MANGO CULTIVARS IN HAWAII

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Cover photo: A 'Harders' mango tree growing in lower Manoa, Oahu.

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Mangos (*Mangifera indica*) are widely grown as a home garden fruit in the warmer, drier areas of all major islands of Hawaii. The fruit is mostly consumed fresh as a breakfast or dessert fruit. Small quantities are also processed into mango seed preserves, pickles, chutney, and sauce.

PRODUCTION

Most mangos in Hawaii are grown in dooryards and home gardens. Although commercial production has been attempted, acreages remain small. Production from year to year tends to be erratic, which has resulted in limited commercial success. Shipment to the U.S. mainland is presently prohibited due to the presence in Hawaii of tephritid fruit flies and the mango weevil, *Cryptorhynchus mangiferae*, which is not found in other mango-growing areas of the United States. Opening of the U.S. market through development of an effective treatment to disinfest mangos of the mango weevil and fruit flies would improve the potential for commercial production.

CULTIVAR TYPES

Mango cultivars in Hawaii are classified by embryo type: polyembryonic and monoembryonic. *Polyembryonic* varieties develop multiple embryos, of which all except one arise from nucellar (i.e., maternal) tissue in the developing seed. Because of this, most seedlings from polyembryonic seeds are genetically identical to the mother tree. The single gametic embryo of such seeds, originating from the sexual process of pollination, is often so underdeveloped and weak that it fails to germinate. *Monoembryonic* varieties produce seeds with a single gametic embryo developed as a result of the sexual process. Among seedling trees of monoembryonic varieties, fruits vary widely in quality and appearance.

In addition to type of embryo produced, mango cultivars can also be classified according to origin (see Table 1). Some mangos in Hawaii derived from early polyembryonic introductions and are known as "Hawaiian" mangos. Another type of polyembronic mango that became popular in Hawaii was the "Chinese" mango ('No. 9'), originally from the West Indies, but so called because it was frequently grown by persons of Chinese ancestry. Indian mangos are mostly monoembryonic types originating on the Indian subcontinent, a center of mango diversity. Many monoembryonic mango cultivars have been introduced to Hawaii as a result of their introduction and selection in Florida, an important center of mango cultivar development in the Americas. Finally, several cultivars, mostly seedlings of monoembryonic types, have been selected and named in Hawaii (Tables 1 and 2).

CULTIVAR INTRODUCTION AND SELECTION

The earliest introduction of mango trees to Hawaii is believed to have been before 1825, possibly in 1824, from at least two different sources. One of these early introductions was brought from Manila by Captain Meek of the brig *Kamehameha*. These plants were divided between Don Marin, a Spanish horticulturist in Honolulu, and Reverend Joseph Goodrich, a missionary in Wailuku, Maui.

Before 1899, when S. W. Damon of Honolulu introduced several grafted trees of selected Indian varieties, most mango trees in Hawaii were seedlings of the polyembryonic type commonly referred to as "Hawaiian" mangos. These were sometimes called 'Manini' mangos, after the name given by Hawaiians to the horticulturist Don Marin.

In 1903 the Hawaii Agricultural Experiment Station was established, and testing of mango varieties for adaptation, quality, and productivity began. Up to the present time, nearly 200 varieties have been evaluated. Many of these have been discarded for various reasons including unsatisfactory production, inferior quality, unattractive color, and susceptibility to anthracnose caused by the fungus *Colletotrichum gloeosporioides*. Anthracnose resistance, or at least some degree of tolerance, is necessary in mangos grown in Hawaii. This is because rainy weather and high humidity frequently occur during the flowering season. Under these conditions susceptible varieties usually set few or no fruit.

Many of the older varieties grown before 1940 have become obsolete or extinct. Table 3 lists mango cultivars tested to date but not presently recommended. Some of these cultivars are superior in other regions but do not perform well or produce acceptable fruit when grown in Hawaii.

Individuals may prefer varieties that cannot be generally recommended. Many cultivars listed in Table 3 may have value for certain persons and purposes. For example, "Hawaiian" seedling

Table 1. Mango cultivars recommended for Hawaii or under consideration, classified as to origin, embryony, and recommended use in Hawaii

Recommendation status for Hawaii	Origin			
	Hawaii	India	Florida	Other countries and states
Suggested for commercial use	Harders Rapoza	none	Keitt	Manzanillo (Mexico)
Suggested for home gardens	Ah Ping Exel Gouveia Harders Kurashige* Momi K Paris Selection No. 1* Pope Rapoza White Pirie	Basti No. 3 Fernandin Himsagar Itamaraca Pirie	Brooks Late Edwards Keitt Haden Zill	Harumanis* (Indonesia) Fairchild (Panama) Julie (Trinidad) Kensington* (Australia) Manzanillo (Mexico) Otts (California) Tete Nene (Puerto Rico)
Undergoing testing	Adams Buchanan Milda Waianae Beauty Wong	Alphan Amin Ibrahimpur Amin Sahai Chowsa Dasheri Fazli Zafrani Husnara Janardin Pasand Langra Padiri Pulihora Taimuria Zardalu	Carrie Eldon Fascel Jacquelin Ruby Simmonds Smith-Haden Sunset Van Dyke Zill Late	Apple* (Kenya) Ataulfo (Mexico) Borbon (Paraguay) Carabao* (syn. Manila) (Philippines) Extrema (Paraguay) Fall (China) Fire Red (China) Francis (Haiti) Graham (Panama) Keowsavoy* (Thailand) Mandeler (China) Milk (China) Mun (Thailand) Nangsangwon* (Thailand) Oakrong* (Thailand) Wa Great (China)

*Polyembryonic cultivar.

Table 2. Characteristics of some mango cultivars recommended for Hawaii

Cultivar	Origin	Bearing season	Fruit size (oz)	Fruit quality	Bearing character
Ah Ping	Hawaii	June–July	16–32	Very good	Moderate yield, regular
Exel	Hawaii	July	10–14	Excellent	Moderate yield, highly susceptible to anthracnose
Fairchild	Panama	June–July	8–12	Very good	Moderate yield
Gouveia	Hawaii	July–August	12–16	Good–excellent	Light yield
Harders	Hawaii	June–September	10–12	Excellent	Regular
Keitt	Florida	August–October	15–30	Excellent	High yield, regular
Manzanillo	Mexico	June–July	20–30	Good	Moderate yield, regular
Momi K	Hawaii	June–July	10–12	Very good	Moderate yield, regular
Pope	Hawaii	Late July–October	10–16	Good	High yield, regular
Rapoza	Hawaii	August–October	25–35	Excellent	Heavy yield, regular
White Pirie	Hawaii	July	Medium	Good	Moderate yield

selections, of which more than 40 are included in Table 3, are sometimes grown as dooryard trees. Seedlings of the general "Hawaiian" type are found growing along roadsides and in pastures and marginal lands throughout the state. The fruit of these "Hawaiian" seedling mangos is usually somewhat fibrous, with a turpentine odor, and not much sought after except by children. Although not marketable as dessert fruit, "Hawaiian" mangos are often processed into mango seed preserves, pickled mango, and chutney.

CULTIVARS GROWN IN HAWAII

'Haden' (Fig. 1) originated from a 'Mulgoba' seedling grown in Florida in 1902. It has been the most widely planted mango in Hawaii. The fruits are medium-large, weighing 16 to 24 oz. The attractive skin color of 'Haden' fruits, crimson over a deep yellow undercolor, has helped to support the cultivar's popularity. Although 'Haden' was undoubtedly superior to most local cultivars at the time of its introduction in Hawaii, it has since been ranked considerably below several other cultivars in taste panel studies (Table 4). The fruit flesh is somewhat fibrous and tends to separate from and deteriorate around the seed, resulting in marginal quality and poor shelf life. 'Haden' seeds are relatively large, and the trees usually develop an undesirable alternate-year bearing habit. All the cultivars recommended here for commercial or home garden planting are superior to 'Haden' in both fruit quality and consistent bearing habit.

'Gouveia' (Fig. 2) was named in 1964 for Mrs. Ruth Gouveia of Palolo Valley, Oahu, who planted the seed from which the original seedling tree grew. 'Gouveia' is probably a seedling of the 'Pirie' cultivar. The trees produce excellent quality, medium-sized fruits that are distinctively aromatic and highly flavored. 'Gouveia' is adapted to "ideal" mango-growing areas, which are warm, sunny, and relatively dry. The quality and bearing do not develop well in areas that are cool and humid during flowering and fruit setting.

'Harders' (Fig. 3) is an excellent variety for both commercial and home garden plantings. It originated from a tree of unknown parentage grown in Manoa, Oahu, recognized by Robert M. Warner, a University of Hawaii horticulturist in the mid-1970s. 'Harders' produces attractive, highly colored, medium-sized fruits of excellent quality. The trees bear regularly and frequently produce off-season fruits in late fall and winter.

'Ah Ping' (Fig. 4) fruits are medium-large (16 to 32 oz) and have a very attractive skin color similar to that of 'Haden'. The cultivar originated from a seedling orchard planted by Mrs. Chun Ah Ping at Mapulehu, Molokai. Fruit appearance is excellent and quality is very good. Bearing is usually midseason (June and July).

'Pope' (Fig. 5) is a consistently high-yielding, regular-bearing cultivar selected by R. A. Hamilton and named in 1960 in honor of Willis T. Pope, horticulturist at the Hawaii Agricultural Experiment Station from 1920 to 1937. Originating in Hawaii from a seedling of the Florida variety 'Irwin', 'Pope' is a late-maturing variety (late July and August). Fruits are medium in size (10 to 16 oz). The undercolor of ripe fruits is greenish yellow,

Figure 1. 'Haden'.

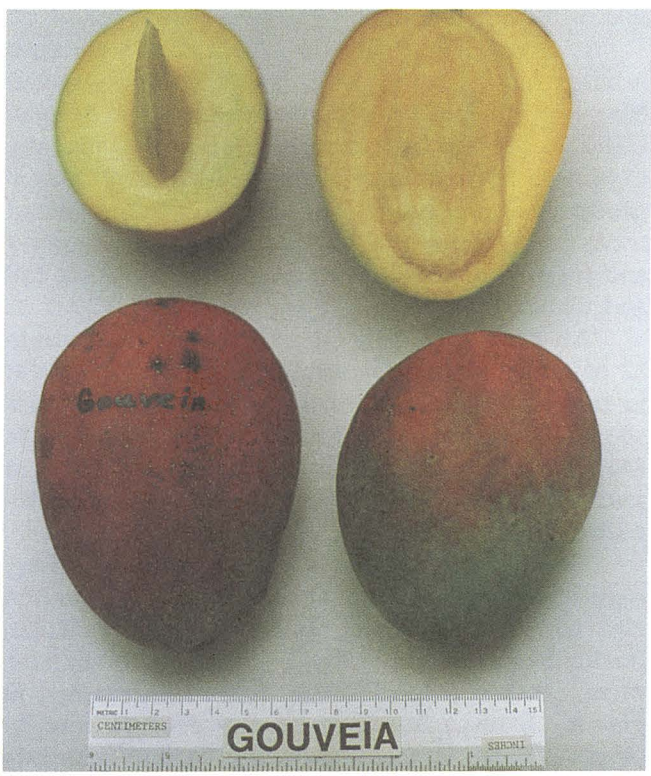

Figure 2. 'Gouveia'.

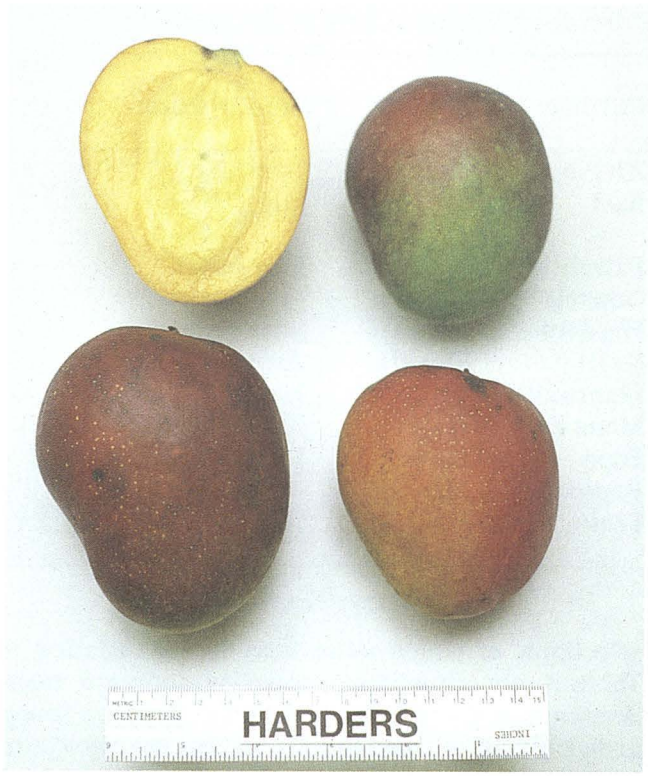

Figure 3. 'Harders'.

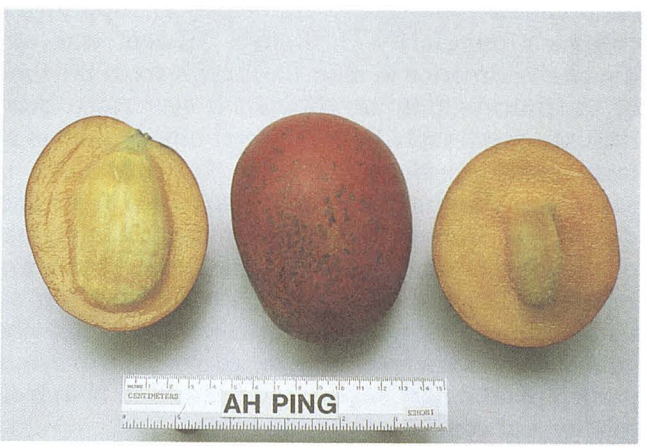

Figure 4. 'Ah Ping'.

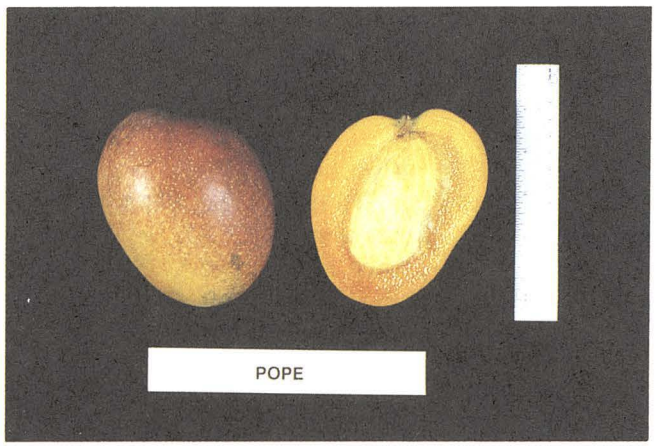

Figure 5. 'Pope'.

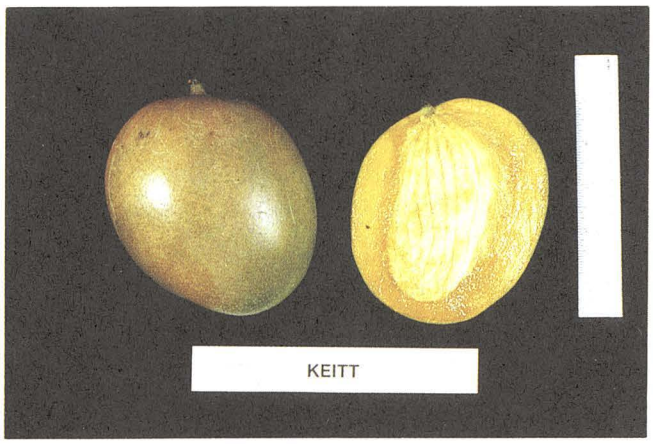

Figure 6. 'Keitt'.

Figure 7. 'Momi K'.

Figure 8. 'Fairchild'.

Figure 9. 'Rapoza'.

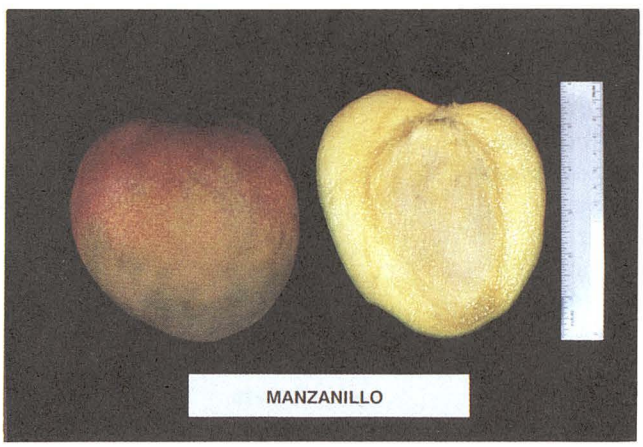

Figure 10. 'Manzanillo'.

which in the popular conception is less desirable than yellow undercolor. Fruit quality is very good.

'Keitt' (Fig. 6) originated in Florida as a seedling of 'Mulgoba' and is the best export variety of the Americas. It bears well and late in Hawaii, maturing one to three months after midseason cultivars. The fruits weigh from 15 to 30 oz, and the flavor and quality are both excellent.

'Momi K' (Fig. 7) originated from a seedling grown in Waipahu, Oahu, by Mrs. (Oliver) Ka Lei Momi Kinney. It was evaluated by University of Hawaii horticulturists in 1957. The trees bear moderately and regularly, producing very good quality, mild-flavored, medium-sized fruits, usually maturing in June and July.

'Fairchild' (Fig. 8) was introduced to Hawaii from Panama by Walter Lindsey in the 1920s. It produces small yellow fruits of very good quality weighing 8 to 12 oz. This cultivar is considered relatively tolerant of anthracnose and produces well in areas marginal for mango production. It is recommended for home gardens in locations where wet, humid weather conditions limit production of other varieties.

'Rapoza' (Fig. 9) was selected by R. A. Hamilton from a seedling of 'Irwin' at the University of Hawaii's Poamoho Research Station in the mid-1970s. It produces very large, attractive, excellent quality fruits weighing 25 to 35 oz. It is generally late bearing, the fruits maturing over a long period from August through October.

'Manzanillo' (Fig. 10) originated in the state of Colima, Mexico, probably from a 'Haden' seedling, and was introduced to Hawaii in the late 1970s. 'Manzanillo' produces large, attractive, mild-tasting fruits of very good quality when half-ripe as well as fully ripe. The fruit matures from June through July.

Table 3. Mango cultivars tested but not presently recommended

(Note: These varieties have been evaluated but are not considered up to present-day standards of color, flavor, firmness, uniformity, productivity, or disease tolerance. Most of these are no longer cultivated. It is understandable that individuals may be partial to certain varieties on this list and therefore prefer them for home use.)

Alphonse	Ehrhorn	Lippens	Roberts
Amini	Ewa	Lotts	S-T
Ameeri	Farrar	Ludwig	Sandershaw
Banganapalli	Fiji Long	Manini	Schobank
Batu Ferringhi	Fiji Short	Maya	Sensation
Bennet's Alphonse	Freitas	McDougal	Shibata
Bicknell	French Wine	Mulgoa	Smith
Bishop	Georgiana	Mulgoba	Smith-Wooten
Blackman	Hansen	Mundappa	Som Keo Won
Borsha	Harries	Murashige	Steward
Bombay	Helens	Nam Doc Mai	Suvarnarekha
Bombay Yellow	Himayuddin	Neelum	Tamuriya
Brindabani	Holt	Nimrod	Tenney
Calidad	Irwin	Non Plus Ultra	Texeira
Cambodiana	Jamshedi	Oahu	Tolbert
Cherukurasam	Joe Welch (syn. Mapulehu)	Ono	Tommy Atkins
Chinese	Kalihi	Osteen	Totapari
Cigar	Kent	Opureva	Van Raj
Cogshall	Kinney	Palmer	Victoria
Crescent	Larnach	Paris	Waterhouse
Cowasji Patel	Lazarus	Parvin	Whalen
D'or	Lemon Chutney	Prince	Whitney
Earlygold	Lewis	R2T2	Wooten

Table 4. Taste panel scores for some mango cultivars grown at Poamoho Research Station, Oahu (from UH Cooperative Extension Service Circular 435, 1969)

Cultivar	Flavor	Texture	Skin color	Flesh color	Size and shape	Proportion of seed to flesh	Total
Gouveia	29.0	21.0	12.5	4.3	4.5	4.8	76.1
Pope	26.5	24.1	12.6	3.8	4.1	4.5	75.6
Momi K	25.7	22.5	14.0	3.7	3.0	4.4	73.3
Pirie	29.1	22.3	9.2	3.3	3.0	3.0	69.9
Zill	23.6	18.8	11.9	3.4	3.1	4.2	65.0
Haden	17.7	17.6	15.3	3.4	3.7	2.9	60.6
Joe Welch	17.2	18.9	11.3	3.2	4.2	4.1	58.9
Highest possible	35.0	30.0	20.0	5.0	5.0	5.0	100.0

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