

**PALM SPECIES SUSCEPTIBLE AND RESISTANT TO
MYCOPLASMA-LIKE ORGANISM — ASSOCIATED LETHAL DECLINES
IN FAIRCHILD TROPICAL GARDEN, 1971 - 1977.**



by

F.W. Howard and M.E. Collins

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Agricultural Research Center
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Fort Lauderdale, Florida 33314

1978

COVER DESIGN. General habit of some palm species in Fairchild Tropical Garden.

Left to right: Schippia concolor Burret, Cocos nucifera L., Pseudophoenix sargentii H. Wendl. ex Sarg., Thrinax radiata Lodd. ex. J. A. Schult, Hyophorbe lagenicaulis (L. H. Bailey) H. E. Moore, Roystonea regia (HBK) O.F. Cook, Chamaedorea geonomaeformis Wendl., Bismarckia nobilis Hild. and Wendl., Licuala grandis Wendl., Copernicia baileyana Leon, Coccothrinax fragrans Burret, Coccothrinax argentata (Jacq.) L. H. Bailey, Sabal causiarum (O. F. Cook) Becc., Caryota aequatorialis (Ridley) Becc.

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INTRODUCTION. Lethal declines (LD) (McCoy and Gwin 1977) are diseases of palms - apparently caused by mycoplasma-like organisms (MLO). Lethal yellowing (LY) of coconut palm (Cocos nucifera L) is a disease of this type. Twenty-five palm species including coconut palm are known to be affected by LD in Florida (Thomas 1974, 1978). About half of the popularly planted palms in southern Florida are susceptible to LD.

Research is being conducted to find LD resistant palms that are well adapted to southern Florida for replanting disease-affected areas (Donselman 1978). The present publication is a contribution to that research effort. This publication lists the LD-susceptible palm species in Florida, the percentage of palms of each species that died of LD in Fairchild Tropical Garden during the period January 1971 - January 1977, and the number of palms of all species in Fairchild Tropical Garden that were exposed to LD infection during that period. These tabulations are being published so as to be available to researchers, nurserymen, horticulturists, urban foresters, park superintendents, palm culturists, and others interested in maintaining a diversity of palms in the landscape of southern Florida.

METHODS. Data were compiled from Fairchild Tropical Garden plant records. The Garden, located on 33 hectares in Coral Gables, has been exposed to LD since 1971, the year of the first reports of LY in Coral Gables. Coconut palm and Pritchardia spp. were injected with antibiotic treatments quarterly from 1972 until late in 1976, using methods described by McCoy (1975). No other palm species in the Garden were under this treatment program.

The Garden has kept records on its plants since 1939. These records were examined, and a list of genera and species compiled. The numbers of individual palms of each genus, including identified and unidentified species, and the numbers of palms of each identified species were counted. Only palms that were growing outdoors in the display area and at least 2 years of age between January 1971 and January 1977 were counted. (An unusually severe freeze in January 1977

confounded disease diagnoses after that date.) We made the assumption that palms of all susceptible species do not show symptoms of LD until at least 2 years of age (hereafter referred to as "the presumed susceptible age"), as is the case with coconut palm (Carter 1966).

RESULTS AND DISCUSSION. Table 1 lists the species in Florida known to be susceptible to LD based on field diagnoses and presence of MLO's in phloem tissue samples (Thomas 1974, 1978), and the percentages of individual palms of these species in Fairchild Tropical Garden that died of LD between January 1971 and January 1977. Table 2 lists 114 genera and 386 species and individual palms of the presumed susceptible age in Fairchild Tropical Garden between January 1971 and January 1977, and the floristic regions (Fig. 1) where the species are naturally distributed. Susceptible species in Table 2 are marked with asterisks (*).

Table 2 may be consulted to determine whether or not particular palm species were present and of the presumed susceptible age in the Garden. Of the species not known to be susceptible, those represented by relatively high numbers of specimens can be considered to be at least partially resistant to LD. If only a few individuals of a species were present, there is less certainty whether or not it may be susceptible than if it was represented by a large number of palms. For example, only 2 individual Ptychosperma angustifolium were exposed to LD in the Garden. Although neither of these palms contracted LD, we would not wish to recommend the species as LD-resistance on the basis of only 2 "samples". In contrast, no LD cases were observed in 143 Thrinax radiata. Thus, we feel that this species must be highly resistant if not immune to LD.

We consider the losses of different LD-susceptible species in Fairchild Tropical Garden to be conservative, compared to losses in most urban areas in southern Florida. The antibiotic treatments of coconut palms and Pritchardia spp. may have lessened the disease incidence in these species, although not in

the 3 species of Pritchardia which were completely eliminated from the Garden by the disease. We did not separate data by subspecific categories (varieties, cultivars, forms, etc.), thus resistance in certain varieties or forms of coconut palm was partially accountable for the relatively conservative loss in this species. In addition, we have hypothesized that the relatively high diversity of palms in the Garden may inhibit disease spread.

ACKNOWLEDGEMENTS. Mr. Don Evans, Superintendent, Fairchild Tropical Garden, made field diagnoses of LD infected palms. He worked closely with Dr. Darryl Thomas, Assistant Professor of Plant Pathology, University of Florida Agricultural Research Center, Fort Lauderdale, who confirmed many of Mr. Evan's field diagnoses with electron microscopic examination of MLO's in tissue samples from the palms. We acknowledge the assistance of Glen Hutchinson, Nana Fowler, and Richard Lane of the Agricultural Research Center. We also thank Dr. John Popenoe, Director, Fairchild Tropical Garden, for his encouragement of this study.

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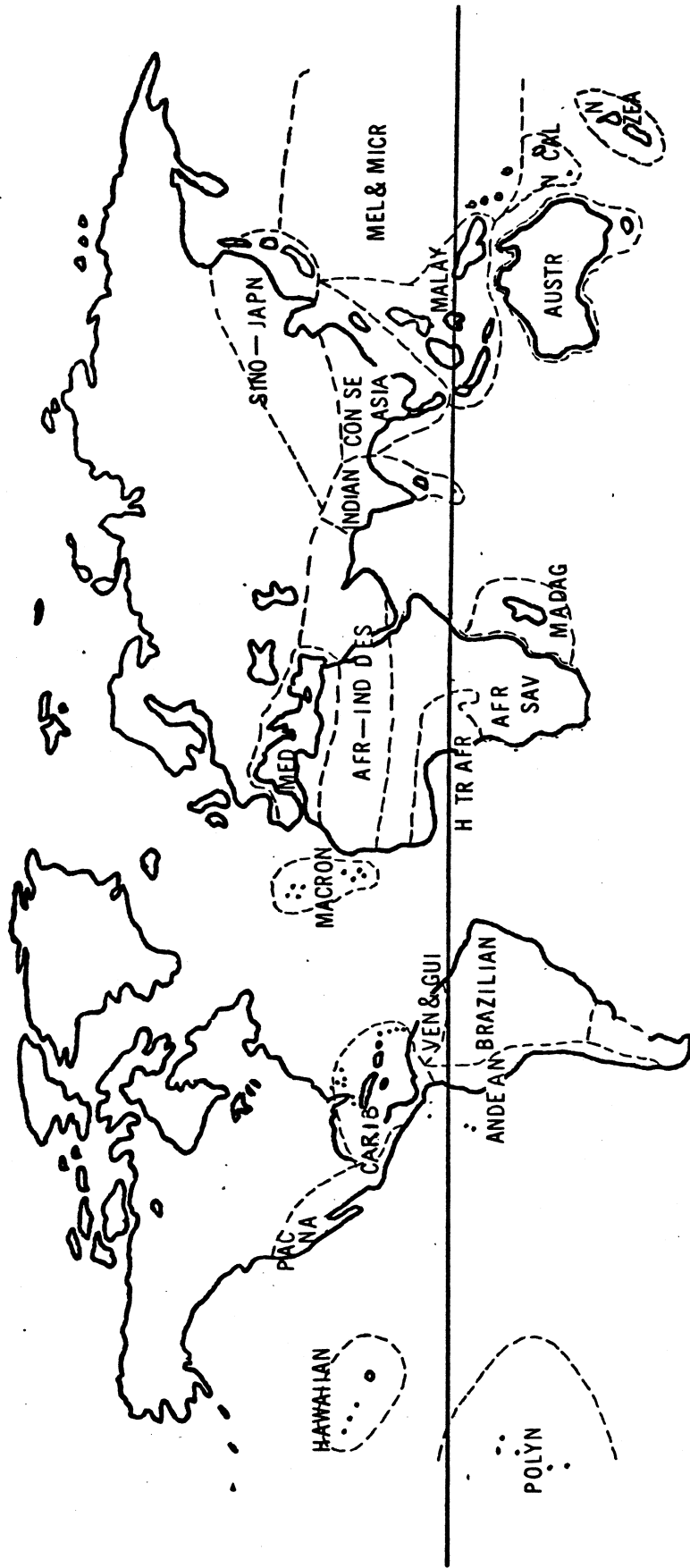


Fig. 1. Floristic Regions (After Good 1964) that are native homes of palms in Fairchild Tropical Garden.

AFR-IND DES, African-Indian Desert	CON SE, Asia Continental Southeast Asia	MEL & MICR, Melanesia & Micronesia
AFR SAV, Savannahs and other drier parts of Africa	CULT, Known only in cultivation	N CAL, New Caledonian
ANDEAN, Andean	HAWAIIAN, Hawaiian	N ZEAL, New Zealand
AUSTR, Australian	H TR AFR, Humid Tropical Africa	PAC NA, Pacific North America & Sonoran
BRAZILIAN, Amazon basin to southern Brazil	INDIAN, Indian	
CARIB, Caribbean	MACRON, Macronesian	POLYN, Polynesian
	MADAG, Madagascar	SINO-JAPN, Sino-Japanese
	MALAY, Malayan	VEN & GUI, Venezuela & Guiana
	MED, Mediterranean	

Table 1. Lethal decline-susceptible palm taxa^{x)}, popularity in landscaping, numbers of individuals of presumed lethal decline susceptible age in Fairchild Tropical Garden 1971-1977^{y)}, and percentages of losses to lethal declines.

<u>Taxa</u>	<u>Popularity as a landscape plant in south-eastern Florida^{z)}</u>	<u>Numbers of Individuals in FTG</u>	<u>Percent lost to lethal declines in FTG</u>
<u>Allagoptera arenaria</u> (Gomes) Kuntz	R	10	0
<u>Arenga engleri</u> Becc.	M	25	32.0
<u>Arikuryoba schizophylla</u> (Mart.) Bailey	C	17	5.9
<u>Borasuss flabellifer</u> L.	R	22	0
<u>Caryota mitis</u> Lour.	C	18	22.2
<u>Chrysalidocarpus cabadae</u> H. E. Moore	R	10	0
<u>Cocos nucifera</u> L.	C	129	54.2
<u>Corypha elata</u> Roxb.	R	17	58.8
<u>Dictyosperma album</u> (Borg.) H. Wendl & Drake	C	33	18.2
<u>Gaussia attenuata</u> (O. F. Cook) Becc.	R	17	17.6
<u>Howeia belmoreana</u> (C. Moore & F. Müell.) Becc.	R	3	0
<u>Hyophorbe verschafeltii</u> H. Wendl.	C	12	0
<u>Latania</u> spp.	C	35	34.3
<u>Livistona chinensis</u> (N. J. Jacquin) R. Br. ex Mart.	C	38	2.6
<u>Nannorrhops ritchiana</u> (W. Griffith) J.E.T.Atch.	R	8	0
<u>Phoenix canariensis</u> Hort ex Chab.	C	21	0
<u>P. dactylifera</u> L.	M	5	40.0

<u>Taxa</u>	<u>Popularity as a landscape plant in south- eastern Florida^z)</u>	<u>Numbers of Individuals in FTG</u>	<u>Percent lost to lethal Declines in FTG</u>
<u>P. reclinata</u> Jacq.	C	29	3.4
<u>P. sylvestris</u> (L.) Roxb.	M	6	0
<u>Pritchardia affinis</u> Becc.	R	7	100.0
<u>P. pacifica</u> Seem. & H. Wendl	C	11	100.0
<u>P. thurstonii</u> F. Muell. & Prude	C	12	100.0
<u>Trachycarpus fortunei</u> (Hook) Wendl.	R	6	33.3
<u>Veitchia merrillii</u> (Becc) H. E. Moore	C	99	3.0
<u>V. montgomeryana</u> H. E. Moore	R	8	0

^x Includes only lethal declines for which electron microscopic examinations of tissue from diseased palms have shown an association with mycoplasmalike organisms.

^y Presumed susceptible age is 2 years or older.

^z C = Common R = Rare M = Moderate

Table 2. Palm taxa, native homes, and numbers in Fairchild Tropical Gardens. Includes palms at least 2 years old between January 1971, and January 1977. (* - susceptible to LD. See table 1).

<u>Taxon</u>	<u>Native Home</u> ¹⁾	<u>Number of Palms</u>
<i>Accolorrhaphe wrightii</i> (Grisebach & H. Wendl.)	CARIB	47
<i>Acrocomia aculeata</i> (N.J. Jacquin) Lodd. ex Mart.	"	22
<i>A. intumescens</i> Drude in Mart.	BRAZILIAN	5
<i>A. mexicana</i> Karw. ex Mart.	CARIB	1
<i>A. quisqueyana</i> L. H. Bailey	"	1
<i>A. totai</i> Mart.	BRAZILIAN	3
<i>Actinokentia divaricata</i> Dammer	N CAL	2
<i>Actinorhytis calapparia</i> (Blume) H. Wendl. & Drude ex Scheff.	MALAY	2
<i>A. poamau</i> Becc.	"	1
<i>Aiphanes acanthophylla</i> Burret	CARIB	35
<i>A. caryotaefolia</i> Wendl. in Kerchove	VEN-GUI	6
<i>A. corallina</i> (Martius) H. Wendl.	CARIB	10
<i>A. erosa</i> (Linden) Burret	"	9
<i>A. pallidispina</i> Mart.	"	1
<i>A. lindeniana</i> H. Wendl.	"	7
* <i>Allagoptera arenaria</i> (Gomes) O. Kuntze	BRAZILIAN	10
<i>A. campestris</i> (Mart.) O. Kuntze	"	2
<i>Allagoptera</i> sp.	"	2
<i>Archontophoenix alexandrae</i> (F. Muell.) H. Wendl. & Drude	AUSTR	18
<i>A. cunninghamiana</i> (H. Wendl.) H. Wendl. & Drude	"	1
<i>Archontophoenix</i> sp.	"	9
<i>Areca catechu</i> L.	MALAY	6

¹⁾ See fig. 1

<i>A. concinna</i> Thwaites	INDIAN	2
<i>A. pumila</i> Mart.	MALAY	1
<i>A. triandra</i> Roxb.	INDIAN	9
<i>A. vestiaria</i> (= <i>langloisiana</i>) Giseke	MALAY	6
<i>Areca</i> spp.	"	14
<i>Arecastrum romanzoffianum</i> (Cham.) Becc.	BRAZILIAN	31
<i>Arenga ambong</i> Becc.	MALAY	5
<i>A. caudata</i> (Loureiro) H. E. Moore	CON SE ASIA	12
* <i>A. engleri</i> Becc.	" " "	25
<i>A. microcarpa</i> Becc.	MALAY	12
<i>A. obtusifolia</i> Mart.	"	5
<i>A. pinnata</i> (Wurmb.) Merr.	"	20
<i>A. porphyrocarpa</i> (Martius) H. E. Moore	"	8
<i>A. tremula</i> (Blanco) Becc.	"	17
<i>A. undulatifolia</i> Becc.	"	3
<i>A. westerhoutii</i> Griff.	"	2
<i>A. wightii</i> W. Griff.	INDIAN	2
<i>A. westerhoutii</i> X <i>A. pinnata</i>	MALAY	1
<i>Arenga</i> spp.	"	5
* <i>Arikuryroba schizophylla</i> (Mart.) L. H. Bailey	BRAZILIAN	17
<i>Astrocaryum alatum</i> H. F. Loomis	CARIB	1
<i>A. awarra</i> de Vriese	VEN-GUI	3
<i>A. mexicanum</i> Liebm. in Mart.	CARIB	16
<i>A. standleyanum</i> L. H. Bailey	"	2
<i>Astrocaryum</i> sp.	ANDEAN	11
<i>Attalea allenii</i> H. E. Moore		1
<i>A. amygdalina</i> HBK	BRAZILIAN	3
<i>A. crassispatha</i> (Mart.) Burret	CARIB	7

<i>A. guaranítica</i> Barb. Rodr.	BRAZILIAN	1
<i>Attalea</i> sp.		1
<i>Bactris coloniata</i> L. H. Bailey	CARIB	1
<i>B. gasipaes</i> (HBK) L. H. Bailey	CARIB-BRAZILIAN	10
<i>B. guineensis</i> (L.) H. E. Moore	CARIB	2
<i>B. major</i> Jacq (H. Wendl.)	"	9
<i>B. mexicana</i> Mart.	"	4
<i>B. ottostapfeana</i> Barb.-Rodr.	BRAZILIAN	1
<i>B. plumeriana</i>	CARIB	9
<i>B. setosa</i> Mart.	BRAZILIAN	1
<i>B. trichophylla</i> Burret	CARIB	1
<i>Bactris</i> spp.	CARIB, BRAZILIAN, VEN-GUI, ANDEAN	48
<i>Balaka microcarpa</i> Burret	MEL-MICR	6
<i>Bentinckia nicobarica</i> (S. Kurz) Becc.	INDIAN	1
<i>Bismarckia mbilis</i> Hild. & Wendl.	MADAG	21
<i>Borassodendron machadonis</i> (Ridley) Beccari	MALAY	6
* <i>Borassus flabellifer</i> L.	INDIAN	22
<i>Brahea aculeata</i> (Brandeyee)	PAC-NA	6
<i>B. armata</i> S. Wats.	" "	14
<i>B. berlandieri</i> H. H. Bartlett	" "	4
<i>B. brandegeei</i> (C. Purpus) H. E. Moore	" "	2
<i>B. clara</i>	" "	1
<i>B. dulcis</i> (HBK) Mart.	" "	2
<i>B. edulis</i> H. Wendl. ex. S. Wats.	" "	1
<i>Brahea</i> spp.	" "	8
<i>Brassiophoenix schumannii</i> Becc.	MALAY	19
<i>Burretiokentia vieillardii</i> (A. Brongniart et Gris) Pichi-Sermolli	N CAL	4
<i>Butia capitata</i> (Mart.) Becc.	BRAZILIAN	1

<i>B. eriospatha</i> Becc.	BRAZILIAN	4
<i>B. yatay</i> (Martius) Becc.	"	4
<i>Butia</i> spp.	"	3
<i>Calamus caryotoides</i> Mart.	AUSTRAL	5
<i>Calamus</i> spp.		16
<i>Calyptracalyx lauterbachianus</i> Becc. ex Burret	MALAY	2
<i>C. spicatus</i> (Lam.) Blume	"	4
<i>Calyptrogyne</i> sp.	CARIB	2
<i>Calyptronoma dulcis</i> (C. Wright ex Grisebach) L. H. Bailey	"	2
<i>C. occidentalis</i> (Swartz) H. E. Moore	"	5
<i>Carpentaria acuminata</i> (H. Wendl. & Drude) Beccari	AUSTR	29
<i>Caryota aequatorialis</i> Ridley (Becc.)	MALAY	5
<i>C. cumingii</i> Lodd.	"	7
<i>C. hendrii</i> (Hort.)	"	1
* <i>C. mitis</i> Loureiro	"	18
<i>C. ochlandra</i> Hance	SINO-JAPN	6
<i>C. plumosa</i> Hort.		9
<i>C. rumphiana</i> Mart.	MALAY	4
<i>C. urens</i> L.	INDIAN	7
<i>Caryota</i> spp.		35
<i>Chamaedorea arenbergiana</i> H. Wendl.	CARIB	7
<i>C. brachypoda</i> Standl. & Steyerm.	"	6
<i>C. cataractarum</i> Mart.	"	12
<i>C. concolor</i> Mart.	"	2
<i>C. costaricana</i> Oersted	"	3
<i>C. dryanderæ</i> Burret	"	1

<i>C. elatior</i> Mart.	CARIB	3
<i>C. elegans</i> Mart.	"	2
<i>C. ernesti-augustii</i> H. Wendl.	"	21
<i>C. erumpens</i> H. E. Moore	"	28
<i>C. fragrans</i> (Ruiz et Parvon) Mart.	"	1
<i>C. geonomaeformis</i> Wendl.	"	2
<i>C. glaucifolia</i> Wendl.	"	5
<i>C. graminifolia</i> Wendl.	"	1
<i>C. klotzschiana</i> Wendl.	"	2
<i>C. liebmannii</i> var. <i>lepidota</i> (Wendl.) Dammer	"	1
<i>C. metallica</i> O. F. Cook	"	4
<i>C. microspadix</i> Burret	"	11
<i>C. oblongata</i> Mart.	"	6
<i>C. oreophila</i> x <i>C. sartorii</i>	"	1
<i>C. pacaya</i> Oerst.	"	3
<i>C. pinnatifrons</i> Oerst.	VEN-GUI	3
<i>C. oreophila</i> Mart.	CARIB	2
<i>C. pochutlensis</i> Mart.	"	4
<i>C. radicalis</i> Mart.	"	14
<i>C. sartorii</i> Liebm. in Mart.	"	8
<i>C. schippii</i> Burret	"	6
<i>C. schiedeana</i> Mart.	"	1
<i>C. seifrizzii</i> Burret	"	22
<i>C. stolonifera</i> H. Wendl.	"	2
<i>C. tepejilote</i> Liebm. in Mart.	"	22
<i>C. ernesti-augustii</i> x <i>C. sartorii</i>	"	1
<i>Chamaedorea</i> spp.	"	58
<i>Chamaerops humilis</i> L.	MED	31

<i>Chambeyronia hookeri</i> Becc.	N CAL	8
<i>C. macrocarpa</i> Vieill. ex Becc.	" "	10
<i>Chambeyronia</i> spp.		9
<i>Chrysalidocarpus arenarum</i> Jumelle	MADAG	9
* <i>C. cabadae</i> H. E. Moore	CULT	10
<i>C. decipiens</i> Becc.	MADAG	2
<i>C. lutescens</i> Wendl.	"	6
<i>C. madagascariensis</i> Becc.	"	21
<i>Chrysalidocarpus</i> spp.	"	18
<i>Coccothrinax alta</i> (O. F. Cook) Becc.	CARIB	6
<i>C. argentata</i> (Jacq.) L. H. Bailey	"	21
<i>C. argentea</i> (Lodd. ex Schult. & Schult.) Sarg. ex Becc.	"	40
<i>C. barbadensis</i> (Lodd.) Becc.	"	1
<i>C. crinata</i> Becc.	"	7
<i>C. miraguama</i> (HBK) Becc.	"	1
* <i>Cocos nucifera</i> L.	MEL & MICR	129
<i>Colpothrinax wrightii</i> Griseb. & Wendl.	CARIB	1
<i>Copernicia australis</i> Becc.	BRAZILIAN	3
<i>C. alba</i> Becc.	"	7
<i>C. baileyana</i> Leon	CARIB	33
<i>C. berteroana</i> Becc.	"	5
<i>C. burretiana</i> Leon	"	2
<i>C. cowellii</i> Brit. & Wilson	"	2
<i>C. curbeloi</i> Leon	"	1
<i>C. curtissii</i> Becc.	"	2
<i>C. ekmanii</i> Burret	"	1
<i>C. gigas</i> Ekman & Burret	"	15
<i>C. glabrescens</i> H. Wendl. & Becc.	"	12

<i>C. hospita</i> Mart.	CARIB	12
<i>C. humicola</i> Leon	"	1
<i>C. macroglossa</i> H. Wendl. ex Becc.	"	6
<i>C. occidentalis</i> Leon	"	1
<i>C. oxycalyx</i> Burret	"	1
<i>C. prunifera</i> (Miller) H. E. Moore	BRAZILIAN	6
<i>C. rigida</i> Britt. & Wils.	CARIB	5
<i>C. x sueroana</i> Leon	"	2
<i>C. tectorum</i> (HBK) Mart.	"	5
<i>C. vespertilionum</i> Leon	"	1
<i>C. yarey</i> Burret	"	9
<i>Copernicia</i> spp.	"	17
* <i>Corypha elata</i> Roxb.	INDIAN	17
<i>C. taliera</i> Roxb.	"	3
<i>C. umbraculifera</i> L.	"	14
<i>Cryosophila argentea</i> Bartlett	CARIB	6
<i>C. warscewiczii</i> (H. Wendl.) Bartlett	"	10
<i>Cryosophila</i> spp.	"	10
<i>Daemonorops margaritae</i> Hance ex Becc.	MALAY	2
* <i>Dictyosperma album</i> (Bory) H. Wendl. et. Drude ex Scheffer	MADAG	33
<i>D. aureum</i> Nicholson	"	9
<i>Desmoncus major</i> Crueger ex Grisebach	CARIB	4
<i>D. polyacanthos</i> Mart.	BRAZILIAN	2
<i>Desmoncus</i> spp.	CARIB	7
<i>Drymophloeus beguinii</i> (Burret) H. E. Moore	MALAY	11
<i>D. olivaeformis</i> (Giseke) Mart.	"	1
<i>Drymophloeus</i> sp.	"	2
<i>Elaeis guineensis</i> Jacquin	H TR AFR	37
<i>E. oleifera</i> (HBK) Cortes	BRAZILIAN	6

<i>Euterpe</i> sp.	CARIB	3
<i>Gastrococos crispa</i> (HBK) H. E. Moore	"	5
* <i>Gaussia attenuata</i> (O. F. Cook) Becc.	"	17
<i>G. principis</i> Wendl.	"	6
<i>Geonoma interrupta</i> (Ruiz et Pavon) Mart.	"	8
<i>Geonoma</i> sp.	"	5
<i>Hemithrinax</i> sp.	"	1
<i>Heterospathe elata</i> Scheffer	MALAY	20
<i>H. humilis</i> Becc.	"	8
<i>H. minor</i> Burret	"	8
<i>H. woodfordiana</i> Becc.	"	2
<i>Heterospathe</i> sp.		11
* <i>Howeia belmoreana</i> Becc.	N ZEA	3
<i>H. forsteriana</i> Becc.	" "	5
<i>Hydriastele douglasiana</i> F. M. Bailey	MALAY	5
<i>Hydriastele</i> spp.		24
<i>Hyophorbe lagenicaulis</i> (L. H. Bailey) H. E. Moore	MADAG	17
* <i>H. vershaffeltii</i> H. Wendl.	"	12
<i>Hyophorbe</i> sp.	"	2
<i>Hyphaene benadirensis</i> Becc.	AFR SAV	2
<i>H. coriacea</i> Gaertn.	" "	6
<i>H. crinita</i> Gaertn.	" "	11
<i>H. guineensis</i> Schum. & Thoon	" "	10
<i>H. indica</i> Becc.	AFR IND DES	14
<i>H. natalensis</i> Kuntz	AFR SAV	8
<i>H. pileata</i> Becc.	" "	3
<i>H. schatan</i> Bojer ex Daumer	MADAG	8
<i>H. ternifolia</i>	AFR SAV	1

<i>H. thebaica</i> (L.) Mart.	AFR SAV	10
<i>H. turbinata</i> H. Wendl.	" "	4
<i>H. ventricosa</i> Kirk	" "	7
<i>Hyphaene</i> spp.		35
<i>Jubaea chilensis</i> HBK	ANDEAN	11
<i>Kentiopsis olivaeformis</i> (Brongn. & Gris.) Brongn.	N CAL	5
* <i>Latania loddigesii</i> Mart.	MADAG	5
* <i>L. lontaroides</i> (J. Gaert.) H. E. Moore	"	7
* <i>L. lontaroides</i> x <i>loddigesii</i>	CULT	2
* <i>L. verschaffeltii</i> Lem.	MADAG	18
<i>Licuala grandis</i> Wendl.	MALAY	16
<i>L. lauterbachii</i> Dammer & K. Schum.	"	8
<i>L. muelleri</i> Wendl. & Drude	AUSTR	10
<i>L. paludosa</i> W. Griffin	MALAY	2
<i>L. peltata</i> Roxb.	CON SE ASIA	10
<i>L. pumila</i> Blume	MALAY	15
<i>L. rumphii</i> Blume	"	9
<i>L. spinosa</i> Thumb.	CON SE ASIA	17
<i>Licuala</i> spp.		16
<i>Livistona australis</i> (R. Br) Mart.	AUSTR	10
<i>L. benthamii</i> F. M. Bailey	"	8
* <i>L. chinensis</i> (Jacquin) R. B. ex Mart.	SINO-JAPN	38
<i>L. crustacea</i> Burret		1
<i>L. decipiens</i> Becc.	AUSTR	16
<i>L. mariae</i> F. J. Muell.	"	9
<i>L. merrillii</i> Becc.	MALAY	3
<i>L. muelleri</i> F. M. Bailey	AUSTR	3
<i>L. robinsoniana</i> Becc.	MALAY	6

<i>L. rotundifolia</i> (Lam.) Mart.	MALAY	7
<i>L. sarbus</i> (Loureiro) Merrill ex Chaval		14
<i>L. speciosa</i> Kurz	CON SE ASIA	1
<i>L. woodfordii</i> Riddley	MALAY	8
<i>Livistona</i> spp.		19
<i>Lodoica maldivica</i> (Groenl) Persoon	MADAG	1
<i>Mauritia armata</i> Mart. l. c.	BRAZILIAN	1
<i>M. vinifera</i> Mart.	"	4
<i>Mauritia</i> sp.	"	1
<i>Maximiliana maripa</i> (Correa de Serra) Drude	CARIB	1
<i>Maximiliana</i> sp.	BRAZILIAN	2
<i>Microcoelum insigne</i> (Hort. ex Drude) Burret	"	2
* <i>Nannorrhops ritchiana</i> (Griff.) Aitch	AFR IND DES	8
<i>Neodypsis decaryi</i> Jumelle	MADAG	5
<i>Neoveitchia storckii</i> (H. Wendland) Becc.	MEL & MICR	1
<i>Normanbya normanbyi</i> (W. Hill) L. H. Bailey	AUSTR	16
<i>Nypa fruticans</i> Wurmb.	MALAY	4
<i>Oncosperma fasciculatum</i> Thwaites	INDIAN	4
<i>O. tigillarum</i> (Jack.) Ridley	CON-SE ASIA	4
<i>Opsiandra maya</i> O. F. Cook	CARIB	19
<i>Orania macropelta</i> laut. & K. Schum.	AUSTR	4
<i>Orbignya barbosiana</i> Burret	BRAZILIAN	1
<i>O. cohune</i> (Mart.) Dahlgr. ex Stand.	"	7
<i>O. guacuyule</i> (Liebm) Hernandez Xoloc	CARIB	2
<i>O. martiana</i>	BRAZILIAN	1
<i>O. phalerata</i> Mart.	ANDEAN	1
<i>O. speciosa</i> (Mart.) Barb-Rodr.	BRAZILIAN	1
<i>Orbignya</i> spp.		7
<i>Pelagodoxa henryana</i> Becc.	MEL & MICR	3

Phoenicophorium borsigianum (C. Koch) Stuntz	MADAG	1
Phoenix abyssinica Drude	AFR IND DES	1
P. acaulis Roxb.	INDIAN	7
* P. canariensis Hort. ex Chabaud	MACRON	21
* P. dactylifera L.	AFR IND DES	5
P. formosana (no standing) Hort.	MALAY	1
P. loureirii Kunth	"	9
P. x macrocarpa Hort. (P. canariensis x P. dactylifera)	CULT	2
P. paludosa Roxb.	CON SE ASIA	1
P. pusilla Gaetn.	INDIAN	6
* P. reclinata Jacq.	H TR AFR	29
P. roebelenii O'Brien	CON SE ASIA	17
P. rupicola T. Anders.	INDIAN	8
* P. sylvestris Roxb.	"	6
Phoenix spp.		14
Phytelephas macrocarpa Ruiz & Pavon	ANDEAN	6
Pigafetta filaris (Giseke) Becc.	MALAY	5
Pinanga bavensis Becc.	"	1
P. kuhlii Blume	"	8
P. maculata Porte ex Lem.	"	1
P. patula Blume	"	4
Pinanga spp.		15
Polyandrococos caudescens (Mart.) Barbarosa- Rodriquez	BRAZILIAN	7
Prestoea montana (Graham) Nichol.	CARIB	9
P. pubigera Hook f. l. c.	"	3
Pritchardia arecina Becc.	HAWAIIAN	7
* P. affinis Becc.	"	7
P. beccariana Rock	"	4

<i>P. lowreyana</i> Rock	HAWAIIAN	1
<i>P. gaudichaudii</i> (Mart.) H. Wendl.	"	5
* <i>P. pacifica</i> Seem. et H. Wendl.	MEL & MICR	11
* <i>P. thurstonii</i> F. Muell. et Drude	" "	12
<i>P. hillebrandii</i> Becc.	HAWAIIAN	5
<i>P. remota</i> Becc.	"	2
<i>P. rockiana</i> Becc.	"	4
<i>Pritchardia</i> spp.		2
<i>Pseudophoenix lediniana</i>	CARIB	2
<i>P. sargentii</i> H. Wendl. ex Sarg.	"	58
<i>P. vinifera</i> (Mart.) Becc.	"	3
<i>Ptychococcus lepidotus</i> H. E. Moore	MALAYAN	4
<i>P. paradoxus</i> (Scheff.) Becc.	"	4
<i>Ptychococcus</i> sp.	"	2
<i>Ptychoraphis</i> sp.	"	1
<i>Ptychosperma angustifolium</i> Blume	INDIAN	2
<i>P. elegans</i> Blume	AUSTR	11
<i>P. hosinoi</i> Moore & Fosberg	MEL & MICR	1
<i>P. hospitum</i> (Burret) Burret	" "	1
<i>P. kerstenianum</i> Burret	MALAYAN	4
<i>P. lineare</i> (Burret)	"	4
<i>P. macarthurii</i> (Wendl.) Nich.	"	18
<i>P. propinquum</i> (Becc.)	"	3
<i>P. salomonense</i> Burret	"	28
<i>P. sanderianum</i> Ridley	"	7
<i>P. waitianum</i> F. B. Essig	"	10
<i>Ptychosperma</i> spp.		67
<i>Raphia farinifera</i> (Gaetn.)	H TR AFR	5
<i>R. humilis</i> Cheval	" " "	2
<i>R. vinifera</i> Palisot de Beauvois	" " "	4

<i>Ravenea hildebrandtii</i> Bouche	MADAG	7
<i>R. spectabilis</i> (Lindl.) Planch ex Griseb.	"	1
<i>Ravenea</i> sp.	"	6
<i>Rehderophoenix</i> sp.	MALAY	6
<i>Reinhardtia gracilis</i> (Wendl.) Drude	CARIB	4
<i>Reinhardtia</i> sp.	"	4
<i>Rhapidophyllum hystrix</i> (Pursh) H. Wendl.	"	29
<i>Rhapis excelsa</i> (Thunb.) Henry	SINO-JAPN	36
<i>R. humilis</i> Blume	" "	7
<i>Rhopaloblaste augusta</i> (Kurz) H. E. Moore	INDIAN	1
<i>R. ceramica</i> (F. A. W. Miguel) Burret	MALAY	3
<i>Rhopalostylis baueri</i> Wendl. & Drude	N ZEA	5
<i>R. cheesemanii</i> Becc. ex Chees.	" "	3
<i>R. sapida</i> Wendl. & Drude	" "	4
<i>Rhyticocos amara</i> (N. J. Jacq.) Becc.	CARIB	9
<i>Roystonea altissima</i> (Miller) H. E. Moore	"	4
<i>R. borinquena</i> O. F. Cook	"	4
<i>R. elata</i> (Bartr.) F. Harper	"	6
<i>R. hispaniolana</i> Bailey	"	5
<i>R. oleracea</i> (Jacq.) O. F. Cook	BRAZILIAN	20
<i>R. princeps</i> (Becc.) Burret	CARIB	12
<i>R. regia</i> (HBK) O. F. Cook	"	8
<i>R. venezuelana</i> L. H. Bailey	VEN & GUI	4
<i>Roystonea</i> spp.	CARIB	28
<i>Sabal allenii</i> Bailey	"	10
<i>S. bermudana</i> Bailey	"	12
<i>S. causiarum</i> (O. F. Cook) Becc.	"	20
<i>S. domingensis</i> Becc.	"	6
<i>S. mauritiiformis</i> (Karst.) Griseb. & Wendl.	"	13

<i>S. mexicana</i> Mart.	CARIB	15
<i>S. minor</i> (N. J. Jacq.) Persoon	"	24
<i>S. palmetto</i> (Walt.) Lodd.	"	6
<i>S. parviflora</i> Becc.	"	4
<i>S. rosei</i> (O.F. Cook) Becc.	"	3
<i>S. uresana</i> Trelease	"	1
<i>S. yapa</i> C. Wright ex Becc.	"	3
<i>Sabal</i> spp.	"	56
<i>Salacca edulis</i> Reinwardt	MALAY	4
<i>Satakentia liukuensis</i> (Hatusima) H. E. Moore	SINO-JAPN	10
<i>Scheelea amylacea</i> Barb-Rodr.	BRAZILIAN	1
<i>S. butyracea</i> (Mutis ex L. F.) H. Karst ex H. Wendl.	CARIB	2
<i>S. huebneri</i> Burret	BRAZILIAN	3
<i>S. leandroana</i> Barbosa-Rodriquez	"	23
<i>S. liebmannii</i> Becc.	CARIB	3
<i>S. martiana</i> Burret	ANDEAN	2
<i>S. osmantha</i> Barb-Rodr.	CARIB	2
<i>S. urbaniana</i> Burret	"	3
<i>S. zonensis</i> L. H. Bailey	"	1
<i>Scheelea</i> spp.	"	20
<i>Schippia concolor</i> Burret	"	9
<i>Serenoa repens</i> (Bartram) Small	"	9
<i>Siphokentia beguinii</i> Burret	MALAY	8
<i>Socratea</i> sp.	BRAZILIAN	1
<i>Strongylocaryum brassii</i> Burret l. c.	MALAY	3
<i>S. latius</i> Burret	"	12
<i>Strongylocaryum</i> sp.	"	5
<i>Syagrus cocoides</i> Mart.	BRAZILIAN	14
<i>S. flexuosa</i> (Mart.) Becc.	"	6

<i>S. inajai</i> (Spruce) Becc.	BRAZILIAN	6
<i>S. oleracea</i> (Mart.) Becc.	"	16
<i>S. orinocensis</i> (Spruce) Burret	VEN-GUI	16
<i>S. quinquefaria</i> (Barb.-Rodr.) Becc.	BRAZILIAN	2
<i>S. sancona</i> H. Karst.	CARIB	1
<i>S. tessmannii</i> Burret	ANDEAN	1
<i>S. vagans</i> (Bondar) Glassman	BRAZILIAN	7
<i>Syagrus</i> spp.		72
<i>Synechanthus fibrosus</i> (H. Wendl.) H. Wendl.	CARIB	5
<i>Tessmanniodoxa chuco</i> Burret	BRAZILIAN	13
<i>Thrinax excelsa</i> Lodd. ex Griseb.	CARIB	10
<i>T. morrisii</i> H. Wendl.	"	68
<i>T. parviflora</i> Swartz	"	16
<i>T. radiata</i> Lodd. ex J. A. Schult	"	143
<i>Thrinax</i> sp.	"	2
* <i>Trachycarpus fortunei</i> (W. J. Hooker) H. Wendl.	SINO-JAPN	6
<i>T. martianus</i> (Wallich) H. Wendl.	INDIAN	1
<i>T. takil</i> Becc.	"	10
<i>Trachycarpus</i> sp.	"	2
<i>Trithrinax acanthocoma</i> Drude	BRAZILIAN	7
<i>T. brasiliensis</i> Mart.	"	10
<i>Veitchia arecina</i> Becc.	N CAL	3
<i>V. joannis</i> Wendl.	MEL & MICR	12
<i>V. mcdanielsii</i> H. E. Moore l. c.	MALAY	10
* <i>V. merrillii</i> (Becc.) H. E. Moore	"	99
* <i>V. montgomeryana</i> H. E. Moore	"	8
<i>V. sessilifolia</i> (Burret) H. E. Moore	MEL & MICR	1
<i>V. winin</i> H. E. Moore	MALAY	16

Veitchia spp.		44
Wallichia disticha T. Anderson	INDIAN	9
Washingtonia filifera (L. Linden) H. Wendl.	PACIF-NA	6
W. robusta H. Wendl.	" " "	19
Zombia antillarum (Descourtilz ex Jackson) L. H. Bailey	CARIB	18