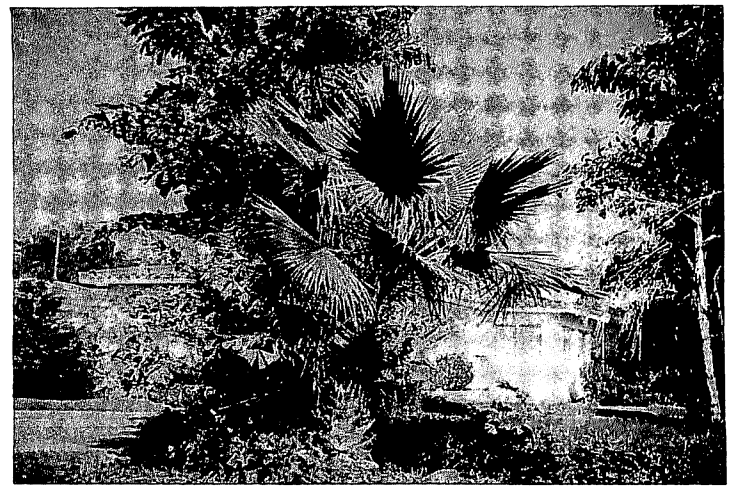

Fig. 5. The same palm as in Fig. 3, was about 10 ft tall in 1980. The trunk appears stout only because of its sheath of criss-crossed bases of fallen leaves. These "boots" will be gradually shed. (Photo by Julia Morton)

Fig. 6. By 1989, the trunk of the curb-side palm, though typically thickened at the base, is beginning to be revealed as a slender stem. The top of the palm has reached the power lines overhead. (Photo by Julia Morton)

Fig. 7. The inevitable future of all Mexican Washington palms is represented by this incongruous "skyduster", which has no longer any asset value in Florida landscaping and is too tall for a hurricane-prone area. (Photo by Julia Morton)

It is known to affect not only *Washingtonia* but also palms in the genera *Archontophoenix*, *Arecastrum*, *Chamaedorea*, *Chrysalidocarpus*, *Howea*, and *Phoenix*. In Los Angeles, it has killed many mature specimens of *Phoenix canariensis* (16).

In southern Florida, a number of palms and trees are being killed by the common fungus, *Ganoderma* sp. The records of the Miami office of the Florida Department of Agriculture and Consumer Services, Bureau of Plant Inspection show that on February 19, 1985, two inspectors confirmed that, amoung 158 Mexican Washington palms on Star Island, 25 had died and there was no sign of *Ganoderma*. In recent months, at Fairchild Tropical Garden, 5 tall *W. robusta* palms have died and have been removed. There was no evidence of *Ganoderma* on these palms though all were growing in the vicinity of other palms with *Ganoderma* symptoms and the trunk of one dead *W. robusta* was only a few inches from 2 *Sabal causiarum* palms with dead crowns and bearing at their bases large fruiting bodies of *Ganoderma*. Material from the felled *W. robusta* palms has been sent to pathologists at the Gainesville office of the Florida Department of Agriculture and Consumer Services for study.

In Florida, *W. robusta* is attacked by the palm aphid (*Ceratophis variabilis*) which causes yellowing of foliage and sooty mold on the insect excretion; an armored black thread scale (*Ischnaspis longirostris*); a palm leaf skeletonizer (*Homaledra sabalella*); the palm tortoise beetle (*Hemisphaeota cyanea*); and the cabbage palm caterpillar (*Litoprosopus futilis*) (4).

Conclusion

It should be obvious to all who care about the quality of Florida landscaping that *Washingtonia robusta* is not a desirable palm for this area from the esthetic standpoint, the practical standpoint (ultimate customer disappointment and need for replacement), nor from the standpoint of its disease susceptibility. South Florida really needs to be replanted with coconut palms and, since *hybrids resistant* to lethal yellowing disease are a reality, they should be made more available and landscapers and their clients should settle for nothing less complimentary.

Literature Cited

1. Anon. 1984. News of the Society; News from Texas. Principes 28 (3):144.
2. Bailey, L. H. 1947. The standard cyclopedia of horticulture. Vol. III. The Macmillan Co., New York.
3. Blatter, E. 1926. The palms of British India and Ceylon. Humphrey Mulford, Oxford Univ. Press, London.
4. Chellman, C. W. 1978. Pests and problems of South Florida trees and palms. Florida Dept. Agr. and Cons. Serv., Div. of Forestry, Tallahassee, FL.
5. Cooper, G. T. R. 1983. Palms in Britain. Principes 27 (1):41-45.
6. Dahlgren, B. E. 1936. Index of American palms. Pub. 355. Field Mus. of Nat. Hist., Chicago, IL.
7. Dickey, R. D. 1961. Palms for northern and central Florida. Pp. 175-176 *in* Ledin, R. B. (ed.), Cultivated Palms. Amer. Hort. Mag. 40 (1):1-189.
8. Dodge, C. R. 1897. Descriptive catalogue of useful fiber plants of the world. Report No. 9, U. S. Dept. Agr., Off. of Fiber Invest., Washington, D. C.
9. Doughty, S. 1988. Growing palms in the New Orleans area. Principes 32 (3):96-100.
10. Hawkes, A. D. 1952. The major kinds of palms. Botan. Papers No. 8. Fairchild Trop. Garden, Coconut Grove, FL.
11. Hertrich, W. 1951. Palms and cycads (Their culture in California as observed chiefly in the Huntington Botanical Gardens). Huntington Botanical Gardens, San Marino, CA.
12. Hianilos, T. 1974. Reported from here and there: "No, the palm isn't falling". Principes 18 (3):105-107.
13. Hodel, D. R. 1985. *Gliocladium* and *Fusarium* diseases of palms. Principes 29 (2):85-88.
14. Holdridge, L. R. and A. Poveda. 1975. Arboles de Costa Rica. Vol. I. Centro Cientifico Tropical, San José, C. R.
15. Hoyt, R. S. 1958. Check Lists for ornamental plants of subtropical regions. Livingstone Press, San Diego, CA.
16. Keim, W. and R. G. Maire. 1975. Gliocladium disease of palm. California Plant Pathology No. 27. Los Angeles County Cooperative Extension, Univ. of California.
17. Kirk, D. R. Wild edible plants of the western United States. Naturegraph Publishers, Healdsburg, CA.
18. Lemmon, R. S. 1949. The best-loved trees of America. Home Garden (October): 47-48 + 2 pls.
19. Liberty Hyde Bailey Hortorium Staff. 1976. Hortus Third: a concise dictionary of plants cultivated in the United States and Canada. Macmillan Publishing Co., NY.
20. Martinez, M. 1959. Plantas utiles de la flora Mexicana. Ediciones Botas, Mexico, D.F.
21. McCurrach, J. C. 1960. Palms of the world. Harper & Bros., NY (reprinted by Horticultural Books, Stuart, FL, 1970).
22. McFadden, L. A. 1961. Palm diseases. Pp. 148-150 *in* Ledin, R. B. (ed.). Cultivated Palms. Amer. Hort. Mag. 40 (1):i-189.
23. McRitchie, J. J. 1976. Stem and frond necrosis of palm. Plant Pathology Cir. 173. Contrib. No. 424. Fla. Dept. Agr. & Cons. Serv., Div. of Plant Indus., Gainesville, FL.
24. Medsger, O. P. 1939. Edible wild plants. The Macmillan Co., NY.
25. Moore, H. E., Jr. 1963. An annotated checklist of cultivated palms. Principes 7 (4):170-182.
26. Moore, H. E., Jr. 1961. The more commonly cultivated palms. Pp. 35-43 *in* Ledin, R. B. (ed.). Cultivated palms. Amer. Hort. Mag. 40 (1):i-189.
27. Moran, R. 1978. Palms in Baja California. Principes 22 (2):47-55.
28. Mowry, H. 1936. Native and exotic palms of Florida. Bull. 84. Univ. of Florida, Agr. Exten. Serv., Gainesville, FL.
29. Muirhead, D. 1961. Palms. Dade Stuart King, Publisher, Globe, AZ.
30. Neal, M. 1965. In gardens of Hawaii (2nd ed.). Bernice P. Bishop Mus. Spec. Pub. 50. Bishop Mus. Press, Honolulu, HI.
31. Parish, S. B. 1907. A contribution toward a knowledge of the genus *Washingtonia*. Bot. Gazette 44:408-434.

32. Pategas, S. G. 1989. Palm markets continue to grow. Fla. Grower and Rancher 82 (5):10-11 + front cover.
33. Perez-Arbelaez, E. 1956. Plantas útiles de Colombia. Libreria Colombiana-Camacho Roldan (Cia. Ltda.), Bogotá, Colombia.
34. Read, R. W. 1961. The native palms. Pp. 27-33 *in* Ledin, R. B. (ed.). Cultivated palms. Amer. Hort. Mag. 40 (1):i-189.
35. Saunders, C. F. 1934. Useful wild plants of the U. S. and Canada. Robert McBride and Co., NY.
36. Smiley, N. 1960. Tropical planting and gardening for South Florida and the West Indies. Univ. of Miami Press, Coral Gables, FL.
37. Sneed, M. V. 1983. *Hyphaene petersiana* amongst animals in the Heartland of Africa. Principes 27 (4):141-151.
38. Sosa, G. 1961. Hablemos de Arboles. Ediciones Vendimiador, Mendoza, Argentina.
39. Standley, P. C. 1920. Trees and shrubs of Mexico (Gleicheniaceae-Betulaceae). Contrib. U. S. Nat'l Herb., Vol. 23, Pt. 1. Smithsonian Inst., U. S. Nat'l Herb., Washington, D. C.
40. Standley, P. C. and J. N. Steyermark. 1958. Flora of Guatemala. Fieldiana: Botany. Vol. 24, Pt. 1. Chicago Nat. Hist. Mus., Chicago, IL.
41. Stresau, F. B. 1986. Florida, my Eden. Florida Classics Library, Port Salerno, FL.
42. Sturtevant, E. L. (Edited by U. P. Hedrick). 1919. Notes on edible plants. New York Agr. Exper. Sta., Geneva, NY,
43. Sweet, M. 1962. Common edible and useful plants of the West. Naturegraph Co., Healdsburg, CA.
44. Watkins, J. V. 1969. Florida landscape plants. Univ. Fla. Press, Gainesville, FL.
45. Yanovsky, E. 1936. Food plants of the North American Indians. Misc. Pub. 237. U. S. Dept. Agr., Washington, D. C.

Proc. Fla. State Hort. Soc. 102:106-108. 1989.

POTASSIUM DEFICIENCY IN SOUTH FLORIDA ORNAMENTALS[1]

TIMOTHY K. BROSCHAT
University of Florida, IFAS
Fort Lauderdale R.E.C
3205 College Avenue
Fort Lauderdale, FL 33314

Additional index words. palms, *Pandanus utilis*, Zingiberales, cycads, *Eucalyptus torelliana*, *Bauhinia* spp., *Dalbergia sissoo*, *Bucida buceras.*

Abstract. **Potassium deficiency has been identified as a widespread and often serious disorder of palms, *Pandanus utilis* Bory, cycads, plants in the Zingiberales, and at least four species of dicotyledonous trees (*Eucalyptus torelliana* F. Muell., *Bauhinia* L. spp., *Bucida buceras* L. and *Dalbergia sissoo* Roxb. ex DC). Symptoms in palms and *Pandanus* include translucent yellowish flecking, necrotic spotting, marginal necrosis, and withering of older leaves. On dicot trees and plants in the Zingiberales, symptoms include discoloration, necrotic spotting, and marginal necrosis of the oldest leaves. Potassium deficiency is prevented and treated by applying controlled release K fertilizers to the soil.**

Although K is known to be deficient in soils throughout the state of Florida, K deficiency on ornamental plants was not considered to be a significant problem (5, 7, 8). Dickey (5) identified K deficiency on *Ligustrum japonicum* Thunb., *Cornus florida* L., and *Acer rubrum* L. growing in northern peninsular Florida, but did not indicate that the problem existed in southern Florida. It is now known to be one of the most widespread of all deficiencies in southern Florida. Potassium deficiency symptoms have been described for several species of palms grown in sand culture (1, 2, 4, 6), but since K deficiency was not reported to occur in southern Florida, this work was largely ignored.

Palm growers have for years wondered about the cause of the translucent yellow to orange flecks or spots found on the oldest leaves of many palm species. Since plant pathologists have never been able to isolate pathogens from these spots and because these spots appeared to be nearly ubiquitous among palms, they were generally thought to be a symptom of natural leaf senescence. Similarly, the marginal necrosis found on old leaves of some palms such as *Roystonea* O. F. Cook spp. was generally thought to be caused by high soil soluble salts. The bronzing of old leaf tips of *Phoenix* L. spp. was attributed to Mg deficiency and the "pencil-point" decline and frizzling of the entire canopy of *Cocos nucifera* L. and *Roystonea* spp. were assumed to be caused by Mn deficiency. The discoloration of *Chrysalidocarpus lutescens* H. Wendl. foliage in the landscape was thought to be caused by N deficiency. All of these symptoms have recently been shown to be caused by K deficiency (3).

Symptoms and Susceptible Species

Potassium deficiency symptoms are quite variable on palms (3). In general, the first symptoms expressed in many species are small (1-2 mm) translucent yellow or orange flecks or spots on the oldest leaves. There may or may not be small necrotic spots associated with the yellowish flecks. On older, more severely affected leaves, or on more distal portions of less affected leaves, marginal necrosis will often be present. Entire leaflets of oldest leaves, or most distal parts of less affected leaves, will be necrotic and frizzled in appearance. In severely deficient palms, few leaves remain and these will be light yellowish-green, reduced in size, and partially frizzled. The trunk will taper to a point and death of the palm can follow if the deficiency is not treated. This progression of symptoms is typical for most species of palms, including *Chrysalidocarpus*, *Hyophorbe* Gaertn., *Cocos*, *Roystonea*, *Acoelorrhaphe* H. Wendl., and others (3).

Spotting of the foliage is not usually present on K deficient *Phoenix* spp. In these palms, oldest leaves will have orange leaf tips with the tips of affected leaflets often necrotic (3). Magnesium deficiency symptoms on these palms are similar, except that the oldest leaves will have broad light yellow bands on the leaf edges, the leaflet bases and the rachis remaining green. On some fan palms such as *Livistona chinensis* (Jacq.) R. Br. ex Mart. and *Bismarckia nobilis* Hildebrandt and H. Wendl., spotting is rare and only discolored older leaves with necrotic leaflet tips will be evident (3).

Most palms are susceptible to K deficiency. Of 53 species of palms growing in the landscape at the Fort

[1]Florida Agricultural Experiment Station Journal Series No. N-00089.