

HONEYBEE PLANTS OF SOUTH FLORIDA

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Of the great and varied plant resources of Florida, perhaps least consciously appreciated by the majority of residents are those which furnish nectar and pollen for honeybees (*Apis mellifera* L.). In 1963, Florida marketed a record 20.9 million pounds of honey valued at \$3,841,000 and beeswax valued at \$138,000, and, as a honey state, continues to stand third in the nation (14).

While most of the food for the bees and the surplus honey comes from native and naturalized wild plants, some is derived from cultivated ornamentals and some from hives placed in agricultural fields and fruit groves for necessary pollination. Many colonies are required for this work and they are moved from crop to crop. After three months of pollinating, the colonies are weak from insecticides and are put out on wild sources to recover (21).

There are more than 200 known beekeepers in Dade County alone and many others who maintain only a hive or two. At the request of the members of the Subtropical Beekeepers Association, I have compiled from honey-plant literature, from interviews with beekeepers, and my own observations, the following information on plants worked by honeybees in South Florida—that is, roughly, south of Palm Beach on the east coast and Sarasota on the west.

Some plants yield only nectar, some only pollen; many provide both. Certain plants having no nectar in their flowers may supply it from extra-floral nectaries on their leaves or at their leaf-bases or on the flower-stalk, or they may have sweet sap or be hosts to insects producing honeydew which bees gather. According to Vansell, honey from this exudate of aphids, leafhoppers, scale and gall insects is usually dark and unpleasant in flavor (33), especially when sooty mold has formed on the sweet excretion, as it often does on the leaves of mango and citrus trees (8).

Some plants are unsafe sources of nectar or pollen. It is interesting to observe, in this connection, that toxic plants fall into three categories: 1. Those with poisonous nectar or pollen

which kills the bees before they can make honey. Examples are non-Floridian locoweed (*Astragalus lentiginosus*), buckeye (*Aesculus californica*), death camass (*Zygadenus venenosus*), *Veratrum californicum*, some species of *Vernonia*, and one Florida and tropical American pest, dodder (*Cuscuta americana*), if its nectar is gathered in quantity. 2. Those having nectar harmless to bees but which yield honey more or less toxic to humans. Notorious plants of this nature are oleander (*Nerium oleander*); jimson weed, angel's trumpet and other species of *Datura*, which occasion frequent deaths in Mexico; mountain laurel (*Kalmia* spp.); Carolina yellow jessamine (*Gelsemium sempervirens*), reportedly fatal to young bees also; snow-on-the-mountain (*Euphorbia marginata*); and the potent *Serjania lethalis* of Brazil.

The very suggestion of poisonous honey comes as a surprise to many, but there are some classic records of honey poisoning. In *The Anabasis*, translated from the Greek, it is related that Xenophon's army in 401 B.C. reached the Black Sea and found many beehives. The men ate the honey (derived from *Rhododendron ponticum*) and thereafter suffered various degrees of vomiting, diarrhea, delirium and stupefaction depending on the amount consumed, but all recovered in 24 hours despite some inaccurate translations to the contrary. Pliny and Dioscorides also wrote of intoxicating honey in that same region (35). However, recent work in Scotland has shown that some species of *Rhododendron* yield perfectly safe honey (E. Oertel).

3. Other poisonous plants have nectar apparently harmless to bees and provide excellent honey. In this category, we find poison ivy (*Rhus toxicodendron*), poison wood (*Metopium toxiferum*), manchineel (*Hippomane mancinella*), physic nut (*Jatropha curcas*), sea myrtle (*Baccharis halimifolia*) and others which are of value in our honey flora. The castor bean (*Ricinus communis*) is an important source of pollen.

There is a rapid change of flora in South Florida attributable to the effects of droughts, floods, hurricanes, fires, drainage, cattle-grazing, the increasing use of weedicides, and development of land for agricultural, residential or industrial purposes.

Ralph Wadlow, a veteran beekeeper of Imokalee, says that certain muckland plants will

produce no nectar when growing in sand; also that great expanses of "custard apple muck,"* which is favorable for nectar production, are now in cultivation "sawgrass muck" gives a poor nectar yield and much is now planted to sugarcane (34).

Jack Little of the Everglades Experiment Station states that the orange tree and various other plants that furnish honey on sand have little or no nectar on some muck soils; there is no orange honey gleaned at Belle Glade. According to Wadlow, the honey from *Citrus* trees on muck around Immokalee is one-fifth the volume of *Citrus* honey on the Ridge and is dark and low in quality. He says there is no surplus of *Citrus* honey on flatwoods land, but if the water table can be lowered below 4 feet there will be a greater honey crop as the trees grow older. *Citrus* trees on muck in the Davie area yield well and, in favorable weather, R. F. Meyer obtains 100 lbs. per hive (21). The Loop Road, Miami and Coral Gables areas are said to be poor grounds for bees and this might be due to the soil types (34). There are many instances of certain species yielding nectar in one area and not in another (E. Oertel).

In the winter, bees usually don't make a surplus of honey (unless they have access to willow) but use honey for increasing the amount of brood (38). Nectar is scarce during the rainy season. The honey flow diminishes about mid-April and resumes in October. Bees may be found dying from lack of nectar in summer (8). For this reason, some beekeepers have asked me for lists of ornamental plants that may help tide bees over lean periods. Some of these, such as the nectar-rich garden flower, *Cleome spinosa*, and the handsome yellow poinciana tree (*Peltophorum inerme*) which blooms from May through August, might be very helpful. The latter could well be more commonly planted not only around the home but along streets and parkways and in public parks in place of the non-productive and often troublesome *Ficus* trees. G. H. Vansell wrote, in 1929, "The State Highway Commission [of California] is increasing the nectar flow by using suitable species along our highways." This idea should be encouraged here in Florida.

There is no shortage of pollen in South Florida throughout the year (17). In spring, the pollen is noticeably yellow from *Citrus*; later may be copper-yellow from Mexican poppy, or pre-

*Typical soil supporting thickets of the custard, or pond apple (*Annona glabra* L.).

dominantly white from palmetto and (in mid-summer and fall) from *Melaleuca* (8). Willow is the chief pollen source in winter.

A relatively short distance causes the flowering season to vary. Around Immokalee, bees can make *Citrus* honey as early as February. At Sebring, not until March. Willow blooming at Immokalee is two months ahead of that at Okeechobee, 60 miles away (34). It is important to note that the nectar flow of different species takes place at different times of day. That of thistle occurs very early in the morning; that of avocado about 9:00 A.M., that of jambolan, all day. Some plants yield nectar in the sun; others in the shade (31). Where an assortment of nectar plants are in bloom, as in old, ungrazed pastures, bees will work only one species at a time, in order of preference (21, 22, 34). Bees do not collect nectars containing less than 20% sugar (Penfold & Willis, *The Eucalypts*).

Among the hazards of beekeeping, are wild bears (numerous in Collier County) that raid the hives for the young bees and the honey; dragonflies (locally known as mosquito hawks) that kill the bees in flight (34); and skunks and marine toads which devour all bees within their reach (21).

Common names by which South Florida beekeepers know their honey plants may not appear in botanical reference works or honey-plant literature of other areas or, if they do, may be applied to unrelated species. To aid in recognition, the following 250 plants are grouped as WILD PLANTS, FIELD CROPS, CULTIVATED FRUITS, and CULTIVATED ORNAMENTALS, with subgroupings—Trees, Palms, Shrubs, Vines, Herbs and Grasses, and Cacti, where appropriate. Of course, some plants such as the seagrape and the pigeon plum, while primarily wild plants are also cultivated as ornamentals, and introduced species such as Caesar bur (*Urena lobata*) and Mexican sunflower (*Tithonia diversifolia*) have escaped from cultivation and occur as weeds. Under each wild species, the general habitat is briefly noted, but space does not permit descriptions.

WILD PLANTS

Trees

Acer rubrum. RED MAPLE. Low hammocks. Season: late Dec. and Jan. (1); same time as willow. Nectar: none on muck (17); abundant elsewhere. Pollen: much. Honey: no surplus

(34); important for brood-rearing; one of first sources of food at start of year (1).

Avicennia nitida. BLACK MANGROVE. Coasts and brackish marshes. *Season*: Apr. to Aug. *Nectar*: flow at times so intense that bees seem to swarm on the tree, especially after rain (27). *Honey*: on west coast usually dark and suitable only for bakery trade. At Punta Gorda and on east coast there is a heavy flow of nectar yielding thin honey, salty or brackish, not very sweet, and light-yellowish-brown due to mixing with that from cabbage palmetto (19). In Cuba, lightness is attributed to mixing with seagrape (27). One beekeeper sold to Miami Beach stores and it was in demand until it was found to granulate too quickly. It is no longer sold retail (31). Old Graves Tract yielded much pure black mangrove honey (21).

Bursera simaruba. GUMBO LIMBO. Coastal hammocks and Keys; also cultivated. *Season*: Apr. and May. *Nectar*: unreliable; in certain years has substantial flow and produces a surplus of honey (27).

Coccoloba diversifolia. PIGEON PLUM. Hammocks and Keys; also cultivated. *Season*: March. *Nectar*: good source (27). *Honey*: Usually mixed with poisonwood and Jamaica dogwood on the Keys (19).

Coccoloba uvifera. SEAGRAPE. Coastal hammocks, dunes and Keys (30). *Season*: Apr. and May; if spring winds blow off first blooms, second flowering in June and July. *Nectar*: copious till well past noon and sometimes to 5:00 P.M.; less abundant than black mangrove (27). *Honey*: very light amber, spicy (7), high moisture content, cloudy, but of good quality. In Cuba may surpass black mangrove in commercial importance; though it has less nectar, it flowers longer (27). In Florida, used for brood-rearing (1).

Colubrina ferruginosa. SNAKEBARK; SOAP TREE. Hammocks and Keys. *Season*: Oct. and Nov. *Nectar*: apparently little; usually visited by only a few bees (27).

Conocarpus erectus. BUTTONWOOD. Coasts, back of mangroves; all Keys, Marco and Sanibel. *Season*: Apr. to Aug. *Pollen and nectar*: both sought by bees (27). *Honey*: surplus; amber, rather dark (8); salty flavor (34); cappings dramatically white (31). Not of great importance to beekeeper (27).

Cordia sebestena. GEIGER TREE. Hammocks and Keys. *Season*: all summer. *Pollen*: possibly some. *Nectar*: much, largely inaccessible

but bees gather from edge of corolla, calyx and next buds to open (27).

Diospyros virginiana var. *mosieri*. PERSIMMON. Hammocks and pinelands. *Season*: May and June. *Pollen*: for building of colonies. *Nectar*: plentiful. *Honey*: light amber; fair flavor; often a surplus (18, 19).

Dipholis salicifolia. BUSTIC CASSADA. Hammocks, pinelands, and Keys. *Season*: Apr. and May. Said to be very attractive to bees (27).

Drypetes lateriflora. GUIANA PLUM. Hammocks and Keys. *Season*: Mar. and Apr. *Pollen*: cream-colored. Scarcely visited by bees (27).

Eugenia axillaris. WHITE STOPPER. Common in hammocks. *Season*: spring. "According to Souza-Novelo it is visited by bees" (27).

Guaiacum sanctum. LIGNUM VITAE. Keys. *Season*: Apr. Visited by bees (22, 27).

Gymnanthes lucida. CRABWOOD. Hammocks and Keys. *Season*: Mar. and Apr. *Pollen*: much; cream-colored from staminate flowers; gathered eagerly by bees (27).

Hippomane mancinella. MANCHINEEL. Now largely limited to Bear Lake and Cape Sable areas of Everglades National Park, and Keys. *Season*: Feb. to Apr. *Nectar*: much. *Honey*: non-toxic; occasionally a surplus on Keys; important in West Indies; next to black mangrove and seagrape in value among coastal trees in Cuba (27). Plant causes external and internal poisoning (22).

Ilex cassine. DAHOON HOLLY; CASSENA. Borders of swamps, waterways, hammocks. *Season*: early spring. *Nectar*: moderate. *Honey*: helpful in building up colonies (19); no surplus (34). Fruits toxic (22).

Laguncularia racemosa. WHITE MANGROVE. Seashore, coastal hammocks and Keys. *Season*: May and June. *Nectar*: plentiful, though less than black mangrove (27). *Honey*: surplus (34); light amber (27), salty; for blending (34).

Leucaena glauca. JUMBIE; LEAD TREE. Hammocks, open fields. *Season*: all year. *Pollen*: abundant, white. Of importance to colony (9). Plant toxic to horses, donkeys, mules and pigs; good fodder for cattle and goats (22).

Licaria triandra (*Misanteca triandra*). GULF MISANTECA. Rare; only wild specimens are in Brickell Hammock, Miami (6); cultivated as an ornamental. *Season*: Dec. *Nectar*: abundant. Considered a good source in the West Indies (27).

Lysiloma bahamensis. WILD TAMARIND. Hammocks and Keys. *Season*: Mar. to June.

Pollen and nectar: both sought by bees but seem unimportant (27).

Metopium toxiferum. POISONWOOD. Pine-woods and hammocks, coastal sand dunes (30); Palm Beach south through Keys. *Season:* Mar. to May. *Nectar:* so copious the bees work eagerly (19, 22). *Honey:* light amber (18), excellent quality, appetizing (19), sells readily. Rarely pure; usually mixed with other species. Blend of poisonwood, Jamaica dogwood and pigeon plum constituted most of surplus from hives placed by O. O. Poppleton of Stuart down on the Keys in 1909. Plant toxic; common cause of dermatitis (22).

Myrica cerifera. WAX MYRTLE. Hammocks, pinelands and swamps. *Season:* winter, spring. *Nectar:* sought by bees. Frank Stirling listed as bee plant of some importance in Florida (27). Ray Turner, nurseryman, of Miami, says that in early days old and hollow cypress stumps were burned out, rubbed with wax myrtle leaves, a crosspiece fastened midway within; bees would raise colony below; deposit honey above.

Persea borbonia. RED BAY. Hammocks and swamps. *Season:* spring. *Nectar:* abundant. *Honey:* dark and of fair (18) or poor (19) quality. Formerly one of the principal sources at Tasmania on west shore of Lake Okeechobee (19), now nearly deserted but bay trees still on creeks (34).

Piscidia piscipula. JAMAICA DOGWOOD; FISH POISON TREE. Common on Keys. *Season:* Mar. to May. *Nectar:* abundant; odor peculiar. *Honey:* superior to mangrove; doesn't granulate. One of the best sources of nectar in the West Indies but abundant in only a few areas (19, 27). Bark and leaves narcotic; used to poison fish (22).

Quercus virginiana. LIVEOAK. Hammocks; also cultivated. *Season:* Apr. *Pollen:* much. *Nectar:* none. Bees gather from oaks a sweet liquid, light-colored and palatable, which is excreted by scale and gall insects. *Honey:* sometimes dark, sometimes light. One Florida beekeeper reported 150 lbs. of oak honey in a season (19). At Cottonwood, Calif., as much as 30 lbs.



Figure 1.—*Metopium toxiferum* POISONWOOD.

Photo by Julia Morton.

per colony of oak honeydew honey has been obtained (33). Some oaks called "honey oak" in U. S. and Mexico (27).

Rhus leucantha. SOUTHERN SUMAC. Hammocks, Everglades Keys (30); scrub (22). *Season*: all year. *Pollen*: abundant, gathered by bees. *Nectar*: plentiful. *Honey*: light in color, of good body and excellent flavor (18). Sumac a rich source of honey in Aug., Sept. and Oct. (27), a major source in Connecticut (19); New York beekeepers use fruits ("bobs") for smoker fuel (34).

Salix caroliniana (*S. amphibia*; *S. longipes*). WILLOW. Low ground, hammocks, swamps. *Season*: Dec. to Feb.; main flow in Jan. *Pollen*: from staminate trees (19), which may be swarming with bees (31). *Nectar*: freely secreted by both male and female flowers (19); rainy years much; dry years none (38). *Honey*: bright-yellow (21), with pleasant, aromatic flavor; granulates fast (17), with fine grain; sometimes slightly bitter and used for bakery (34). One of the earliest honey flows; at this time Dade County hives may be all in agricultural fields for pollination. Surplus only in South Florida. Hives brought to Wadlow for willow from Central Florida and Georgia. John Houston puts hives in willow around Loxahatchee River and gets surplus right before *Citrus* (34). A very important source of nectar and pollen for early brood-rearing; many queen yards are located in willow areas (33). Insect inhabitants often occasion much honeydew in summer and fall (33).

Sapindus saponaria. SOAPBERRY. Hammocks and Keys. *Season*: Nov. to Feb. *Nectar*: bees seek avidly (19).

Sideroxylon foetidissimum. MASTIC. Hammocks. *Season*: June, or mid-Aug. to Sept. *Pollen* (pale-yellow) and *nectar*: Both gathered by bees; of medium importance (27).

Swietenia mahagoni. MAHOGANY. Key Largo, Cape Sable, and cultivated in Miami area. *Season*: May and June. Has been said to be a good source of honey, which is dark (27). Ordetx never saw bees on flowers.

Zanthoxylum clava-herculis. TOOTHACHE TREE; PRICKLY ASH. Hammocks of South Florida but not Keys. *Season*: Apr. to June. *Pollen and nectar*: abundant. *Honey*: light-colored; pungent in flavor (19).

Palms

Sabal etonia. SCRUB PALMETTO; "BLUE-BUD." Dry pineland and scrub (30); "with saw

palmetto on the various terraces of the central sand ridge" (L. Brass, Archbold Biolog. Sta.). *Season*: right after *Citrus*, late May and June. *Nectar*: plentiful in dry weather, scarce in rainy weather. *Honey*: similar to cabbage palmetto. A good source but yield irregular (34).

Sabal palmetto. CABBAGE PALMETTO. Prairies, marshes, pinelands and hammocks (30). *Season*: Apr., if warm, wet weather; otherwise May and June (21). *Nectar*: much in wet land; good flow around Boca Raton and Deerfield Beach; none on dry land (21). *Honey*: thin, watery, light amber, mild odor and flavor; ferments unless heated (1); good quality but foams and ferments if taken off unripe. Even after it is sealed it will often foam as though fermenting but bubbles will disappear on standing. Inferior to saw palmetto (19, 34); may blow off caps; occasionally a surplus in South Florida; Georgia beekeepers bring hives to Lake City for summer stores (34).

Serenoa repens. SAW PALMETTO. Hammocks, pinelands, scrub and sand dunes (30). *Season*: Apr., May, June. *Nectar*: in commercial quantities (1); a leading source (19). *Honey*: light greenish to amber (1) or lemon-yellow; thick, heavy; fine mild flavor; good quality even if taken off before it is sealed (19); granulates more slowly than orange honey (34). Cappings are white (21). Bees sometimes suck berry juice and produce dark, strong, medicinal honey sometimes used to feed the bees (20, 34).

Thrinax microcarpa. BRITTLE THATCH PALM. Upper and Lower Keys, esp. Big Pine (6). *Season*: Mar. and Apr. *Nectar*: abundant. *Honey*: good surplus in favorable weather (19).

Shrubs

Baccharis halimifolia. SALT BUSH; GROUNDSEL BUSH; GLADE MYRTLE; SEA MYRTLE. Salt marshes and low, wet areas; waste land. *Season*: Fall. *Pollen*: medium source in Queensland, Aust. (3). *Nectar*: valuable source, from flowers and from pappus after flowers are gone (34). *Honey*: light-colored; bad odor in hive with *Melaleuca* flavor but flavor good when cured (21). Used to be good source at Vero Beach and Titusville (21). Honey sold as "Myrtle" (8). Valuable for building up colonies (18). Plant kills horses and cattle in North Carolina (22).

Befaria racemosa. FLYCATCHER PLANT; CATCHFLY; TAR FLOWER. Pinelands (30)



Figure 2.—*Baccharis halimifolia*. SALT BUSH, SEA MYRTLE, or GROUNDSEL.

Photo by Julia Morton.

and scrub (22). *Season*: May and June. *Pollen*: good source. *Nectar*: worked by bees. *Honey*: may be a surplus at Ortona (34). Honeybees and other insects sometimes caught on sticky petals (5, 20, 34).

Bumelia angustifolia. SAFFRON PLUM; TROPICAL BUCKTHORN. Coastal hammocks and Keys. *Season*: Oct. to Feb. *Nectar*: gathered by bees. *Honey*: amber, of good flavor (27).

Cephalanthus occidentalis. BUTTONBUSH; HONEYBALLS; PINCUSHION FLOWER. Swamps, canals, ponds; all Florida, not Keys. *Season*: late May (22) to Sept. *Nectar*: "a reliable source, abundantly supplied with moisture and easily worked by bees" (33). *Honey*: light-colored, mild, fine flavor (18); surplus not unusual (33); generally mixed with other kinds (18). Much on Rt. 84 near Ft. Lauderdale (21). Hundreds of acres along Rt. 98; plentiful on Kissimmee River, but raising water table and drainage depleting species (34). Leaves toxic to cattle according to Hyatt, M. T., R. G. Brown and J. W. Herron, *Some Plants of Kentucky Poisonous to Livestock*, U. of Ky. Agric. Cir. 502, 1953. However, Meyer, Wadlow and Yeomans state that cows and deer eat leaves and new growth (21, 34, 38).

Chrysobalanus icaco and *C. icaco* var. *pellocarpus*. COCOPLUM. Beaches and canal banks, and cultivated (22). *Season*: Spring and early

summer. *Nectar*: plentiful (27). *Honey*: dark from cocoplum areas (8).

Chrysobalanus pallidus. GOPHER APPLE; GROUND-OAK. Pinelands. *Season*: Mar. to July. *Nectar*: not a reliable source (1). *Honey*: amber and of good flavor (18); used mostly by colony (1); in some areas plant abundant enough for surplus (18).

Callicarpa americana. AMERICAN BEAUTYBERRY. Pinelands and hammocks. *Season*: May and June. *Nectar*: good source at this time of year but plants scattered (1). *Honey*: for brood-rearing (1).

Croton punctatus. SILVERLEAF CROTON; BEACH-TEA. Beaches, sand-dunes. *Season*: summer to fall or all year. *Pollen*: some; olive-colored. *Nectar*: abundant. "In spring, very useful to apiculturists near coasts" (27).

Gaylussacia dumosa and *G. frondosa*. HUCKLEBERRY. Acid swamps, low pinelands and scrub. *Season*: winter and spring. *Nectar*: gathered by bees (34). *Honey*: white with fine flavor (18).

Guilandina crista. NICKER NUT, GRAY NICKER. Coastal thickets and Keys. *Season*: June and July. *Pollen*: some. *Nectar*: much; possibly of importance where plant is abundant. *Honey*: copper yellow (27).

Hamelia patens. SCARLET BUSH; FIRE-BUSH. Hammocks and Keys. *Season*: all year but principally May to Sept. (22). *Nectar*: largely inaccessible due to narrow tube but bees lap edge of corolla. *Honey*: supply insignificant (27).

Ilex glabra. GALLBERRY; INKBERRY. Low pinelands, damp areas and along waterways, on acid, not limestone, soil; common in Collier County (34). *Season*: Mar., Apr., May (1). *Nectar*: abundant on some soils; moderate on sand ridges (20). *Honey*: commercial quantities; light in color (white to very pale amber), heavy, mild in flavor (1, 22); non-granulating (19); usually mixed with palmetto in Palmdale area (20). Fruits toxic.

Jussiaea peruviana (fls. 2 in. or more) and *J. scabra* (fls. 1 in.). PRIMROSE WILLOW; SWAMP DOGWOOD; "YELLOWWEED," in Okeelanta (13); "HYPOLUXO" (21). Swamps, along waterways and in damp soil of fields and roadsides (30). *Season*: summer and fall. *Nectar*: much (34). *Honey*: at first looks like oil, clears, is of medium color and good flavor; usually mixed with *Sesbania* in Dade Co. (31); bakery grade (34). Wadlow obtained tons of honey for 2 or 3 years from solid stand on abandoned to-



Figure 3.—*Jussiaea scabra* (left); *Jussiaea peruviana* (right). PRIMROSE WILLOW.

Photo by Julia Morton.

mato farm at Ochopee; disappeared in a dry season; fire also kills out (34).

Lantana camara. LANTANA. Common weed in dry land; also cultivated. *Season*: all year. Visited occasionally by bees; value questionable (17, 27, 34). In Hawaii considered "of importance to colony" (9). Listed as bee plant of Ghana (15). Plant toxic to grazing animals; unripe fruits toxic to humans (22).

Morinda roioi. WILD MULBERRY; RAT'S PINEAPPLE; SAW WEED; "RHUBARB." Very common in pinelands, hammocks, vacant lots, gardens; often climbing like a vine (5, 22). *Season*: all year. *Nectar*: some; gathered by bees (27).

Oxypolis filiformis. WATER-DROPWORT, "WILD DILL." Low pinelands and shallow ponds, swamps (30). *Season*: late Oct. and Nov. *Nectar*: vigorously worked by wild honeybees. Common in Pinecrest area (A. R. Caves, Homestead; R. W. Read, Fairchild Garden).

Picramnia pentandra. BITTERBUSH. Hammocks and Keys. *Season*: Apr. and May. *Nectar*: one of the last sources each season (27).

Pithecellobium guadelupense. CAT'S CLAW; BLACK-BEAD. Lower east coast pinelands, hammocks, sand dunes; Keys (30). *Season*: Oct. and Nov. (6, 19). *Nectar*: abundant. *Honey*: surplus (19).

Pithecellobium unguis-cati. CAT'S CLAW; BLACK-BEAD. Lower west coast hammocks;

Keys. Season: Mar. and Apr. (5, 27). *Nectar*: abundant. *Honey*: light amber (27).

Pycnothymus rigidus. WILD PENNY-ROYAL; STIFF SAVORY. Pinelands. *Season*: Dec. to Mar.; main flow in Jan. (19). *Nectar*: abundant. *Honey*: light in color with minty odor and flavor (19); quality good; quantity varies with weather; good for building up in early spring (1, 19). Throughout South Florida but of little value to beekeepers south of Lake Apopka (19). Plentiful in Collier County pineland; once important in Tasmania but cattle and fire destroying (34).

Rubus cuneifolius, SAND BLACKBERRY (erect); and *R. trivialis*, SOUTHERN DEWBERRY (trailing). Sandy woods, thickets and fields. *Season*: winter and spring. *Nectar*: gathered by bees (34). *Honey*: white or very light amber (18). Common in Glades Co. and south Highlands Co. (34).

Sambucus simpsonii. ELDERBERRY. Low ground and marshes. *Season*: all year; mainly spring and summer. *Pollen*: moderately abundant, canary-yellow (27); worked by bees only when other pollen is scarce (21). *Nectar*: none in flowers; nectary at leaf base visited by bees occasionally (20, 21, 27, 31, 34). Plant reportedly toxic to grazing animals (22), but was regularly cut and fed to goats at Belle Glade years ago (13).

Sophora tomentosa. NECKLACE POD. Coastal sand dunes; all Keys (30). *Season*: Aug. to Nov. (22). *Nectar*: ample and gathered by bees. *Honey*: surplus (19, 27). Plant and seeds contain toxic alkaloid (22).

Tetrazygia bicolor. TETRAZYGIA. Hammocks and pinelands, Everglade Keys (30). *Season*: May to October. Flowers worked by bees in early morning (A. R. Caves, Homestead).

Tournefortia gnaphalodes. SEA LAVENDER. Coastal sand dunes and Keys. *Season*: all year. Said to produce good honey (27).

Urena lobata. CAESAR BUR; CAESAR'S WEED; "COCKLE-BUR." Hammocks, waste places, roadsides (30); scrub (22). *Season*: all year (2). *Nectar*: gathered by bees (27). Common at Immokalee (22, 34).

Vines

Ampelopsis arborea. PEPPERVINE. In thickets and on fences in low land (22); not on Keys (18). *Season*: spring and early summer (1). *Nectar*: worked by bees (1). *Honey*: dark amber (19); fair quality for table use but apt

to granulate (1). Tends to ferment in combs at Baton Rouge, La. (E. Oertel).

Cardiospermum halicacabum. BALLOON-VINE; HEARTSEED. Moist thickets. *Season*: all year (30). *Nectar*: considerable in some localities (27). *Honey*: light amber; good quality (18).

Cissus sicyoides. WATER LIANA. Hammocks and Keys. *Season*: July and Aug. *Nectar*: visible; gathered avidly during the greater part of the day (27).

Funastrum clausum. MILKWEED VINE. Coastal hammocks, thickets, lake regions, and Keys (30). *Season*: Aug. and Sept., very profuse. *Nectar*: abundant. "A very good honey plant" (34). Common on Tamiami Trail and Immokalee Road; abundant on Janes Memorial Scenic Drive, Copeland (22).

Ipomoea pes-caprae. RAILROAD VINE; BEACH MORNING-GLORY. Sandy beaches. *Season*: spring, summer (22). *Pollen*: white. *Nectar*: abundant. Both gathered by bees (27).

Melothria pendula. MELONETTE; WILD CUCUMBER. Swamps, thickets, canal banks,

cultivated areas (22). *Season*: midsummer to late fall. *Nectar*: gathered by bees at Belle Glade (20). *Honey*: a little too good for bakery; not quite good enough for table; medium light in color (20); usually mixed with smartweed and Spanish needles (17). One year abundant on willows but did not produce honey (23). Also covers elderberries (13) and hives in bee yards on muck; becomes a nuisance (34).

Mikania cordifolia. SNOWVINE; HEMP VINE. Low hammocks, canal banks and trailing over vegetation in canals; climbing to tops of cypress trees in swamps (22); also on Keys (19). *Season*: May to Dec.; profuse in Sept. (22). *Nectar*: much (21). *Honey*: surplus (19); light amber, blends with saw palmetto inconspicuously (21); vanilla-flavored (34). Abundant along Tamiami Trail, Immokalee Road and Janes Memorial Scenic Drive (22).

Momordica charantia var. *abbreviata*. BAL-SAM PEAR. Hammocks, thickets, waste-places (30); fields and groves (22). *Season*: Nearly all year (22). *Pollen*: orange-colored; important (34). *Nectar*: gathered by bees in preference to

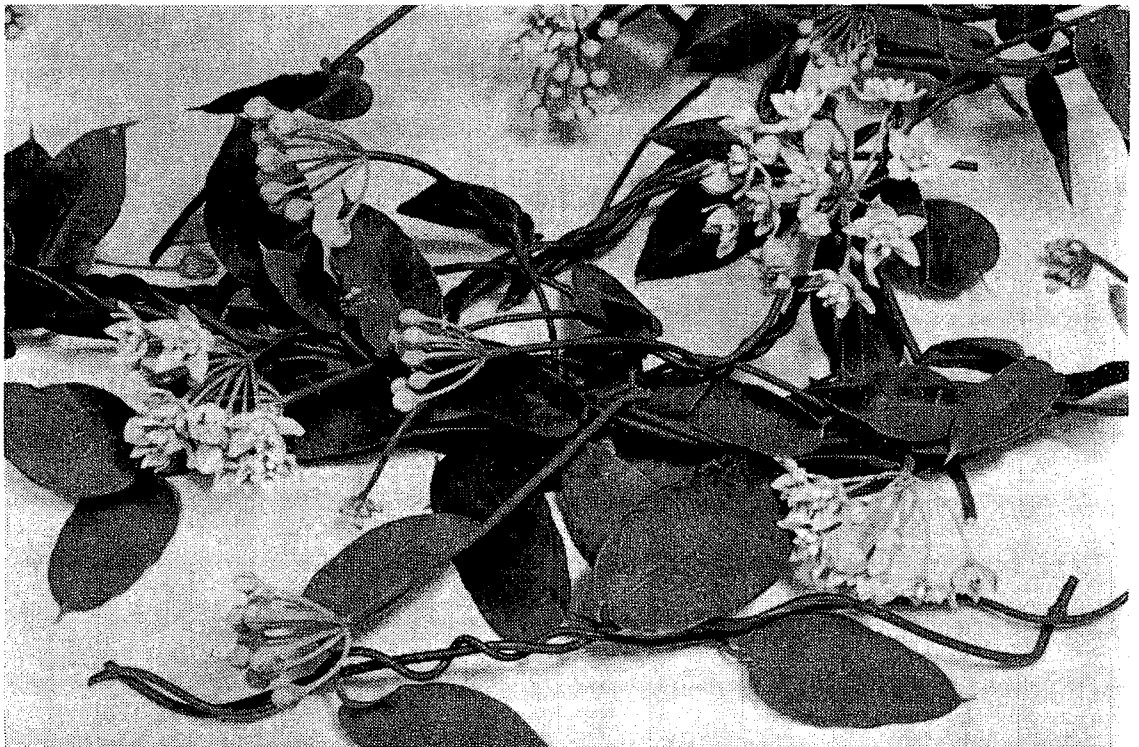


Figure 4.—*Funastrum clausum*. MILKWEED VINE.

Photo by Julia Morton.



Figure 5.—*Mikania cordifolia*. SNOWVINE; HEMP VINE.

Photo by Julia Morton.

various other nearby species (21, 22). Ripe fruit toxic to dogs and children (22).

Mucuna deeringiana. VELVET BEAN. Pine-lands, hammocks, *Citrus* groves and old fields; cultivated as a ground cover (30). *Season*: principally Aug. *Nectar*: much, especially after rains; not all accessible to bees (27); thin at first, thickens as honey ripens (19). *Honey*: white in comb; when extracted yellow or light-brown with vinegar odor and mild acid flavor; granulates quickly on approach of cold weather. Usually fed back for wintering (18).

Operculina dissecta. NOYEAU. Pinelands. *Season*: all year, principally May to Sept. *Pollen*: abundant, cream-colored. *Nectar*: occasionally sought by bees (27).

Parthenocissus quinquefolia. VIRGINIA CREEPER. Woods, hammocks. *Season*: June and July. *Nectar*: good supply (27). *Honey*: light amber, slight reddish cast; pronounced, distinctive flavor (19). Eagerly visited by bees in California but too scarce there to be of importance (33).

Rhus toxicodendron. POISON IVY. Hammocks and pinelands. *Season*: spring and summer. *Nectar*: plentiful. *Honey*: well-ripened is apparently harmless; excellent quality (19); granulates rapidly (33). Surplus seldom obtained in the East (19). Some believe eating the honey develops immunity to the dermatitis commonly caused by contact with this plant.

Vitis spp. GRAPE. Hammocks, pinelands and Keys. *Season*: Apr. *Pollen*: good source and bees work eagerly, but available when there is no shortage (34). *Nectar*: easily accessible (25); light-colored (E. Oertel). *Honey*: good flavor; sours easily (18); no surplus (19). H. B. Lovell describes as reddish but this is questioned by E. Oertel.

Herbs and Grasses

Agave decipiens. FALSE SISAL. Lower Keys. *Season*: Mar. to May. *Nectar*: gathered by bees (19). *Honey*: no surplus (19). Plant has irritant sap (22).

Agave sisalana. SISAL. An escape from cultivation, on vacant pineland. *Season*: May and Oct. (22). *Nectar*: so much that it drops onto leaves and the bees become greatly excited; at times they seem to swarm on the flower spike (27). *Honey*: dark, strong, poor flavor (18). Of great value for brood-rearing (30). Plant has irritant sap (22).

Amaranthus spinosus. SPINY AMARANTH. Common weed in disturbed land. *Season*: June to Sept. *Pollen*: ochre-yellow, abundant; gathered only when other more favored sources are scarce (27).

Ambrosia artemisiifolia. RAGWEED. Abundant on low cultivated land, and waste places. *Season*: summer and fall (27). *Pollen*: green (34); sometimes of value in autumn (19); abundant on muck; little on sand (34). *Nectar*: none (27).

Andropogon glomeratus. BUSHY BEARD GRASS. Low fields and roadsides, swamps, marshes and wet pinelands (30). *Season*: late summer and fall. *Pollen*: collected by bees (21).

Argemone mexicana. MEXICAN POPPY. Common weed of disturbed dry land (22). *Season*: Mar. and Apr. *Pollen*: copper-yellow (27); much sought by beekeepers (3); an especial favorite of bees (27). R. F. Meyer has seen much of this pollen in his hives (21). *Nectar*: scarce. *Honey*: insignificant quantities (3). Plant toxic; seeds fatal to chickens (22).

Aster adnatus.* ASTER. Dry, rocky pine-lands (16) or high canal banks and road shoulders (20). *Season*: Sept. to Nov. (19). *Nectar*: gathered by bees. *Honey*: of fair color, medium quality, granulates rapidly in the comb if not sealed (19); strong odor in hive which disappears when honey is well-ripened (18).

Bacopa monnieri. MONNIER'S HEDGE HYSSOP. Wet ground, sandy shores of rivers

*Also *A. carolinianus*, of swamps, and other species.

and ponds, especially brackish or salty (30). *Season*: all year. *Nectar*: eagerly sought by bees (21, 22).

Bidens pilosa var. *radiata*. SPANISH NEEDLES. Abundant along roadsides, in fields and any disturbed dry land (22). *Season*: some all year, but mainly spring and fall (13). *Pollen*: orange in winter (8); abundant, providing food for colonies (27); most important food of our native bees (11). *Nectar*: some years more than others; plentiful at certain times of year, neither too dry nor too wet (31). Secondary flow and swarming in Sept. and Oct. is primarily due to Spanish needles; cold weather stops it (8). *Honey*: reddish, evident in topping of *Citrus*; thick, fragrant, smooth, mild flavor (21, 22); good-keeping, non-granulating, doesn't foam; many people request it (21), though generally regarded as bakery grade (34). R. F. Meyer sells as "wildflower honey" (8). South Florida beekeepers emphatically contradict Ordetx' statement that, while this plant is proclaimed as a honey source, it actually yields little and product undoubtedly comes from other species (27).

Chamaecrista brachiata. PARTRIDGE PEA; HONEY-CUPS; BEE BLOSSOMS (30). Pinelands and abandoned fields (30). *Season*: early spring to Dec. (2). *Pollen*: gathered by bumblebees (19). *Nectar*: not in flowers but in a disk-like gland on the upper side of the leafstalk near the base. At times in large quantities unless washed away by rains (19). *Honey*: light amber, thin, with poor flavor. Sells because of fine appearance to bakeries (19). Must be heated to prevent fermentation (1).

Cirsium horridulum var. *Elliottii*. PURPLE THISTLE (purple, or nearly red, lavender, yellow, cream or white). Prefers wet soil; also on roadsides, beaches, dry pinelands (16). *Season*: principally May and June. *Nectar*: gathered by bees. *Honey*: a mixture (8). Scattered plants west of Ft. Lauderdale, also in Immokalee area (22); more common in neglected horse pastures in Dade County (8).

Cirsium nuttallii. NUTTALL'S THISTLE. In custard apple muck, stems 2 to 3 in. thick and 3 to 14 ft. tall; not so big in sawgrass muck or dry pinelands. *Season*: right after *Citrus*; Apr. and May and continues sporadically to fall (20). *Pollen*: white, plentiful, collects on bees while gathering nectar (20). *Nectar*: much. *Honey*: light in color, medium thick, good mild or neutral (26) flavor; slow to granulate (1). W. D. Motes started selling Thistle Honey, continued by Markham; in 1950 there were a half-dozen producers

(13); today sugarcane is replacing thistle grounds (26) and sugarcane aphid sucks juices of thistle and has contributed to its decline as a major source of honey (17); now found mainly below Big Cypress (26).

Crotalaria pumila. RATTLEBOX. Hammocks, pinelands, sand-dunes and Keys (30). *Season*: Jan. and Feb. or later. *Pollen and nectar*: gathered by bees (19). Plant toxic to grazing animals and poultry.

Crotalaria spectabilis. SHOWY CROTALARIA. Cultivated as cover crop and escaped in pinelands and fields. *Season*: all year, especially June to Sept. *Nectar*: some years much and considered excellent honey plant; other years nectar scarce; undependable. *Honey*: dark, strong-flavored. Plant becoming common in *Citrus* groves along Route 27 (26). Plant toxic to grazing animals and poultry (22) but sometimes cattle develop tolerance to it and eat the plant and the seeds (34).

Cynodon dactylon. BERMUDA GRASS. Cultivated and wild in fields and waste places. *Season*: variable; all year. *Pollen*: gathered by bees (34, 38).

Desmodium tortuosum (*Meibomia purpurea*). FLORIDA BEGGARWEED; TICK TREFOIL. Roadsides, fields, hammocks (30). Reported of value for nectar or pollen or both (24).

Eichhornia crassipes. WATER HYACINTH. Shallow waterways. *Season*: all year. *Nectar*: apparently some. *Honey*: on rare occasions, water-white (17). Bees have been seen to work the flowers when they first open, not later (21); at times may be merely gathering water (34).

Eupatorium serotinum. BONESET; IRONWEED; THOROUGHWORT. Everglades, along stream and canal banks, in wet prairies, salt flats, edges of mangrove hammocks; rarely in pinelands (16). *Season*: July to Sept. (22). *Nectar*: plentiful. *Honey*: light amber, good quality (13), though strong odor (18); ferments readily and may blow caps off (20). An occasional surplus up to 30 lbs. in Central States (18). Very common on both sides of Rt. 27 east of Clewiston and along Flamingo Rd. west of Hollywood (22). High water causes plant to disappear (20).

Euphorbia heterophylla. PAINTED LEAF; WILD POINSETTIA. Pinelands and roadsides. *Season*: Aug. and Sept. *Pollen*: some. *Nectar*: abundant (27); gathered by bees but acrid and unfit for honey (28). Plant toxic to cattle; sap caustic to human skin (28).

Euphorbia hirta. ASTHMA PLANT; "MILKWEED." Hammocks, roadsides, fields. *Season*:



Figure 6.—*Eupatorium serotinum*. THOROUGHWORT, BONESET, or IRONWEED.

Photo by Julia Morton.

spring and summer. *Nectar*: apparently not much but visited by bees especially the day after a rain (27).

Helianthus agrestis. PRAIRIE SUNFLOWER. Pinelands, scrubs, prairies (30). *Season*: scarce in April; mainly Oct. and Nov. *Nectar*: abundant (27). *Honey*: golden; strong flavor (19); some people like it, but usually bakery grade; granulates readily with a coarse grain (34). Plentiful around Bee Ridge (21). Used to be important source between Palmdale, Moore Haven and Tasmania; virtually disappeared due to drainage; needs fire for germination; now spreading around Immokalee and into Big Cypress (34).

Heliotropium leavenworthii. HELIOTROPE. Low hammocks and wet places, mostly in Everglades (30); also pinelands (22) and Keys. *Season*: all year. *Nectar*: worked by bees (21).

Iresine celosia. WHITE GOLDENROD. Hammocks, marshes, old fields (30), and roadsides (2). *Season*: summer and fall, or all year (30). Visited by bees (21).

Liatris spicata. BLAZING STAR. Moist woods; low pinelands, wet prairies, etc. (16). *Season*: fall. *Nectar*: gathered by bees on muck land (34).

Lippia nodiflora. CREEPING CHARLIE, MATCHWEED; CAPE VINE. Common weed in lawns, pastures, groves and on roadsides. *Season*: May to Sept. *Nectar*: none on sand; on muck, the flow is steady and abundant (26). *Honey*: white or sometimes light-amber, mild in flavor, distinctive (26); heavy, granulates with a fine grain; quality equal to that from alfalfa (19). Good honey source in pastures in Caloosahatchee River valley (26). Varies with climatic conditions. In Texas considered poor source (33). J. H. Lovell states this to be one of the principal honey plants of Louisiana (19). E. Oertel considers this report erroneous.

Paspalum notatum. BAHIA GRASS. Cultivated in pastures. *Season*: spring. *Pollen*: gathered by bees (34, 38).

Pluchea foetida, MARSH FLEABANE, locally "QUEEN OF THE MEADOW" (low plant



Figure 7.—*Lippia nodiflora*. CREEPING CHARLIE, or MATCHWEED.

Photo by Julia Morton.

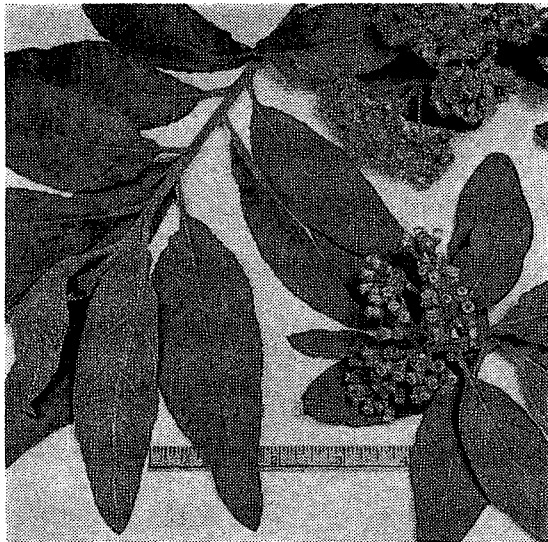


Figure 8.—*Pluchea odorata*. SHRUBBY FLEABANE.

Photo by Julia Morton.

of wet areas; *season*: all year), and *P. odorata*, SHRUBBY FLEABANE (bushy plant of hammocks and waste ground; *season*: spring and summer). *Pollen*: grayish-white (27). *Nectar*: abundant (27). *Honey*: light-amber, strongly aromatic (27); usually mixed with ironweed and *Sesbania* (31). Scattered throughout South Florida.

Polygonum punctatum. SMARTWEED; WATER SMARTWEED. (White-flowered; not pink). Low grounds and swamps (30). *Season*: mid- or late-summer to Dec. in Collier County (34); mostly Sept. and Oct. in Belle Glade muck (23). *Nectar*: very abundant if water below ground level; if water above ground, plenty of bloom but no nectar yield (20). *Honey*: light-amber, thin, ferments quickly unless thoroughly ripened (26); bakery grade; moisture high, like cabbage palmetto will sometimes blow caps off; must be fully capped before removed (34). Some solid stands have now disappeared with drainage (34).

Pontederia cordata. PICKEREL WEED; "BLUE FLAG LILY." Swamps and shallow waterways. *Season*: summer and fall. *Nectar*: heavily worked by bees (18).

Portulaca oleracea. PURSLANE. Hammocks, pinelands, cultivated ground and waste places (30); all Keys. *Season*: summer and fall. *Nectar*: flowers open in early morning and then close; nectar scarce; visited by few bees (27). *Honey*: sometimes a surplus (19). In cantaloupe

fields, bees prefer this plant and it gives poor flavor to cantaloupe honey; should be weeded out before melons bloom, in order to get better pollination of melons (31).

Richardia scabra. "PUSLEY"; MEXICAN CLOVER; FLORIDA CLOVER; SPANISH CLOVER. Common weed along roads and in cultivated fields. *Season*: all year. *Nectar*: much. *Honey*: light-amber, thin, with tart flavor; may ferment (18); not first quality but used by bees for winter brood-rearing (1).

Rudbeckia hirta. BLACK-EYED-SUSAN. Fields, roadsides. *Season*: June to Oct. *Nectar*: gathered by bees. *Honey*: yellow-amber, strong flavor; not very desirable (18). Becoming common along Tamiami Trail 40 miles west of Miami, and from Naples north (16).

Sagittaria lancifolia. ARROWHEAD. Swamps, ponds, and low river banks (30). *Season*: all year. *Nectar*: gathered by bees (34).

Senecio glabellus. BUTTERWEED; "WILD MUSTARD." Wet soil and river bottoms (30). *Season*: Apr., May and June. *Nectar*: plentiful; yields heavily (34). *Honey*: golden-amber (20) and strong (17), especially after extraction (20); slightly bitter (34); sold for blending and bakery (17); good for spring build-up (34). Common in low places north and west of Hialeah and along some ditches and canals in Collier Co. (16); flatwoods pastures as well as sand and muck soils around Lake Okeechobee and southward (Ever-

glades Sta. Mimeo. Rpt. 63-15). Disappearing because of weed-killing in pastures (13). Plant toxic to cattle (22).

Sida acuta. WIREWEED; TEAWEED; BROOMWEED. Pinelands, hammocks, cultivated ground (30), roadsides, overgrazed pastures, neglected dooryards (22), dry muck (20). *Season*: all year; main flow in Jan. (34). *Pollen*: abundant, gathered by bees (20). *Nectar*: plentiful in muck (34) and gathered by bees (21).

Solidago fistulosa, GOLDENROD (low areas in pinelands, in marshes and borders of swamps (2)), and *S. sempervirens* (coastal salt flats and marshes, also inland marshes, meadows and glades, wet ditches, roadsides (16)). *Season*: late summer and fall. *Nectar*: gathered by bees (34). *Honey*: medium amber, strong odor and flavor, good body, granulates rapidly; bakery grade (20). W. E. Addison of Fort Pierce suggests the golden amber and slightly bitter flavor of Sept. and Oct. honey may be due to goldenrod.

Solidago microcephala. FLAT-TOPPED GOLDENROD. Open fields and flatwoods (1). *Season*: Sept. and Oct. or Nov. *Nectar*: plentiful except on muck (17). *Honey*: golden, heavy; should be well-ripened (19); quality poor when first stored, later rich and pleasant; granulates with coarse grain in two months. Seldom a surplus. Bees use for winter feeding. Very good source at Palmdale especially in improved pastures; depended on for late increase after summer honey (34).

Sonchus asper. SPINY-LEAVED SOW THISTLE. Waste places, fields and roadsides (30). *Season*: spring. *Nectar*: Bees work the yellow heads (21) and have been found working the intermediate stage between flowering and the dispersal of the pappus (22). *Honey*: light amber. Used to be considered good source (17). In 1930's was abundant in bean fields around Belle Glade and South Bay (13).

Sonchus oleraceus. SOW THISTLE. Cultivated grounds, waste-places and fields (30). *Season*: spring, summer in Florida. *Nectar*: In Hawaii, "insects may gather nectar from flowers during most of the year" (28). Listed in California bulletin 217 (1911) as a honey plant of California.

Stenotaphrum secundatum. ST. AUGUSTINE GRASS. Planted in pastures and for lawns. *Pollen*: gathered by bees (34, 38).

Teucrium Nashii. GERMANDER; WOOD-SAGE. Hammocks, thickets, wet grounds, often limestone soils (30). *Season*: June. *Nectar*:

worked well by bees (34). *Honey*: not known; mixed with that of other wild flowers (34).

Tithonia diversifolia. MEXICAN SUNFLOWER. Pinelands, roadsides and gardens (30). *Season*: winter. *Pollen and nectar*: very attractive to bees (27).

Tribulus cistoides. PUNCTURE VINE. Hammocks, waste places and cultivated as ground cover. *Season*: all year. *Pollen*: canary-yellow; collected by bees (27). *Nectar*: collected actively by bees (34) between the corolla and the calyx (27). "Of importance to colony" (9). Spreading on road shoulders from Palm Beach to Clewiston (34).

Trichostema suffrutescens. BLUE CURLS. Scrub (30). *Season*: spring to Sept. Vansell lists *Trichostema* as a nectar or pollen plant of California (32). Numerous insects seen hovering over the blooms on Key Biscayne (22).

Typha angustifolia. CATTAIL. Swamps and shallow waterways. *Season*: Dec. to May. *Pollen*: immense quantities (19).

Valerianoides jamaicensis. BLUE PORTERWEED; SPIKEWEED. Pinelands, coastal sand dunes, waste places (30). *Season*: June to Oct. or later (22). *Nectar*: gathered by bees. *Honey*: surplus; amber, strong of flavor; for bakery and blending (17). Of importance to colony (9). In 1962 there was a solid stand from Belle Glade to 20 Mile Bend (34). Very common on Key Largo (22).



Figure 9.—*Valerianoides jamaicensis*. BLUE PORTERWEED, or SPIKEWEED.

Photo by Julia Morton.

Yucca aloifolia. SPANISH BAYONET; BEAR GRASS. Sand dunes and cultivated. *Season*: Apr., May, June. *Nectar*: very little secreted in *Yucca* species generally (19). On occasion visited by many bees (27). *Honey*: no surplus (19).

Cacti

Opuntia austrina (low-growing) and *O. dilenii* (up to 6 ft.). PRICKLY PEAR. Pinelands and old pastures. *Season*: all year. *Pollen*: abundant (11, 34). *Nectar*: some years, none (11); some years, much, especially in hot humid weather (19). Bees may collect the red juices of the fruit, making red spots in honeycombs (19).

FIELD CROPS

Aloe barbadensis (*A. vera*). ALOE; MEDITERRANEAN ALOE. *Season*: Feb. and Mar. *Pollen*: yellowish; gathered by bees. *Nectar*: abundant; flowers hang down and nectar drips around the inside of the corolla from where it is gathered by bees (34). *Honey*: dark; bitter. At Palm Lodge Tropical Grove, Homestead, Albert Caves breaks off the flower spikes which are considered detrimental to development of the plant; bees continue to work the discarded flowers.

Cajanus indicus. PIGEON PEA. *Season*: winter. *Nectar*: little; visited by few bees (27).

Citrullus vulgaris. WATERMELON. *Season*: spring. *Nectar*: moderate. *Honey*: amber, not choice flavor; bakery grade or blending, very little surplus because so many bees are killed by insecticides (34). Watermelons dependent on bees for pollination; at least 8 visits per blossom for viable seed. Wadlow rents more hives for watermelon fields than any other crops (34).

Cucumis melo. MELON, CANTALOUPE. *Season*: Mar. and Apr. *Pollen*: more abundant than nectar. *Nectar*: moderate quantity, but in large cantaloupe fields plenty for a good honey harvest (27). *Honey*: medium-light in color, medium thick; good flavor (19, 31). Melons should have one hive per acre; need more than 8 visits per blossom (31).

Cucumis sativus. CUCUMBER. *Season*: early crop bloom is in Oct.; late crop from late Jan. to Mar. *Pollen*: plentiful. *Nectar*: very little; need a large field for any quantity (31). *Honey*: pale-yellow or amber; flavor strong at first, later mild; tastes like cucumber (27), low yield (31). Cucumber requires pollination; usually interplanted with sunflower which must be cut so bees will concentrate on cucumber (31).

Cucurbita maxima. SQUASH. *Season*: Oct. to Apr.; plantings staggered in series of 20 acres (31). *Pollen*: gathered from male flowers. *Nectar*: abundant (19). *Honey*: medium-light, good quality; color and flavor differs with variety. Calabaza honey is yellowish like that from *Sesbania* and resembles the latter in flavor. Crookneck and Acorn squash honey distinct. Steely rents more hives for squash than for any other crop and squash is in all his honey (31).

Fragaria virginiana. STRAWBERRY. *Season*: all winter and well into spring. *Pollen*: gathered from perfect flowers. *Nectar*: scarce; bees do not visit frequently. *Honey*: no surplus (19). Some strawberry varieties need pollination to set a crop (31).

Helianthus annuus. SUNFLOWER. *Season*: Oct. to Apr. *Pollen*: abundant for a long time. *Nectar*: Some, avidly worked by bees (31). *Honey*: amber, with characteristic flavor, granulates fast. One winter a good yield at Belle Glade (23). Cultivated as windbreak for cucumbers and, to a lesser extent, for beans; seed not harvested in South Florida; no viable seed on muck (23).

Hibiscus cannabinus. KENAF. *Season*: all year. *Nectar*: extra-floral nectaries on leaves exude sweet juice in early morning (10). *Honey*: light amber, resembles that from primrose willow (20).

Hibiscus esculentus. OKRA. *Season*: winter in commercial plantings. *Nectar*: much; not fully accessible to bees; flow ceases at noon; bees seek within flower and between the corolla and the calyx, the inner face of which is coated with a sweet substance (27). *Honey*: hard to obtain pure; mixture is sufficiently light and of good quality (27). Dr. Frank Robinson, Entomologist, Univ. of Florida, believes an extra-floral nectary is worked, not the flower.

Melilotus alba var. *annua*. SWEET CLOVER (Hubam and Floranna varieties). *Season*: winter. *Nectar*: plentiful. *Honey*: excellent (34). Planted for pastures on moist soil not subject to flooding.

Panicum purpurascens. PARA GRASS. Fred Steely planted as forage for mules. One morning found bees all over the grass gathering honeydew produced by aphids or possibly the sweet juice of the grass (31).

Phaseolus vulgaris. BUSH BEAN (Bountiful variety). *Season*: winter. *Nectar*: some years abundant. *Honey*: occasionally a surplus; light in color and of good table quality (20).

Saccharum officinarum. SUGARCANE. *Season*: Oct. to Apr. *Pollen and nectar*: none. When no nectar plants are available (20) and bees are desperate, they will avidly seek the sweet juice from cut stalks, producing a dark honey of low quality (17). This may be discarded or sometimes sold to cookie manufacturers (34). The stalks used to lie in piles and bees produced a surplus, but mechanical harvesting is so much quicker there is less opportunity for bees to gather the juice. Also, new cane varieties with harder and smaller stalks ooze less juice (13). The sugarcane leaf hopper excretes a honeydew and in the early 1900's plagued the Hawaiian cane fields. During that period, Hawaii exported over 400 tons of honeydew annually. It was very dark amber, slightly ropy and molasses-flavored, did not granulate and was used by bakers (33).

Sesbania emerus. SESBANIA. *Season*: late summer. *Pollen*: some. *Nectar*: much; dependable flow (31). *Honey*: light yellowish, like Calabaza squash in appearance and taste (31); flavor not very appealing (34).

Trifolium repens. WHITE CLOVER; WHITE DUTCH CLOVER (Louisiana variety). *Season*: midwinter to Mar. (13, 20). *Pollen*: plentiful, gathered when bees are taking nectar (19, 25). *Nectar*: quantity varies with strain and other factors: highest on limestone (19), sparse on muck; none on sand (20). *Honey*: light in color, of medium density, acrid flavor (22). "Clover has such a dominant flavor that more than 10% in a blend is noticeable. We usually blend with palmetto, gallberry and black mangrove" (7). Planted for pasture and for seed at Cocoa; for seed requires pollination.

Zea mays. CORN. *Season*: winter, spring. *Pollen*: much, gathered by bees (20). *Nectar*: none. "Under some conditions, bees may fill frames with corn pollen. Reports of corn honey have arisen from rare occurrence of much honeydew from aphids which bees gather. Bees also collect sap from cut stalks." (19, 33).

CULTIVATED FRUITS

Trees

Achras zapota. SAPODILLA. *Season*: Mainly winter and spring. *Nectar*: questionable source but in Yucatan and Colima locally called "zapote de abejas" (bee sapote) (27). Bees eagerly suck juice from holes in fallen fruits (4).

Anacardium occidentale. CASHEW. *Season*: Feb. and Mar.; sometimes second flowering in

May or June. *Nectar*: a rich supply, gathered by numerous bees all day (15, 27).

Averrhoa carambola. CARAMBOLA. *Season*: Dec. to Feb. and at other times throughout year (22). *Nectar*: copious (27).

Blighia sapida. AKEE. *Season*: May and Oct. Bees seen vigorously working the blooms all day at Subtropical Experiment Station, Homestead, and U. S. Plant Introduction Station, Miami (22).

Calocarpum mammosum. SAPOTE. *Season*: fall and winter. *Nectar*: abundant (27).

Casimiroa edulis. WHITE SAPOTE. *Season*: Jan. and Feb. *Nectar*: abundant; gathered eagerly by bees in great numbers (27).

Citrus aurantifolia. LIME. *Season*: all year. *Nectar*: not a great deal. *Honey*: a small surplus (19). Fred Steely's bees have almost starved several years in an 80-acre lime grove (31).

Citrus limonia. LEMON. *Season*: spring, or all year with some varieties. *Nectar*: near coast yields much. *Honey*: light-yellow, with strong acid flavor and lemon aroma. Not as important as the orange as a honey plant (19).

Citrus mitis. CALAMONDIN. *Season*: Aug. and Sept. or all year if forced. Honeybees employed to pollinate 6 acres of calamondins at Vosters Nursery grown as potted "miniature oranges." *Nectar*: plentiful, bees work continuously. *Honey*: Joe Borden, Perrine, has obtained a surplus; aromatic, orange-amber, not very dense, with rich, pleasant flavor and a slightly acid aftertaste, especially when first taken from hive (4).

Citrus sinensis. ORANGE; SWEET ORANGE. *Season*: Feb. through Apr. *Nectar*: more abundant than in other *Citrus*. In good weather yields more nectar than any other source in U. S. dripping on pickers, equipment and the ground in California. Florida nectar flow not as copious (19); as stated, varies with soil (17, 34). *Honey*: some years almost white or pale-yellow; some years dark amber; always darkens with age (29, 31, 34); clear, heavy (19); pleasant in flavor, with orange-blossom odor. Granulates a few months after extraction, so in California sage honey is preferred by dealers (19).

Citrus paradisi. GRAPEFRUIT. *Season*: Mar. and Apr. *Nectar*: good supply. "Adds materially to the crop of *Citrus* honey" (18).

Clausena lansium. WAMPEE. *Season*: spring. "Important to colony" in Hawaii (9).

Eriobotrya japonica. LOQUAT. *Season*: July; also Oct. to Feb. *Pollen*: much (19). *Nectar*: moderate (19) to abundant (33), worked by many

honey bees during sunny hours (21, 33). *Honey*: amber and of good flavor (19).

Eugenia uniflora. SURINAM CHERRY. *Season*: Jan. and Feb. *Pollen*: white or cream-colored; a major source, gathered in the morning (27). *Nectar*: probably some (15).

Flacourtia indica. RAMONTCHI; GOVERNOR'S PLUM. *Season*: Mar. Honeybees seen actively working the blooms (22).

Hovenia dulcis. JAPANESE RAISIN TREE. *Season*: Apr. Honeybees seen busily working the blooms at the Subtropical Experiment Station, Homestead (22).

Litchi chinensis. LYCHEE. *Season*: Feb. and Mar. *Nectar*: Eagerly sought by bees (22, 31), in preference to other sources (37). *Honey*: Mrs. R. J. Sunman, Rt. 5, Box 221, Ft. Myers, writes: "We found a wild hive of bees in a metal box in the lychee grove. The honey was the best I ever ate. It is a real light amber color." E. Carter Worley, of Miami, reports: "In 1963, my lychee honey was dark, exceedingly thick; it was 3 or 4 months before all bubbles rose to the top; probably due to very dry weather. In 1964, honey was light amber, of medium-heavy density, non-granulating. February rains and new canal may have provided bees with sufficient moisture to make this difference. Avocado, mango, tangelo trees and Spanish needles were in bloom at the same time and the honey may have been a mixture." (37) It was sweet but with a delightful lime-like flavor (22). After birds or other predators make holes in the skin of the ripe fruits, bees avidly seek the sweet juice (37).

Macadamia integrifolia. MACADAMIA NUT. *Season*: spring. *Pollen*: "enormous amounts, gathered by pollen-collecting honeybees." *Nectar*: gathered from the base of the style and the lower extremities of the sepals where the nectar accumulates. Honeybees are the principal insects working macadamia blooms. (Ukio Urata, *Pollination Requirements of Macadamia*; Hawaii Agric. Exp. Sta. Tech. Bul. 22, June 1954).

Mangifera indica. MANGO. *Season*: Nov. to Apr. (early and late varieties). *Pollen and nectar*: plentiful in early morning in warm weather with adequate rain; greatly reduced by cold and drought (27). *Honey*: brownish-amber, cappings sandy-brown (4); dense and of distinctive flavor in Florida; very dark in Jamaica (27). In Florida, bees seldom work mango blossoms (8, 21, 31, 37). Fred Steely says he had mango honey once; had hives in groves 2 years before they were filled; a Cuban worker was able to select the combs of mango honey because of their

dark-amber color and distinctive flavor (31). Bees sometimes feed on the sweet juice of fallen fruits pecked by birds (27).

Melicocca bijuga. MAMONCILLO; SPANISH LIME. *Season*: Mar. and Apr. *Nectar*: much. *Honey*: somewhat dark but of agreeable flavor (27).

Mimusops elengi. INDIAN MEDLAR. *Season*: June and July. *Nectar*: not much (27).

Muntingia calabura. JAMAICA CHERRY. *Season*: nearly all year, especially spring and summer. "Impossible to determine value as honey plant, may produce as much as those of shorter season" (27).

Persea americana. AVOCADO. *Season*: Feb. to Apr. (early and late varieties). *Pollen*: gathered moderately by bees (33). *Nectar*: abundant in favorable weather conditions. *Honey*: generally mixed from various sources; when pure is dark, like cane sirup and thick (15, 27); favored by buckwheat-honey fanciers (31).

Pouteria campechiana. CANISTEL; EGG-FRUIT. *Season*: Apr. and May. *Nectar*: valuable source (27).

Psidium guajava. GUAVA. *Season*: mainly spring; some all year. *Nectar*: Cited as good source in Hawaii, Puerto Rico and Brazil. Ordetx feels it is not of great importance to beekeepers (27). In Hawaii said to be of importance to colony (9). No reports obtained in Florida (22).

Syzygium cumini. JAMBOLAN. *Season*: Feb. and Mar. *Nectar*: abundant, all day. *Honey*: light amber; flavor inferior to mesquite; slow to granulate (9). A great honey plant (27). Next to largest producer (mesquite) in all Hawaiian islands (9). Furnishes most of the honey in the Western Ghats, India (Firminger's *Gardening in India*).

Syzygium jambos. ROSE APPLE. *Season*: spring. *Nectar*: good supply. *Honey*: amber, according to Irvine and Ordetx, but rose apple honey brought to me by E. Carter Worley is brown, medium dense, and has a pleasant, mild sorghum sirup flavor (22). Good harvest every year in Cuba. "One of the fruit trees of greatest value to the beekeeper" (27).

Tamarindus indica. TAMARIND. *Season*: late summer and fall. *Nectar*: not abundant but in this time of scarcity is very useful to beekeepers where tree is common (27). Flowers always visited by bees (15).

Zizyphus mauritiana. INDIA JUJUBE. *Season*: trees vary, from Aug. to Oct. (22). Numerous honeybees and other insects observed working the blooms (22).

Large Herbs

Carica papaya. PAPAYA. *Season*: all year.

Pollen: some, especially from male flowers. *Nectar*: some (27). Flowers are pollinated by the sphinx moth (13).

Musa paradisiaca var. *sapientum*. BANANA. *Season*: all year. *Pollen*: very abundant. *Nectar*: plentiful though not fully accessible to bees, otherwise it would be a valuable plant for apiculturist (27). Apple banana nectar drips on ground; Laymond Hardy has seen bees collecting it as it flows from the flowers in the morning (13). *Honey*: In Jamaica, dark, thick, flavor not very tempting (27). In Queensland, Aust., reported to be light-colored and of fair quality (19).

Vines

Passiflora edulis. PASSION FRUIT. *Season*: spring and summer. *Pollen and nectar*: very attractive to bees; nectar visible in nectaries throughout the day (27).

Sechium edule. CHAYOTE. *Season*: late summer; late winter. *Nectar*: male and female flowers have 10 glands secreting nectar in abundance and some beekeepers believe the vine one of the best honey plants in the world (27).

CULTIVATED ORNAMENTALS

Trees

Acacia farnesiana. SWEET ACACIA. *Season*: early spring, summer or all year (36). *Pollen*: abundant (27) and important (18). "Valuable source for construction of honey combs" (Audas, *Native Trees of Australia*). *Nectar*: very little or none (27). Stated to be of importance to the colony in Hawaii (9); listed as a bee plant of Ghana (15). Vansell says in the majority of acacias the nectaries are extra-floral (33).

Albizia lebbek. LEBBEK, WOMAN'S TONGUE. *Season*: spring. *Nectar*: mostly inaccessible to bees (27); difficult to collect (15). Of little use in apiculture (27).

Albizia thorelii. *Season*: Feb. Bees seen working the flowers at the U. S. Plant Introduction Station (22).

Bixa orellana. ANNATTO. *Season*: Sept. and Oct. *Nectar*: some, gathered by bees. *Honey*: dark-red, medicinal, in Brazil (27).

Bucida buceras. BLACK OLIVE. *Season*: May. *Nectar*: at times secreted in abundance and

eagerly visited by bees. Cannot be depended on every year (27).

Callistemon viminalis. WEEPING BOTTLE BRUSH. *Season*: spring. *Pollen*: of medium importance. *Nectar*: gathered by bees. *Honey*: medium amber. Of minor importance as a honey source (3).

Cassia fistula. GOLDEN SHOWER. *Season*: May and June. Visited by bees but of no importance as a honey plant (27).

Casuarina glauca. "BRAZILIAN OAK." *Pollen*: minor source. *Honey*: none (3).

Ceiba pentandra. KAPOK. *Season*: Dec. to Mar. *Pollen*: abundant; orange. *Nectar*: copious. *Honey*: amber; of characteristic taste; generally mixed. Considered one of the most valuable trees of apiculturists in the Tropics (27).

Cochlospermum vitifolium. "BUTTERCUP TREE." *Season*: late winter. Reported as a honey plant in Panama (27).

Delonix regia. ROYAL POINCIANA. *Season*: May-Aug. (22). *Nectar*: usually little or none; some years, in rainy periods, much and bees gather excitedly (31).

Eucalyptus spp. EUCALYPTUS. *Season*: chiefly winter and spring. Flowering may occur annually or every 2, 3 or 4 years. *Pollen*: in some species, little or none; in others abundant. *Nectar*: copious in some species, less in others. *Honey*: varies greatly in color, flavor and quality. Some eucalypts rated among best honey plants in the world and provide most of the honey crop of Australia (Penfold & Willis, *The Eucalypts*). In California, *Eucalyptus* honey usually dark, thin and poor-flavored (19). In Florida, a *Eucalyptus* plot, intended as a nectar source, is not yet of flowering age (Elbert Schory, Tropical Forester, Fort Myers).

Gliricidia sepium. MADRE DE CACAO. *Season*: Jan. to Mar. *Nectar*: early in morning and in afternoon; also bees visit fallen flowers. *Honey*: light-amber, very dense but generally mixed. Very sensitive to climate; in dry seasons, no nectar; rain brings intense flow. Considered good honey plant in Cuba (27).

Grevillea robusta. SILK OAK. *Season*: spring. *Pollen and nectar*: both gathered by bees. *Honey*: dark; pronounced flavor; and very dense (27, 33).

Hibiscus tiliaceus. MAHOE. *Season*: nearly all year; least in winter. *Nectar*: flowers so full of slightly sweetened water that ants compete with bees and drown. *Honey*: amber and of good quality (27).

Jacaranda acutifolia. JACARANDA. *Season*: May; also Aug. (22). *Nectar*: good source (27). In California, *J. ovalifolia* worked freely for pollen and nectar (33).

Jatropha curcas. PHYSIC NUT. *Season*: Apr. and May. *Nectar*: abundant; sought by bees but difficult to collect. *Honey*: dark-amber, strong, but agreeable in flavor. One of the last sources of the season (27). A bee plant of Ghana (15). Seeds poisonous (22).

Kigelia pinnata. SAUSAGE TREE. *Season*: June and July. Flowers open after sunset and close in the morning (22). Said to be visited by bees (27).

Koelreuteria formosana. GOLDEN RAIN TREE. *Season*: fall. No information on this species but the hardier *K. paniculata*, grown in other southern states and in California is worked heavily for nectar (18, 33).

Lysiloma latisiliqua. SABICU. *Season*: May. Bees observed eagerly working the blooms (22).

Melaleuca leucadendron. CAJEPUT; PUNK TREE. *Season*: mainly Oct., Nov., Dec.; lesser bloom in June and July (22). *Nectar*: plentiful; causes penetrating odor in apiary. *Honey*: amber; strong flavor disliked by most people; somewhat bitter (1); very sugary, granulates readily (21). Some is sold to health food stores and some to wholesalers for blending (31), being usable in 1-20 ratio. As much as 5% cajeput in *Citrus* honey makes the latter unsalable as such. One producer declares the bad flavor is dispelled by much stirring; another heats the honey; another heats in the sun but is troubled by bees which come to steal from the drums. R. F. Meyer states that when allowed to stand in drums covered with cheesecloth, the honey will lose its objectionable flavor. There was much alarm among beekeepers when cajeputs were planted for erosion control around Okeechobee but it subsided when it was emphasized that the trees do not bloom the same time as *Citrus*. Those who raise package bees for sale have found cajeput honey excellent for rearing them (26). In cajeput areas, Wadlow strips supers off and puts in foundations, and the bees draw wax and utilize the nectar in wax-building instead of honey (34). Bees will draw wax faster on this than on anything else (21). Some people believe that eating cajeput honey will develop immunity to the respiratory irritation caused by the trees when in bloom (22).

Melia azedarach. CHINABERRY. *Season*: May and June. *Nectar*: gathered by bees (15),

but usually with little interest (27). *Honey*: bees store the honey when colony needs are great for brood-rearing (33).

Moringa oleifera. HORSERADISH TREE. *Season*: all year. Bees apparently gain some sustenance from the flowers (27). Listed as a bee plant of Ghana (15).

Parkinsonia aculeata. JERUSALEM THORN. *Season*: Mar. to Oct. *Nectar*: not very attractive to bees (27). *Honey*: amber; fair flavor; seldom a surplus (18). Considered of medium importance in Texas where it abounds (18). Listed as a bee plant of California (32).

Peltophorum inerme. YELLOW POINCIANA. *Season*: June to Sept. *Nectar*: the principal source for honeybees in Manila, Philippines (27).

Pithecellobium dulce. GUAMUCHIL. *Season*: Dec. to Apr. *Pollen and nectar*: both abundant (15, 27). *Honey*: always a mixture; is of good quality (27). Sap of tree irritates skin (22).

Pithecellobium flexicaule (*Ebenopsis flexicaulis*). TEXAS EBONY. *Season*: flowering induced by spring and summer rains, occurs 2 or 3 times a year. *Nectar*: flows for a week. *Honey*: good quality; light in color (27).

Pongamia pinnata. PONGAM. *Season*: May; also Sept.-Oct. *Pollen*: good source. *Nectar*: Bees collect eagerly. *Honey*: surplus; dark; sweet at first with "chalky" aftertaste; medium dense (4). Seeds and roots used as fish poison. (22).

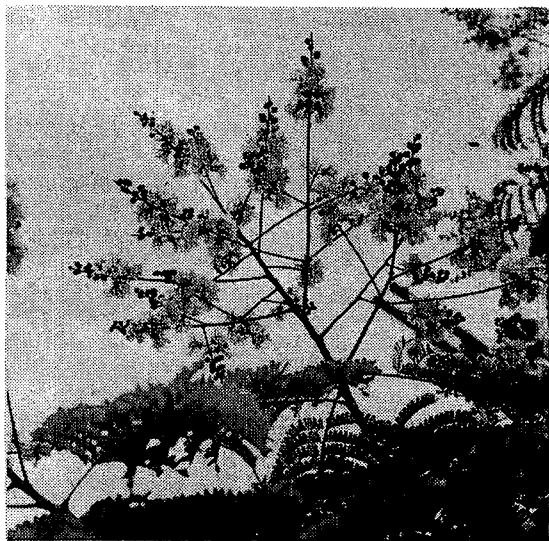


Figure 10.—*Peltophorum inerme*. YELLOW POINCIANA. Photo by Julia Morton.

Schinus terebinthifolius. BRAZILIAN PEPPER; "FLORIDA HOLLY." *Season*: Aug. to Oct.; light bloom in spring. *Nectar*: plentiful; at times eagerly sought by bees but they may abruptly shift to disinterest (21, 27). *Honey*: medium amber, of medium density, with distinctive peppery taste (22). Sells readily as "Florida holly honey" (21). Plant considered good source of honey at Palm Beach and around Miami, Ochopee, Immokalee and other areas where it has escaped and formed extensive thickets (22). When in bloom the plant may cause skin and respiratory irritation. Fruits eaten in quantity by children or pets may cause enteritis (22).

Stenolobium stans. YELLOW ELDER. *Season*: Oct. and Nov., with lesser bloom in spring. *Nectar*: much; popular with bees (31). Valuable for commercial apiculturist (27).

Tabebuia argentea. SILVER TRUMPET TREE. *Season*: spring. *Nectar*: much; attracts many bees but the tube is too deep and they don't get all (27).

Tabebuia pentaphylla. PINK TRUMPET TREE. *Season*: Mar. and Apr. (time of scarcity

of other sources). *Nectar*: gathered from flowers on tree and on ground. Valuable to apiculturist (27).

Terminalia arjuna. ARJAN. *Season*: June to Aug. *Nectar*: plentiful (27).

Terminalia catappa. TROPICAL ALMOND. *Season*: Feb. and Mar. *Nectar*: not abundant; mostly inaccessible to bees (27); difficult to collect (15).

Tetrapanax papyriferum. RICE-PAPER PLANT. *Season*: winter. Blooms (in huge sprays) irresistible to honeybees who abandon other plants in favor of this (Ray Turner, Miami).

Thevetia peruviana. LUCKY NUT. *Season*: nearly all year. *Nectar*: abundant. *Honey*: quality unknown (27). Plant toxic; seeds very dangerous (22).

Palms

Arecastrum romanzoffianum. QUEEN PALM. *Season*: May, and at other times (22). *Nectar*: probably copious; bees observed working in great numbers (17, 20, 22).

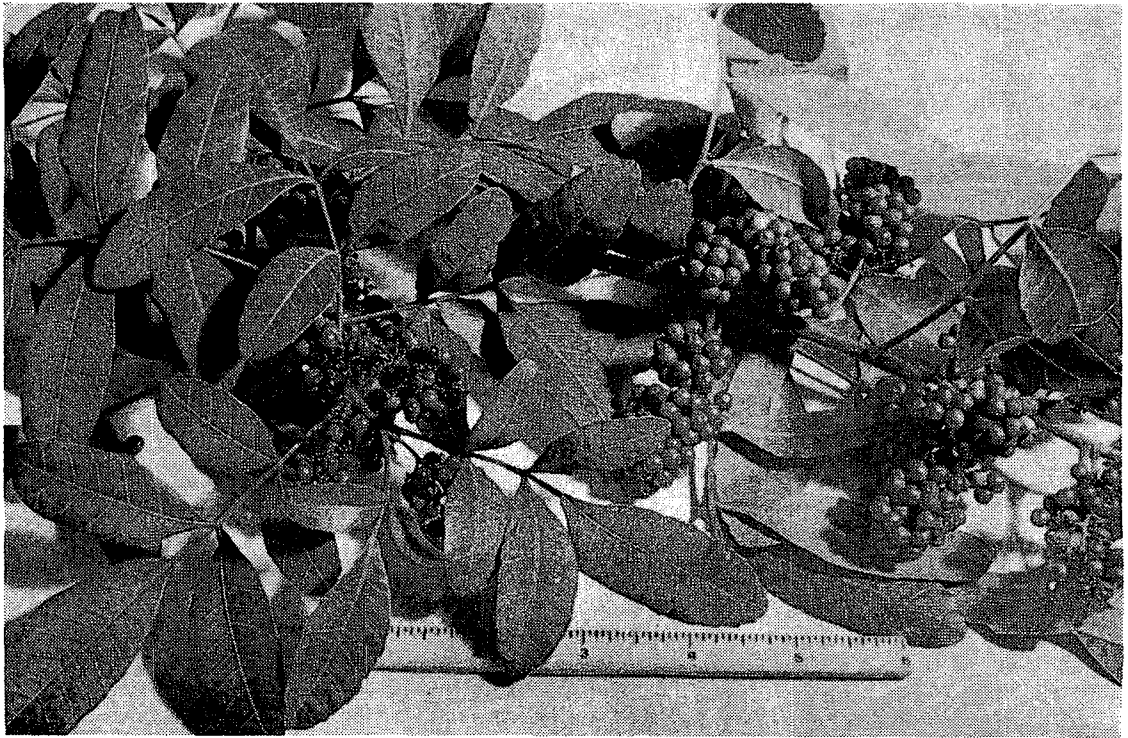


Figure 11.—*Schinus terebinthifolius*. BRAZILIAN PEPPER, or "FLORIDA HOLLY."

Photo by Julia Morton.

Chrysalidocarpus lutescens. GOLDEN CANE PALM. *Season*: spring. Attracts numerous bees (27).

Cocos nucifera. COCONUT. *Season*: all year. *Pollen*: white to cream-colored (4). *Nectar*: abundant near coast; less inland. *Honey*: light amber or colorless if pure (27), or greenish-yellow like motor oil (21); good flavor (15); good quality (27); thin, granulates in three months (8). In addition to the flowers, bees work the nectar-coated infant coconuts (about 1 inch wide) for about a week (37).

Phoenix canariensis. CANARY DATE PALM, and *P. dactylifera*, DATE PALM. *Season*: varies, Jan. through Mar. *Pollen*: whitish, in large quantity; eagerly collected by bees (27). *Nectar*: none.

Roystonea elata. ROYAL PALM. *Season*: late summer. *Pollen*: much; cream-white. *Nectar*: copious, avidly collected by bees. *Honey*: light amber, thin, of delicious aroma and flavor (27), though strong.

Shrubs

Caesalpinia pulcherrima. DWARF POINCIANA. *Season*: spring to fall. *Nectar*: good supply. *Honey*: said to be of good quality (Standley, *Trees and Shrubs of Mexico*; Standley & Steyermark, *Flora of Guatemala*).

Cassia alata. CANDLEBUSH. *Season*: winter, mainly. Listed as a bee plant of Ghana (15). Ordetx says rarely visited by bees (27).

Cestrum diurnum. DAY JESSAMINE. *Season*: several times a year. *Nectar*: plentiful but almost inaccessible to bees (27); bees were found starving near where these plants were blooming profusely (8). Plant toxic to grazing animals; fruit toxic to humans (22).

Cryptostegia grandiflora and *C. madagascariensis*. RUBBER VINE. *Season*: all year. *Nectar*: not abundant; on occasion bees visit it in numbers in the morning (27).

Dombeya wallichii. PINK BALL. *Season*: fall and winter. *Pollen*: great quantities. *Nectar*: abundant. *Honey*: light in color; of very fine flavor (27).

Dombeya dregeana x *D. elegans*. Spontaneous hybrid at U. S. Plant Introduction Station being evaluated by Paul Soderholm. *Season*: mid-Oct. to mid-Nov. Many bees seen busily working the blooms all day (22).

Dracaena fragrans. FRAGRANT DRACAENA. *Season*: Dec. and Jan. *Nectar*: much; bees gather in late afternoon and until dark (27).

Duranta repens. GOLDEN DEWDROP. *Season*: spring, summer. Very attractive to bees (19).

Euphorbia pulcherrima. POINSETTIA. *Season*: winter. *Nectar*: yellow extra-floral nectaries secrete nectar so richly that it drips on ground. Of no importance as a honey plant in the U. S. (19). Bees rarely seen on it (31). Sap toxic externally and internally (22).

Hibiscus rosa-sinensis. CHINESE HIBISCUS. *Season*: all year, less in winter. *Pollen*: collected by bumblebees; honeybees ignore (*Trop. Homes & Gard.*, June, 1953, p. 25). *Nectar*: on rare occasions, a little (27).

Lagerstroemia indica. CRAPE MYRTLE. *Season*: spring, summer. *Pollen*: abundant, pale-yellow. *Nectar*: none (27).

Leucophyllum texanum. TEXAS SAGE; SILVERLEAF. *Season*: mainly late fall; less at other times of year. *Pollen and nectar*: abundant (27).

Ligustrum japonicum and *L. vulgare*. PRIVET. *Season*: May and June. *Nectar*: attractive to bees (33). *Honey*: surplus; dark, ill-flavored, rather strong, with bitter aftertaste (18, 19); lowers the grade when mixed with other honeys, though said to be an important honey plant in England (18). Plant toxic to grazing animals; fruits toxic to humans (22).

Malvaviscus grandiflorus. TURKSCAP; SLEEPING HIBISCUS. *Season*: all year. *Nectar*: abundant but bees may collapse from trying to get at it in flowers that do not open sufficiently (F. Murat, Miami). Hummingbirds pierce flower near throat and the bees can then work the nectar (21). *Honey*: amber, mild in flavor (F. Murat).

Murraya paniculata. ORANGE JASMINE. *Season*: fall. *Nectar*: apparently abundant (27).

Ricinus communis. CASTOR BEAN. *Season*: all year. *Pollen*: much, gathered by a large number of bees (27). *Nectar*: there are extra-floral nectaries on stems, leafstalks, base of leaf-blades, and on teeth of leaves, but they are practically functionless (19). Plant a respiratory irritant; seeds poisonous (22).

Rosa spp. ROSE. *Season*: all year. *Pollen*: abundant and gathered by bees. *Nectar*: most roses are nectarless (19).

Turnera ulmifolia. BUTTERCUP PLANT. *Season*: all year; flowers close at noon. *Pollen and nectar*: both gathered by bees; not abundant (27).

Vines

Antigonon leptopus. CORAL VINE. *Season*: early summer to late fall. *Pollen*: some gathered by honeybees (19). *Nectar*: copious in the morning and all day when cloudy (27). *Honey*: there are conflicting descriptions in the literature; Ordetx says that in Cuba the honey is light in color and of good flavor; J. Lovell, p. 188, says it is white with aster-honey flavor; p. 298, says it is dark. H. B. Lovell states there is a color controversy but most say black as buckwheat and that hives are kept away from the vines. Actually, coral vine honey supplied to me by Fred Steely is dark-brown, flows easily, has a molasses-like flavor with a tang. Has not granulated in 4 years. R. F. Meyer says that under the name of "Florida Buckwheat honey" it sells readily to health food stores and to people from buckwheat areas (22). Tropical American apiculturists regard this vine as a perennial fountain of honey and in Florida its cultivation as a nectar source has been strongly advocated in the past (27).

Asparagus falcatus. SICKLETHORN ASPARAGUS. *Season*: May. Bees seen eagerly working the profuse bloom (22).

Ipomoea horsfalliae. HORSFALL MORNING GLORY. *Season*: Nov. to Jan. *Nectar*: rich supply but not all accessible to bees (27).

Ipomoea tuberosa. WOOD ROSE. *Season*: fall. *Nectar*: copious and very attractive to bees (27).

Jasminum volubile (*J. simplicifolium*), and *J. azoricum*. JASMINE. *Season*: winter, and fall and winter, respectively. *Nectar*: bees gather only a part because of long tube. *J. azoricum*, with narrow tube, is of lesser value (27).

Pandorea ricasoliana. PANDORA VINE. *Season*: Nov. to Feb. *Nectar*: probably rich; bees visit throughout the day (27).

Petrea volubilis. QUEEN'S WREATH. *Season*: spring to Aug. (22). Bees visit all the while and seem to obtain some sustenance (27).

Porana paniculata. CHRISTMAS VINE. *Season*: fall. Profuse bloom abuzz with bees (N. Smiley, Miami Herald).

Pyrostegia ignea. FLAME VINE. *Season*: Feb. *Nectar*: rich, but not fully accessible to bees, which cannot reach the base of the flower (27).

Senecio confusus. MEXICAN FLAME VINE. *Season*: all year. Bees have been seen working the flowers (21). Plant may cause skin rash (22).

Tecomaria capensis. CAPE HONEYSUCKLE.

Season: Aug. to Jan. *Pollen*: some. *Nectar*: abundant but not all accessible to bees (27). In 1963 nectar flowed out and was eagerly worked by bees (31).

Thunbergia grandiflora. SKY VINE. *Season*: all year. *Nectar*: much; attractive to bees (21, 27).

Herbs

Beloperone guttata. SHRIMP PLANT. *Season*: late winter to summer. *Nectar*: rich supply but mostly out of reach of bees (27).

Cleome spinosa. SPIDER FLOWER. *Season*: spring and summer. *Nectar*: copious in favorable weather. *Honey*: dark, like greenish motor oil; delicious flavor; sold as novelty. Was planted as ornamental at Okeelanta, spread to one acre and bees worked eagerly, even by one-half to full moonlight. (13).

Pedilanthus tithymaloides. SLIPPER FLOWER. *Season*: winter. *Nectar*: plentiful but almost inaccessible; bees get only that which seeps to the rim of the flowers (27). Plant toxic; has very irritant sap (22).

Pentas lanceolata. EGYPTIAN STAR CLUSTER. *Season*: nearly all year. Honeybees seen working the blossoms at Belle Glade (V. E. Green, Everglades Exper. Sta.)



Figure 12.—*Cleome spinosa*. SPIDER FLOWER. Photo courtesy R. H. Shumway, Seedsman.

Rhoeo spathacea. OYSTER PLANT; MOSES-IN-A-BOAT. *Season*: winter. *Pollen*: white; great quantities. *Nectar*: apparently none. (27). Sap may cause skin rash (22).

Salvia coccinea. RED SAGE. *Season*: mainly Feb. and Mar. Bees observed working the flowers (22).

Zebrina pendula. WANDERING JEW. *Season*: Nov. to Feb. *Pollen*: grayish-white; bees gather avidly. *Nectar*: apparently none. It was first noticed in Puerto Rico that the plant was visited by bees in cane fields and coffee plantations (27). Commonly grown as an ornamental in Florida, it has escaped into the fields at South Bay and Belle Glade (13).

Cacti

Cereus peruvianus. APPLE CACTUS. *Season*: several times a year. *Pollen*: probably abundant; many bees seen traveling up and down pistil eagerly (31).

Pereskia aculeata. BARBADOS GOOSEBERRY; LEMON VINE. *Season*: late summer and early fall. *Pollen*: plentiful and gathered by bees. *Nectar*: worked all day (34). "Each blossom with a bee feasting on its nectar" (Mabel Dorn, *Trop. Gardening for South Florida*, p. 136).

ADDENDA

I observed many honeybees working *Colvillea racemosa* and *Coleus blumei* in Nov.; *Calliandra haematocephala* in Jan. Wadlow reported bees working *Vitex trifolia* in Nov. V. E. Green says bees visit *Hylocereus undatus*, early mornings, July-Oct.

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OTHERS ARE NAMED IN THE TEXT

THE EFFECT OF RADIATION ON MOLD POPULATIONS ON FRESH LYCHEES

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²The basic unit of radiation used is the rad, defined as 100 ergs of energy absorbed per gm of biological tissue. The kilorad (abbreviated KR) is equal to 1,000 rads.

Mold has been long established as a problem for fruit growers and processors. The fresh market potential of lychee fruit has not been fully realized, partially due to their high susceptibility to fungus. Thus, control of mold on lychee fruits is vitally important to this infant industry.

Various methods have been applied to control the growth of mold on lychees. In 1958 Dennison and Hall (3) reported that the use of dehydroacetic acid and chlortetracycline slightly extended the shelf life of fresh lychees. Dennison (2) made