



Pikake

A Fragrant-Flowered Plant for Landscapes and Lei Production

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Pikake is the Hawaiian name for a jasmine, *Jasminum sambac*, which is one of about a dozen *Jasminum* species grown in Hawaii as ornamentals. The name is adapted from the word "peacock," because the Hawaiian Princess Kaiulani reportedly was fond both of this flower and the bird, according to Marie Neal (*In Gardens of Hawaii*). *J. sambac* is known as sampaguita in the Philippines, where it is the national flower, gunda mallige in India, mo li in parts of China, and Arabian jasmine in the mainland USA. It is grown commercially in India, Thailand, China, and the Philippines for its fresh flowers, which are also used to make perfume and as flavoring for tea. In Hawaii, pikake is grown in landscapes and gardens and by commercial producers of lei flowers.

Description

Jasminum sambac, from the olive family (Oleaceae), is a native of India. It is a fragrant-flowered shrub, 2–3 feet wide and up to 6 feet tall, that is fairly hardy and drought resistant. It has a moderate growth rate in spring and summer but grows slowly during cool seasons. It has downy branches bearing rich green, rounded to oval, paired leaves with prominent veins. The plant has both bushy and viny growth characteristics. The ½–¾-inch cream-white flowers are borne at branch terminals either singly or in clusters on new growth. The unopened bud is oval, and the open flower is star-shaped.



Pikake buds strung crosswise, forming a "rope" lei.

Varieties

Four distinct flower types can be distinguished in *Jasminum sambac*. One is the single flowered variety with white petals that are ovate to acute, with a ¾–1¼-inch diameter flower. This is the variety commercially grown in Hawaii as a lei flower.

A semi-double variety has flowers with elongated white petals forming a flower ¾–1¼ inch in diameter. This variety is not suited for lei making, because the stems on the flower buds cannot be pushed into the flower bud be-

low it due to the greater number of petals.

The rose pikake is a double-flowered variety with white, rounded petals. The diameter of an open flower is ¾–1¼ inch. The name comes from its structural resemblance to a rose flower. Rose pikake produces fewer flowers per plant than the single or semi-double varieties.

A multi-whorled variety has petals so packed that it resembles a small, white, ¾–1⅜ inch diameter carnation. This variety, like the rose pikake, produces fewer flowers compared to the single and semi-double varieties.

Single and semi-double varieties have their peak flower production from March to September, with very few flowers produced during the winter months. The rose and multi-whorled pikake have their peak flower production from April to August, with very few flowers produced during the remaining months. These flowering periods may vary, depending on the location and the weather conditions of the particular year.

Propagation

Propagation may be done by layering, but only a few plants can be obtained from each parent plant. This may be the preferred method to propagate a few plants for the home garden. Mass propagation for commercial purposes is more feasible using cuttings. Make cuttings of mature (1–2-year-old) wood. Use a rooting compound with 0.3% NAA or IBA before sticking the cuttings 1–2 inches into a clean, well drained medium such as a mixture of equal parts peat and perlite. Then place the cutting trays on a protected bench with intermittent mist or in a shaded greenhouse with high humidity. Rooting time is 2–3 weeks. After the cuttings have rooted, plant them in containers with a rich loam soil and place them in brighter sun in preparation for field planting.

Soil

Good results are obtained when pikake is grown in rich loam, silty clay loam, or sandy soils with irrigation. Good drainage is essential because waterlogging kills almost all species of *Jasminum*. The soil pH should be 6.0–6.5.

Growing conditions

Long days and hot weather favor good flower production and large flowers. Pikake grows best in dry locations, and it flowers most profusely when grown in full sun. Under shade, (such as beneath a tree or under the eave of a house) the plant does not grow as well and produces fewer flowers. Daytime temperatures of 80–90°F (27–32°C) and nighttime temperatures of 70–80°F (21–27°C) are ideal. Lowland, leeward areas free from cool mountain breezes provide these conditions. If night temperature drops below 70°F (21°C), flower production and size are reduced. One night of temperatures in the low '60s (15–17°C) can shut down flowering for 1–2 weeks.

Commercial plantings are grown as hedgerows, with plants spaced about 1½ feet apart in rows 5–6 feet apart. The plant is moderately tolerant of salt and wind, but wind can damage the flowers.

Irrigation

Water the entire root zone, and allow the soil to become slightly dry between waterings. In most areas, this can be accomplished with moderate irrigation, about 1 inch per week.

Fertilizer

A soil test to determine the nutrient status of the soil is recommended. Generally, a fertilizer such as 10-30-10 or 10-10-10 is recommended for good flower production. Fertilizer is applied when the plants are pruned during the winter months and two to three times during the rest of the year. The fertilizer application rate will depend on the soil nutrient levels, but 20–30 lb of a complete fertilizer per 1000 sq ft of planting per year (made in three or four applications) is generally adequate. An alternative to broadcasting granular fertilizer is to deliver liquid fertilizer with the irrigation water. Foliar sprays of iron and other micronutrients may be required under intensive cultivation. Diluted foliar fertilizer can be included in pesticide spray applications.

Pruning

Pruning is usually done during November–January, when the plants are not producing flowers. The plants are trimmed back with a hedge trimmer to allow passage between the rows and to facilitate harvesting. The plants may also be pruned back once or twice during the flowering months to induce a heavier flower set. Pruning will induce lateral branching and thereby promote flowering, because pikake produces flowers only on the terminal ends of new growth. See more on pruning under *Manipulating flowering*, below.

Old plants are rejuvenated by pruning the whole plant back to a height of about 2 feet. Root suckers are unproductive and should be eliminated.

Pests, diseases, integrated pest management

Many insect and mite species can be problems on pikake if they are not controlled. We recommend the integrated pest management (IPM) approach. IPM is based on predicting the need for a control measure and considering the ecological causes of pest problems and the ecological consequences of control measures. It is a holistic approach emphasizing tactics that are practical, effective and cost-effective, and safe for humans and the environment. These tactics include releasing and encouraging natural predators and parasitoids of pest organisms, modifying crop environments, and adjusting cultural practices in ways that favor the crop while creating an unfavorable situation for the pest. Often, IPM maximizes the use of non-chemical control practices and decreases reliance on and use of chemical pesticides.

Other strategies of an IPM program include applying mineral oils, soaps, and plant extracts; using inter-crops, natural predators, barriers, traps, and trap crops; and utilizing strict sanitation practices.

When chemical pesticides must be used, we recommend that wettable powder insecticide formulations be used instead of emulsifiable liquid forms to avoid toxicities that may result from the oil derivatives. It is also recommended that a rotation of approved pesticides of different chemical classes be used rather than the continuous application of one class of pesticide; this avoids the build-up of pesticide resistance in the pests.

Pikake pests

Hawaiian flower thrips (*Thrips hawaiiensis*): causes loss of buds and flowers.

Western flower thrips (*Frankliniella occidentalis*): causes loss of buds and flowers.

Blossom midge (*Contarinia maculipennis*): deforms or aborts flower buds.

Broad mite (*Polyphagotarsonemus latus*): deforms or aborts flower buds; causes curling and stunting of young foliage.

Carmine spider mite (*Tetranychus cinnabarinus*): removes plant sap and chlorophyll from foliage, reducing plant vigor.

Jasmine whitefly (*Aleuroclava jasmini*), kirkaldy whitefly (*Dialeurodes kirkaldyi*), jasmine whitefly (*Aleuroclava jasmini*): sucks plant sap; excrement becomes a medium for the growth of sooty mold fungus.

Longtailed mealybug (*Pseudococcus longispinus*): sucks plant sap; deforms developing tissues.

Armored scales (several species): sucks plant sap, reducing plant vigor.

Inornate scale (*Aonidiella inornata*)

Hibiscus snow scale (*Pinnaspis strachani*)

Mining scale (*Howardia biclavis*)

Dictyospermum scale (*Chrysomphalus aonidum*)

An armored scale (*Parlatoria opsis* sp.)

Gray hawk moth (*Psilogamma menephron*): caterpillar feeds on foliage.

Pikake is host to a range of diseases caused by viral, nematode, and fungal pathogens. Root rots can kill cuttings during propagation and adult plants in high-rainfall areas and where soil drainage is poor. A virus disease, infectuous chlorosis, infects pikake and most other

Jasminum species. The symptom is a yellowish mottling on the leaves. There is no known control for this disease. Seed collected from infected plants may produce virus seedlings. Grafting with infected plant material will ensure its spread. The disease is probably also spread by sucking insects. As long as plants are otherwise healthy, this disease appears to cause no appreciable reduction in flower yield or quality.

Pikake diseases

Southern blight (*Sclerotium rolfsii*): white wefts of mycelium spread fanwise up the stem from the crown and also out into the soil.

Root rot: *Pythium* and *Rhizoctonia* species.

Powdery mildew: powdery to mealy coating on leaves and buds; affected parts may be stunted.

Reniform nematode: impaired roots and reduced plant vigor.

Infectuous chlorosis: yellowish leaf mottling.

Manipulating flowering

Flower bud production starts to slow in October, depending on the temperature, and continues to decline. Flower size will be smaller during the winter months, and florists may hesitate to buy them because it takes more labor (time and cost) and many more smaller flowers to make a lei. Winter flowering can be forced by using plastic tunnels to retain heat around the plants into the nighttime.

CTAHR research on Molokai using clear polyethylene plastic over a frame of arched PVC pipe creating a quonset-type tunnel to capture heat to increase winter flowering had excellent results. Additional benefits of growing the plants in these tunnels were that the flower buds were twice the size and much brighter white than buds from plants in the same field but not in the tunnels. Buds and flowers must not come in contact with the plastic, or they will be damaged and become unmarketable. Growers are cautioned to open the plastic tunnels by mid-morning (8:00–9:00 a.m.) before the temperature inside exceeds the mid-90s (34–35°C), which risks “cooking” the flower buds. The tunnels should be closed by mid- to late afternoon (3:00–4:00 p.m.) before the temperature drops much.

Enhanced summer flowering and timing a flush to meet a specific harvest period (for example, May–June for graduations, proms, and weddings) can be accom-



A pikake planting protected by windbreaks of ‘Tropic Coral’ erythrina. Above, before pruning; below, a pruned row.

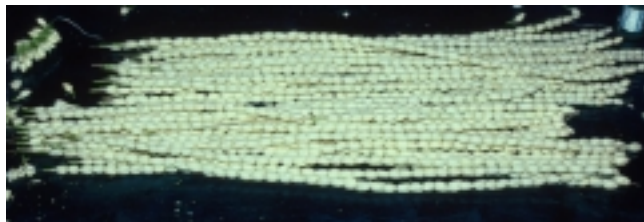
plished by scheduling pruning. Plants will flower approximately 30 days after pruning in summer, or 40 days in the cooler months of the blooming period. The response time may differ from one location to another. Careful growers keep a log to record the dates of pruning for each row and the dates of the following flowering flush, then they use this information to fine-tune flowering manipulation for their particular conditions. A recommended practice is to prune a section of the field every week to achieve constant production.



Once a flowering flush begins, the plants will flower for 5–10 days or longer, depending on the time of year. Sometimes during the heat of summer, particularly healthy and vigorous plants may go through a double cycle when they will flush, take a short rest, then flush again, resulting in a production period of 20 days or more. This may be the result of accumulated carbohydrate reserves in the plant.

Harvesting

Pikake is harvested in the morning, usually between the hours of 7:00–10:00 a.m., when the flowers contain the



Lei strands of pikake buds strung lengthwise.

maximum amount of perfume. During the winter, particularly during “kona” weather, harvesting is delayed until midday, allowing the buds more time to mature. Buds must be white before they are harvested. If they are harvested too young (light creamy green-yellow) they will not open and emit the typical fragrance for which pikake is known. The buds are harvested on the basis of color rather than size or firmness, because bud size and firmness depend on the weather conditions during bud development.



Buds on the branch terminal.

Yield

Commercial yields range widely and depend on many factors, including plant age, planting density, nutrition, irrigation, crop management practices, pest and disease management, and the weather. Bright, hot weather is essential for high yield. Farm yield data range from 8000 to 60,000 flower buds harvested per acre per day during peak periods. A good grower in a suitable location can expect to harvest 2–3 million flowers per acre per year.

Lei making

Buds are strung soon after they are harvested. A single lei strand is 36–38 inches long. The number of buds in a single strand of buds strung lengthwise varies with the length of the strand and the time of the year. During summer when the buds are large, about 85 are needed to make a single strand. During winter when the buds are smaller, about 125 buds may be needed. A large, fancy rope lei with the buds strung crosswise takes approximately 1000 buds. A pikake lei can be kept for 4–6 days with no loss of fragrance or quality when stored in a plastic bag at 40–45°F (4.4–7.2°C).