

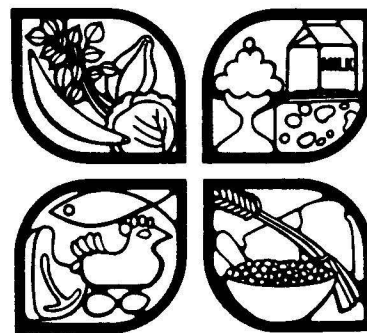
HAWAII COOPERATIVE EXTENSION SERVICE

Hawaii Institute of Tropical Agriculture and Human Resources

University of Hawaii at Manoa

COMMODITY FACT SHEET LYCH-3(A)

FRUIT



LYCHEE

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Family: Sapindaceae

Scientific name: *Litchi chinensis*

Origin: Southern China

Description

Lychee is a round-topped, long-lived, subtropical ever-green tree growing to 40 ft (12 m) in height. Immature leaflets are pale green, often tinged with bronze or pink, turning dark green and leathery when mature. Leaves are pinnate with one to five pairs of leaflets. Flowers are small, greenish-white or yellow, lacking petals, and borne in large numbers on branched, terminal panicles up to 12 in. (30 cm) long. The fruit is a tubercled, oval to ovoid drupe about 1 in. (2.5 cm) in diameter by 1-1/4 to 1-1/2 in. (3-4 cm) long with rough, brittle, red skin. The fruit flesh is juicy, white, translucent, and gelatinous, and does not adhere to the seed. The single seed is usually large but occasionally small and shrunken or abortive. Such abortive seeds are often referred to as "chicken tongue" seeds.

Lychee is related to longan (*Dimocarpus longan*), rambutan (*Nephelium lappaceum*), and pulasan (*N. mutabile*). Longan fruit, known as "dragon's eye," is similar to lychee but smaller and rounder, with smoother, dull yellow to light brown skin, and a more aromatic, spicy fruit. Longan grows well in Hawaii, but fruiting of seedling trees is erratic. Rambutan and pulasan are more tropical in origin than lychee or longan.

Lychees are and probably will remain a favorite home garden tree in Hawaii, since there is hardly a more attractive ornamental fruit tree than a well shaped, dark green lychee tree heavily laden with clusters of bright red fruits.

Although a few commercial lychee orchards have been planted in Hawaii, they are erratic in bearing habit and productivity.

Cultivars

Most of the many known lychee cultivars do not bear regularly or well under Hawaii's conditions. Lychee cultivars presently recommended for Hawaii are 'Groff' (Figure 1), 'Kaimana' (Figure 2), and 'Kwai Mi' (Figure 3). 'Groff' and 'Kaimana' are seedling selections originating in Hawaii. 'Kwai Mi' is an ancient and important Chinese cultivar.

'Kwai Mi' is a tall, upright, vigorous cultivar that does not bear regularly in Hawaii but can bear heavily in good years. It usually matures in May-June, producing large clusters of bright red fruits that average about 30 to a pound.

'Groff', developed from a 'Hak Ip' seedling, is an upright tree of medium vigor that bears somewhat regularly and is often late maturing (late August through September). Its fruits are dull red and small, 38-42 to a pound, and a high percentage have abortive seeds.

'Kaimana', also a 'Hak Ip' seedling, is a medium-sized, compact, rounded tree that usually matures fruit from mid-June through July. Like 'Groff', it is considered good-bearing compared with most other varieties in Hawaii. Its fruits are large, deep red, and 15-20 to a pound, with seeds that are not large in relation to the amount of flesh.

Location

Lychees are better adapted to subtropical than to tropical climates. In Hawaii, they grow from sea level up to about 2000 ft (610 m) elevation. Areas with 60-140 in. (152-356 cm) rainfall per year are suitable for lychees, but they can also be grown in drier areas with irrigation. Short periods of soil waterlogging and light flooding are tolerated, but standing water is not. Lychee trees are susceptible to wind damage and need good wind protection.

Flowering and Fruiting

New growth flushes occur several times a year. Under suitable conditions, one of these flushes, usually in the late winter months after the first of the year, may develop into a flowering flush. Increases in flowering and fruit set occur when there is a growth check caused by dry and/or cool weather after shoots of the previous growth flush have matured. Flowering and fruiting are usually poor whenever an adequate period or combination of cool or dry weather fails to occur. Favorable conditions for flowering and fruiting do not occur every year in Hawaii, or in any predictable sequence or pattern. When favorable conditions do occur, flowering takes place between February and April. Fruit matures three to five months after flowering.

The best climates for growing lychee have a warm, wet spring and summer followed by a cool, dry fall and winter.

Ideal conditions for lychee production occur in subtropical Guangdong and Fujian, China, where the trees are planted along dikes and stream banks as well as in orchard blocks in frost-free, lowland areas. Temperatures drop below 50°F (10°C) in January and rise above 90°F (>32°C) in the summer. The rainfall averages about 65 in. (165 cm) per year, with 80 percent received between March and September.

Under less-than-ideal conditions, yields are usually variable and erratic. This is often the case in Hawaii. Excessively wet weather during October, November, and December initiates vegetative flushing when the trees should be undergoing a rest period, and these flushes use stored carbohydrate that is preferably reserved for flowering and fruiting. Breaking off late-flushing vegetative terminals may inhibit vegetative growth and result in better flowering. Warm, humid winter weather also results in poor fruiting. Rain and wind during flowering interfere with pollination and increase flower drop. Lack of rain, or low humidity, after flowering (between February and May) decreases fruit set. Strong winds during fruit development also reduce yields. Weather conditions different from these and more like those of Guangdong and Fujian, China, are conducive to better fruiting behavior.

Many of the cultivars imported from China seldom if ever fruit in Hawaii, regardless of weather conditions. As a consequence, they should not be planted except in variety collections. Examples of varieties with this history are 'Kwa Luk', 'No Mai Tsze', and 'Heung Lai'.

Soils

Lychee is adaptable over a wide range of soil types, from heavy clays to a'a lavas, and tolerates wet soils to some degree. Coral sands are the least desirable soil type. Acidic soils from pH 5.0 to pH 6.5 are preferable.

Propagation

Lychee propagation from seed is unsatisfactory because varieties do not reproduce true from seed. Seedling trees often take 10 years or more to come into bearing.

Air-layering. The most common method of propagating lychee is air-layering, a technique for inducing a branch to form roots while still attached to the tree, after which it is removed and planted. Air-layering is done when leaves of the previous growth flush have matured. Air-layered trees usually take three to five years from planting to become established and begin bearing.

Branches selected for air-layering should be 1/4 in. (0.6 cm) or larger in diameter with one strong, main leader. A ring of bark 1 in. (2.5 cm) wide is removed from the branch at the point where root formation is desired. The thin cambium layer beneath the bark is scraped away. For best results, this ringed area should be left exposed for several weeks until callus tissue begins to form at the end toward the branch tip. If air-layering is done too soon after branches are ringed, rooting often fails. This is because freshly exposed cambium cells may continue to divide and overgrow the ringed area, thus inhibiting rooting.

Sphagnum moss is the preferred rooting medium, and transparent sheet plastic (about 10 in. [25.4 cm] square) is used to hold the moss firmly in place around the branch and retain moisture. The moss should be moist but not wet.

The ringed area should be surrounded by a layer of moss about 1 in. (2.5 cm) thick and 4 in. (10 cm) long. The plastic wrap ends are tied tightly around the branch with string and sealed with plastic tape to keep rainwater out. After two to four months, when several roots have formed and are visible through the plastic, the air-layered branch is cut off immediately below the plastic. The wrapping is then removed and the rooted air-layer planted in a suitable container.

Containers with newly transplanted air-layered plants should be placed in a shaded area for about two weeks with a lightweight plastic bag placed over the plant to retain humidity until the plant begins to put out new growth. Later on, the plants can be gradually exposed to full sun to "harden." Transplanting to the field is best done during a rainy season, but if this is not possible, the plants should be watered every two to three days until well established. The trunk and rooted area should not be buried more than 1–2 in. (2.5–5 cm) below the level of the soil in the container. Removing about half of the leaves at the time of planting in the container and again when transplanting to the ground will prevent excessive moisture loss.

Budding. Well grown lychee seedlings can be successfully patch-budded when the bark slips readily. Although not often used with lychee, budding is an excellent method that produces trees with better root systems than air-layering. Seedling rootstocks for budding should be 1/3–1/2 in. (0.9–1.3 cm) in diameter.

Lychee seeds are short-lived, losing viability after a few days, and are best planted fresh from the fruit. They should not be refrigerated, because this rapidly destroys viability.

Cultural practices

Young plants should be trained to establish good tree structure, avoiding sharp crotch angles. Air-layered plants tend to develop low branches and should be pruned to a single leader at transplanting time. Later, pruning should direct growth into about four well spaced scaffold branches. Acute-angled branches form weak crotches, which often split, and should be pruned off.

Trees in orchards should be spaced 30–40 ft (9–12 m) apart. Closer spacings, e.g., 23 ft (7 m) between trees, have been tried elsewhere, but this requires periodic pruning to control tree size. Temporary trees can be included in the centers with the idea of increasing early fruit production. These extra trees should be (but seldom are) removed before serious crowding occurs. Trees in houselots should be planted 25–30 ft (7.6–9 m) away from any building, large tree, or other obstruction. One lychee tree fully developed and symmetrical is better than two or more trees crowded together, competing for space and sunlight.

Girdling, also called ring-barking, is sometimes done to check growth and to promote increased flowering. The utility and efficacy of this practice are poorly documented for the lychee varieties commonly grown in Hawaii. A pruning saw cut the width of the saw blade is made in the bark around the branch or trunk. The cut should form a complete ring and extend through (but not far beyond) the thin, white cambium layer beneath the bark. Girdling is preferably done in early September in Hawaii. Different branches are sometimes girdled in successive years to avoid damaging the tree.

Propping or bracing branches is advisable when heavy crops occur on trees with weak, sharp-angled crotches.

Fertilizers

Severe deficiency of soil phosphorus (P) should be corrected before planting by thoroughly mixing P fertilizer with the soil. Lime should be similarly incorporated to bring soil pH above 5.0. Surface applications of lime and P are not as effective as those that are tilled in. Dolomite can be substituted for part of the lime to provide magnesium.

At transplanting, mix into the soil in the planting hole 4 oz (113 g) of triple superphosphate (0-46-0) plus 4 oz of a complete fertilizer (containing nitrogen [N], phosphoric acid [P₂O₅], and potash [K₂O]) in a 1-1-1 or 1-2-1 ratio.

For young trees up to three or four years of age, apply a complete fertilizer beginning after the hardening of the first growth flush after transplanting. Subsequent applications should be made after hardening of each succeeding flush, or every two to four months. Apply a total of about 1 lb (454 g) during Year 1, 1-1/2 lb (680 g) during Year 2, 2-1/2 lb (1135 g) during Year 3, and 4 lb (1816 g) during Year 4. The fertilizer should be spread evenly around the

tree at least 1 ft (30 cm) from the trunk. Stop applying fertilizer in the spring of the third or fourth year, when the tree is large enough to bear a crop the next year.

Apply fertilizer to bearing trees immediately after fruit harvest. If rainfall is limited, apply irrigation water at that time to promote a vigorous flush. Bearing trees need less P than developing trees, so a fertilizer formulation such as 10-5-20 is appropriate. Excessive amounts of available N during the winter will favor untimely vegetative flushes; thus, N application levels should be calculated so that the N is depleted before a rest period prior to flowering occurs.

After fruit set, when the fruits are pea-sized, a supplemental application of 10-5-20 or 10-5-40 will provide adequate potassium for fruit development. This application should be light, because too much N at the time of fruit ripening may cause fruits to crack during rainy periods.

Amounts of fertilizer applied to bearing trees vary depending on tree condition and location. With many fruit trees, a general rule is to apply annually 1 lb (454 g) of fertilizer for each inch of trunk diameter measured at a height 4-5 ft (1.2-1.5 m) from the ground. This rule may be difficult to use with lychee cultivars that have low branches. An alternative method is to apply 3/4 lb (340 g)



Figure 1. 'Groff' lychee.



Figure 2. 'Kaimana' lychee.



Figure 3. 'Kwai Mi' lychee.

of fertilizer for every year of tree age, reaching the maximum application level around Years 10 to 12.

Organic soil amendments and fertilizers are useful to promote tree establishment but should be used with caution on bearing trees. Organic N is released more slowly than most chemical fertilizer N, and it may be more difficult to manage the time of availability and depletion of N from mulches and manures.

Harvest

Fruits are harvested after their skins turn red. Green fruits do not ripen satisfactorily after removal from the tree. In Hawaii, early varieties are harvested in May and June, late varieties from mid-July through September. Fruits are removed from the tree by cutting or breaking the branch off just above the panicle bearing the fruits.

After harvest, fruit skin color turns reddish-brown in a few days if not refrigerated. Refrigeration at 32–40°F (0–5°C) and storage in plastic bags can prolong fresh fruit color and flavor for about two weeks. Fruit to be stored in refrigeration should be broken off the panicle, leaving a bit of stem attached. If the fruit is pulled from the stem, the skin may break, resulting in dehydration and, possibly, spoilage. Lychees may be quick-frozen, dried, or canned.

Under current (1990) regulations, fresh lychee fruits may not be exported from Hawaii to the U.S. Mainland or Japan. Frozen lychee fruits may be taken to the U.S. Mainland after inspection by Hawaii plant quarantine authorities.

Diseases

No serious disease problems are presently found on lychees in Hawaii.

Insects

Litchi mite, erinose mite (*Eriophyes litchii*)
Green scale (*Coccus viridis*)
Hemispherical scale (*Saissetia coffeae*)
White litchi scale (*Pseudaulacaspis major*)
Chinese rose beetle (*Adoretus sinicus*)
Litchi fruit moth (*Cryptophlebia ombrodelta*)
Koa seedworm, macadamia husk borer
(*Cryptophlebia illepida*)

Anthurium thrips (*Chaetanaphothrips orchidii*)
Redbanded thrips (*Selenothrips rubrocinctus*)
Black twig borer (*Xylosandrus compactus*)
A twig borer (*Xylosandrus crassiusculus*)
An ambrosia beetle (*Xyleborus fornicatus*)
A spider mite (*Oligonychus biharensis*)
Ants

The erinose mite is a tiny pest (1/200 in. [0.13 mm] long) that cannot be seen without a microscope, but its damage on lychee is distinctive and often extensive. Leaflets become curled and distorted and have a velvety brown appearance. The mites begin their attack on new leaves at the onset of growth flushes. Early indications of their damage are small, wartlike swellings about 1/16 in. (1.6 mm) in diameter on the upper surface of leaflets and light yellow spots on the corresponding sites on the lower surface. Erinose mite damage seldom kills lychee trees but is unsightly. Yield loss as a result of erinose mite damage has not been demonstrated.

Besides the erinose mite, the most common insect pests of lychee are the *Cryptophlebia* spp. (damaging fruits) and thrips and scales (affecting foliage).

Birds

Red-vented bulbul (*Pycnonotus cafer*)
Red-whiskered bulbul (*P. jocosus*)
Mejiro, Japanese white-eye (*Zosterops japonicus*)

Mejiro and bulbuls are serious pests of both immature and ripe fruit. These and most other birds are protected by state and in some cases federal regulations, and they may not be trapped or killed without a permit. Shiny objects and streamers are sometimes used to repel birds, usually with only temporary success. Bird netting can be used to protect fruiting branches.

Bulbuls are presently (1990) established only on Oahu, but they have been seen on the neighbor islands. Sightings of bulbuls beyond Oahu should be reported to the local office of the Department of Land and Natural Resources, the Hawaii Department of Agriculture, or the Cooperative Extension Service.

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