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Loquat

Eriobotrya japonica

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A fruit of wide appeal, the loquat, *Eriobotrya japonica* Lindl., (syn. *Mespilus japonicus* Thunb.), of the rose family, Rosaceae, has been called Japan, or Japanese, plum and Japanese medlar. To the Italians, it is *nespola giapponese*; to French-speaking people, it is *néflier du Japon*, or *bibassier*. In the German language, it is *japanische mispel*, or *wollmispel*; in Spanish, *nispero*, *nispero japonés*, or *nispero del Japón*; in Portuguese, *ameixa amarella*, or *ameixa do Japao*.

Description

A tree of moderate size, the loquat may reach 20 to 30 ft (6-9 in), has a rounded crown, short trunk, and woolly new twigs. The evergreen leaves, mostly whorled at the branch tips, are elliptical-lanceolate to obovate lanceolate, 5 to 12 in (12.5-30 cm) long and 3 to 4 in (7.5-10 cm) wide; dark-green and glossy on the upper surface, whitish-or rusty-hairy beneath, thick, stiff, with conspicuous parallel, oblique veins, each usually terminating at the margin in a short, prickly point. Sweetly fragrant flowers, borne in rusty-hairy, terminal panicles of 30 to 100 blooms, are white, 5-petalled, 1/2 to 3/4 in (1.25-2 cm) wide. The fruits, in clusters of 4 to 30, are oval, rounded or pear-shaped, 1 to 2 in (2.5-5 cm) long, with smooth or downy, yellow to orange, sometimes red-blushed, skin, and white, yellow or orange, succulent pulp, of sweet to subacid or acid flavor. There may be 1 to 10 seeds, though, ordinarily, only 3 to 5, dark-brown or light-brown, angular - ellipsoid, about 5/8 in (1.5 cm) long and 5/16 in (8 mm) thick.

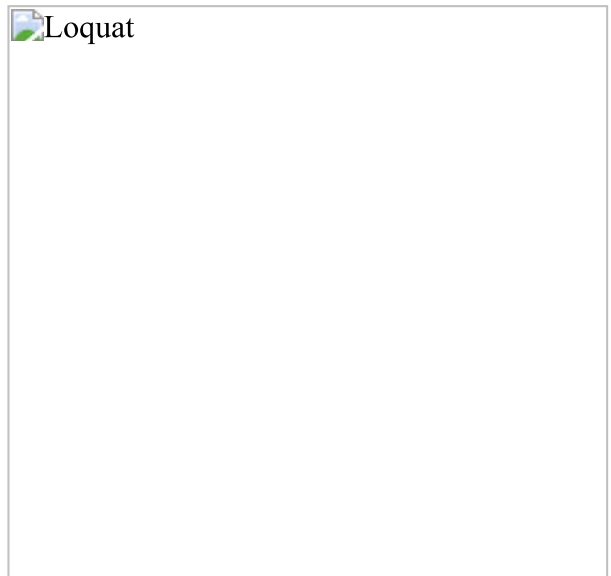


Plate XI: LOQUAT, *Eriobotrya japonica*

Origin and Distribution

The loquat is indigenous to southeastern China and possibly southern Japan, though it may have been introduced into Japan in very early times. It is said to have been cultivated in Japan for over 1,000 years. The western world first learned of it from the botanist Kaempfer in 1690. Thunberg, who saw it in Japan in 1712, provided a more elaborate description. It was planted in the National Gardens, Paris, in 1784 and plants were taken from Canton, China, to the Royal Botanical Gardens at Kew, England, in 1787. Soon, the tree was grown on the Riviera and in Malta and French North Africa (Algeria) and the Near East and fruits were appearing on local markets. In 1818, excellent fruits were being produced in hothouses in England. The tree can be grown outdoors in the warmest locations of southern England.

Cultivation spread to India and southeast Asia, the medium altitudes of the East Indies, and Australia, New Zealand and South Africa. Chinese immigrants are assumed to have carried the loquat to Hawaii.

In the New World, it is cultivated from northern South America, Central America and Mexico to California: also, since 1867, in southern Florida and northward to the Carolinas, though it does not fruit north of Jacksonville. It was quite common as a small-fruited ornamental in California gardens in the late 1870's. The horticulturist, C.P. Taft, began seedling selection and distributed several superior types before the turn of the century, but further development was slow. Dwarfing on quince root-stocks has encouraged expansion of loquat cultivation in Israel since 1960. In the northern United States and Europe, the tree is grown in greenhouses as an ornamental, especially var. *variegata* with white and pale-green splashes on the leaves.

In India and many other areas, the tree has become naturalized, as it volunteers readily from seed. Japan is the leading producer of loquats, the annual crop amounting to 17,000 tons. Brazil has 150,000 loquat trees in the State of Sao Paulo.

Varieties

The loquat has been the subject of much horticultural improvement, increasing the size and quality of the fruit. There are said to be over 800 varieties in the Orient. T. Ikeda catalogued 46 as more or less important in Japan; over 15 have originated in Algeria through the work of L. Trabut; C.P. Taft selected and introduced at least 8 into cultivation in California; 5 or 6 have been selected in Italy; only 1 in Florida. A number of widely planted, named cultivars have been classed as either "Chinese" or "Japanese". In the Chinese group, the trees have slender leaves, the fruit is pear-shaped or nearly round with thick, orange skin and dark-orange flesh, not very juicy, subacid, but of distinct flavor. The seeds are small and numerous. The harvesting period is midseason to late and the fruits are of good keeping quality.

In the Japanese group, the tree has broad leaves, the fruit is pear-shaped or long-oval, the skin is usually pale-yellow, the flesh whitish, very juicy, acid but otherwise not very distinct in flavor. The seeds are large and there may be just a few or only one. The harvesting period is early to midseason. Keeping quality is fair to poor.

In Egypt, most loquats are of Lebanese origin. Egyptian horticulturists have selected from seedlings of 'Premier' 2 superior clones, 'Golden Ziad' and 'Maamora Golden Yellow' and have vegetatively propagated them on quince rootstocks for commercial distribution.

Some of the oldtime selections, 'Advance', 'Champagne', 'Premier', 'Success' and 'Tanaka' are no longer popular in California but are performing well in other areas. In Florida, 'Oliver' has always been the most common cultivar, though a number of others—'Advance', 'Champagne', 'Early Red', 'Pineapple', 'Premier', 'Tanaka' and 'Thales' have been more or less successful.

In the State of Sao Paulo, Brazil, 2 cultivars are raised on a commercial scale—'Precoce de Itaquera' and 'Mizuho'. In the southernmost state of the U.S.S.R., Georgia, several loquat cultivars are grown, including 'Champagne', 'Comune', 'Grossa de Sicilia', 'Premier', 'Tanaka', and 'Thales'.

The following are the cultivars most commonly described:

'Advance' (Japanese group)—A seedling selected by C. P. Taft in California in 1897. Fruit is borne in large clusters; pear-shaped to elliptic-round; of medium to large size; skin downy, yellow, thick and tough; flesh

thick, cream-colored, juicy, subacid, of excellent flavor. Seeds of medium size, may be as many as 4 or 5; average is 3.20 per fruit. A late cultivar though it ripens earlier than 'Champagne' which it otherwise closely resembles. Tree is a natural dwarf, to a little over 5 ft (1.58 m); is highly resistant to pear blight. Self-infertile; a good pollinator for other cultivars. It is interplanted with 'Golden Yellow' and 'Pale Yellow' in India.

'**Ahdar**' (Lebanese; grown in India)—oval, of medium size; greenish-yellow with white flesh; bears moderately; late-ripening; of poor keeping quality.

'**Ahmar**' (Lebanese; grown in India)—pear-shaped, large, with reddish-orange skin; yellow flesh, firm, juicy; early ripening; of good keeping quality. A leading cultivar in Lebanon. Very precocious. Self-infertile.

'**Akko 1**' or 'Acco 1' (of Japanese origin)—long-oval to pear-shaped, 20 to 25 g in weight; skin orange with a little russeting, thick; flesh yellow, juicy, of average flavor, and there are 3 or 4 seeds. Ripens in midseason, beginning in mid-April in Israel where it constitutes 10 to 20% of commercial plantings. Precocious and a good bearer; sets 20 to 30 fruits per cluster and requires drastic thinning, leaving about 6 fruits. Fruit is subject to sunburn. Stands harvesting and shipping well, keeps in good condition less than 2 weeks under refrigeration. This cultivar is self-fertile.

'**Akko 13**' or 'Acco 13' (of Japanese origin)—pear-shaped, 20 to 25 g in weight; dark-orange, with no russeting; flesh yellow, juicy, with acid, agreeable flavor; 2 or 3 seeds. Bears from end of March through April in Israel, regularly and abundantly; constitutes 50 to 70% of commercial plantings in Israel; of good handling and keeping quality; stands transportation for 2 weeks at 32°F (0°C). Fruit is subject to sunburn. Needs cross-pollination.

'**Asfar**' (Lebanese, grown in India)—oval, smaller than 'Ahmar', with yellow skin and flesh, very juicy, of superior flavor, but very perishable.

'**Blush**' ('Red Blush') -Resembles 'Advance' but is very large. Was selected by C.P. Taft as being immune to blight, but was abandoned after 'Advance' proved to be highly blight-resistant.

'**Champagne**' (Japanese), often misidentified as 'Early Red'. Selected and introduced into cultivation in California by C. P. Taft around 1908. Elongated pear-shaped, often oblique; small to large (depending on where it is grown); skin pale-golden to deep-yellow, thick, tough, astringent; flesh white or yellow, soft, juicy, mild and subacid to sweet; of excellent flavor. There are 3 to 5 seeds. Midseason to late. Prolific; fruits borne in large clusters. Perishable; good for preserving. Tree has long, narrow, pointed leaves; is self-infertile.

'**Early Red**' (Japanese); originated by Taft in 1909. Obliquely pear-shaped; medium-large; skin orange-red with white dots, thick, tough, acid; flesh orange, very juicy, sweet, of fair to excellent flavor; has 2 or 3 seeds. Earliest in season, often appearing on California markets at the end of January or in the beginning of February. Borne in compact clusters.

'**Eulalia**' (a seedling of 'Advance' selected by M. Payan in California in 1905)—pear-shaped to obovate -pear-shaped; skin faintly downy, orange-yellow with red blush and pale gray dots, thick, tough; flesh pinkish or orange, melting, soft, very juicy; subacid in flavor. Seeds medium in size, numerous. Early in season.

'**Fire Ball**' (popular in India)—ovate to ovate-elliptic; small, with yellow, thick skin; flesh white to straw-colored, thick, crisp, smooth, of mild, subacid flavor. Seeds are large: average 2.90 per fruit. Midseason. Tree is a natural dwarf to 9.5 ft (2.84 in).

'**Glenorie Superb**' (grown in Western Australia)—round, large, dark-orange with yellow flesh which is juicy and sweet. Somewhat late in season. Inclined to bruise during harvesting.

'**Golden Red**' (grown in California)—flesh pale-orange, medium-thick, smooth, melting, of subacid, agreeable taste; few seeded. Midseason.

'**Golden Yellow**' (grown in India)—ovate-elliptic; of medium size; skin orange-yellow; flesh pale-orange, medium-thick, soft, smooth, with subacid, mild flavor. Seeds of medium size; average 4.83 per fruit.

'Golden Ziad' (#2-6) (grown in Egypt)—dark-yellow to light-orange; up to 1 1/2 in (3.96 cm) long; average number of seeds, 2.93-3.83 per fruit. Early. High-Yielding; 50 lbs (23.5 kg) per tree.

'Herd's Mammoth' (grown in Western Australia)—long and slightly tapering at the stem end; large; yellow to orange with white to cream-colored flesh. Ripens earlier than 'Victory'. Subject to black spot; not often planted.

'Improved Golden Yellow' (grown in India)—ovate-elliptic; skin orange-yellow; flesh orange-yellow, thick, crisp, smooth, with subacid to sweet, mild flavor. Seeds large; average 3.06 per fruit. Tree to 15 ft (4.49 in). Early.

'Improved Pale Yellow' (grown in India)—flesh pale-orange or cream-colored, firm or soft, smooth, of subacid, pleasant flavor, with medium number of seeds. Midseason.

'Kusunoki' (grown in Japan)—small; early.

'Large Agra' (grown in India)—ovate-round; of medium size; skin deep-yellow; flesh yellow or pale-orange, medium thick, smooth, firm, of pleasant flavor, fairly sweet. Seeds small; average 5.10 per fruit. Midseason. Tree a medium-dwarf—to 9 1/2 ft (2.83 in).

'Large Round' (grown in India)—ovate-round; of medium size; yellow of skin with cream-colored flesh, firm, coarse, subacid to sweet, mild. Seeds of medium size; average 4.80 per fruit. Midseason. Tree fairly tall—13 ft. (3.92 in).

'Maamora Golden Yellow' (#7-9) (grown in Egypt)—dark-yellow to light-orange; to 1 1/2 in (3.91 cm long); seeds average 2.40 to 4.03 per fruit; late in season. High-yielding—44 lbs (20 kg) per tree.

'Mammoth' (grown in Australia; mentioned in California in 1889)—flesh orange, medium thick, granular, coarse, of subacid, agreeable flavor. Midseason.

'Matchless' (grown in India) pear shaped; flesh medium-thick, pale-orange, smooth, soft, of mild, subacid flavor; medium number of seeds. Midseason.

'Mizuho' (grown in Japan)—rounded-oval; extra large (70-120 g); juicy, with agreeable, slightly acid though also sweet flavor, and with 5 or more seeds. Subject to fruit spots and sunburn.

'Mogi' (grown in Japan)—elliptical, light-yellow; small (40-50 g); Ripens in early spring. Tree is cold sensitive. Self-fertile. Constitutes 60% of the Japanese crop of loquats.

'Obusa' (a hybrid of 'Tanaka' and 'Kusunoki', developed and grown in Japan)—deep yellow, very large (80-100 g); of medium flavor; good keeping and shipping quality. Ripens earlier than Tanaka. Tree bears regularly and is resistant to insects and diseases, but fruit is subject to sunburn (purple stains on skin).

'Oliver' ('Olivier' × 'Tanaka'). In the past was considered the best loquat for southern Florida.

'Pale Yellow' (grown in India)—oblique -elliptic to round; light yellow, large; flesh white or cream-colored, thin, smooth, melting, of subacid to sweet flavor; seeds large; average 4.8 per fruit. Early. Tree is fairly tall—to 13 ft (4 in).

'Pineapple' (developed and introduced into cultivation in California by Taft in 1899)—round or sometimes pear-shaped; light-yellow with white flesh. Of good quality but inferior to 'Champagne'. Abandoned in California because of the weakness of the tree.

'Precoce de Itaquera' (erroneously called 'Tanaka'; grown in Brazil; believed to be a local selection of 'Mogi')—oval-pear-shaped; deep-orange; very small (25.3-29.1 g). Flesh is firm and acid-sweet. Very productive: 1,500 to 2,000 fruits per tree annually. Subject to sunburn (purple stains on skin) but less so than 'Mizuho'. Was for a long time the leading cultivar in the State of Sao Paulo but has lost ground to 'Mizuho' even though a pear-shaped fruit is preferred by consumers, because it does not keep or ship as well as the 'Mizuho', which now makes up 65% of the plantings and 'Precoce de Itaquera' 35%.

'Premier' (originated by Taft in California in 1899)—oval to oblong-pear-shaped; large; skin downy, orange-yellow to salmon-orange with large white dots; medium-thick, tough; flesh whitish, melting, juicy, subacid, of agreeable flavor; seeds average 4 or 5 per fruit. Late. Good for dooryards. Does not ship well, nor keep well.

'Safeda' (grown in India)—flesh is cream-colored, thick, smooth and melting, of subacid, excellent flavor; contains medium number of seeds. Early to midseason.

'Saint Michel' (unclassified; grown in Israel)—round but has the thin skin and white flesh of the Japanese group. Ripens late. Self-infertile.

'Swell's Enormity' (grown in Western Australia)—pear-shaped, very large; deep apricot-colored externally with flesh of the same color. Acid if harvested too early. Very late in season. Subject to sunburn in hot weather.

'Tanaka' (Chinese group; a seedling originated in Japan; young trees introduced by the United States Department of Agriculture in 1902; widely grown)—ovoid or round; large (70-80 g) in Japan; in some other areas small (30 g); skin orange or orange-yellow; flesh brownish-orange, medium thick, coarse, firm, juicy, sweet or subacid, of excellent taste. There may be 2 to 4 seeds; average 2.70 per fruit. Ripens late—beginning the first of May, which is too late for California because of susceptibility to sunburn. The tree is of medium size—nearly 10 ft (2.98 m); precocious; bears regularly; is self-fertile to a degree. Constitutes 10% of commercial crop in Israel; 35% of the crop in Japan. Highly cold-tolerant.

'Thales', also known as 'Gold Nugget' and 'Placentia', (Chinese group; very similar to 'Tanaka' and possibly a clone. Introduced from Japan and planted at Placentia, California, between 1880 and 1900)—oblong-obovate to round, large, skin orange-yellow with numerous white dots, tough; flesh, orange, thick, firm, juicy, of sweet, apricot-like flavor. There are 2 to 4 seeds. Late in season. Fruits borne only a few to a cluster; keep and ship well. Self-fertile.

'Thames Pride' (grown in India)—ovate-elliptic, of medium size or sometimes large; pale-orange or deep-yellow with cream colored or pale-orange, juicy, coarse, somewhat granular flesh of subacid flavor; moderately seedy; average 3.20 seeds per fruit. Early in season. Tree tall, to 13 1/2 ft (4.19 m). Bears heavily. This cultivar is grown and canned commercially.

'Tsrifin 8' (grown in Israel)—rounded pear-shaped; 25 to 30 g in weight; yellow-orange with some russetting. Of excellent quality with good acid and sugar content. Stands handling, shipping and storage well. Late—mid-April to mid-May. Precocious, bears regularly and abundantly but is subject to sunburn. Constitutes 10% of Israeli plantings.

'Victor' (originated by C.P. Taft in 1899)—oblong-pear-shaped; large; skin deep-yellow, medium-thick, tough. Flesh whitish, translucent, melting, very juicy, of sweet, mild flavor. There may be 3 to 5 seeds. Very late; too late for California. Good for canning.

'Victory' (the most popular cultivar in West Australia)—oval, large, yellow to orange, becoming amber on the sunny side. Flesh is white to cream-colored, juicy, sweet. Midseason to occasionally early.

'Wolfe', (S.E.S. #4) (a seedling of 'Advance' selected and named at the Agricultural Research and Education Center of the University of Florida in Homestead, and released in 1966)—obovoid to slightly pear-shaped; 1 3/4 to 2 in (4.5-5 cm) long and 1 to 1 1/4 in (2.5-3.2 cm) wide; yellow with fairly thick skin and pale-yellow, thick, firm, juicy flesh of excellent flavor, acid but also sweet when tree-ripe; has 1 to 5 seeds (usually 1 to 3). Tree reaches 25 ft (7.5 m) and bears well nearly every year,

Pollination

The loquat is normally pollinated by bees. Some cultivars such as 'Golden Yellow' are not self-fertile. 'Pale Yellow', 'Advance', and 'Tanaka' are partially self-fertile. In India, it has been observed that cross-pollination generally results in 10-17 % increased production over self-pollination. 'Tanaka' pollinated by 'Pale Yellow' has a lower yield than when self-pollinated, indicating a degree of cross-incompatibility. Whereas, when pollinated by 'Advance', the normal yield of 'Tanaka' is nearly doubled.

When cross-pollinating for the purpose of hybridizing, only flowers of the second flush should be used, as early and late flushes have abnormal stamens, very little viable pollen, and result in poor setting and undersized fruits.

Climate

The loquat is adapted to a subtropical to mild-temperate climate. In China it grows naturally at altitudes between 3,000 and 7,000 ft (914-2,100 m). In India, it grows at all levels up to 5,000 ft (1,500 m). In Guatemala, the tree thrives and fruits well at elevations between 3,000 and 6,900 ft (900-1,200 m), but bears little or not at all at lower levels.

Well-established trees can tolerate a drop in temperature to 12° F (-11.11°C). In Japan, the killing temperature for the flower bud is 19.4°F (7°C); for the mature flower, 26.6°F (-3°C). At 25°F (-3.89°C), the seed is killed, causing the fruit to fall.

Loquats are grown on hillsides in Japan to have the benefit of good air flow. Extreme summer heat is detrimental to the crop, and dry, hot winds cause leaf scorch. Where the climate is too cool or excessively warm and moist, the tree is grown as an ornamental but will not bear fruit.

Soil

The tree grows well on a variety of soils of moderate fertility, from light sandy loam to heavy clay and even oolitic limestone, but needs good drainage.

Propagation

Generally, seeds are used for propagation only when the tree is grown for ornamental purposes or for use as rootstock. Loquat seedlings are preferred over apple, pear, quince or pyracantha rootstocks under most conditions. Quince and pyracantha may cause extreme dwarfing-to less than 8 ft (2.5 in). Quince rootstock tolerates heavier and wetter soils than loquat but is apt to put out numerous suckers. Loquat seeds remain viable for 6 months if stored in partly sealed glass jars under high humidity at room temperature, but the best temperature for storage is 40°F (5°C). They are washed and planted in flats or pots soon after removal from the fruit and the seedlings are transplanted when 6 to 7 in (15-17.5 cm) high to nursery rows. When the stem is 1/2 in (1.25 cm) thick at the base, the seedlings are ready to be top-worked. In India, inarching is commonly practiced but budding and grafting are more popular in most other areas. Shield-budding, using 3-month-old scions, is successful. Cleft-grafting has been a common practice in Florida. Veneer-grafting in April has proved to be a superior method in Pakistan. Cuttings are not easy to root. Air-layering may be only 20% successful, though 80 to 100% of the layers root in 6 weeks if treated with 3% NAA (2-naphthoxyacetic acid).

Trees that are vegetatively propagated will begin to bear fruit in 5 years or less, as compared to 8 to 10 years in seedling trees. Old seedling trees can be converted by cutting back severely and inserting budwood of a preferred cultivar.

Culture

The rainy season is best for planting loquats. When planted on rich soil, normal size trees should be set 25 to 30 ft (7.5-9 m) apart, allowing about 83 trees per acre (200 per ha). In Brazil, a spacing of 23 × 23 ft (7×7 m) is recommended on flat land, 26 × 20 ft (8×6 m) or 26 × 16.5 ft (8×5 m) on slopes. Dwarf trees are spaced at 13 × 6.5 ft (4×2 m) in Japan and this may allow 208 per acre (500 per ha). The tree is a heavy feeder. For good fruit production the trees require ample fertilization and irrigation. In the tropics, animal manure is often used. A good formula for applications of chemical fertilizer is: 1 lb (0.45 kg) 6-6-6 NPK three times a year during the period of active growth for each tree 8 to 10 ft in height. The trees should be watered at the swelling of blossoms and 2 to 3 waterings should be given during harvest-time. Thinning of flowers and young fruits in the cluster, or the clipping off of the tip of the cluster, or of entire clusters of flowers and fruits, is sometimes done to enhance fruit size. This is carefully done by hand in Japan. With the 'Tanaka' cultivar, the Japanese leave only one fruit per cluster; with the 'Mogi', two. In Taiwan, thinning is done by spraying with NAA when the flowers are fully open.

In Taiwan, because of the hazard of strong typhoons, the loquat is grown as a mini-dwarf no more than 3 ft (0.9 m) high and wide, and branch tips may be tied to the ground because branches kept at a 45° angle flower heavily. Spraying with gibberellic acid (60 ppm) at full bloom enhances fruit set and increases fruit size and weight, total reducing sugars and ascorbic acid content, reduces fruit drop, number of seeds, and acidity. Spraying the same at 300 ppm results in small, seedless fruits. There should be judicious pruning after harvest, otherwise terminal shoots become too numerous and cause a decline in vigor which may result in biennial bearing. In Brazil, the clusters are bagged to eliminate sunburn (purple staining of the skin) to which both of the leading cultivars are susceptible.

Because of the shallow root system of the loquat, great care must be taken in mechanical cultivation not to damage the roots. The growing of dwarf trees greatly reduces the labor of flower-and fruit-thinning, bagging, and, later, harvesting and pruning.

Season

Generally, the loquat tree blooms in the fall and fruits in early spring. However, in tropical climates, the tree may flower 2 or 3 times a year beginning in July and set fruit mainly from the second flowering. In Florida, ripening begins in February; in California, usually in April; in Israel, the crop ripens from March to May. In Brazil, the harvesting extends from May to October.

Harvesting

Loquats reach maturity in 90 days from full flower opening. Determination of ripeness is not easy, but it is important because unripe fruits are excessively acid. Full development of color for each cultivar is the best guide.

The fruits are difficult to harvest because of the thick, tough stalk on each fruit which does not separate readily from the cluster, and the fruits must be picked with stalk attached to avoid tearing the skin. Clusters are cut from the branch with a sharp knife or with clippers. Whole clusters are not particularly attractive on the market, therefore the individual fruits are clipped from the cluster, the stalk is detached from each fruit and the fruits are graded for size and color to provide uniform packs. Great care is taken to avoid blemishes.

Major Japanese growers have monorail systems for conveying the picked fruits and equipment from their hillside plantations.

Yield

Dwarf loquats in Israel have produced 7 tons/ha at 3 years of age, 25 tons/ha at 7 years. Normal size trees in Brazil are expected to bear 110 lbs (50 kg) per tree, 4.17 tons per acre (10 tons/ha) when planted at a rate of 83 trees per acre (200 trees/ha). The 'Wolfe' cultivar in southern Florida has borne 100 lbs (45 kg) per tree at 5 years of age; 300 lbs (136 kg) when 15 to 20 years old.

Keeping Quality

Loquats generally will keep for 10 days at ordinary temperatures, and for 60 days in cool storage. After removal from storage, the shelf-life may be only 3 days. Treatment with the fungicide, benomyl, makes it possible to maintain loquats for one month at 60°F (15.56°C) with a minimum of decay. Other fungicides tried have proved much less effective. Cold storage of loquats in polyethylene bags alters the flavor of the fruit, promotes internal browning and the development of fungi.

Pests and Diseases

In Japan, scale insects, aphids, fruit flies and birds damage the fruits and may necessitate covering the clusters with cloth or paper bags. Laborers can attach 1,000 to 1,500 bags per day. An acre may require 62,500 bags (150,000/ha). A pole with a hook at the tip is employed to bring each branch within reach. The process is labor intensive. In Israel, wire netting is placed over trees to protect the crop from birds.

The Caribbean fruit fly (*Anastrepha suspensa*) has ruined the dooryard loquat crop for the past several years in Florida. The fruit flies, *A. striata* and *A. serpentina*, require control in Venezuela, the Mediterranean fruit

fly, *Ceratitis capitata*, in Tunisia. Another fruit fly, *Dacus dorsalis*, is the major pest in India, forces the harvesting of mature fruits while they are still too hard to be penetrated, and the complete removal of all immature fruits at the same time so that they will not remain as hosts. The soil around the base of the tree must be plowed up and treated to kill the pupae. The second most important predator is the bark-eating caterpillar, *Indarbela quadrinotata*.

Minor pests include leaf-eating chafer beetles, *A doretus duvauceli*, *A. lasiopygus*, *A. horticola* and *A. versutus*; gray weevils, *Myloccerus lactivirens* and *M. discolor* which attack the margins of the leaves. The scale insects, *Coccus viridis*, *Eulecanium coryli*, *Parlatoria oleae*, *P. pseudopyri*, *Pulvinaria Psidii* and *Saissetia hemisphaerica* suck the sap from loquat leaves and branches. Carpenter bees, *Megochile anthracina*, cut holes in the leaves and take the tissue to line their mud nests. Aphids (*Aphis malvae*) suck sap from twigs and shoots and sooty mold develops on the honeydew which they excrete. Flowers are attacked by thrips (*Heliothrips* sp.). The caterpillars of the anar butterfly, *Virachola isocrates*, bore into the fruits and lay eggs on the fruits, flowers and leaves. In New Zealand, a leaf-roller caterpillar eats into the buds and flowers. In California, the main pests of loquat are the codlin moth (*Cydia pomonella*), the green apple aphid (*Aphis pomi*) and scales.

The roots of loquat trees in India are preyed on by nematodes—*Criconemoides xenophax*, *Helicotylenchus* spp., *Hemicriconemoides communis*, *Haplolaimus* spp. and

Xiphinema insigne.

Diseases

Pear blight (*Bacillus amylovorus*) is the major enemy of the loquat in California and has killed many trees. *Phytophthora* is responsible for crown rot and *Pseudomonas eriobotryae* causes cankers in California. Scab may occur on the bark of the trunk and larger branches. A serious disease is collar rot and root rot caused by *Diplodia natalensis*. *D. eriobotrya* sometimes affects the leaves. The parasitic fungus, *Monochaetia indica*, induces leaf spot in India. Leaf spot is also caused by the soil-inhabiting fungus *Schlerotium rolfsii*. *Spilocaeeae eriobotryae* causes black spot on fruits and leaves in Italy and South Western Australia. Fleck, caused by the fungus *Fabraea maculata* is recognized by red-brown spots with whitish centers on leaves, shoots and fruit. In Florida, leaf spot may result from infection by *Pestalotia* sp. The foliage of young plants in Brazilian nurseries is damaged by the fungus *Entomosporium maculatum*. Other fungus problems of the loquat include stem-brown disease caused by *Batrjosphaeria dothidee*; die-back from *Macrophoma* sp., withertip from *Collectotrichum gloeosporioides*, and twig blight and canker from *Cytospora chrysosperma*. Post-harvest fruit rot is the result of infection by *Diplodia natalensis*, *Pestalotia* sp. or *Aspergillus niger*.

Sunburn, "purple spot", is responsible for much fruit loss in hot regions with long summers. Chemical sprays have been employed to hasten fruit maturity to avoid sunburn. Various types of bags have been tried in Brazil to protect the fruit from this blemish. The best are 2- and 3-ply newspaper bags.

Food Uses

The skin of the loquat is easily removed. Peeled and seeded fruits are eaten fresh, sometimes combined with sliced banana, orange sections and grated coconut. They are delicious simply stewed with a little sugar added. The fruits are also used in gelatin desserts or as pie-filling, or are chopped and cooked as a sauce. Loquats canned in sirup are exported from Taiwan. Some people prepare spiced loquats (with cloves, cinnamon, lemon and vinegar) in glass jars. The fruit is also made into jam and, when slightly underripe, has enough pectin to make jelly. The jelly was formerly manufactured commercially in California on a small scale.

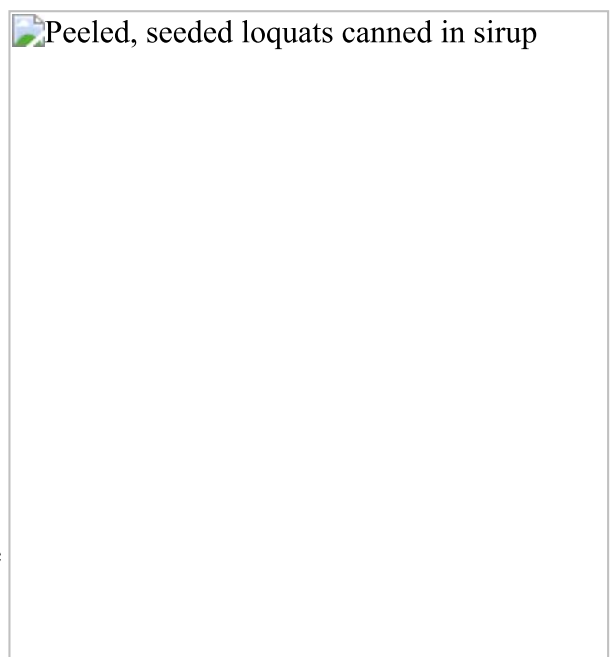


Fig. 29: Peeled, seeded loquats (*Eriobotrya japonica*) canned in sirup in Taiwan.

Food Value Per 100 g of Edible Portion*	

Calories	168
Protein	1.4 g
Fat	0.7 g
Carbohydrates	43.3 g
Calcium	70 mg
Phosphorus	126 mg
Iron	1.4 mg
Potassium	1,216 mg
Vitamin A	2,340 I.U.
Ascorbic Acid	3 mg

*Analyses reported by the Agricultural Research Service of the United States Department of Agriculture.

The fruit contains laevulose, sucrose and malic acid and lesser amounts of citric, tartaric and succinic acid. The pulp contains the carotenoids *B*-carotene (33%); *γ*-carotene (6%); cryptoxanthin (22%), lutein, violaxanthin, neoxanthin (3-4% each). The peel is 5 times richer than the pulp in carotenoids which are similar to those in apricots.

Toxicity

A 5-year-old girl in Florida ate 4 unripe loquats, fell asleep and was difficult to awaken and seemed dazed. After about 2 hours, she was back to normal. There have been instances of poisoning in poultry from ingestion of loquat seeds. The seeds contain amygdalin (which is converted into HCN); also the lipids, sterol, β -sitosterol, triglyceride, sterolester, diglyceride and compound lipids; and fatty acids, mainly linoleic, palmitic, linolenic and oleic. There is amygdalin also in the fruit peel. The leaves possess a mixture of triterpenes, also tannin, vitamin B and ascorbic acid; in addition, there are traces of arsenic. Young leaves contain saponin. Some individuals suffer headache when too close to a loquat tree in bloom, The emanation from the flowers is sweet and penetrating.

Other Uses

Wood: The wood is pink, hard, close-grained, medium-heavy. It has been used instead of pear wood in making rulers and other drawing instruments.

Animal feed: The young branches have been lopped for fodder.

Perfume: In the 1950's, the flowers attracted the interest of the perfume industry in France and Spain and some experimental work was done in extraction of the essential oil from the flowers or leaves. The product was appealing but the yield was very small.

Medicinal Uses: The fruit is said to act as a sedative and is eaten to halt vomiting and thirst.

The flowers are regarded as having expectorant properties. An infusion of the leaves, or the dried, powdered leaves, may be taken to relieve diarrhea and depression and to counteract intoxication from consumption of alcoholic beverages. Leaf poultices are applied on swellings.

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