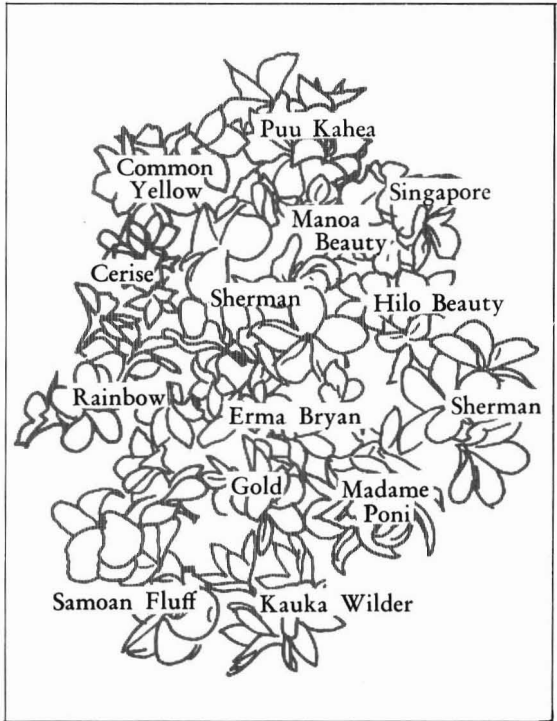




Circular 410  
University of Hawaii  
Cooperative Extension Service

# HAWAIIAN PLUMERIAS

COVER



## HAWAIIAN PLUMERIAS

*Donald P. Watson, James T. Chinn, Horace F. Clay  
and James L. Brewbaker\**

The plumeria is an important ornamental tree in Hawaii as well as in Florida, the West Indies, Central America, India, China, Indonesia, Australia, islands of the Pacific basin, and some other tropical regions. Although originally called "plumiera" after a French Botanist, Charles Plumier (1646-1706), in many tropical regions it is known as "Frangipani." To Hawaiians it is the "pumeli" or "melia."

*Plumeria acuminata* Aiton (*P. acutifolia* Poir), better known to kamaainas as 'graveyard' or 'Common Yellow,' was introduced in 1860 by William Hildebrand. The original specimen still grows today where it was planted in Foster Garden in Honolulu. *Plumeria rubra* L. (an all-red flower) was brought to the islands from Mexico around the turn of the century. The first tree still grows in the area of Keeaumoku and Heulu Streets in Honolulu. In 1931 Harold Lyon brought the original specimen of *P. obtusa* L., 'Singapore,' from the Singapore Botanic Garden and it is still growing at Foster Garden. Two additional species, *P. alba* L. and *P. babamensis* Urban, were introduced in the 1950's from India and Nassau, respectively.

Most of the popular Hawaiian plumerias in use today are descendants of these early introductions; especially *P. acuminata* and *P. rubra*.

Plumerias vary in size from small specimens grown in containers to medium-sized trees which range up to 30 feet in height.

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The branches are thick and fleshy with leaves that are arranged alternately and have their marginal veins running parallel to the margin. The tree is somewhat ungainly in appearance because of its rapid growth. The new wood is soft and breaks easily, exuding latex. The flowers are produced on terminal inflorescences and the petals unfold in a spiral fashion. As many as 60 flowers may be produced on one inflorescence during a flowering season. Deep within the corolla tube, near its base, are the anthers and a two-lobed pistil. When successfully fertilized, the ovary develops into two leathery pods (follicles) with about 30 winged seeds in each.

Natural hybridization appears to have contributed to great variation in flower size, color, and scent among plumerias in Hawaii.

#### PLUMERIA SPECIES AND SOME MAJOR CULTIVARS

The three most common species of plumeria in Hawaii may be identified by the shape and appearance of their leaves (Fig. 1).

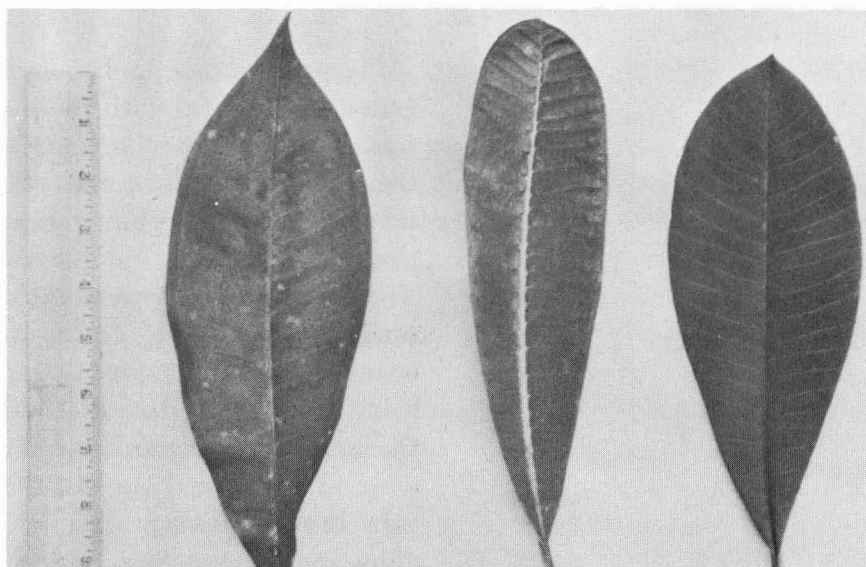


Fig. 1. Leaf shapes of three common species of plumeria in Hawaii.. Left to right, *Plumeria acuminata*, *P. obtusa*, and *P. rubra*.



*Plumeria acuminata* Ait. (*P. acutifolia* Poir) has light-green, shiny leaves with narrow pointed tips. It is called "acuminata" because of the acuminate leaf. The flowers are white with large yellow centers diffusing into white toward the tips of the petals. The blossoms are produced on upright, slightly hairy flower stalks. They are fragrant and have good keeping quality. One seed pod produces about 30 seeds. The tree grows to be 35 feet in height. Cultivars with *P. acuminata* parentage: Common 'graveyard' Yellow, 'Gold,' 'Sherman' and 'Samoan Fluff.'

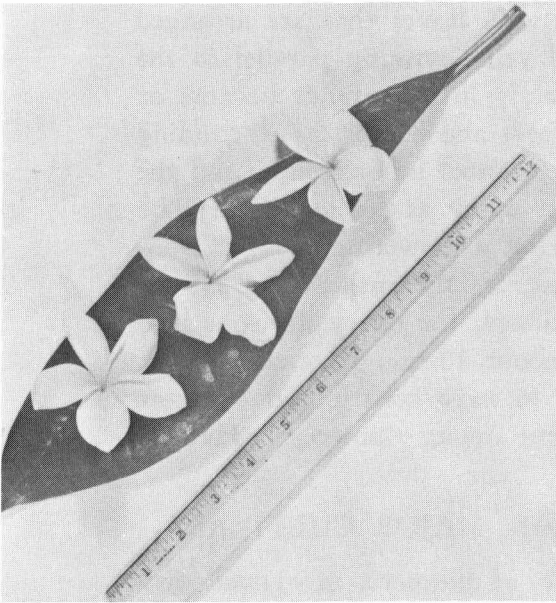


Fig. 2. *P. acuminata*.

*Plumeria obtusa* L. has dark-green, shiny leaves with rounded tips. The leaves are present on the trees throughout the year, while many other plumerias are almost completely defoliated. The showy white flowers with a small bright yellow center are borne on upright, green, non-hairy flowering stalks. Although the flowers are fragrant and have some value for making leis, they turn brown quickly after handling and storage. Seed pods are produced in quantity and have characteristic up-curved tips.

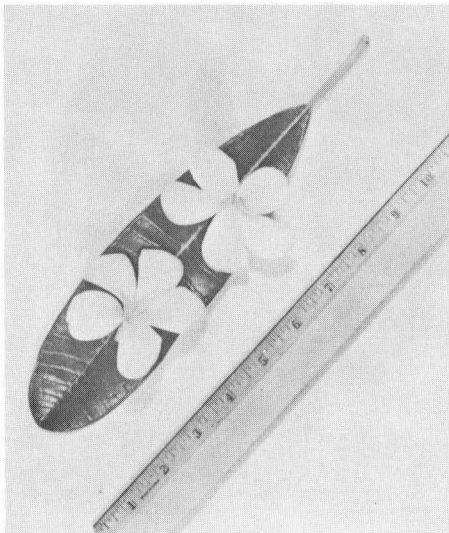


Fig. 3. *P. obtusa*.

The tree grows up to 26 feet in height.

'Singapore' appears to be the only representative of this species in Hawaii today. Since it is a favored host for scale insects and mites, many gardeners are reluctant to plant it.

*Plumeria rubra* L. has dull-green, elliptical leaves with a tendency to be broader at the tips than at the bases. Typical of the species are red flowers without yellow centers. The blossoms are borne on hairy flower stalks that usually hang downward. Seed pods are fairly prevalent and trees reach 26 feet in height.

'Hilo Beauty,' 'Japanese Hanging Basket,' 'Scott Pratt,' and 'Erma Bryan' have *P. rubra* parentage. 'Madame Poni,' 'Puu Kahea,' 'Kauka Wilder,' 'Daisy Wilcox,' and 'Rainbow,' although of hybrid origin, have in their background some *P. rubra*, as well as *P. accuminata* or *P. obtusa*.

Less common species:

*Plumeria alba* L. has light-green, shiny, paddle-shaped leaves with rounded tips. The flowers are small, 1 inch in diameter, white with small yellow

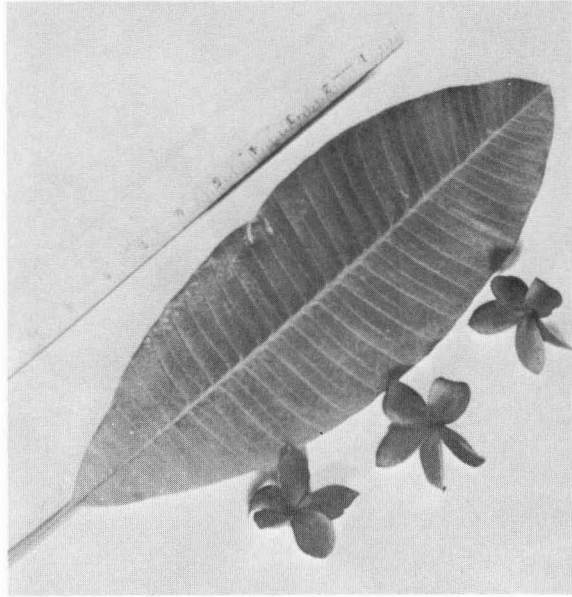


Fig. 4. *P. rubra*.

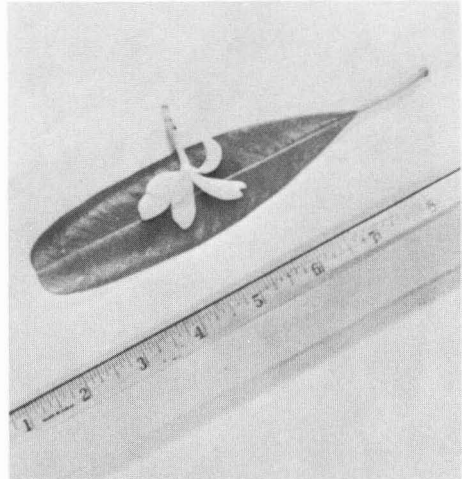


Fig. 5. *P. alba*.

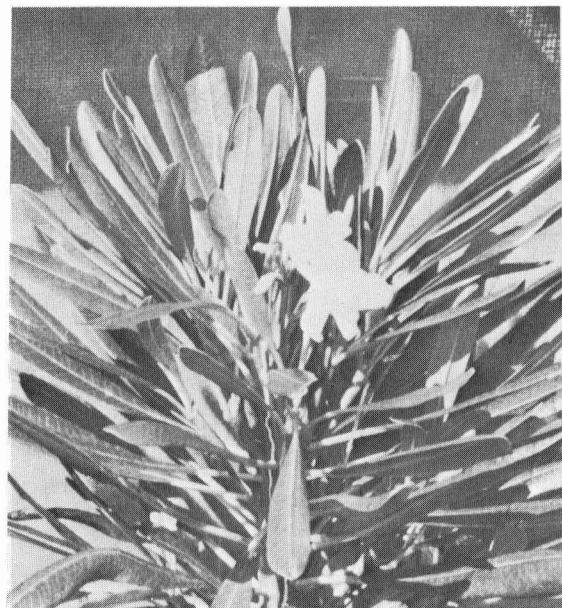


Fig. 6. *P. babamensis*.

centers. They are borne in a loose cluster on a green, non-hairy stalk. Seed pods rarely form. The branches are small and the tree which grows to be 35 feet high, is spindly in habit. The plant may have landscape value.

*Plumeria babamensis* Urban has shiny, dark-green, long, narrow leaves with pointed tips. The white flowers are 1½ to 2 inches in diameter and have a small yellow center. They are sparsely produced on an upright, non-hairy stalk and are of questionable commercial value. The branches have small diameters and the tree rarely grows to be more than 10 feet in height.

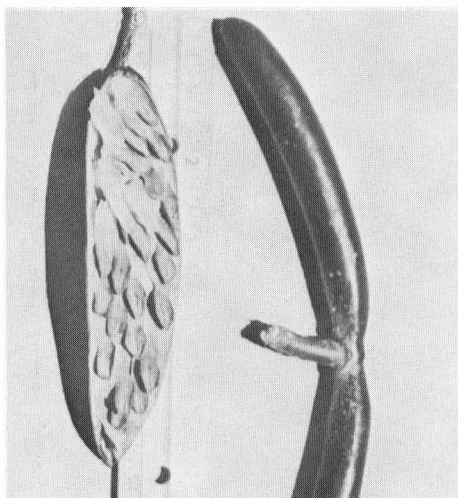


Fig. 7. Seed pods of *P. rubra*.

Seed pods, or follicles, are frequently produced on *Plumeria rubra*, *P. acuminata* and *P. obtusa*. Eight months are required for the seeds to mature.

## PROPAGATION

Few Hawaiian gardens are without a plumeria tree, perhaps a reflection of the neighborly generosity of the people and the ease of propagation by seeds and by cuttings.

Plumeria cuttings of almost any size will root easily. Most growers use mature branches at least 2 feet long from well-established trees. The presence of leaves and flowers on the cuttings does not seriously hamper rooting. An asphalt tree paint should be applied to the cut end of the stem of the parent plant to seal the cut surface and to prevent disease invasion. Cuttings may be planted shallowly in well-drained soil with or without a storage period to dry them. The root system will establish more rapidly by staking the cuttings securely in the soil. Ample moisture aids rooting but avoid overflowing to prevent the base from rotting. After the cutting has rooted and new leaves begin to grow, apply a teaspoonful of balanced fertilizer for continued growth and flower production. If the cuttings are planted in small containers, they should be transplanted to larger containers or to the garden when the roots fill the can and the leaf growth requires more water than can be supplied by the container. Cuttings generally flower within a year.

Plumerias may also be started from seeds and should flower within 3 years. Seeds should be collected from ripe pods as soon as possible to prevent attack from moth larvae and fungi. Fresh, mature seeds germinate readily in 4 to 5 days at room temperature between moist paper towels or in well-drained soil at a planting depth of  $\frac{1}{2}$  inch. Seedlings about 5 inches high can be transplanted to individual containers. Water the seedlings lightly and apply a small amount of balanced fertilizer 1 week after transplanting to enhance growth.

Grafting scions of different cultivars on the same stock will add novelty and variety to an established specimen. Mature scionwood in 6- to 12-inch lengths with leaves removed is preferred.



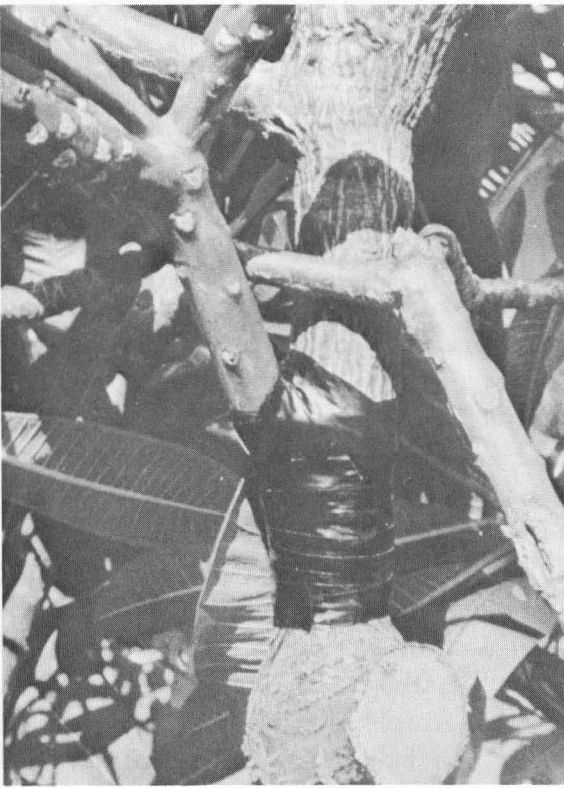


Fig. 8. Recently grafted mature scion on the stock of another cultivar.

Any of the standard methods of joining scion and stock to produce side or apical grafts can be used. The scion can be secured to the stock with plastic electrician's tape. This wrap covering the wound area may be removed 1 month after the graft union has healed (Fig. 8).

### *Hybridizing*

Most plumerias being grown in Hawaii are the result of selecting seeds at random from pods on existing plants and growing new seedlings by chance. In this process only the seed parent is known. Although a promising hybrid once established in this manner can be the mother plant for many cuttings, a grower needs to know the male parent if he wishes to intensify some definite horticultural traits. By knowing the two parents, the grower may carry out a breeding program

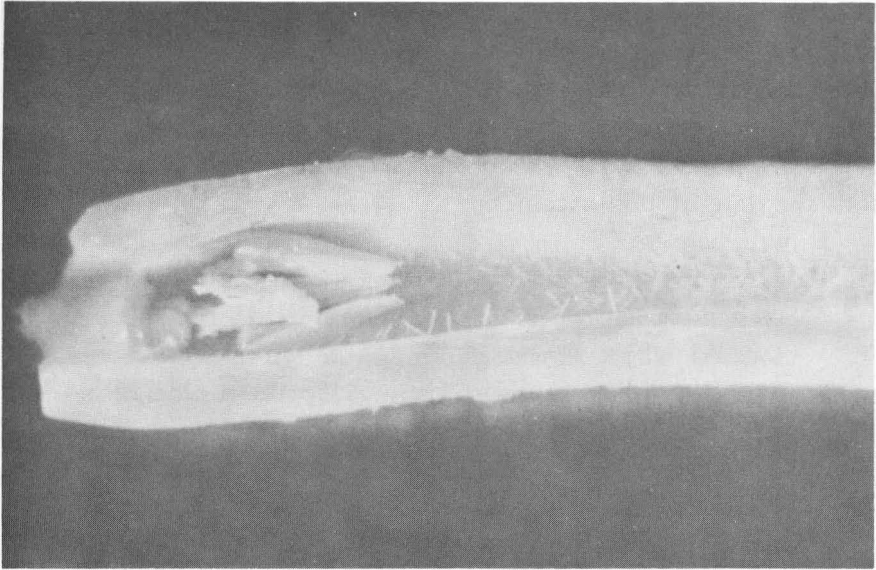


Fig. 9. Base of a plumeria flower tube has been cut in half to show anthers and mass of pollen situated above a bi-lobed style. The pollen-receptive area of the style is in the white, sticky collar.

1. Select in the morning 2 newly opened flowers, 1 as a seed, and 1 as a pollen parent.
2. Cut off corolla tube about  $\frac{1}{2}$  inch above junction of the tube and the stem. Allow latex to flow from the cut and dry the latex with some absorbent material.
3. Carefully open the corolla tube with a sharp needle to expose the style and some of the surrounding anthers.
4. Remove the anthers to avoid possible self-pollination.
5. With a needle introduce the pollen to the mid-section of the style or within the receptive collar of sticky fluid (Fig. 9).
6. Protect the style and reduce drying by slipping a 2-inch piece of large plastic drinking straw over the style and plugging it at the top with wet cotton.
7. Tag the pollinated flower, indicating the parents used—"Sherman (seed) x Rainbow (pollen)"—and the date.

A successful pollination will result in the fertilization of the ovaries, causing 2 seed pods to enlarge within 2 weeks after pollination. In about 7 months these seed pods will be nearly mature and should be covered with a paper bag to prevent loss of the hybrid seed. The seed pod will split open in from about 8 to 8½ months from the date of pollination.

It will help to:

1. Use flowers on trees that are known to have set several seed pods naturally. It is preferable that the trees be located where flower picking is controlled.
2. Sterilize pollen applicator with 95 percent alcohol before pollinating with different pollen to avoid pollen contamination.
3. Label pollinated flowers with bright colored tags and secure them to the "stems" of flowers to record the pollination and to discourage accidental picking.
4. Allow seed pod to open naturally before harvesting seeds.
5. Harvest seeds promptly to protect them from being eaten by insects.
6. Try reversing parents if your first attempt is not successful, since some plumeria flowers are better for seed than for pollen parents.

## SOIL, WATER AND FERTILIZER

Plumerias rarely require a specially prepared soil. In locations where the soil is compacted, growth will be improved by incorporating well-rotted compost, manure, or organic matter and sand to improve drainage and aeration.

Areas in full sunlight are preferred to shade or partial shade. Full-grown plants will respond to the addition of a pound of a well-balanced fertilizer (10-10-10 or 12-12-12) twice a year. After each application is spread uniformly under the full spread of the branches, the plants should be well irrigated to dissolve the fertilizer.

Plumerias do not require supplementary applications of water

except during extremely dry periods. Most cultivars grow surprisingly well under normal rainfall conditions, which range greatly in different locations and seasons. In dry locations, all plumerias, including 'Singapore,' are inclined to lose their leaves during the winter months.

## PRUNING

Branches and stems are often weak and break easily. For this reason, flower pickers should not climb on the younger limbs. If some branches are broken and removed accidentally, the rough ends may be cut off and pruning can be less severe than if all of the branches had remained intact. Plumerias may be pruned at any time of the year and cut ends of branches should be treated with an asphalt tree paint.

When plumerias are grown primarily for their landscape effect (Fig. 10), pruning can be used to train the plants to a size

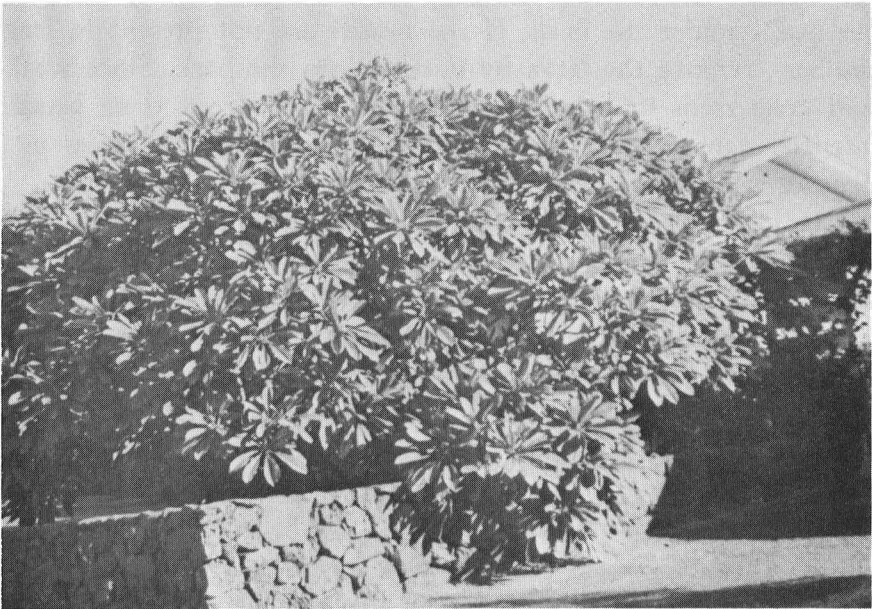


Fig. 10. Landscaping is one of the foremost uses of the plumeria tree. The tree provides a screen, shade, or accents areas of the yard.

that is appropriate for the location. If one wishes to produce flowers for lei making, top branches may be removed or shortened so that flowers will be produced within easy reach.

Above all, do not be reluctant to prune plumerias, for they produce new branches freely and will resume flowering in a few months.

## INSECTS AND DISEASES

Scale insects, beetles, and thrips often attack plumerias. Mites may also be troublesome.

One insect which has recently caused considerable damage to limbs of old established trees is the grub of the long-horned beetle. These larvae are whitish or yellowish, soft-bodied, and possess powerful mouthparts for biting into the hardest of wood. Wilt-ing of established limbs of the plumeria may indicate the presence of this insect under the bark. If the insects are not present in large numbers, remove the larva by cutting into the bark. Since weakened trees seem to be more prone to attack from these beetles, potential damage may be averted by maintaining the trees in a vigorous condition.

If insect injury is serious, a regular spraying program may be necessary to maintain clean and healthy plants. Apply an all-purpose garden spray of the type sold for other garden plants to control insects and diseases. If the area to be sprayed is great, it will be more economical to mix your own combination insecticide-fungicide spray, using 1½ pints 75 percent Malathion emulsion, plus 2 pounds 50 percent Captan (all wettable powder) in 100 gallons of water. When using all types of insecticides or fungicides, follow safety precautions.

In Hawaii, diseases attributed to bacteria, fungi, and viruses are rarely serious on plumeria trees. Occasionally, fungal leaf and petal spotting have been observed on established trees. Although these diseases do not often become severe problems, they may be



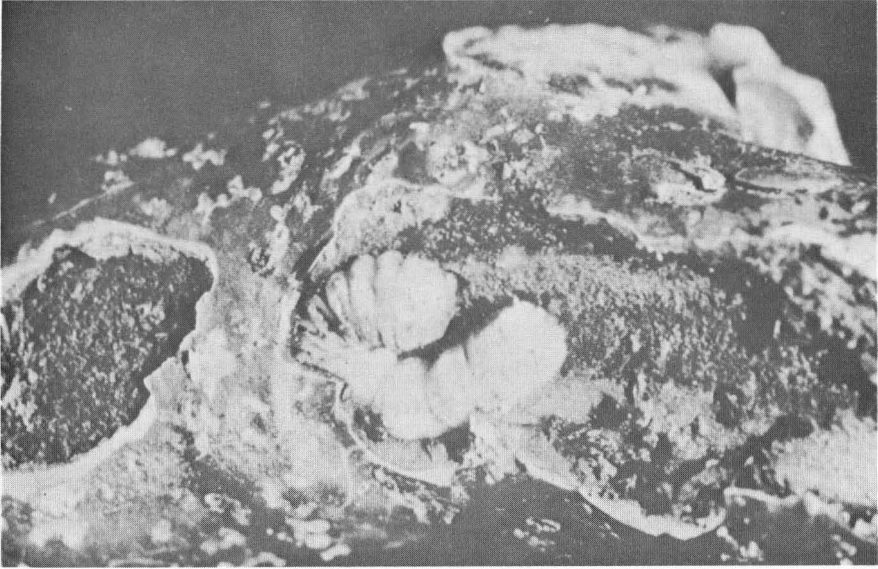


Fig. 11. Larva of the long-horned beetle, *Lagocheirus obsoletus* Thoms. in the stem of the plumeria.

controlled by use of the fungicide Zineb as prescribed on the manufacturer's label.

Sooty mold, a black powdery fungus that covers the limbs and leaves of plumeria trees, can also be distracting. This mold grows on the sugary excretions from aphids, scales, and white flies. It can be removed from the branches with soapy water and a brush. By control of the insects further occurrence of this mold can be minimized.

### KEEPING QUALITY

The keeping quality of picked flowers can be prolonged by soaking them in water for 15 minutes, draining off the excess water, and placing them between wet paper towels in the vegetable compartment of a household refrigerator. Tests using chemicals in the water have not improved the keeping quality to the same extent as lowering the temperature.

Lei makers and other users of plumerias select their flowers on the basis of their attractiveness and keeping quality.

Although the flower of the 'graveyard' or 'Common Yellow' plumeria is considered to be one of the most durable, tests on several cultivars indicate that other blossoms keep equally well. All flowers were picked fresh and sprinkled lightly with tap water before being stored at temperatures of 70° F. and 40° F. (see Table below). The results of these tests show that flowers from the cultivars of 'Common Yellow,' 'Gold,' and 'Puu Kahea' have better keeping quality than the other blossoms tested. Blossoms of varying sizes do not differ noticeably in keeping quality. Flowers with thicker and more rigid petals tend to keep the longest.

Refrigerated blossoms of some cultivars remain fresh and free from discoloration and wilting for more than 3 days, but observations have indicated that these blossoms deteriorate slightly faster after they are removed from the refrigerator. For this reason, leis or floral arrangements should be made from blossoms that have been stored no longer than 3 days at 40° F.

Fresh flowers that wilt in storage can often be revived by sprinkling with tap water and then refrigerating them in closed plastic bags.

Number of days flowers remained fresh.

	<i>Days of unblemished storage</i>		<i>Fragrance (1-day storage)</i>
	<i>at 70° F.</i>	<i>at 40° F.</i>	
Graveyard yellow	3+	3+	pleasant-mild
Gold	3	3	pleasant-mild
Puu Kahea	3	3	pleasant-mild
Rainbow	2	3	pleasant-mild
Singapore	2	3	pleasant-mild
Hilo Beauty	2	2	pungent-strong
Madame Poni	1	3	pleasant-mild
Samoan Fluff	1	2	pleasant-mild
Kauka Wilder	1	1	pleasant-strong
Scott Pratt	1	1	pungent-strong
Sherman	1	1	pleasant-mild

## SOME USES OF PLUMERIAS

The fragrant plumeria blossoms are prized for lei making and for decorations.

Whole branches can also be used as decorative material in the home as well as outdoors. Cut to proper size and drained of exuding latex, branches with leaves and flowers can be used indoors or on the lanai in containers without water for several weeks. These unrooted branches may later be planted in the garden for a supply of lei flowers.

Lei makers have skillfully devised different methods of stringing the blossoms into leis or garlands. Usually, the flowers are strung end to end or through the base of the flowers if a fuller lei is

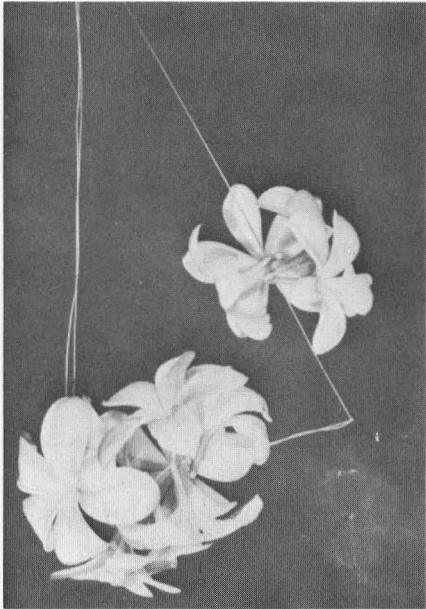


Fig. 12. To create a thick lei, flowers may be strung closely through the base of their corolla tubes.

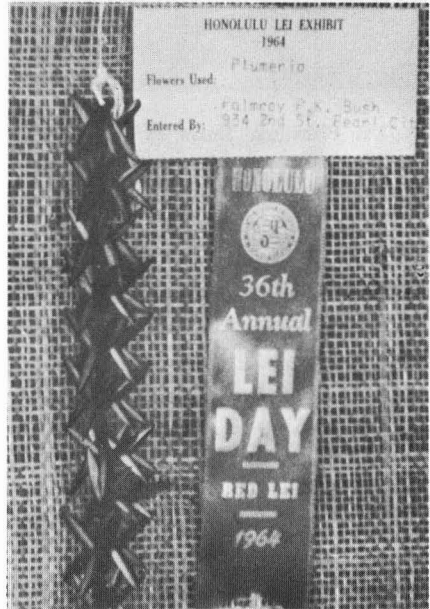


Fig. 13. Novel methods of stringing plumeria include using the closed buds and alternating the direction of the flowers.



Fig. 14. Plumeria floral arrangements. Left, wedding bouquet using 'Sherman' plumerias. Right, table decoration using 'Sherman' plumerias and Sansevieria.

wanted. Contests have uncovered the ingenuity of amateur and veteran lei makers.

The attractive flowers, from which there are many colors and tones to choose, are also suitable for wedding bouquets, corsages, and table decorations (Fig. 14). Used by themselves or with different flowers or plant parts, the plumeria blossoms add accent to a Hawaiian theme.

The latex of plumeria has been used as a medicine for itches, swellings, and fevers in other parts of the world, although it is reputedly poisonous when ingested. The bark, leaves, flower buds, and seeds are also reported to have medicinal value.

The white, soft, lightwood is used to make drums in India; harder, more mature trunks of the trees are used in the Caribbean area for making bowls, trays, cabinets, and furniture.

## SCENT OF THE BLOSSOMS

Fragrance is an intangible and variable characteristic of plumeria blossoms, ranging from strong to mild and from pleasant to highly pungent. Plumerias with yellow centers or stripes seem to have a more agreeable fragrance than those lacking this character. Red plumerias, for instance, have a distinctly different odor, often objectionable in older flowers.

As a guide to the selection of flowers, a few subjective observations on the scent of the tested blossoms after one day of storage have been included in the Table on page 14.

## MARKETING OF THE FLOWERS AND LEIS

During and since World War II plumerias became a common lei flower. Most flowers are harvested from private gardens whether they are used privately or reach the commercial markets. Prices



Fig. 15. An exhibit of commercial leis by Carmen Castro.



in 1965 range from 50c to \$1.00 per bucket, depending upon the supply of flowers. Commercial florists often purchase leis already strung. The bulk of the crop is used privately or marketed directly to the consumer in town, at the airport, or at the ship harbor (Fig. 15). A well-made fresh lei retails for from \$1.00 to \$2.00 and contains from 40 to 60 individual flowers. Increasing numbers of plumeria leis are being sold locally and many are being packed for air shipment out of the state.

NOTE: The mention, in this circular, of one commercial product or another does not imply endorsement of the product or criticism of other comparable products.

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