



Mango

Family: Anacardiaceae

Scientific name: *Mangifera indica*

Origin: South and Southeast Asia

Description

Mango is a large, deep-rooted, symmetrical evergreen tree growing to 90 ft high and 80 ft wide. It has simple, alternate, lanceolate leaves 12–16 inches long that are yellow-green, purple, or copper colored when young, turning leathery, glossy, and deep green when mature. New leaves arise in terminal growth flushes that occur several times a year. The pyramidal flower panicles borne on mature terminal branches contain several hundred pale pink to white flowers that are about $\frac{1}{4}$ inch wide when open. Most of the flowers function as males and provide pollen, but some are bisexual and set fruit. Pollination is by flies, wasps, and bees.

The fruit weighs about $\frac{1}{4}$ pound to 3 pounds. Fruit shape varies according to variety and may be round, ovate, or obovate. The color of immature fruit is green, gradually turning to yellow, orange, purple, red, or combinations of these colors as the fruit matures. Mature fruit has a characteristic fragrance and a smooth, thin, tough skin. The flesh of ripe mangos is pale yellow to orange and is juicy, sweet, and sometimes fibrous. The single seed usually is large and flattened and adheres to the flesh. The seed contains one or more embryos, depending on variety or type. Mangos are commonly peeled and eaten fresh as a dessert fruit but are also used in juice preparation and made into preserves, chutney, dried slices, and pickles.

Varieties

Recommended mango varieties for Hawaii are 'Ah Ping', 'Fairchild', 'Gouveia', 'Harders', 'Keitt', 'Momi K', 'Pope', and 'Rapoza', all of which are productive and have superior quality fruit. They have less pronounced alternate-year bearing characteristics than the more common 'Haden' and 'Pirie' varieties. All these varieties, including 'Haden' and 'Pirie', are monoembryonic and do not come true from seed. Flowering occurs from December to April, but off-season flowering is common, resulting in variable harvest times. 'Fairchild' is considered somewhat resistant to anthracnose and is fa-

vored for humid areas where other varieties usually fail to fruit because of this fungus.

Location

Mangos will grow from sea level to an elevation of about 1500 ft in Hawaii, but are most productive below 1200 ft. They are best adapted to hot, dry leeward areas receiving less than 60 inches of rainfall annually, although supplemental irrigation is desirable for highest yields in those areas. In humid, high-rainfall areas, anthracnose disease often damages or destroys both flowers and developing fruits.

The best fruit production occurs when the weather is dry during the flowering period. Yields are reduced if wind damages the flowers during winter storms or if wet weather occurs throughout the flowering season. Mango trees should be protected from strong winds, but windbreaks that shade or compete with them should be avoided.

Soils

Mangos can be grown on a wide range of soil types, from light sandy loams to red clay soils. Preferred soil pH is 5.5 to 7.5. The best production and fruit quality are on rich, deep soils. Soils should be well drained, and moderately sloping sites are recommended to prevent waterlogging. On soils where tap root growth is not impeded by impermeable layers, mangos may develop a deep taproot that aids drought tolerance and wind resistance.

Propagation

Most improved mango varieties are monoembryonic, with single embryos of hybrid origin, and therefore do not produce true from seed. They are propagated by grafting onto seedling root stocks. Polyembryonic varieties, on the other hand, produce two or more plants of nucellar (maternal) origin from each seed. These plants are predominantly true to type, and may be grown from seed without the necessity of grafting. The so-called common or Hawaiian mango varieties are polyembryonic.

Grafted trees grow more slowly and are often smaller than seedling trees. They usually produce fruit in three to five years in dry areas, while seedling trees usually take at least

*Replaces HITAHR Commodity Fact Sheet MAN-3(A), 1988.

five years to come into bearing. In arching is sometimes done to propagate mango varieties, and older trees may be top worked. Mangos are not propagated from cuttings or by air layering because the resulting trees are weak rooted.

Harvest

Mango trees may remain in production for 40 years or more. Fruits are usually picked after they develop some red, orange, or yellow color. Mangos will ripen and may be picked when the flesh inside has turned yellow, regardless of exterior color. The harvest season is usually between June and September in Hawaii, depending on variety. Fruit matures three to five months after flowering.

Mangos should be picked before they are fully ripe, at which time they soften and fall. The fruit bruises easily and must be handled carefully to avoid damage. They are ripened at room temperature and then refrigerated. Mature mangos keep fairly well under refrigeration for two to three weeks at 50–55°F.

Cultural practices

Transplant container-grown plants promptly, before they become pot-bound, to permit good root development. Avoid transplanting plants that are flushing. Treble super phosphate (0-45-0) fertilizer should be mixed with the soil in the planting hole, but other fertilizers should not be applied until after the plants recover from transplanting shock.

Mangos are large trees and should be planted 35–40 ft apart. For increased early production, an extra tree may be planted in the center of a 40-ft square to be removed later. Unfortunately, however, this extra tree is seldom removed, which leads to overcrowding. Developing trees should be trained to eliminate low branches less than 2 ft from the ground, leaving three to four main branches on the trunk at different heights. The few fruits set in a tree's first years of fruiting should be removed to speed up tree development. Pruning of well-formed older trees is usually confined to removal of dead branches. Pruning is preferably done after fruiting, before a growth flush occurs. Pruning can also be done to restrict tree size for small yards or when more than 35 trees per acre are planted. Some delay in flowering can be expected from new growth produced in response to pruning.

Young mango trees should not lack water. If rainfall is limited, irrigation water should be applied about once every two weeks during the first year, every three weeks during the second year, and once a month thereafter. Mature trees are more productive if irrigation water is withheld for at least two months before flowering. Although hot, dry weather is favorable to fruit development, supplementary irrigation between flowering and harvest is advisable for good yields.

Fertilizer may be a 1:1:1 or 1:2:2 ratio formulation, such as 16-16-16 or 10-20-20 N-P-K. During tree establishment, phosphorus (P) is important for root development. Nitrogen (N) and potassium (K) are needed by bearing trees for good yields. Young trees should receive 1½–3 oz of N (e.g., 1–2 lb of 10-20-20 fertilizer) per year during the first year and 3–5 oz of N (e.g., 1½–3 lb of 10-20-20) during years two and three. The total annual amount of fertilizer should be divided into three or four applications, preferably applied before growth flushes are anticipated.

In general, bearing mango trees should receive about 1 lb of a complete fertilizer (containing N, P, and K) annually for each inch of trunk diameter measured 4–5 ft above ground level. Half of the fertilizer should be applied just before flowering and the rest applied after the crop is harvested. Supplemental N should be applied just before flowering rather than during fall and winter, when vegetative growth flushes rather than flowering occur. Slow-release fertilizer formulations are preferred, except for supplemental N applications, which should have rapid release. Fertilizers should be spread in a zone directly beneath the leaf drip line and, if possible, application should be followed by irrigation.

Insect pests of mango

Mediterranean fruit fly, *Ceratitis capitata*

Oriental fruit fly, *Dacus dorsalis*

Mango weevil, *Sternochetus mangiferae*

Scales, including *Ceroplastes rubens*, *Pseudaulacaspis cockerelli*

Red-banded thrips, *Selenothrips rubrocinctus*

Mango blossom midge, *Dasineura mangiferae*

Southern green stink bug, *Nezara viridula*

Mango shoot caterpillar, *Bombotelia jocosatrix*

Black twig borer, *Xylosandrus compactus*

Mites

Diseases of mango

Anthracnose, *Colletotrichum gloeosporioides* (flowers, fruits)

Stem-end rot (fruits)

Sooty mold (leaves and fruits)

Powdery mildew, *Oidium mangiferae* (flowers, leaves, young fruit)

Tip burn (leaves; associated with potassium deficiency, water stress)

C. L. Chia, R. A. Hamilton, and D. O. Evans

CTAHR Department of Horticulture

The authors thank Drs. M. Aragaki, H. Y. Nakasone, and R. F. L. Mau for their comments and suggestions on the manuscript.