

agapanthus

OTHER COMMON NAMES: African lily, blue lily, lily of the Nile

SCIENTIFIC NAME: *Agapanthus africanus*

FAMILY: Liliaceae (lily family)

NATURAL SETTING/LOCATION: native to South Africa



CURRENT STATUS IN THE WILD IN HAWAII: introduced garden plant

CULTIVARS: 'Albus', 'Flore Pleno'

Growing your own

PROPAGATION

FORM: division (easiest and fastest; use 6" clumps); seeds (seedlings take longer to flower than plants from divisions)

PREPLANTING TREATMENT: soak seeds in water for 24 hours

PLANTING DEPTH: sow seeds ¼" deep in medium; keep root crown just below soil level for divisions

GERMINATION TIME: slow and erratic

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, moisture-retentive

SOIL PH: 5.0–6.5

LIGHT: full sun to partial shade

WATER: moderate; tolerates drought once established

TEMPERATURE: tolerates temperatures down to 25°F, but prefers temperatures above 50°F

ELEVATION: 10–4500'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 12–18" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 12" pots or larger (prefers crowded conditions)

SPECIAL CULTURAL HINTS: divide every 5–6 years



agapanthus

Plant characteristics

HEIGHT: foliage 1½–2' tall; flower stalks 2–5' tall; dwarf cultivars are available

SPREAD: 2'

GROWTH RATE: moderate

GROWTH HABIT: clumps of arching, ever-green leaves

FLOWERS

SIZE: 1½–3"

COLOR: dark blue to pale blue to white

SHAPE: tubular

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes, if propagated from large divisions

FLOWERING PERIOD: summer

TIME TO FLOWERING: 2–3 years from seed, less if from division

INDUCING AND MAINTAINING FLOWERING: not known

PESTS

COMMON DISEASES: none serious

OTHER PESTS: slugs, snails

Harvesting considerations

WHAT IS HARVESTED: flowers, buds with 1–2" stem

HARVESTING TECHNIQUES: cut, don't pull

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

VASE LIFE: to 7 days

CLEANING OF PLANT MATERIALS: place stems in water

STORING RAW LEI MATERIALS: refrigerate at 40°F for up to 7 days

PREPARING FOR USE IN LEI: if sewing, cut flower with ⅛" of stem

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place in sealed plastic container and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Joffe, Pitta. 1993. *The Gardener's Guide to South African Plants*. Cape Town, South Africa: Tafelberg Publishers Ltd.

Nowack, Joanna and Ryszard M. Rudnicki. 1990. *Postharvest Handling and Storage of Cut Flowers, Florist Greens, and Potted Plants*. Portland, Oregon: Timber Press.

Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.

'ākulikuli-lei

OTHER COMMON NAMES: 'ākulikuli, ice plant, noon flower

SCIENTIFIC NAME: *Lampranthus glomeratus* (magenta), *Lampranthus* sp.

FAMILY: Aizoaceae (fig-marigold family)



NATURAL SETTING/LOCATION: native to coasts of South Africa along the Sahara

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: cuttings from stems with spent flowers

PREPLANTING TREATMENT: allow cut end to air-dry 1–2 days, treat with mild rooting hormone

PLANTING DEPTH: insert base of cutting 1–1½" into medium

CUTTING ROOTING TIME: 1 month

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: sparingly; tolerates drought

TEMPERATURE: 40–70°F

ELEVATION: common magenta form 300–3200', orange form 3000–4000'

SALT TOLERANCE: good

WIND RESISTANCE: good



MANAGEMENT

FERTILIZER NEEDS: medium; apply after flowering and in late summer

RECOMMENDED SPACING: 18–24" apart

ADAPTATION TO GROWING IN CONTAINERS: not recommended

PRUNING: not necessary

SPECIAL CULTURAL HINTS: likes hot days

and cold nights (Kula, Waimea climates are ideal); do not overwater

Plant characteristics

HEIGHT: to 18"

SPREAD: to 36"

GROWTH RATE: moderate

GROWTH HABIT: low groundcover

‘ākulikuli-lei

FLOWERS

SIZE: 1½–2½"

COLOR: magenta, white, orange to brownish orange

SHAPE: daisy-like

FRAGRANCE: very light

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: depends on transplanting time

TIME TO FLOWERING: cuttings flower in less than 9 months

INDUCING AND MAINTAINING FLOWERING: if attempting to produce flowers for graduation time (May–June), transplant or make cuttings for planting in August through October (depending on elevation); flowers will emerge starting in early May; natural flowering will be later by 1 month

PESTS

COMMON DISEASES: nematodes, root rot, southern blight

OTHER PESTS: scales

Harvesting considerations

WHAT IS HARVESTED: flower buds with 1–2" stem

HARVESTING TECHNIQUES: cut or break by hand

BEST TIME OF DAY TO HARVEST: early morning before flowers open

BEST WAY TO TRANSPORT FROM PICKING AREA: metal can



The lei shown also contains cymbidium orchid and anthurium.

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers.

STORING A COMPLETED LEI BEFORE WEARING: place lei in paper box and refrigerate; no water

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: no water

STORING RAW LEI MATERIALS: store in paper box and refrigerate at 40°F for up to 10 days

PREPARING FOR USE IN LEI: clip stems at different sizes, then sew; for *poepoe* (circular) style, sew closed flowers—open flowers not usually used; no water

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Joffe, Pitta. 1993. *The Gardener's Guide to South African Plants*. Cape Town, South Africa: Tafelberg Publishers Ltd.

Mathias, Mildred E. 1973. *Color for the Landscape: Flowering Plants for Subtropical Climates*. Los Angeles: Los Angeles Beautiful, Inc.

asparagus fern

OTHER COMMON NAMES: asparagus

SCIENTIFIC NAME: *Asparagus setaceus* var. *plumosus*; *Asparagus densiflorus* var. *sprengeri*, *myersii*

FAMILY: Liliaceae (lily family)

NATURAL SETTING/LOCATION: southern and eastern Africa

CURRENT STATUS IN THE WILD IN HAWAII: not found



CULTIVARS: *A. densiflorus* var. *sprengeri* is light yellow-green, coarse, and has recurving spines; *A. densiflorus* var. *myersii* has elongated, foxtail-like shoots; *A. setaceus* var. *plumosus* has dark green, finely divided branches and looks fern-like

Growing your own

HANDLING CAUTIONS: some have thorns

PROPAGATION

FORM: seeds; division

PREPLANTING TREATMENT: remove seeds from fleshy pulp, plant fresh, germinate at 85/70°F (day/night)

PLANTING DEPTH: sow seeds on surface of medium or slightly below (¼"); keep division root crown just below soil level

GERMINATION TIME: 60–90 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, light, sandy; in pots, 1:1 peat:perlite

SOIL PH: 6.0–7.0

LIGHT: full sun to partial shade (best quality with up to 50% shade)

WATER: high quality best, though tolerant of slightly brackish water. Irrigate deeply about once a week—more frequently in light soils during dry weather.

TEMPERATURE: 70–80°F (day), 60–70°F (night)

ELEVATION: 10–1000'



SALT TOLERANCE: avoid direct salt spray; tolerates slightly brackish water

WIND RESISTANCE: tolerant, but *S. setaceus* varieties develop brown leaf tips when dehydrated by wind

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: *A. densiflorus*: 3' apart; *A. setaceus*: 1–2' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, pots or planter boxes, container size 8" or larger and 8–12" deep; plants can split plastic and cement containers as they grow

PRUNING: harvest recently matured shoots twice a week; old shoots lose their leaves quickly after harvest, and young shoots wilt; experience will determine the best stage to cut; allow at least 6–8 developing shoots per plant to remain

SPECIAL CULTURAL HINTS: may become weedy if left unchecked

SUGGESTED COMPANION PLANTINGS: could be used as an underplanting or border plant in landscape; *sprengeri* and *myersii* varieties are useful accent plants in the landscape

asparagus fern

Plant characteristics

HEIGHT: *A. setaceus* to 8–10', *A. densiflorus* to 36"

SPREAD: *A. setaceus* to 6–8', *A. densiflorus* to 5–6'

GROWTH RATE: fast

GROWTH HABIT: erect, climbing, or trailing woody herb

FOLIAGE

TEXTURE: fine

COLOR: green

SHAPE: needle-like

FRAGRANCE: none

PESTS

COMMON DISEASES: leaf spot and root rot

OTHER PESTS: mites, scales, thrips

Harvesting considerations

WHAT IS HARVESTED: mature stems

HARVESTING TECHNIQUES: break or cut; leave 6–8 shoots per plant

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 16 days, depending on cultivar

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: place stems in water immediately after harvesting, refrigerate at 45°F for up to 10 days



The lei shown also contains pakalana, globe amaranth, plumeria, bougainvillea, and Spanish moss.

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei; stem length should be 3–4"

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp newspaper, place in sealed plastic bag or container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Bredmose, N. 1976. "Blueprint Cropping of Asparagus Fern." *Scientia Horticulturae* 4:201–210.

Clay, Horace F., and James C. Hubbard. 1977. *The Hawai'i Garden: Tropical Exotics*. Honolulu: University of Hawai'i Press.

ALERT: *Asparagus setaceus* and *A. densiflorus* could be invasive species and cause problems in agricultural and natural areas in Hawai'i. *A. setaceus* scores a rating of 13 and *A. densiflorus* scores a rating of 15 on the Hawai'i-Pa-

cific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai'i or similar Pacific islands and is about 95% accurate. Any score above 6 indicates the potential for invasiveness, though there are varying levels of concern. The HPWRA score does not necessarily mean you should remove established plants from urban landscapes or avoid planting them at all, but *A. setaceus* and *A. densiflorus* should not be introduced to areas where they are not already growing. *A. densiflorus* has already naturalized in some places on Kaua'i, Maui, and Hawai'i Island. Birds can spread the seeds of both species. If used in lei, seeds should be removed first if possible. If fertile material is used, lei should not be discarded in areas where *A. setaceus* and *A. densiflorus* are not naturalized and where the seeds can germinate and grow. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

aster

OTHER COMMON NAMES: koniaka, Michaelmas daisy, New York aster (*Aster novi-belgii*)

SCIENTIFIC NAME: *Aster novi-belgii* and *A. ericoides*

FAMILY: Asteraceae (formerly Compositae) (aster family)

NATURAL SETTING/LOCATION: North America



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: *A. novi-belgii*: 'Alert', 'Bonningale White', 'Crimson Brocade', 'Eventide'; *A. ericoides*: 'Monte Casino', 'Pink Casino'

Growing your own

PROPAGATION

FORM: division or cuttings (most growers purchase rooted cuttings from plant propagators)

PLANTING DEPTH: insert base of cutting 1–2" into medium, use mild rooting hormone; keep division root crown just below soil level

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: adapted to most soils

SOIL PH: 5.5–7.0

LIGHT: full sun to light shade

WATER: moist

TEMPERATURE: 68–70°F

MANAGEMENT

FERTILIZER NEEDS: medium; do not fertilize once flowers begin to open

RECOMMENDED SPACING: 12–18"

ADAPTATION TO GROWING IN CONTAINERS: yes, 1- to 2-gallon pots

PRUNING: remove dead and old flowers to promote development of new ones

SPECIAL CULTURAL HINTS: plants spread through underground rhizomes; often self-sown; does not reproduce true from seed



aster

Plant characteristics

HEIGHT: 1–3'
SPREAD: 12"
GROWTH RATE: fast
GROWTH HABIT: short shrub

FLOWERS

SIZE: 12"
COLOR: red, pink, purple, white, and mixtures
SHAPE: round, daisy-like
FRAGRANCE: none
TIME TO FLOWERING: 16–18 weeks
INDUCING AND MAINTAINING FLOWERING: requires short days (less than 12 hours) for consistent and abundant flowering

PESTS

COMMON DISEASES: *Botrytis*, leaf spots, powdery and downy mildew, *Rhizoctonia* foliage blight
OTHER PESTS: aphids, mites, thrips, and whiteflies

Harvesting considerations

WHAT IS HARVESTED: flowers and buds
HARVESTING TECHNIQUES: cut
BEST TIME OF DAY TO HARVEST: early morning
BEST WAY TO TRANSPORT FROM PICKING AREA: cooler or plastic container with water
AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



The lei shown also contains bleeding heart, bougainvillea, and globe amaranth.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse
VASE LIFE: 5–7 days
CLEANING OF PLANT MATERIALS: cold water soak for 2 minutes to get dust off; foliage wilts quickly so should be removed
STORING RAW LEI MATERIALS: store in plastic container with water and refrigerate at 35–40°F for up to 7 days
PREPARING FOR USE IN LEI: clip the wrinkled, limp, or poor-quality areas before adding to lei
STORING A COMPLETED LEI BEFORE WEARING: sprinkle with water, drip dry, wrap in newspaper, and place in plastic container
PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Faber, Willie, and Jeff McGrew. 1998. *The Ball RedBook*. 16th ed., p. 372–385. Batavia, Illinois: Ball Publishing.
 Hessayon, D.G. 1995. *The Flower Expert*. London: Transworld Publishers.
 Nau, Jim. 1993. *Ball Culture Guide: The Encyclopedia of Seed Germination*. 2nd ed. Batavia, Illinois: Ball Publishing.
 Sascalis, John N. 1993. *Cut Flowers, Prolonging Freshness*. Batavia, Illinois: Ball Publishing.

Introduced Perennials

baby's breath

SCIENTIFIC NAME: *Gypsophila paniculata*

FAMILY: Caryophyllaceae (pink family)

NATURAL SETTING/LOCATION: native to central Asia, central and eastern Europe



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: 'Bristol Fairy', 'Double Snowflake', 'Pink Fairy', 'Red Sea', 'Klamingo'

Growing your own

PROPAGATION

FORM: cuttings; seeds of named cultivars

PREPLANTING TREATMENT: none

PLANTING DEPTH: sow seeds on surface or slightly below (1/8"); use medium rooting hormone on cutting and insert base 1–2" into medium

GERMINATION TIME: 5–10 days

CUTTING ROOTING TIME: 10–14 days during summer

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained; in fields, loam to sandy soils; in pots, 1:1 peat:perlite

SOIL PH: 7.0

LIGHT: full sun, long daylength

WATER: keep moist

TEMPERATURE: requires 55°F nights followed by long days (14–16 hours); preferred daytime temperature range is 60–70°F

ELEVATION: 500–3500'

SALT TOLERANCE: poor

WIND RESISTANCE: poor



MANAGEMENT

FERTILIZER NEEDS: medium; amend field soils with Ca and Mg if analysis is low

RECOMMENDED SPACING: 18–24" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs, but planting in the ground is better

PRUNING: remove old flower stalks

SPECIAL CULTURAL HINTS: most cultivars propagated vegetatively due to variability of seedlings; seed is used for only a few cultivars; better production in 2nd year; don't overwater

SUGGESTED COMPANION PLANTINGS: statice or sweet william (*Dianthus barbatus*)

baby's breath

Plant characteristics

HEIGHT: 2–4'

SPREAD: 36"

GROWTH RATE: slow to moderate

GROWTH HABIT: short, mound-like

FLOWERS

SIZE: ¼–¾"

COLOR: white, pink

SHAPE: round, flat

FRAGRANCE: none

FLOWERS IN FIRST YEAR: requires cool temperatures before flowering

FLOWERING PERIOD: natural flowering occurs in late spring to late summer; lights are needed for winter production; can be treated as perennial or annual

TIME TO FLOWERING: once flowering has started, wait about another 10 weeks to harvest

INDUCING AND MAINTAINING FLOWERING: lighting may be necessary during summer months in Hawai'i and is necessary during winter months for good flower production, as it requires 14–16 hours of light

PESTS

COMMON DISEASES: damping off, root rot, nematodes, crown gall, *Botrytis* (on flowers)

OTHER PESTS: spider mites, thrips

Harvesting considerations

WHAT IS HARVESTED: flowering branches

HARVESTING TECHNIQUES: for fresh flowers, cut 1–2" stems when 60–70% of flowers are open; for drying, cut when 80–90% are open



The lei shown also contains bougainvillea, Geraldton waxflower, chrysanthemum, bleeding heart, globe amaranth, and joyweed.

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper box

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 57 days

CLEANING OF PLANT MATERIALS: none; do not wet flower heads

STORING RAW LEI MATERIALS: place stems in water and refrigerate at 40°F for up to 7 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei; boil water and place cut stems in hot water to force flowering if not all have bloomed

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place on damp paper towel, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Anonymous. 1995. *Gypsophila: Cultivation Practices in Israel*. Beit Dagan, Israel: Danziger 'Dan' Flower Farm.

Armitage, A.M. 1993. *Specialty Cut Flowers*. Portland, Oregon: Varsity Press and Timber Press.

Nowack, Joanna and Ryszard M. Rudnicki. 1990. *Postharvest Handling and Storage of Cut Flowers, Florist Greens, and Potted Plants*. Portland, Oregon: Timber Press.

Sascalis, John N. 1993. *Cut Flowers, Prolonging Freshness*. Batavia, Illinois: Ball Publishing.

bleeding heart

OTHER COMMON NAMES: clerodendrum, glorybower, hō‘ehapu‘uwai

SCIENTIFIC NAME: *Clerodendrum thomsoniae* and *Clerodendrum x speciosum*

FAMILY: Verbenaceae (verbena family)



NATURAL SETTING/LOCATION: native to tropical West Africa

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: soft wood or semi-ripe cuttings under mist; commercially propagated from single-node cuttings; also grown from root cuttings and rooted suckers

PRETREATMENT: treat cutting with medium rooting hormone

PLANTING DEPTH: insert base of cutting 1–1½" into medium

CUTTING ROOTING TIME: 6–8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 5.5–6.5 (avoid high-pH soils)

LIGHT: full sun for best bloom

WATER: keep moist; over-watering can cause leaf drop

TEMPERATURE: tolerates temperatures down to 35°F, but temperatures below 60°F inhibit growth

ELEVATION: 10–2000'



SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 36" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, will flower in 6" pot, but larger containers are easier to maintain

PRUNING: prune after flowering; can be maintained as a shrub or high ground cover 24–36" high (6–7 nodes above the roots); pruning shorter than this will delay flowering

SPECIAL CULTURAL HINTS: provide support if vining is desired

bleeding heart

Plant characteristics

HEIGHT: 10–15'

SPREAD: 36"

GROWTH RATE: fast

GROWTH HABIT: evergreen, twining shrub

FLOWERS

SIZE: calyx (leafy base of flower)
½–¾"

COLOR: *C. thomsoniae* calyx is white with red corolla; *C. x speciosum* calyx is pink, corolla deep rose to red

SHAPE: flowers consist of bell-shaped calyx and narrow tubular corolla; the calyx stands out and is used in lei

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round under high-light conditions, heaviest in winter through spring

TIME TO FLOWERING: 3–5 months; terminal cuttings flower soonest, and seed-propagated plants take at least 1 month longer than cuttings to flower

INDUCING AND MAINTAINING FLOWERING: both types are short-day plants; nights longer than 10 hours promote flowering; high light intensity also promotes flowering and can minimize the need for long nights

PESTS

COMMON DISEASES: none serious

OTHER PESTS: none serious



The lei shown also contains shinobu.

Harvesting considerations

WHAT IS HARVESTED: flower calyx (leafy base)

HARVESTING TECHNIQUES: plant has long internodes; cut close to nodes to avoid leaving long pieces of dying stem

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 2 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in sealed container and refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei; true flowers are most often removed, as well as the leaves

STORING A COMPLETED LEI BEFORE WEARING: soak lei in water for 5 minutes, drip dry, place in sealed container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Sanderson, K.C., and W.C. Martin Jr. 1975. "Cultural Concepts for Growing *Clerodendrum thomsoniae* Balf. as a Pot Plant." *Proceedings of the Florida State Horticultural Society* 88: 439–441.

Shillo, Ruth, and Ronnie Engel. 1985. "Clerodendrum speciosum." In: *CRC Handbook of Flowering*. vol. II, ed. A.H. Halevy, p. 302–307. Boca Raton, Florida: CRC Press.

Stromme, E., and H. Hildrum. 1985. "Clerodendrum thomsoniae." In: *CRC Handbook of Flowering*. vol. II, ed. A.H. Halevy, p. 299–301. Boca Raton, Florida: CRC Press.

blue jade vine

OTHER COMMON NAMES: green jade vine, jade vine

SCIENTIFIC NAME: *Strongylodon macrobotrys*

FAMILY: Fabaceae (pea family)



NATURAL SETTING/LOCATION: Philippines

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

HANDLING CAUTIONS: may stain some fabrics

PROPAGATION

FORM: air layering; semi-woody cuttings 9" long; fresh seeds

PREPLANTING TREATMENT: use fresh seeds, plant immediately upon opening of capsule, scarify seeds by scratching seedcoat or put in water that has been brought to a boil and removed from heat and soak for about 24 hours; use strong rooting hormone on cuttings

PLANTING DEPTH: sow seeds ½–1" deep in medium; insert cutting ½ its length into medium

GERMINATION TIME: 10–14 days at 80–85°F

AIR LAYERING ROOTING TIME: 4–8 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, moist, well drained

SOIL PH: 6.0–7.0

LIGHT: full sun to partial shade

WATER: moderate

TEMPERATURE: 60–90°F

ELEVATION: 10–800'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium; apply after flowering and in spring

RECOMMENDED SPACING: 8' apart

ADAPTATION TO GROWING IN CONTAINERS: not recommended

PRUNING: prune to manage spread of plant



SPECIAL CULTURAL HINTS: provide strong arbor, trellis, or other support; stem is too weak to support itself in an upright position

blue jade vine

Plant characteristics

HEIGHT: twining vine to 40'

SPREAD: 20–30'

GROWTH RATE: fast

GROWTH HABIT: perennial, evergreen, woody, flowering vine

FLOWERS

SIZE: 2½–3" clusters to 36" long

COLOR: aquamarine to jade green

SHAPE: beak-like

FRAGRANCE: none

FLOWERS IN FIRST YEAR: no

FLOWERING PERIOD: late summer, fall

TIME TO FLOWERING: air layering quicker than seed-propagated plants, with first flowering in 3 years

INDUCING AND MAINTAINING FLOWERING: remove old flowers and seed pods

PESTS

COMMON DISEASES: root rot, leaf spot, root-knot nematodes

OTHER PESTS: black stink bugs, mealybugs, scales

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUES: snap

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



The lei shown also contains tuberoses.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head

VASE LIFE: 4 days

CLEANING OF PLANT MATERIALS: spray with water

STORING RAW LEI MATERIALS: place in a sealed plastic container and refrigerate at 40°F for up to 4 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Riffle, Robert L. 1998. *The Tropical Look: An Encyclopedia of Dramatic Landscape Plants*. Portland, Oregon: Timber Press.

Teho, Fortunato G. 1971. *Plants of Hawaii: How to Grow Them*. Hilo, Hawai'i: Petroglyph Press.

Warren, William. 1997. *Tropical Plants for Home and Garden*. London: Thames and Hudson.

bougainvillea

OTHER COMMON NAMES: kepalō, pu-kanawila

SCIENTIFIC NAME: *Bougainvillea* cultivars

FAMILY: Nyctaginaceae (four-o'clock family)

NATURAL SETTING/LOCATION: native to Brazil



CURRENT STATUS IN THE WILD IN HAWAII: not naturalized but often found in public areas

CULTIVARS: many, including “double-bract” forms that are particularly useful in lei making

Growing your own

HANDLING CAUTIONS: most cultivars have thorny stems

PROPAGATION

FORM: cuttings (semi-soft wood, 1/8" thick)

PREPLANTING TREATMENT: treat cuttings with strong rooting hormone

PLANTING DEPTH: insert cutting 1–2" into medium

CUTTING ROOTING TIME: semi-soft cuttings root in 4 weeks, woody cuttings root in 4–8 weeks, depending on variety and rooting treatment

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well-drained soil is best; tolerates many soil types

SOIL PH: 5.5–6.0

LIGHT: full sun

WATER: keep relatively dry after plant is established

TEMPERATURE: 50–90°F

ELEVATION: 10–2500'

SALT TOLERANCE: good

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: light

RECOMMENDED SPACING: 5' apart or more

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs or larger

PRUNING: prune back vigorous, vining growth and allow shorter side branches to develop



SPECIAL CULTURAL HINTS: provide trellis or other support; variety of growth habits possible

bougainvillea

Plant characteristics

- HEIGHT:** to 20'
- SPREAD:** to 20'
- GROWTH RATE:** fast
- GROWTH HABIT:** vine, sprawling shrub

FLOWERS

- SIZE:** bracts: ½–2"
- COLOR:** magenta, rose, pink, red, or orange, gold, white, bicolor
- SHAPE:** bracts are triangular to almost round
- FRAGRANCE:** none
- FLOWERS IN FIRST YEAR:** yes

FLOWERING PERIOD: heaviest from September through April

TIME TO FLOWERING: rooted cuttings flower in 7–10 weeks

INDUCING AND MAINTAINING FLOWERING: flowers occur on new growth; short daylengths enhance flowering; keep N and water on the low side; plants in heavy shade or pruned too frequently will not flower

PESTS

COMMON DISEASES: *Phytophthora* foliar blight, leaf spots, *Pythium* root rot, reniform nematodes

OTHER PESTS: aphids, caterpillars, grasshoppers, mites, soft scales, whiteflies



The lei shown also contains mock orange leaves.

Harvesting considerations

WHAT IS HARVESTED: clusters of bracts with or without flowers

HARVESTING TECHNIQUES: clip

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: wrap in damp newspaper in plastic container or paper box and refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip off the wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, wrap in damp newspaper in plastic container or paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Criley, Richard A. 1997. "Bougainvillea." In: *Tips on Growing Specialty Potted Crops*. eds. M.L. Gaston, S.A. Carver, and C.A. Irwin. Columbus, Ohio: Ohio Florists' Assoc.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Iredell, Jan. 1990. *The Bougainvillea Growers Handbook*. Brookvale, Australia: Simon & Schuster Australia.

Watson, Donald P., and Richard A. Criley. 1973. *Bougainvilleas*. University of Hawai'i, Cooperative Extension Service, Circular 469.

carnation

OTHER COMMON NAMES: pink, ponimō‘ī

SCIENTIFIC NAME:
Dianthus caryophyllus

FAMILY:
Caryophyllaceae (pink family)

NATURAL SETTING/LOCATION: native to the Mediterranean



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: many; some pot types available from seed

Growing your own

PROPAGATION

FORM: tip cuttings (most growers purchase rooted cuttings); seeds (purchase from seed source)

PRETREATMENT: treat cutting with mild rooting hormone; chill seeds for 1–2 weeks at 30–35°F before sowing

PLANTING DEPTH: sow seeds on surface with a light covering; insert base of cutting 1" into medium

GERMINATION TIME: 1–2 weeks

CUTTING ROOTING TIME: 2–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well-drained, loamy soil

SOIL PH: 5.5–6.5

LIGHT: full sun to partial shade

WATER: keep moist

TEMPERATURE: 80°F days, 50–60°F nights

ELEVATION: 10–3000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor



MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 4–8" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 6" pots or larger

PRUNING: many different techniques used; pinching or pruning is a strategy used to time flowering around periods of high demand; spray types for lei production are usually not pruned

SPECIAL CULTURAL HINTS: good planting time is at the end of summer; flowering will first occur in mid-December and then continuously; calyx (green, leafy base) splitting is a major problem, particularly for single-stem flower types; nonsplitting types are available; requires soil free of disease and nematodes where carnation hasn't been grown before; container culture will avoid soil-borne problems; mostly grown under cover

carnation

Plant characteristics

HEIGHT: 36"

SPREAD: 1'

GROWTH RATE: relatively fast

GROWTH HABIT: sprawling herb

FLOWERS

SIZE: large-flowered types 2½–4" in diameter, smaller-flowered (spray types) 1½–3" in diameter, miniature-flowered 1½–2" in diameter

COLOR: red, white, pink, yellow, orange, white, purple

SHAPE: round

FRAGRANCE: varies from nonfragrant to spicy

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round; more flowers in summer

TIME TO FLOWERING: plants flower 3–4 months after transplanting; peak production in 6 months

INDUCING AND MAINTAINING FLOWERING: remove first flower; remove spent flowers, and harvest flowers regularly

PESTS

COMMON DISEASES: rootknot nematodes, *Botrytis* on flowers; fungal problems including *Fusarium* rust, stem rot (*Rhizoctonia*), *Alternaria* blight, leaf spot, or branch rot; at least four viruses are found in carnation; bacterial diseases include bacterial and *Fusarium* wilt, both of which can persist in the soil for several years

OTHER PESTS: caterpillars, Hawaiian flower thrips (infest flowers), spider mites



Harvesting considerations

WHAT IS HARVESTED: open flowers plus 1–2" of stem

HARVESTING TECHNIQUES: cut

BEST TIME OF DAY TO HARVEST: early morning while flowers are turgid

BEST WAY TO TRANSPORT FROM PICKING AREA: brown paper box or bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 6–9 days

CLEANING OF PLANT MATERIALS: no water

STORING RAW LEI MATERIALS: refrigerate at 40–48°F for up to 14 days; don't wet flowers; store in covered box, lay flowers on dry newspaper (to absorb moisture) over polyethylene liner, put layers of newspaper between layers of flowers, and don't allow flowers to contact the plastic; boxes should have vents to prevent ethylene build-up and should be spaced away from each other to allow for circulation around box

PREPARING FOR USE IN LEI: for single lei, cut flower close to the calyx (green, leafy base), leaving little or no stem; for double lei, remove calyx of each blossom or split open

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, place on dry newspaper in paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Boodley, James W. 1998. *The Commercial Greenhouse*. 2nd ed. Albany, New York: Demar Publishing.

Gardenier, Phil, and Van Staaveren. 1998. "Dianthus (Carnation)." In: *Ball Red Book*. 16th ed., p. 473–477. Batavia, Illinois: Ball Publishing.

Holley, Winfred D., and Ralph Baker. 1963. *Carnation Production, Including the History, Breeding, Culture and Marketing of Carnations*. Dubuque, Iowa: Brown.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Nau, Jim. 1993. *Ball Culture Guide: The Encyclopaedia of Seed Germination*. 2nd ed. Batavia, Illinois: Ball Publishing.

Neal, Marie C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Honolulu: Bishop Museum Press.

Trujillo, Eduardo E. 1989. *Diseases and Pests of Carnation*. University of Hawai'i, CTAHR, Research Extension Series 107.

cigar flower

OTHER COMMON NAMES: pua kīkā

SCIENTIFIC NAME: *Cuphea ignea*

FAMILY: Lythraceae (loosestrife family)

NATURAL SETTING/LOCATION: native to Mexico



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: other species and cultivars available.

Growing your own

PROPAGATION

FORM: cuttings or seeds (purchase from seed source)

PREPLANTING TREATMENT: treat cuttings with mild rooting hormone.

PLANTING DEPTH: sow seed 1/8" deep in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 2 weeks at 70°F; temperature-sensitive

CUTTING ROOTING TIME: 3–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: silty loam, or soil with a high organic matter content

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: drought tolerant

TEMPERATURE: 60–95°F

ELEVATION: 10–2000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 1' apart within rows, 4–6' between rows

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs

PRUNING: prune to reduce size, maintain shape, and keep full and bushy



SPECIAL CULTURAL HINTS: plant in a well-drained area to avoid root rot problems

SUGGESTED COMPANION PLANTINGS: mixed border or mixed bedding planting

cigar flower

Plant characteristics

HEIGHT: 1–3'

SPREAD: 2–5'

GROWTH RATE: moderate

GROWTH HABIT: low, dense, evergreen shrub

FLOWERS

SIZE: 1" long

COLOR: orange, red (other types available in purple and pink)

SHAPE: tubular

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round

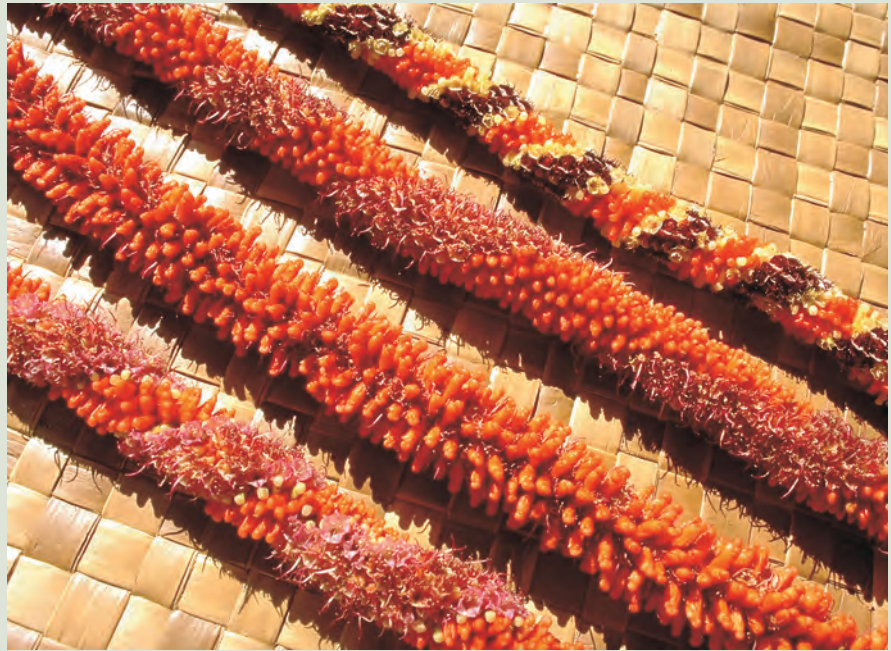
TIME TO FLOWERING: seedlings flower about 3½ months after germination; cuttings produce flowers 6–8 weeks after rooting

INDUCING AND MAINTAINING FLOWERING: avoid drastic pruning and excessive N fertilizer

PESTS

COMMON DISEASES: fungal root rots, foliar blights

OTHER PESTS: aphids, beetles, grasshoppers, sunflower spittle bug



Harvesting considerations

WHAT IS HARVESTED: flowers with ½" of stem

HARVESTING TECHNIQUES: pluck flowers

BEST TIME OF DAY TO HARVEST: early morning or evening

BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: place in sealed container and refrigerate at 40°F for up to 7 days

PREPARING FOR USE IN LEI: clip off stem then sew; for other styles of lei, remove leaves from stem before using

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, place in sealed container, and refrigerate; lei may be revived by soaking in water and placing in plastic bag in refrigerator for 3 hours

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Holttum, R.E., and Ivan Enoch. 1991. *Gardening in the Tropics*. Portland, Oregon: Timber Press.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Moggi, Guido, and Luciano Giugnolini. 1983. *Simon and Schuster's Guide to Garden Flowers*. New York: Simon and Schuster.

Scott, Susan, and Craig Thomas. 2000. *Poisonous Plants of Paradise: First Aid and Medical Treatment for Injuries from Hawai'i's Plants*. University of Hawai'i Press.

crown flower

OTHER COMMON NAMES: giant milkweed, pua kalaunu

SCIENTIFIC NAME: *Calotropis gigantea*

FAMILY: Asclepiadaceae (milkweed family)

NATURAL SETTING/LOCATION: native to India and the East Indies



CURRENT STATUS IN THE WILD IN HAWAII: typically not found

CULTIVARS: small-flowered type available (*Calotropis procera*)

Growing your own

HANDLING CAUTIONS: all plant parts are poisonous; milky sap in eyes may cause blindness, on skin may cause considerable irritation

PROPAGATION

FORM: seeds; cuttings

PREPLANTING TREATMENT: soak seeds in water for 4–6 hours; use medium rooting hormone on cuttings

PLANTING DEPTH: sow seeds ¼" in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 1–2 weeks

CUTTING ROOTING TIME: 6–8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: requires irrigation during dry periods

TEMPERATURE: >70°F

ELEVATION: 10–1000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate



MANAGEMENT

FERTILIZER NEEDS: light

RECOMMENDED SPACING: 8–12' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2- to 5-gallon tubs

PRUNING: pruning to keep within picking height will temporarily reduce flower production; thinning out old branches induces vigorous new growth

SPECIAL CULTURAL HINTS: grow in dry and hot areas; keep low for harvesting

SUGGESTED COMPANION PLANTINGS: low annuals

Plant characteristics

HEIGHT: to 12'

SPREAD: 15'

GROWTH RATE: fast

GROWTH HABIT: erect, evergreen, rounded shrub

FLOWERS

SIZE: 1" diameter

COLOR: pale lavender, pink, or white

SHAPE: five curled-back petals and a prominent crown

FRAGRANCE: faint

crown flower

FLOWERS IN FIRST YEAR: yes, from cuttings

FLOWERING PERIOD: year-round

TIME TO FLOWERING: maturity after 3–4 years (from seed)

INDUCING AND MAINTAINING FLOWERING: not known

PESTS

COMMON DISEASES: none

OTHER PESTS: caterpillars (monarch butterfly)

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUES: break off; gloves and eye protection advised to avoid contact with sap while harvesting

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

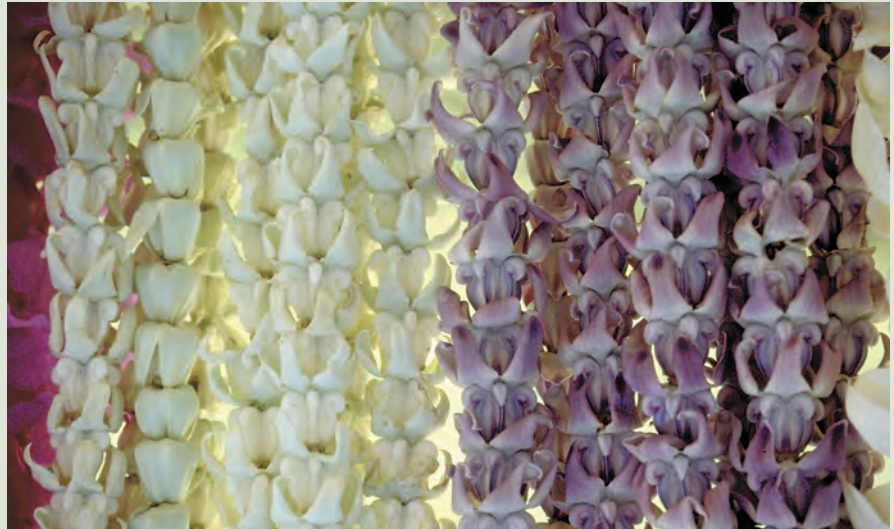
BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 3 days for purple flowers, 2 days for white flowers

CLEANING OF PLANT MATERIALS: cold water soak for 5 minutes

STORING RAW LEI MATERIALS: store purple flowers for up to 5 days in refrigerator at 40°F; white flowers for up to 4 days

PREPARING FOR USE IN LEI: for crown lei, separate blossoms and buds; for bud lei, use buds of same size; for whole crown lei, use all of the newly opened and fully developed blossoms; for crown flower petal lei, use petals in best condition



STORING A COMPLETED LEI BEFORE WEARING:

mist lei, shake off excess water, place on dry paper towel in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY:

air-dry

References and further reading

Bird, Adren J., and Josephine P.K. Bird. 1987. *Hawaiian Flower Lei Making*. Honolulu: University of Hawai'i Press.

Clay, Horace F., and James C. Hubbard. 1977. *The Hawai'i Garden: Tropical Exotics*. Honolulu: University of Hawai'i Press.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

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Riffle, Robert L. 1998. *The Tropical Look: An Encyclopedia of Dramatic Landscape Plants*. Portland, Oregon: Timber Press.

Warren, William. 1997. *Tropical Plants for Home and Garden*. London: Thames and Hudson.

ALERT: *Calotropis gigantea* can be an invasive species and cause problems in agricultural and natural areas in Hawai'i, especially in pastures. It scores a rating of 15 on the Hawai'i-Pacific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai'i or similar Pacific islands, and is about 95% accurate. Any score above 6 indicates the potential for invasiveness, though there are varying levels of concern. The HPWRA score does not necessarily mean you should remove established plants from urban landscapes or avoid planting them at all, but *C. gigantea* should not be introduced to areas where it is not already growing. *C. gigantea* has already naturalized in some places on Kaua'i, Moloka'i, and Maui. Wind and birds can spread the seeds and the plant can reproduce by suckers. If used in lei, seeds should be removed first if possible. If fertile material is used, lei should not be discarded in areas where *C. gigantea* is not naturalized and where the seeds can germinate and grow. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

cup-and-saucer plant

OTHER COMMON NAMES: Chinaman's hat, parasol flower

SCIENTIFIC NAME: *Holmskioldia sanguinea*, *H. sanguinea* f. *citrina*, *H. tettensis*

FAMILY: Lamiaceae (mint family)



NATURAL SETTING/LOCATION: foothills of Indian Himalayas (*H. sanguinea*); southeast Africa (*H. tettensis*)

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: woody cuttings

PREPLANTING TREATMENT: treat cuttings with medium rooting hormone

PLANTING DEPTH: insert base of cutting 1–1½" into medium

CUTTING ROOTING TIME: 6–8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well-drained loam

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: keep dry

TEMPERATURE: 55–90°F

ELEVATION: 10–3200'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 4–6' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2-gallon tubs or larger

PRUNING: vigorous pruning recommended to manage shape and induce new growth and flowering; *H. tettensis* best pruned to tall, linear form during the winter after main flowering period



cup-and-saucer plant

Plant characteristics

HEIGHT: *H. sanguinea* to 10',
H. tettensis to 15'

SPREAD: *H. sanguinea* to 6',
H. tettensis up to 4'

GROWTH RATE: *H. sanguinea* fast,
H. tettensis moderate

GROWTH HABIT: *H. sanguinea*, rounded
shrub; *H. tettensis*, upright shrub

FLOWERS

SIZE: ¾–1"

COLOR: orange to red (*H. sanguinea*),
yellow-green (*H. sanguinea* f. *ci-*
trina), purplish (*H. tettensis*)

SHAPE: round, funnel-shaped

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest
in winter and spring

TIME TO FLOWERING: 6–8 months, but 2–3
years for full maturity

INDUCING AND MAINTAINING FLOWERING:
flowers on new wood, so pruning is
essential to stimulate new growth

PESTS

COMMON DISEASES: *Pythium* root rot,
nematodes

OTHER PESTS: ants, mealybugs, scales,
thrips



The lei shown also contains baby's breath, globe amaranth, dusty miller, feverfew, and galphimia.

Harvesting considerations

WHAT IS HARVESTED: flowers with 1–2"
of stem

HARVESTING TECHNIQUES: pinch

BEST TIME OF DAY TO HARVEST:
early morning

BEST WAY TO TRANSPORT FROM PICKING AREA:
paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS:
smoke, car exhaust, ripening fruits,
and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head,
wrist, ankle, horse

VASE LIFE: 3–5 days

CLEANING OF PLANT MATERIALS: cold water
soak for 5 minutes

STORING RAW LEI MATERIALS: place on
damp newspaper in paper or plastic
container and refrigerate at 40°F for
up to 10 days

PREPARING FOR USE IN LEI: clip off wrin-
kled, limp, or poor-quality areas
before adding to lei

STORING A COMPLETED LEI BEFORE WEARING:
soak lei, drip dry, place in paper or
plastic container, and refrigerate

**PRESERVING A LEI FOR LONG-TERM STORAGE OR
DISPLAY:** air-dry

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawai'i Garden: Tropical Shrubs*. Honolulu: University of Hawai'i Press.

Holtum, Richard E., and Ivan Enoch. 1991. *Gardening in the Tropics*. Singapore: Times Editions.

dracaena tricolor

OTHER COMMON NAMES: money tree

SCIENTIFIC NAME: *Dracaena marginata*
var. *tricolor*

FAMILY: Agavaceae (agave family)



NATURAL SETTING/LOCATION:

D. marginata is from tropical West Africa; var. *tricolor* is only found in cultivation

CURRENT STATUS IN THE WILD IN HAWAII:
not found

Growing your own

PROPAGATION

FORM: cuttings (minimum 6" long)

PREPLANTING TREATMENT: treat with medium rooting hormone

PLANTING DEPTH: insert base of cutting 3–4" into medium

CUTTING ROOTING TIME: 1–3 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained; tolerant of various soil types

SOIL PH: 5.5–6.5

LIGHT: full sun to partial shade

WATER: moderate

TEMPERATURE: 65–90°F

ELEVATION: 10–2000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: heavy

RECOMMENDED SPACING:
2–4' apart

ADAPTATION TO GROWING IN CONTAINERS:

yes, 1- to 5-gallon tubs

PRUNING: prune tips back to induce new, thin shoots with smaller leaves and to control size

SUGGESTED COMPANION

PLANTINGS: low-growing plants



dracaena tricolor

Plant characteristics

HEIGHT: to 15'

SPREAD: 3–5'

GROWTH RATE: fast

GROWTH HABIT: erect, angular, woody, evergreen

FOLIAGE

TEXTURE: leathery, pliable

COLOR: from emerald to gray-green, sometimes variegated

SHAPE: lance-shaped

FRAGRANCE: none

PESTS

COMMON DISEASES: *Fusarium* and other leaf-spot fungi, root rot, bacterial soft rot, nematodes (root-knot, reniform, spiral)

OTHER PESTS: caterpillar (banana moth), mealybugs, scales

Harvesting considerations

WHAT IS HARVESTED: leaves

HARVESTING TECHNIQUES: pull or snap leaf off of stem; don't cut

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic bag



The lei shown also contains dusty miller.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: hand wash under cold, running water

STORING RAW LEI MATERIALS: place in sealed plastic container and refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, wrap in paper towels, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawai'i Garden: Tropical Shrubs*. Honolulu: University of Hawai'i Press.

Poole, R.T., A.R. Chase, and L.S. Osborne. *Dracaena Production Guide*. University of Florida, IFAS. <www.ifas.ufl.edu/~apkweb/folnotes/dracaena.htm>.

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

dusty miller

SCIENTIFIC NAME: *Senecio cineraria*;
Centaurea cineraria

FAMILY: Asteraceae (formerly Compositae) (aster family)

NATURAL SETTING/LOCATION: western and southern Mediterranean



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: 'Silver Lace', 'Silver Dust', 'Silver Storm'

Growing your own

PROPAGATION

FORM: tip cuttings; seeds (purchase from seed source)

PREPLANTING TREATMENT: treat cuttings with mild rooting hormone

PLANTING DEPTH: sow seeds 1/8" deep in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 2–3 weeks

CUTTING ROOTING TIME: 3 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, rich soil

SOIL PH: 6.0–7.0

LIGHT: full sun

WATER: moderate

TEMPERATURE: 50–90°F

ELEVATION: 10–4000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: light; amend field soils with Ca and Mg if analysis is low

RECOMMENDED SPACING: 15" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 6–8" pots

PRUNING: pinch flower buds as they appear in order to maintain foliage quality

SPECIAL CULTURAL HINTS: treat as an annual in Hawai'i; avoid waterlogged and poorly drained soils



dusty miller

Plant characteristics

HEIGHT: 1–2'

SPREAD: 1–2'

GROWTH RATE: fast

GROWTH HABIT: compact, mounding herb

FOLIAGE

TEXTURE: fuzzy

COLOR: gray-green to silvery

SHAPE: feathery lobes

FRAGRANCE: none

PESTS

COMMON DISEASES: *Phytophthora* blight, root rot, root-knot nematodes

OTHER PESTS: caterpillars

Harvesting considerations

WHAT IS HARVESTED: leaves

HARVESTING TECHNIQUES: cut or pinch off

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag



The lei shown also contains rose, ‘ōhi‘a lehua, pa‘iniu, and palapalai.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: hand wash under cold running water

STORING RAW LEI MATERIALS: place in plastic container and refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, wrap in damp newspaper, place in plastic or paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Nau, Jim. 1998. “*Senecio* (Dusty Miller).” In: *Ball RedBook*. 16th ed., p. 750–751. Batavia, Illinois: Ball Publishing.

Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.

feverfew

SCIENTIFIC NAME: *Tanacetum parthenium*

FAMILY: Asteraceae (formerly Compositae) (aster family)



NATURAL SETTING/LOCATION: native to southeast Europe and Caucasus mountains

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: seeds (purchase from seed source); division; cuttings

PREPLANTING TREATMENT: use mild rooting hormone on cuttings

PLANTING DEPTH: sow seeds on surface of medium or slightly below (1/8"); for divisions, keep root crown just below soil level; insert base of cutting 1–2" into medium

GERMINATION TIME: 10–15 days at 70°F

CUTTING ROOTING TIME: 3–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL

CHARACTERISTICS: sandy, loamy

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: moderate to light

TEMPERATURE: 60–70°F (day), 55°F (night)

ELEVATION: 500–3500'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 1' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 1- to 2-gallon tubs

PRUNING: prune to generate new shoots from crown; pinching generally not needed for branching



SPECIAL CULTURAL HINTS: cuttings from vegetative shoots result in a more uniform plant; avoid wet growing conditions, as plants die out from root rot in wet soils

SUGGESTED COMPANION PLANTINGS: baby's breath

feverfew

Plant characteristics

- HEIGHT:** 15–24"
- SPREAD:** clump size 10–15"
- GROWTH RATE:** fast
- GROWTH HABIT:** clumping herb

FLOWERS

- SIZE:** ¾" diameter
- COLOR:** white, cream, yellow
- SHAPE:** round, flat (daisy-type flower) singles, doubles
- FRAGRANCE:** none
- FLOWERS IN FIRST YEAR:** from division, yes; from seed, yes; from cutting, yes (if propagated in spring)
- FLOWERING PERIOD:** late spring, summer; provide lights for better year-round flowering
- TIME TO FLOWERING:** 10–12 weeks from established seedling during spring or summer; 10 weeks after start of light treatment

INDUCING AND MAINTAINING FLOWERING: flowering duration is 8 weeks; can be pruned and renewed

PESTS

- COMMON DISEASES:** *Botrytis* on flowers, mildew on foliage, root rot; may be susceptible to aster yellows
- OTHER PESTS:** aphids, spider mites, thrips



The lei shown also contains baby's breath, hydrangea, rose, ageratum, statice, and chrysanthemum.

Harvesting considerations

- WHAT IS HARVESTED:** flowers
- HARVESTING TECHNIQUES:** cut stems low to encourage branching from crown of the plant
- BEST TIME OF DAY TO HARVEST:** early morning
- BEST WAY TO TRANSPORT FROM PICKING AREA:** brown paper bag
- AVOID CONTACT WITH THESE PRODUCTS:** smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

- BEST FOR WHICH TYPE OF LEI:** neck, head, wrist, ankle, horse
- VASE LIFE:** 4 days
- CLEANING OF PLANT MATERIALS:** put stem bases in water; do not wet flower heads

STORING RAW LEI MATERIALS: store in sealed plastic container and refrigerate at 40°F for up to 10 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei; remove leaves

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, wrap in damp newspaper, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Ball, Vic, ed. 1998. "Feverfew." In: *Ball RedBook*. 16 ed., p. 250–251. Batavia, Illinois: Ball Publishing.

Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.

gardenia

OTHER COMMON NAMES: kiele

SCIENTIFIC NAME: *Gardenia augusta*

FAMILY: Rubiaceae (coffee family)

NATURAL SETTING/LOCATION: native to China



CURRENT STATUS IN THE WILD IN HAWAII:

G. augusta not found in the wild; three native species (*G. brighamii*, *G. remyi*, *G. manni*) are either rare or endangered

CULTIVARS: there are many, but only a few are available with a consistently used name: 'Enchantress', 'Mystery', 'Amy Yoshioka', 'Veitchii'

Growing your own

PROPAGATION

FORM: seeds; cuttings 6–7" long; air layering; grafting

PREPLANTING TREATMENT: soak seeds in water for 24 hours; treat cuttings with medium rooting hormone

PLANTING DEPTH: sow seeds ¼" deep in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 3 months

CUTTING ROOTING TIME: 3–6 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL

CHARACTERISTICS: rich, well drained

SOIL pH: 5.0–5.5 (avoid high pH)

LIGHT: sunny location

WATER: heavy soaking

TEMPERATURE: 60–75°F

ELEVATION: 10–2500'

SALT TOLERANCE: poor

WIND RESISTANCE:

moderate (wind damages fragile flowers)

MANAGEMENT

FERTILIZER NEEDS:

medium; to correct chlorosis, apply acidifying fertilizer such as iron sulfate

RECOMMENDED SPACING: 5' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2- to 5-gallon tubs, but growing in the ground is best

PRUNING: remove weak wood; head back (cut back) vigorous stems; avoid pruning late in the year; prune to keep within picking height and to produce new shoots for flowering



SPECIAL CULTURAL HINTS: under high-pH conditions, new growth will turn yellow: give iron; remove spent flowers; regular irrigation important to keep plant strong and healthy

SUGGESTED COMPANION PLANTINGS: low herbs or annuals requiring partial sun or shade

gardenia

Plant characteristics

HEIGHT: 2–6'

SPREAD: 4–5'

GROWTH RATE: moderate

GROWTH HABIT: upright, oval shrub

FLOWERS

SIZE: 2–5"

COLOR: white to cream

SHAPE: round

FRAGRANCE: highly scented

FLOWERS IN FIRST YEAR: yes, from cuttings or air layering

FLOWERING PERIOD: late spring, early summer

TIME TO FLOWERING: less than 1 year from cutting and air layering, 2–3 years from seed

INDUCING AND MAINTAINING FLOWERING: can induce by pruning

PESTS

COMMON DISEASES: leaf spots, stem canker, root-knot nematode, sooty mold (a problem when ants, aphids, and scales are not controlled)

OTHER PESTS: ants, aphids, mealybugs, mites, scales, thrips

Harvesting considerations

WHAT IS HARVESTED: flowers and calyx (green, leafy base); harvesting only from cultivated plants is recommended due to scarcity of the native *Gardenia* species

HARVESTING TECHNIQUES: cut, don't pull

BEST TIME OF DAY TO HARVEST: morning for buds, afternoon for open flowers



The lei shown also contains agapanthus, bougainvillea, and lantern 'ilima.

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic bag or container

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

VASE LIFE: 2 days

CLEANING OF PLANT MATERIALS: spray with water

STORING RAW LEI MATERIALS: place on wet paper towel in a bowl and refrigerate at 40°F for up to 1 day for flowers and 3 days for buds

PREPARING FOR USE IN LEI: for flower lei, remove calyx, then sew; if calyx is sewn into lei, clip bottom; for wili (twisting pattern) lei, remove calyx

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, place in sealed container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

- Baird, Eugene, and Alex Laurie. 1942. "Studies of the Effect of Environmental Factors and Cultural Practices on Bud Initiation, Bud Abscission, and Bud Development of the Gardenia." *Proceedings of the American Society for Horticultural Science* 40:585–588.
- Burkhart, Leland, and H.N. Biekart. 1937. "Gardenia Nutrition in Relation to Flower Bud Development." *Proceedings of the American Society for Horticultural Science* 35:768–769.
- Hasek, Raymond F. 1948. "Observation on Gardenia Flower Production at High Air and Soil Temperatures." *Proceedings of the American Society for Horticultural Science* 51:610–612.
- Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.
- Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.
- Watkins, J.V. 1950. *Gardenias in Florida*. University of Florida, Agriculture Extension Service Bulletin 145.
- Wilkins, H.F. 1986. "Gardenia jasminoides." In: *CRC Handbook of Flowering*. vol V., ed. by A. H. Halevy, p. 127–131. Boca Raton, Florida: CRC Press.

ginger (white and yellow)

OTHER COMMON NAMES: ‘awapuhi ke‘oke‘o (white ginger), ‘awapuhi meleleme (yellow ginger)

SCIENTIFIC NAME: *Hedychium coronarium*, *H. flavescens* and other species

FAMILY: Zingiberaceae (ginger family)



NATURAL SETTING/LOCATION: southwest China and northeast India

CURRENT STATUS IN THE WILD IN HAWAII: has potential to be invasive in wet areas

CULTIVARS: a number of hybrids exist with different colors and flower sizes; few are readily available

Growing your own

PROPAGATION

FORM: division of rhizomes is best; seeds

PREPLANTING TREATMENT: remove any diseased portion of the division and dust the cuts with fungicide before planting

PLANTING DEPTH: sow seeds on surface or slightly below (¼"); keep root crown of division just below soil level

GERMINATION TIME: 1 month

RHIZOME ROOTING TIME: 3–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: high organic matter

SOIL PH: 5.5–6.5

LIGHT: full sun to partial shade

WATER: heavy watering

TEMPERATURE: 50–75°F

ELEVATION: 10–6000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: heavy

RECOMMENDED SPACING: 3–5' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2- to 5-gallon tubs

PRUNING: remove old canes after flowering

SPECIAL CULTURAL HINTS: divide and replant after 5 years

SUGGESTED COMPANION PLANTINGS: can be grown under light shade of tall trees



Plant characteristics

HEIGHT: to 5–6'

SPREAD: depends on age of clump (3–5' for 2- to 3-year-old plants)

GROWTH RATE: clump size increases 10% per year

GROWTH HABIT: upright, sprawling, herbaceous

FLOWERS

SIZE: 2½–3"

COLOR: white, yellow, orange

SHAPE: tubular

FRAGRANCE: yes, strong

FLOWERS IN FIRST YEAR: from divisions, yes; seeds take 2–3 years

FLOWERING PERIOD: white forms flower in late summer, yellow forms flower year-round

TIME TO FLOWERING: 3 months minimum, depending on size of division and time of year the division is taken; spring is the best time to make divisions

ginger (white and yellow)

INDUCING AND MAINTAINING FLOWERING: in winter, use of flood lamps to interrupt dark period causes mature plants to flower 8–10 weeks later

PESTS

COMMON DISEASES: bacterial leaf spots, root rot, nematodes (root-knot, burrowing, lesion, reniform)

OTHER PESTS: ants, aphids, mealybugs, scales, thrips

Harvesting considerations

WHAT IS HARVESTED: flower buds

HARVESTING TECHNIQUES: pull buds from stalk

BEST WAY TO TRANSPORT FROM PICKING AREA: brown paper bag, or wrap in ti leaf and put in sealed container

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: depends on lei pattern; for single or double, place buds in water to slightly open flowers; for Micronesian pattern, do not place in water, keep in bud form, and place on ti leaf sealed in cellophane; refrigerate at 40°F for up to 3 days

PREPARING FOR USE IN LEI: depends on lei pattern; for single or double, gently open up flowers; for Micronesian, leave bud covering on until lei is completed



STORING A COMPLETED LEI BEFORE WEARING: mist lei, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

- Chapman, Timothy S. 1995. *Ornamental Gingers: A Guide to Selection and Cultivation*. St. Gabriel, Louisiana: T.S. Chapman.
- Clay, Horace F., and James C. Hubbard. 1977. *The Hawai'i Garden: Tropical Exotics*. Honolulu: University of Hawai'i Press.
- Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.
- Riffle, Robert L. 1998. *The Tropical Look: An Encyclopedia of Dramatic Landscape Plants*. Portland, Oregon: Timber Press.

ALERT: *Hedychium coronarium* and *H. flavescens* could be invasive species and cause problems in forests and natural areas in Hawai'i. *H. coronarium* scores a rating of 14 and *H. flavescens* scores a rating of 11 on the Hawai'i–Pacific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai'i or similar Pacific islands and is about 95% accurate. Any score above 6 indicates the potential for invasiveness, though there are varying levels of concern. The HPWRA score does not necessarily mean you should remove established plants from urban landscapes or avoid planting them at all, but *H. coronarium* and *H. flavescens* should not be introduced to areas where they are not already growing. *H. coronarium* has already naturalized in some places on O'ahu, Moloka'i, Maui, Lana'i, and Hawai'i Island, and *H. flavescens* has already naturalized in some places on Kaua'i, O'ahu, Moloka'i, Maui, Lana'i, and Hawai'i Island. The plants spread via rhizomes and stolons. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

hoya

OTHER COMMON NAMES: honey plant, pua-hōkū-hihi, star flower, wax plant

SCIENTIFIC NAME: *Hoya* species

FAMILY: Asclepiadaceae (milkweed family)



NATURAL SETTING/LOCATION: Asia, Oceania

CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: many cultivars and species available: 'Exotica', 'Krinkle Kurl', 'Variegata'

Growing your own

PROPAGATION

FORM: cuttings; seeds (seeds rarely available)

PREPLANTING TREATMENT: allow cuttings to dry for 7 days before planting, treat with medium rooting hormone

PLANTING DEPTH: insert base of cutting 1" into medium

GERMINATION TIME: unknown

CUTTING ROOTING TIME: 2–3 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, loose

SOIL PH: 6.0–6.5

LIGHT: full sun to partial shade

WATER: keep dry

TEMPERATURE: 45–105°F

ELEVATION: 10–2000'

SALT TOLERANCE: moderate

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 2' in rows

ADAPTATION TO GROWING IN CONTAINERS: yes, with a well-drained and nematode-free medium; hanging baskets preferred; support needed when grown in pots



SPECIAL CULTURAL HINTS: spray whole plant when watering; highly susceptible to burrowing nematodes; provide trellis or other support

hoya

Plant characteristics

HEIGHT: 10', depending on support height

SPREAD: 36"

GROWTH RATE: fast to slow, depending on species

GROWTH HABIT: moderately compact vine

FLOWERS

SIZE: ¼–¾"

COLOR: white, pink, peach

SHAPE: flat with fleshy crown, star-shaped

FRAGRANCE: sweet

FLOWERS IN FIRST YEAR: possibly 3 clusters of flowers with stalks of nearly equal length

FLOWERING PERIOD: year-round

TIME TO FLOWERING: 6 months

INDUCING AND MAINTAINING FLOWERING: continual, minimal fertilizer

PESTS

COMMON DISEASES: fungal root rot, root-knot and burrowing nematodes

OTHER PESTS: mealybugs, scales



The lei shown also contains aster, rose, bleeding heart, globe amaranth, ageratum, bougainvillea, and 'ākia.

Harvesting considerations

WHAT IS HARVESTED: individual flowers and flower clusters

HARVESTING TECHNIQUES: do not remove persistent stalk (that which remains attached to the plant)

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: keep damp with wet paper towels and refrigerate at 40°F for up to 10 days

PREPARING FOR USE IN LEI: clip off the wrinkled, limp, or poor-quality areas before adding to lei. stem length should be ¼"

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp paper towel in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Elbert, Virginie F., and George A. Elbert. 1975. *Fun with Growing Odd and Curious House Plants*. New York: Crown Publishers Inc.

Heintze, Steven. 1981. "Hoyas." *American Horticulturist* 60 (12): 2428, 35.

Hirsch, Doris F. 1977. *Indoor Plants: Comprehensive Care and Culture*. Radnor, Pennsylvania: Chilton Book Co.

hydrangea

OTHER COMMON NAMES: ajisai, hortensia, mil flores, pōpōhau

SCIENTIFIC NAME: *Hydrangea macrophylla*

FAMILY: Hydrangeaceae (hydrangea family)



NATURAL SETTING/LOCATION: native to Japan

CURRENT STATUS IN THE WILD IN HAWAII: occasionally found but not naturalized

CULTIVARS: 'Bottstein', 'Jennifer', 'Rose Supreme', 'Sister Therese'

Growing your own

HANDLING CAUTIONS: all parts of the plant are poisonous if eaten

PROPAGATION

FORM: cuttings

PREPLANTING TREATMENT: treat with medium rooting hormone

PLANTING DEPTH: plant base 1–2" into medium

CUTTING ROOTING TIME: 3–5 weeks with mist and bottom heat (72°F)

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well-drained loam or sandy loam

SOIL PH: pink flowers are produced at pH >6.0–6.5, blue flowers are produced with the addition of aluminum sulfate and a lower pH of 5.0–5.5

LIGHT: full sun to partial shade

WATER: keep moist

TEMPERATURE: for flower initiation, night temperature in the 65–70°F range is necessary; an exposure to 52°F for a period of 6–8 weeks will improve flowering

ELEVATION: 500–3500' (flowering is erratic at lower elevations)

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 3–5' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 3- to 5-gallon tubs or large planter boxes

PRUNING: pinch shoots back to 2 nodes in late May and early July; thin out weak growth early in the year; don't prune late in the year or you may lose next year's flowers

SPECIAL CULTURAL HINTS: pinch through early summer to produce many branches; plants under long-day conditions remain vegetative, while short-day conditions encourage flower initiation; for pink flowers, avoid acidic soils high in aluminum (Al); for blue flowers, high-Al soils are good, or aluminum sulfate can be



added to lower pH; if Al is added to pots with pink flowers, they may gradually turn to a mauve-blue color; some cultivars have stable flower color

SUGGESTED COMPANION PLANTINGS: azalea

hydrangea

Plant characteristics

HEIGHT: to 10'

SPREAD: to 5–6'

GROWTH RATE: fast

GROWTH HABIT: spreading shrub

FLOWERS

SIZE: inflorescences are 4–8" in diameter

COLOR: white, pink, red, blue, lavender, mauve

SHAPE: inflorescence spherical, individual florets squarish

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes if forced, but normally flowering occurs during the second year

FLOWERING PERIOD: spring

TIME TO FLOWERING: floral development requires 8–10 weeks from initiation

INDUCING AND MAINTAINING FLOWERING: for plants grown in covered areas, 6–10 weeks of short days (8–12 hours) and 65°F nights in late summer are needed to stimulate flower initiation; for potted plants, provide 6 weeks of temperature below 55°F and force at 60–65°F; no good control system for open field-grown plants

FOLIAGE

TEXTURE: coarse

COLOR: dark green

SHAPE: ovate with serrated margins and acuminate tip

FRAGRANCE: none

PESTS

COMMON DISEASES: powdery mildew, root rot, various leaf spots, viruses

OTHER PESTS: aphids, mites, scales, slugs, snails, thrips, whiteflies



The lei shown also contains feverfew, baby's breath, rose, ageratum, statice, and chrysanthemum.

Harvesting considerations

WHAT IS HARVESTED: inflorescence or parts of one

HARVESTING TECHNIQUES: pluck individual inflorescence

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 4 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: wrap individual flowers in wet paper towel, place in plastic or paper container, and refrigerate at 40°F for up to 10 days.

PREPARING FOR USE IN LEI: clip off the wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in wet paper towel, place in plastic or paper container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry when flowers are older (in the green color stage)

References and further reading

Bailey, Douglas A. 1989. *Hydrangea Production*. Portland, Oregon: Timber Press.

Miller, Robert O. 1998. "Hydrangea." In: *Ball RedBook*, 16th ed., p. 553–564. Batavia, Illinois: Ball Publishing.

ixora

OTHER COMMON NAMES: pōpōlehua

SCIENTIFIC NAME: *Ixora coccinea*;
I. chinensis; *I. casei*

FAMILY: Rubiaceae (coffee family)

NATURAL SETTING/LOCATION: Southeast
Asia and China



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: many cultivars are available, in dwarf and standard sizes; 'Nora Grant' is very popular

Growing your own

PROPAGATION

FORM: terminal cuttings; air layering

PREPLANTING TREATMENT: treat cuttings with medium rooting hormone

PLANTING DEPTH: insert base of cutting 1–2" into medium

CUTTING ROOTING TIME: 2–3 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, loamy to sandy loam; in pots, 1:2:2 soil:peat:perlite or volcanic cinders

SOIL PH: 5.0–5.5; considerable chlorosis develops at higher pH

LIGHT: full sun (tolerates partial shade but does not flower as profusely)

WATER: keep moist

TEMPERATURE: 55–90°F

ELEVATION: 10–1000'

SALT TOLERANCE: moderate

WIND RESISTANCE: good



MANAGEMENT

FERTILIZER NEEDS: medium; to correct chlorosis, apply acidifying fertilizer such as iron sulfate

RECOMMENDED SPACING: larger type should be planted about 5' on center unless grown as a hedge, in which case 8–36", depending on type

ADAPTATION TO GROWING IN CONTAINERS: yes, 2-gallon tubs or larger with drainage

PRUNING: cut back to leave 3–4 leaf pairs on a branch; thin out weak branches

ixora

Plant characteristics

HEIGHT: 2–12'

SPREAD: 2–5'

GROWTH RATE: moderate

GROWTH HABIT: spreading to erect, evergreen, woody shrub

FLOWERS

SIZE: terminal clusters up to 10" across; a double red form exists

COLOR: white, red, pink, orange, yellow

SHAPE: individual flowers with long tube and 4-lobed petals

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest in summer

TIME TO FLOWERING: from transplanted cuttings, allow 4–6 months; seedlings have a juvenility period and take longer to flower than do cuttings

INDUCING AND MAINTAINING FLOWERING: flowers occur on new growth; prune as needed to produce new shoots; pruning back to old wood stimulates small axillary flower clusters; use of a growth retardant stimulates flowering

PESTS

COMMON DISEASES: root rot in wet soils, *Botrytis* on flowers in wet weather, leaf spots, nematodes, sooty mold with high insect populations, susceptible to nutrient imbalances

OTHER PESTS: ants, aphids, mealybugs, scales, whiteflies



The lei shown also contains bougainvillea, epidendrum orchid, panax, aster, moa, and ti.

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUES: pluck individual flowers

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

VASE LIFE: 2 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in water and refrigerate at 40°F for up to 4 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, place on wet paper towel in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawaii Garden: Tropical Shrubs*. Honolulu: University of Hawai'i Press.

Odenwald, Neil G., and James R. Turner. 1980. *Plants for the South: A Guide to Landscape Design*. Baton Rouge, Louisiana: Claitor's Publishing Division.

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

Shillo, Ruth, and Hadas Tsook. 1989. "Ixora." In: *CRC Handbook of Flowering*, vol. VI, p. 379–386. Boca Raton, Florida: CRC Press.

joyweed

OTHER COMMON NAMES: Joseph's coat, palewāwae

SCIENTIFIC NAME: *Alternanthera tenella*

FAMILY: Amaranthaceae (amaranth family)

NATURAL SETTING/LOCATION: tropical and subtropical America



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: other species of the genus *Alternanthera* can be used; review seed catalogs for available color forms and leaf varieties

Growing your own

PROPAGATION

FORM: cuttings (2–3" cuttings root rapidly); division

PREPLANTING TREATMENT: rooting hormone not needed

PLANTING DEPTH: insert base of cutting 1" into medium; keep division root crown just below soil level

CUTTING ROOTING TIME: 7–14 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, moisture retentive

SOIL PH: 5.5–6.5

LIGHT: full sun produces the best leaf color; tolerates partial shade

WATER: moderate

TEMPERATURE: frost-tender; low temperatures reduce foliage color

ELEVATION: 10–2000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor



MANAGEMENT

FERTILIZER NEEDS: medium; fertilize lightly after shearing

RECOMMENDED SPACING: 4–6" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, ½- to 1-gallon pots, but planting in the ground is better

PRUNING: responds well to clipping and shearing and can be maintained at 4–6" height; plants become weak and thin when allowed to grow too tall

joyweed

Plant characteristics

HEIGHT: 6–12"
SPREAD: 10–12"
GROWTH RATE: fast
GROWTH HABIT: low, creeping, mat-like shrub

FOLIAGE

TEXTURE: smooth
COLOR: multicolored in yellow, red, orange, green, and white
SHAPE: spoon shaped or ovoid
FRAGRANCE: none

PESTS

COMMON DISEASES: root rot, foliar blights, southern blight, rootknot nematodes
OTHER PESTS: broad mite, mealybugs, slugs, snails

Harvesting considerations

WHAT IS HARVESTED: branch tips
HARVESTING TECHNIQUES: cut, don't pull
BEST TIME OF DAY TO HARVEST: early morning
BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag
AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



The lei shown also contains crown flower, liriopoe, moa, baby's breath, and pentas.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse
VASE LIFE: 3 days
CLEANING OF PLANT MATERIALS: cold water soak
STORING RAW LEI MATERIALS: refrigerate in plastic container at 40°F for up to 14 days
PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei
STORING A COMPLETED LEI BEFORE WEARING: soak lei in water for 5 minutes, drip dry, wrap in damp newspaper, place in sealed plastic container, and refrigerate
PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Holttum, Richard E., and Ivan Enoch. 1991. *Gardening in the Tropics*. Singapore: Times Editions.
 Odenwald, Neil G., and James R. Turner. 1980. *Plants for the South: A Guide to Landscape Design*. Baton Rouge, Louisiana: Claitor's Publishing Division.
 Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.
 Warren, William. 1997. *Tropical Plants for Home and Garden*. London: Thames and Hudson.

kalanchoe

SCIENTIFIC NAME: *Kalanchoe* species, and cultivars of *K. blossfeldiana*

FAMILY: Crassulaceae (orpine family)

NATURAL SETTING/LOCATION: native to Madagascar



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: many available from commercial sources: 'Pumila', 'Tetra Vulcan'

Growing your own

PROPAGATION

FORM: stem cuttings 2–3 nodes long; leaf cuttings used for some species; preferred propagation material varies among species; seeds available from some seed sources

PREPLANTING TREATMENT: cuttings can be dried for 3–4 days before propagating; use mild rooting hormone

PLANTING DEPTH: insert base of cutting 1–2" into medium; sow seeds on surface of medium, do not cover

GERMINATION TIME: 15 days

CUTTING ROOTING TIME: 3 weeks for stem cuttings; leaf cuttings may require 8–10 weeks to generate roots and shoots

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained; in pots, 2:1:1 peat:perlite:sand; plant has fine root system and needs a fine medium, so commercial mixes that are mostly peat and perlite are satisfactory

SOIL PH: 5.8–6.5

LIGHT: 50–60% shade to full sun; plants are photoperiod-sensitive: long days promote vegetative growth, while short days (9–10



hours of light) are required for flowering

WATER: drought tolerant; do not over-water; allow the soil to dry slightly before watering

TEMPERATURE: flowering delayed below 65°F or above 75°F

ELEVATION: 1000–3500'; some cultivars adapted to low elevations

SALT TOLERANCE: moderate

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: a 6" potted plant would require 12–15" space from its center to the center of the adjacent plant

ADAPTATION TO GROWING IN CONTAINERS: yes, 4–8" plastic or clay pots

PRUNING: about 3 weeks after potting, pinch out one set of leaves from tip of plant to induce more branches; pinching delays flower development by 4 weeks

SPECIAL CULTURAL HINTS: avoid oil-based or emulsifiable sprays

SUGGESTED COMPANION PLANTINGS: begonia

kalanchoe

Plant characteristics

- HEIGHT:** to 40" (depending on species)
- SPREAD:** to 12" (depending on species)
- GROWTH RATE:** slow to moderate
- GROWTH HABIT:** compact, succulent herb

FLOWERS

- SIZE:** clusters to 4" in diameter
- COLOR:** red, yellow, orange, pink, rose, white (some species with two-tone flowers)
- SHAPE:** round to irregular cluster of 4-petalled flowers
- FRAGRANCE:** none
- FLOWERS IN FIRST YEAR:** yes

FLOWERING PERIOD: during and following the short-day period of the year

TIME TO FLOWERING: from seed: about 10–11 months; from cuttings: 12–16 weeks, depending on variety and daylength treatments

INDUCING AND MAINTAINING FLOWERING: provide rooted transplants with 2–4 weeks of long days (minimum 12 hours of light) both before and after pinching; to time of flowering, provide 3–6 weeks of short days (11–11½ hours of light); flower development requires 5–8 weeks from the end of short days, depending on the variety

PESTS

COMMON DISEASES: bacterial soft rot, *Botrytis* on the flowers, mildew on the foliage, fungal leafspot, crown rot, rootknot nematodes

OTHER PESTS: aphids, caterpillars, mealybugs, thrips, whiteflies



The lei shown also contains panax and shinobu.

Harvesting considerations

- WHAT IS HARVESTED:** flower spikes
- HARVESTING TECHNIQUES:** pinch flowers off
- BEST TIME OF DAY TO HARVEST:** early morning
- BEST WAY TO TRANSPORT FROM PICKING AREA:** cloth or paper bag or container
- AVOID CONTACT WITH THESE PRODUCTS:** smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

- BEST FOR WHICH TYPE OF LEI:** neck, head, wrist, ankle, horse
- CLEANING OF PLANT MATERIALS:** stick stems in water
- STORING RAW LEI MATERIALS:** store in sealed plastic container and refrigerate at 40–45°F for up to 7 days

- PREPARING FOR USE IN LEI:** haku (mounting against a background) pattern requires about 3–4" of stem with a cluster tied together; clip off wrinkled, limp, or poor-quality areas before adding to lei
- STORING A COMPLETED LEI BEFORE WEARING:** soak lei, shake off excess water, place in sealed plastic container, and refrigerate
- PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY:** cannot be preserved

References and further reading

Ball, V., ed. 1998. "Kalanchoe." In: *Ball RedBook*, 16 ed., p. 586–591. Batavia, Illinois: Ball Publishing Co.

Pertuit, A.J. 1997. "Kalanchoe." In: *Tips on Growing Specialty Crops*. Columbus, Ohio: Ohio Floral Association.

kīkānia lei

OTHER COMMON NAMES: cockroach berry, polohauai'i

SCIENTIFIC NAME:
Solanum capsicoides

FAMILY: Solanaceae
(nightshade family)



NATURAL SETTING/LOCATION: native to Brazil

CURRENT STATUS IN THE WILD IN HAWAII: common weed in disturbed areas such as pastures, trails, and pond banks

Growing your own

HANDLING CAUTIONS: fruits are used in lei but are poisonous if eaten; stems and foliage have thorns

PROPAGATION

FORM: seeds

PRETREATMENT: remove seeds from pulp, soak in water for 24 hours

PLANTING DEPTH: sow ¼" deep in medium

GERMINATION TIME: 2 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 5.5–6.5

LIGHT: sunny location

WATER: keep dry

TEMPERATURE: 60–80°F

ELEVATION: 10–2500'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate



MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 4' apart

ADAPTATION TO GROWING IN CONTAINERS: not recommended

SPECIAL CULTURAL HINTS: pick spent flowers; for larger fruits, remove new flowers after first fruits have set

Plant characteristics

HEIGHT: to 36"

SPREAD: to 36"

GROWTH RATE: fast

GROWTH HABIT: short-lived shrub

FRUIT

SIZE: ¾–1"

COLOR: orange at maturity

kīkānia lei

- SHAPE:** round
- TYPE:** smooth, hard berry
- FRAGRANCE:** none
- FLOWERS IN FIRST YEAR:** yes
- FLOWERING PERIOD:** year-round
- TIME TO FLOWERING:** 4 months
- INDUCING AND MAINTAINING FLOWERING:** plant is always flowering

PESTS

- COMMON DISEASES:** alternaria and other foliar diseases affecting nightshade plants
- OTHER PESTS:** mealybugs, mites, white-flies



The lei shown also contains bird of paradise and kuhuna o ka lā (mangrove).

Harvesting considerations

- WHAT IS HARVESTED:** mature fruits
- HARVESTING TECHNIQUES:** pick fruit by hand; gloves advised due to thorns on stems and foliage
- BEST TIME OF DAY TO HARVEST:** early morning
- BEST WAY TO TRANSPORT FROM PICKING AREA:** glass jar

Notes on lei making

- BEST FOR WHICH TYPE OF LEI:** neck, head, wrist, ankle, horse
- CLEANING OF PLANT MATERIALS:** no water
- STORING RAW LEI MATERIALS:** store in glass or plastic container and refrigerate at 40°F for up to 20 days; no water
- PREPARING FOR USE IN LEI:** remove calyx (green, leafy base) and stem before sewing

- STORING A COMPLETED LEI BEFORE WEARING:** place in glass or plastic container and refrigerate; no water
- PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY:** cannot be preserved

References and further reading

Haselwood, E.L., and G.G. Motter. 1983. *Handbook of Hawaiian Weeds*. 2nd ed., revised and expanded by Robert Hirano, Harold L. Lyon Arboretum. Honolulu: University of Hawai‘i Press.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

McDonald, Marie A. 1989. *Ka Lei: the Leis of Hawaii*. Honolulu: Ku Pa‘a Inc., and Press Pacifica.

ALERT: *Solanum capsicoides* can be an invasive species and cause problems in agricultural areas in Hawai‘i. It scores a rating of 15 on the Hawai‘i-Pacific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai‘i or similar Pacific islands, and is about 95% accurate. Any score above 6 indicates the potential for invasiveness, though there are varying levels of concern. The HPWRA score does not necessarily mean you should remove established plants from urban landscapes or avoid planting them at all, but *S. capsicoides* should not be introduced to areas where it is not already growing. *S. capsicoides* has already naturalized in some places on Kaua‘i, O‘ahu, Moloka‘i, Maui, Lana‘i, and Hawai‘i Island. Birds can spread the seeds. If fertile material is used, lei should not be discarded in areas where *S. capsicoides* is not naturalized and where the seeds can germinate and grow. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

lantern 'ilima and royal 'ilima

OTHER COMMON NAMES: abutilon, ma'ō (lantern 'ilima); triple 'ilima (royal 'ilima)

SCIENTIFIC NAME: *Abutilon pictum* (lantern 'ilima); *A. grandiflorum* (royal 'ilima)

FAMILY: Malvaceae (mallow family)



NATURAL SETTING/LOCATION: Brazil, Uruguay, and Argentina

CURRENT STATUS IN THE WILD IN HAWAII: *A. pictum* not found; *A. grandiflorum* naturalized in dry areas

Growing your own

PROPAGATION

FORM: cuttings; seeds

PREPLANTING TREATMENT: soak seeds in water for 24 hours; treat cuttings with medium rooting hormone, place under mist

PLANTING DEPTH: sow seeds ¼" deep in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 1–3 months

CUTTING ROOTING TIME: 3–5 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 6.0–7.5

LIGHT: full sun

WATER: apply ½" every other day in dry areas once established

TEMPERATURE: 45–90°F

ELEVATION: 10–2500'

SALT TOLERANCE: poor

WIND RESISTANCE: very poor

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 4' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 10-gallon tubs

PRUNING: prune to manage size and shape and keep full and bushy

SPECIAL CULTURAL HINTS: plant in raised beds or mounds in areas with poor drainage; stake in areas where winds are strong; a beneficial virus (abutilon mosaic virus) causes leaves to be mottled and rugose (bumpy); plants without the virus

have smooth leaves and grow vigorously but produce flowers that are not desirable and are few in number;



royal 'ilima grown from seed varies in size, shape, and growing characteristics

lantern 'ilima and royal 'ilima

Plant characteristics

HEIGHT: 8'
SPREAD: 4'
GROWTH RATE: fast
GROWTH HABIT: sprawling shrub

FLOWERS

SIZE: 1"
COLOR: yellow with red veins and stamens (*A. pictum*); yellow-orange (*A. grandiflorum*)
SHAPE: bell-shaped (*A. pictum*); tight cluster, roundish (*A. grandiflorum*)
FRAGRANCE: none
FLOWERS IN FIRST YEAR: yes
FLOWERING PERIOD: year-round
TIME TO FLOWERING: some flower at 4–6 months; maturity after 12–18 months

PESTS

COMMON DISEASES: root rot, rust fungi (*A. grandiflorum*); *A. pictum* is affected by abutilon mosaic virus (causing mottled leaves), but it is not a problem; nematodes
OTHER PESTS: Chinese rose beetle, mealybugs, thrips, whiteflies



Harvesting considerations

WHAT IS HARVESTED: flowers
HARVESTING TECHNIQUES: pull or snap
BEST TIME OF DAY TO HARVEST: early morning
BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag
AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle
VASE LIFE: 8–24 hours
CLEANING OF PLANT MATERIALS: no water

STORING RAW LEI MATERIALS: store in shallow, stackable open trays until flowers open. Don't pack in boxes; refrigerator temperature should be less than 40°F (38°F is good); no water
PREPARING FOR USE IN LEI: remove calyx (green, leafy base) before stringing
STORING A COMPLETED LEI BEFORE WEARING: place lei in sealed container and refrigerate; no water
PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.
 Odenwald, Neil G., and James R. Turner. 1980. *Plants for the South: A Guide to Landscape Design*. Baton Rouge, Louisiana: Claitor's Publishing Division.
 Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.

laua'e

OTHER COMMON NAMES: lauwa'e, maile-scented fern

SCIENTIFIC NAME:
Phymatosorus grossus (*Microsorium scolopendria*)

FAMILY: Polypodiaceae (polypody family)

NATURAL SETTING/LOCATION: Old World tropics, Polynesia



CURRENT STATUS IN THE WILD IN HAWAII: common; naturalized, especially in disturbed areas, from coastal to shaded moist lowland forests and windswept ridges

CULTIVARS: laua'e iki (dwarf cultivar)

Growing your own

HANDLING CAUTIONS: may cause skin irritation

PROPAGATION

FORM: spores; division; rhizome cuttings (with at least one node)

PREPLANTING TREATMENT: rooting hormone not needed for cuttings

PLANTING DEPTH: sow spores on surface of medium; keep division root crown just below soil level; insert base of cutting 1–2" into medium

CUTTING ROOTING TIME: 6–8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 5.5–6.5

LIGHT: full sun to light shade

WATER: moderate to wet

TEMPERATURE: 55–90°F

ELEVATION: 10–1500'

SALT TOLERANCE: moderate

WIND RESISTANCE: poor to moderate

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 1' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs or larger

PRUNING: remove old fronds

SPECIAL CULTURAL HINTS: keep in contained area to keep it from taking



over unplanted areas; full sun will cause fronds to be lighter green

SUGGESTED COMPANION PLANTINGS: plants that provide shade

laua'e

Plant characteristics

HEIGHT: 2–3'

SPREAD: 6–10'

GROWTH RATE: slow at first, fast when established

GROWTH HABIT: fern, groundcover

FOLIAGE

TEXTURE: smooth

COLOR: green to black

SHAPE: large, pinnately lobed

FRAGRANCE: spicy, maile-like

PESTS

COMMON DISEASES: fungal root rot, root-knot and lesion nematodes

OTHER PESTS: fern weevil, mites, scales, slugs, snails

Harvesting considerations

WHAT IS HARVESTED: leaves

HARVESTING TECHNIQUES: cut, don't pull

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag



The lei shown also contains asparagus fern and dusty miller.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 14 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in sealed plastic container and refrigerate at 40°F for up to 30 days

PREPARING FOR USE IN LEI: leave fronds out overnight to soften, then braid with ti leaf

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp newspaper, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Hoshizaki, Barbara J. 1976. *Fern Grower's Manual*. New York: Alfred A. Knopf.

Neal, Marie C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Honolulu: Bishop Museum Press.

Valier, Kathy. 1995. *Ferns of Hawai'i*. Honolulu: University of Hawai'i Press.

maunaloa

SCIENTIFIC NAME:

Canavalia cathartica

FAMILY: Fabaceae (pea family)

NATURAL SETTING/LOCATION: East Africa, India, Malaysia, Polynesia



CURRENT STATUS IN THE WILD IN HAWAII: naturalized in dry to mesic (medium-wet) disturbed sites

Growing your own

PROPAGATION

FORM: seeds

PLANTING DEPTH: sow seeds ½" deep in medium

GERMINATION TIME: 7 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: tolerant of many soil types

SOIL PH: 6.0–7.0

LIGHT: sunny location

WATER: drought tolerant

TEMPERATURE: 50–90°F

ELEVATION: 10–1000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate



MANAGEMENT

FERTILIZER NEEDS: light

RECOMMENDED SPACING: 4' apart

ADAPTATION TO GROWING IN CONTAINERS: not recommended

PRUNING: prune to keep plant manageable for easy harvesting

SPECIAL CULTURAL HINTS: provide a trellis or other support; may become weedy if left unchecked

maunaloa

Plant characteristics

HEIGHT: limited to height of support

SPREAD: 20'

GROWTH RATE: fast

GROWTH HABIT: rampant vine

FLOWERS

SIZE: 1½"

COLOR: lavender, pink, purple

SHAPE: bilaterally symmetrical, like a pea flower

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest in spring and summer

TIME TO FLOWERING: 3 months

INDUCING AND MAINTAINING FLOWERING: remove spent flowers and pods

PESTS

COMMON DISEASES: fungal root rot

OTHER PESTS: black stink bug

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUES: pinch flowers off

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth container

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: spray with water.

STORING RAW LEI MATERIALS: store in sealed plastic bag or container and refrigerate at 40°F for up to 3 days; no water

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: place lei on wax paper in sealed plastic bag or container and refrigerate; no water

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Kuck, Loraine E., and Richard C. Tongg. 1955. *The Modern Tropical Garden: Its Design, Plant Materials, and Horticulture*. Honolulu: Tongg Publishing Co.

Neal, Marie C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Honolulu: Bishop Museum Press.

'ohai ali'i

OTHER COMMON NAMES: dwarf poinciana, pride of Barbados

SCIENTIFIC NAME:
Caesalpinia pulcherrima

FAMILY: Fabaceae (pea family)

NATURAL SETTING/LOCATION:
tropical America



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: none named; red-orange, yellow, pink, cream, and rose types are grown

Growing your own

HANDLING CAUTIONS: thorns on stems

PROPAGATION

FORM: seeds

PREPLANTING TREATMENT: soak seeds in water for 24 hours

PLANTING DEPTH: sow in well-drained medium (1 seed per container, ¼" deep in medium) and put in full sun

GERMINATION TIME: 7 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 5.5–6.5

LIGHT: sunny location

WATER: drought tolerant

TEMPERATURE: 50–90°F

ELEVATION: 10–1500' or more

SALT TOLERANCE: moderate

WIND RESISTANCE: good



MANAGEMENT

FERTILIZER NEEDS: light

RECOMMENDED SPACING: 6–8' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs or larger

PRUNING: thin out weak growth and head back (cut back) vigorous shoots to induce branching; prune branch tips to old wood after flowering

SPECIAL CULTURAL HINTS: plants can be variable when grown from seed; may become weedy if left unchecked

SUGGESTED COMPANION PLANTINGS: ferns

'ohai ali'i

Plant characteristics

HEIGHT: 10'

SPREAD: 10'

GROWTH RATE: fast

GROWTH HABIT: rounded shrub or small tree

FLOWERS

SIZE: 1" diameter, 2" long

COLOR: red-orange, yellow, pink, rose, cream

SHAPE: round, with long stamens

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round

TIME TO FLOWERING: 6–12 months

INDUCING AND MAINTAINING FLOWERING: remove seed pods as they form to maintain flowering

PESTS

COMMON DISEASES: fungal stem rot, root rot

OTHER PESTS: caterpillars, scales

Harvesting considerations

WHAT IS HARVESTED: flowers with 1–2" of stem

HARVESTING TECHNIQUES: pinch flowers

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth container

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



The lei shown also contains *Dracaena tricolor* and Mexican creeper.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in sealed plastic container in refrigerator at 40°F for up to 4 days

PREPARING FOR USE IN LEI: for sewing, clip stem when picking; for haku (mounting against a background) or wili (twisting pattern), leave stem; mist with water frequently while making lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, place on dry tissue paper in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawaii Garden: Tropical Shrubs*. Honolulu: University of Hawai'i Press.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

Warren, William. 1997. *Tropical Plants for Home and Garden*. London: Thames and Hudson.

orchid: cymbidium

OTHER COMMON NAMES: ‘okika

SCIENTIFIC NAME: *Cymbidium* species

FAMILY: Orchidaceae
(orchid family)

NATURAL SETTING/LOCATION: Southeast
Asia to India



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: many large and miniature
species and varieties

Growing your own

PROPAGATION

FORM: seeds; mericlone (commercial growers purchase tissue-cultured plantlets in sterile flasks); division

PREPLANTING TREATMENT: pods are sterilized before aseptic culture; remove old foliage and bulbs from divisions

PLANTING DEPTH: sow seeds on surface of aseptic medium; keep division root crown just below soil level

GERMINATION TIME: 2–3 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: soilless media, gravel, cinder, hāpu‘u, wood bark

SOIL PH: 5.5–6.5

LIGHT: full sun to partial shade

WATER: keep moist

TEMPERATURE: 55°F at night during summer

ELEVATION: 1500–4000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: light to medium; varies among types

RECOMMENDED SPACING: 2 ft² per plant

ADAPTATION TO GROWING IN

CONTAINERS: yes, 2-gallon plastic pots or larger

PRUNING: not necessary; remove old flower stalks and yellow or dead leaves



SPECIAL CULTURAL HINTS: sterilize tools between cuttings and remove old medium when deflasking; sanitation is important

SUGGESTED COMPANION PLANTINGS: other orchids

orchid: cymbidium

Plant characteristics

HEIGHT: 3–4'

SPREAD: gets large if left undivided

GROWTH RATE: moderate

GROWTH HABIT: vertical, epiphytic

FLOWERS

SIZE: 2–4"

COLOR: white, green, red, yellow, pink, orange

SHAPE: star-shaped

FRAGRANCE: faint, sweet

FLOWERS IN FIRST YEAR: yes, but flowers are small until the following season, when they become larger and more numerous

FLOWERING PERIOD: spring through early summer

TIME TO FLOWERING: 8 months from divisions, about 2–3 years from seed

INDUCING AND MAINTAINING FLOWERING: summer night temperature must remain at or below 55°F for consistent flower initiation for most varieties; miniature types can flower with warmer temperatures

PESTS

COMMON DISEASES: *Pythium* and *Phytophthora* root rot, black rot, *Colletotrichum* leaf spot (fungus), petal and blossom spot (fungi), bacterial stem rot, cymbidium mosaic and odontoglossum ringspot viruses

OTHER PESTS: aphids, mice, mites, slugs, snails, thrips



The lei shown also contains cup-and-saucer plant, kangaroo paw, kalanchoe, Peruvian lily, and 'ōhi'a lehua.

Harvesting considerations

WHAT IS HARVESTED: spray (raceme with flowers) or individual flower on 2" of stem

HARVESTING TECHNIQUES: cut or snap spray close to the base

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: place cut end of spray in a container with water; individual flower stems can be placed in water in a plastic tube sealed with a rubber band or plastic cover

AVOID MIXING WITH THESE MATERIALS: smoke, car exhaust, ripening fruits, and wilting flowers; avoid extremes of heat and cold

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 14 days

CLEANING OF PLANT MATERIALS: soak flowers in clean water for 5 minutes after harvesting; check for insects in throat of flower

STORING RAW LEI MATERIALS: spray can be stored for up to 14 days in water; individual flower can be stored for up to 14 days if stem is wrapped with a piece of moist paper in a plastic bag; refrigerate both at 40°F

PREPARING FOR USE IN LEI: clip stem if sewing lei, keep stem if using in other lei patterns

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place in sealed plastic container or bag, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Leonhardt, K.W. 1980. *Simple Orchid Culture*. University of Hawai'i, CTAHR, CES Circular 452.

Sacalis, John N. 1993. *Cut Flowers, Prolonging Freshness*. Batavia, Illinois: Ball Publishing.

orchid: dendrobium

OTHER COMMON NAMES: ‘okika

SCIENTIFIC NAME: *Dendrobium* species

FAMILY: Orchidaceae (orchid family)

NATURAL SETTING/LOCATION: found worldwide



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: many UH-CTAHR cultivars available; some recent ones are ‘Splendor’ and ‘White Cascade’

Growing your own

PROPAGATION

FORM: seeds; aerial offshoots; division; mericlone (commercial growers purchase tissue-cultured plantlets in sterile flasks)

PREPLANTING TREATMENT: green pods or seeds are sterilized before aseptic culture; remove old foliage and bulbs from divisions

PLANTING DEPTH: sow seeds on surface of aseptic medium; keep division root crown just below soil level

GERMINATION TIME: 2–4 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: soilless media, gravel, cinder, wood bark, hāpu‘u

SOIL PH: 5.5–6.5

LIGHT: 30% shade

WATER: prefers high humidity; water 3–4 times per week

TEMPERATURE: 75–85°F (day) / 65°F (night)

ELEVATION: 10–1000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: light to medium; varies among types

RECOMMENDED SPACING: 1 ft² per plant

ADAPTATION TO GROWING IN CONTAINERS: yes; plastic, clay, or cement pots; polybags

PRUNING: not necessary; remove old flower stalks and yellow or dead leaves



SPECIAL CULTURAL HINTS: sterilize tools between cuts and remove old medium when deflasking; sanitation is important

SUGGESTED COMPANION PLANTINGS: other orchids

orchid: dendrobium

Plant characteristics

HEIGHT: to 6'

SPREAD: 24"

GROWTH RATE: fast

GROWTH HABIT: upright, epiphytic

FLOWERS

SIZE: 2–4"

COLOR: white, purple, blush-pink, yellow

SHAPE: star-shaped, 3 petals, 3 sepals

FRAGRANCE: yes, varies

FLOWERS IN FIRST YEAR: no

FLOWERING PERIOD: heaviest during summer

TIME TO FLOWERING: 18 months from flask

INDUCING AND MAINTAINING FLOWERING: maintain good plant health and provide adequate fertilizer

PESTS

COMMON DISEASES: *Pythium* and *Phytophthora* root rot, black rot, *Colletotrichum* leaf spot (fungus), petal and blossom spot (fungi), bacterial stem rot, cymbidium mosaic and odontoglossum ringspot viruses

OTHER PESTS: aphids, blossom midge, mealybugs, mice, mites, orchid weevil, scales, slugs, snails, thrips

Harvesting considerations

WHAT IS HARVESTED: spray (raceme with flowers), or individual flower on 2" of stem

HARVESTING TECHNIQUES: cut or snap spray close to the stem

BEST TIME OF DAY TO HARVEST: early morning



BEST WAY TO TRANSPORT FROM PICKING AREA: cut end of spray under water in a plastic container or pick flowers and carry in plastic, paper, or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers; avoid extremes of heat and cold

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: to 7 days

CLEANING OF PLANT MATERIALS: soak flowers in clean water for 5 minutes after harvesting; check for insects inside throat of flower

STORING RAW LEI MATERIALS: spray can be stored for up to 14 days with cut end in water; individual flower can be stored for up to 14 days if stem is wrapped with a piece of moist paper in a plastic bag; refrigerate both at 40°F

PREPARING FOR USE IN LEI: clip stem if sewing lei, keep stem if using other lei patterns

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place in sealed plastic bag or container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Leonhardt, K.W. 1980. *Simple Orchid Culture*. University of Hawai'i, CTAHR, CES Circular 452.

Leonhardt, K.W., and Kelvin Sewake. 1999. *Growing Dendrobium Orchids in Hawai'i: Production and Pest Management Guide*. University of Hawai'i, CTAHR.

Northen, Rebecca T. 1990. *Home Orchid Growing*. 4th rev. ed. New York: Prentice Hall Press.

Orchid Society of South East Asia. 1993. *Orchid Growing in the Tropics*. Singapore: Times Editions.

Teoh, Eng Soon. 1989. *Orchids of Asia*. Singapore: Times Books International.

orchid: epidendrum

OTHER COMMON NAMES: baby orchid, butterfly orchid, buttonhole orchid, epis, 'okika, reed orchid

SCIENTIFIC NAME: *Epidendrum* species

FAMILY: Orchidaceae (orchid family)

NATURAL SETTING/LOCATION: tropical America and tropical West Africa



CURRENT STATUS IN THE WILD IN HAWAI'I: only one species has become naturalized in Hawai'i: *Epidendrum x obrienianum*

CULTIVARS: over 1,000 species and numerous hybrids and cultivars

Growing your own

PROPAGATION

FORM: aerial offshoot; seeds; division; mericlone (commercial growers purchase tissue-cultured plantlets in sterile flasks)

PRETREATMENT: pods are sterilized before aseptic culture; remove old leaves and bulbs from divisions

PLANTING DEPTH: sow seeds on surface of aseptic medium; keep division root crown just below soil level

GERMINATION TIME: 2–4 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rock, orchid bark, hāpu'u, cinder

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: most prefer high humidity and daily irrigation

TEMPERATURE: 55–90°F

ELEVATION: 10–1000'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate to poor



MANAGEMENT

FERTILIZER NEEDS: light to medium; varies among types

RECOMMENDED SPACING: varies with plant size; generally 6–18" apart

ADAPTATION TO GROWING IN CONTAINERS: yes; beds, bags, plastic or clay pots

PRUNING: not necessary; remove old flower stalks and yellow or dead leaves

SPECIAL CULTURAL HINTS: if grown in a pot, re-pot every 1–2 years; sterilize tools between cuttings and remove old medium; sanitation is important

SUGGESTED COMPANION PLANTINGS: other orchids and bromeliads

orchid: epidendrum

Plant characteristics

HEIGHT: to 4'

SPREAD: 8"

GROWTH RATE: fast

GROWTH HABIT: upright, epiphytic

FLOWERS

SIZE: 1–2½"

COLOR: white, pink, purple, yellow, green, red, orange

SHAPE: star-shaped, 3 petals and 3 sepals

FRAGRANCE: varies

FLOWERS IN FIRST YEAR: yes, from cuttings and divisions

FLOWERING PERIOD: year-round

TIME TO FLOWERING: 18–24 months from flask for some

INDUCING AND MAINTAINING FLOWERING: keep healthy and give adequate light

PESTS

COMMON DISEASES: *Pythium* and *Phytophthora* root rot, black rot, *Colletotrichum* leaf spot (fungus), petal and blossom spot (fungi), bacterial stem rot, cymbidium mosaic and odontoglossum ringspot viruses

OTHER PESTS: blossom midge, mites, orchid weevil, thrips

Harvesting considerations

WHAT IS HARVESTED: flower with 1–2" of stem

HARVESTING TECHNIQUES: pluck flower heads

BEST TIME OF DAY TO HARVEST: early morning



The lei shown also contains Peruvian lily, oncidium orchid, and laua'e fern.

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers; avoid extremes of heat and cold

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days

CLEANING OF PLANT MATERIALS: soak flowers in clean water for 5 minutes after harvesting; check for insects stuck in lip

STORING RAW LEI MATERIALS: place in sealed plastic container and refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip stems if sewing lei, keep stem if using other lei patterns

STORING A COMPLETED LEI BEFORE WEARING:

soak lei, shake off excess water, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Leonhardt, K.W. 1980. *Simple Orchid Culture*. University of Hawai'i CTAHR, CES Circular 452.

Northen, Rebecca T. 1990. *Home Orchid Growing*. 4th rev. ed. New York: Prentice Hall Press.

Orchid Society of South East Asia. 1993. *Orchid Growing in the Tropics*. Singapore: Times Editions.

Sessler, G.J. 1978. *Orchids and How to Grow Them*. New York: Prentice Hall Press.

Teoh, Eng Soon. 1989. *Orchids of Asia*. Singapore: Times Books International.

orchid: vanda

OTHER COMMON NAMES: ‘Miss Joaquim’, ‘okika, vanda

SCIENTIFIC NAME: *Vanda* species

FAMILY: Orchidaceae
(orchid family)

NATURAL SETTING/LOCATION:
found worldwide



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: many readily available: ‘Miss Joaquim’ varieties include Rose Marie, Josephine, John Laycoch; inbred cultivars include Diane, Atherton, Shimomishi

Growing your own

PROPAGATION

FORM: cuttings; tissue culture; mericlone; seeds (seeded plants are not generally used in lei flower production)

PREPLANTING TREATMENT: pods are sterilized before aseptic culture

PLANTING DEPTH: sow seeds on surface of aseptic medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 1–4 months

CUTTING ROOTING TIME: 2–4 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: soilless media, hāpu‘u, gravel, cinder

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: high humidity, daily irrigation

TEMPERATURE: 75–85°F (day), 65°F (night)

ELEVATION: 10–1000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: light to medium; varies among types

RECOMMENDED SPACING:
8–12 plants per ft²

ADAPTATION TO GROWING IN CONTAINERS: yes; hāpu‘u logs, plastic pots, polybags, or similar

PRUNING: as needed when plant becomes too tall for harvesting; some growers remove summer and fall flower spikes before they flower to encourage stronger winter flowering



SPECIAL CULTURAL HINTS: replant when 6' tall; sterilize tools between cuttings and remove old medium; sanitation is important

SUGGESTED COMPANION PLANTINGS: other orchids

orchid: vanda

Plant characteristics

HEIGHT: indeterminate, but cut and replant when plant reaches 6'

SPREAD: very confined; grows straight upward

GROWTH RATE: fast

GROWTH HABIT: epiphytic

FLOWERS

SIZE: 2–3"

COLOR: purple

SHAPE: star-shaped, 3 petals and 3 sepals

FRAGRANCE: yes, light

FLOWERS IN FIRST YEAR: yes, from cuttings

FLOWERING PERIOD: summer

TIME TO FLOWERING: 8–12 months from cuttings

INDUCING AND MAINTAINING FLOWERING: provide full sun and keep healthy

PESTS

COMMON DISEASES: *Pythium* and *Phytophthora* root rot, black rot, *Colletotrichum* leafspot (fungus), petal and blossom spot (fungi), bacterial stem rot, cymbidium mosaic and odontoglossum ringspot viruses, foliar nematodes

OTHER PESTS: mites, orchid weevil, scales, stink bugs, thrips



Harvesting considerations

WHAT IS HARVESTED: flower with 1–2" of stem

HARVESTING TECHNIQUES: don't remove pollinia while hand picking; ethylene gas from detached pollinia, fruits, and exhaust from internal combustion engines can cause flowers to turn white prematurely

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers; avoid extremes of heat and cold

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: soak flowers in clean water for 5 minutes after harvesting; check for insects in throat of flower

STORING RAW LEI MATERIALS: lay flowers on top of damp newspaper and cover with dry tissue; place in paper box and refrigerate at 40°F for up to 5 days

PREPARING FOR USE IN LEI: clip stem if sewing lei, keep stem if not; check to make sure pollinia are intact, otherwise discard flower if it is missing

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place on top of damp newspaper in paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Leonhardt, K.W. 1980. *Simple Orchid Culture*. University of Hawai'i CTAHR, CES Circular 452.

Northen, Rebecca T. 1990. *Home Orchid Growing*. 4th rev. ed. New York: Prentice Hall Press.

Orchid Society of South East Asia. 1993. *Orchid Growing in the Tropics*. Singapore: Times Editions.

Teoh, Eng Soon. 1989. *Orchids of Asia*. Singapore: Times Books International.

pakalana

OTHER COMMON NAMES: Chinese violet

SCIENTIFIC NAME:
Telosma cordata

FAMILY: Asclepiadaceae
(milkweed family)



NATURAL SETTING/LOCATION: native to Southeast Asia

CURRENT STATUS IN THE WILD IN HAWAII:
not found

Growing your own

PROPAGATION

FORM: cuttings with 2–3 nodes; seeds; air layering

PREPLANTING TREATMENT: treat cuttings with medium rooting hormone

PLANTING DEPTH: sow seeds on surface of medium or slightly ($\frac{1}{8}$ ") below; insert base of cutting 1–2" into medium

GERMINATION TIME: 1 month

CUTTING ROOTING TIME: 4–5 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 6.0–6.5

LIGHT: sunny location

WATER: keep moist; water deeply twice a week

TEMPERATURE: 70–90°F for rapid flowering

ELEVATION: 10–300'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS:
medium

RECOMMENDED SPACING:
24–36" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2- to 3-gallon tubs with support

PRUNING: thin out old shoots to induce new growth

SPECIAL CULTURAL HINTS: provide a trellis or other support; can also be grown in a large pot raised above ground with room for vines to hang down around it to allow for easy flower picking; flowers occur on new growth



SUGGESTED COMPANION PLANTINGS: grows best without competition from other plants; in particular, it does not compete well with other vines

pakalana

Plant characteristics

HEIGHT: 8–10'

SPREAD: will spread to 3–4' wide if not supported

GROWTH RATE: fast

GROWTH HABIT: vine

FLOWERS

SIZE: about ½"

COLOR: greenish yellow upon opening, turning orange with age

SHAPE: 5-lobed corollas on short tubes

FRAGRANCE: similar to violets

FOLIAGE

TEXTURE: smooth

COLOR: dark green

SHAPE: broad, heart-shaped

FRAGRANCE: none

PESTS

COMMON DISEASES: root rots in wet soils, nematodes, mosaic virus

OTHER PESTS: mites, soft scales, stink bugs, thrips, whiteflies



Harvesting considerations

WHAT IS HARVESTED: flowers and sometimes leaves (depending on lei type)

HARVESTING TECHNIQUES: cut or pinch (don't pull) individual flowers from cluster, leaving unopened buds

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: glass jar

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: wrap in a damp paper towel, place in plastic or glass container, and refrigerate at 40°F for up to 5 days

PREPARING FOR USE IN LEI: clip stem and sew, unless making other styles, then leave flowers on cluster

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, wrap in a damp paper towel, place in plastic or glass container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Criley, Richard A. 1995. "Temperature Influences Flowering of Pakalana (*Telosma cordata* Merrill) under Long Days." *Hort-Science* 30(3):482–483.

Criley, Richard A. 1989. "Some Advances in Lei Flower Production." Univ. of Hawaii, CTAHR, *Horticulture Digest* 89:68.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

McDonald, Marie A. 1989. *Ka Lei: the Leis of Hawaii*. Honolulu: Ku Pa'a Inc., and Press Pacifica.

panax

OTHER COMMON NAMES: fern-leaf aralia, parsley panax

SCIENTIFIC NAME: *Polyscias* species

FAMILY: Araliaceae (ginseng family)

NATURAL SETTING/LOCATION: India to Polynesia



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: 'Golden Prince', 'Ming Aralia'

Growing your own

PROPAGATION

FORM: cuttings; can also be grafted onto common hedge panax

PREPLANTING TREATMENT: treat with medium rooting hormone

PLANTING DEPTH: insert base 1–2" into medium

CUTTING ROOTING TIME: 4–6 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL

CHARACTERISTICS: well drained; tolerates various soil types

SOIL PH: 5.5–6.5

LIGHT: full sun to partial shade

WATER: moderate

TEMPERATURE: 45–90°F

ELEVATION: 10–3000'

SALT TOLERANCE: good

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: heavy

RECOMMENDED SPACING: 24–36" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2-gallon tubs or larger

PRUNING: prune to reduce size, maintain shape, and keep full and bushy



SPECIAL CULTURAL HINTS: older plants can be habitats for termites

SUGGESTED COMPANION PLANTINGS: short, shade-loving plants

panax

Plant characteristics

HEIGHT: to 12'

SPREAD: to 3–4'

GROWTH RATE: fast

GROWTH HABIT: erect, evergreen, woody shrub

FOLIAGE

TEXTURE: smooth, bumpy, feathery

COLOR: dark green or variegated

SHAPE: finely divided, compound with leaflets; various sizes and shapes

FRAGRANCE: none

PESTS

COMMON DISEASES: fungal root and stem rots, bacterial leaf spots, root-knot and reniform nematodes

OTHER PESTS: borers, mealybugs, rats, scales, termites (in older plants)

Harvesting considerations

WHAT IS HARVESTED: foliage

HARVESTING TECHNIQUES: cut

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag



The lei shown also contains *Dracaena tricolor* and a fern.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 14 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: wrap in damp newspaper and place in sealed plastic container; refrigerate at 40°F for up to 30 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp newspaper, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawaii Garden: Tropical Shrubs*. Honolulu: University of Hawai'i Press.

Rauch, Fred D. 1996. *Tropical Landscape Plants*, 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

pentas

OTHER COMMON NAMES: Egyptian star-flower

SCIENTIFIC NAME: *Pentas lanceolata*

FAMILY: Rubiaceae (coffee family)

NATURAL SETTING/LOCATION: Madagascar, tropical South Africa



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: none named, but red, rose, violet, and pink types have been selected

Growing your own

PROPAGATION

FORM: seeds (purchase from seed source); cuttings

PREPLANTING TREATMENT: treat cuttings with mild rooting hormone

PLANTING DEPTH: sow seeds on surface or slightly (1/8") below; insert base of cutting 1–2" into medium

GERMINATION TIME: 5–12 days

CUTTING ROOTING TIME: 3–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well-drained loam or sandy loam; in pots, 1:1 peat:perlite

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: keep moist

TEMPERATURE: 50–90°F

ELEVATION: 10–2000'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate–poor

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 12–18" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 1- to 3-gallon tubs

PRUNING: cut back to 12–18" but not back to hard wood



SUGGESTED COMPANION PLANTINGS: globe amaranth

pentas

Plant characteristics

HEIGHT: to 36"

SPREAD: to 36"

GROWTH RATE: fast

GROWTH HABIT: spreading, woody, ever-green shrub

FLOWERS

SIZE: clusters of about 30 flowers 2–4" across; individual flower about $\frac{3}{8}$ "

COLOR: white, pink, red, red and pink, lilac

SHAPE: 5-petaled, star-shaped

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest in summer

TIME TO FLOWERING: about 8–10 weeks from rooted cutting, about 4 months from seed

INDUCING AND MAINTAINING FLOWERING: to induce more flowering shoots, pinch the young shoots to leave 2 or 3 pairs of nodes; remove spent flowers

PESTS

COMMON DISEASES: *Botrytis* on the flowers, southern blight

OTHER PESTS: aphids, caterpillars, mites, whiteflies



The lei shown also contains ti, panax, and aster.

Harvesting considerations

WHAT IS HARVESTED: flower cluster with 1–2" of stem

HARVESTING TECHNIQUES: pluck flowers

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: stick stem in water.

STORING RAW LEI MATERIALS: store in sealed container and refrigerate at 40°F for up to 4 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak for 30 minutes, drip dry, store in sealed container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

Reference and further reading

Nau, Jim. 1993. *Ball Culture Guide: The Encyclopedia of Seed Germination*. 2nd ed., p. 50–51. Batavia, Illinois: Ball Publishing.

pikake

OTHER COMMON NAMES: jasmine, lei-pikake, sampaguita (Philippines), single-flowered star jasmine

SCIENTIFIC NAME: *Jasminum sambac*

FAMILY: Oleaceae (olive family)

NATURAL SETTING/LOCATION: native to tropical Asia



CURRENT STATUS IN THE WILD IN HAWAII: typically not found

CULTIVARS: 'Grand Duke' is a double form used in haku lei

Growing your own

PROPAGATION

FORM: cuttings from 1-year-old wood

PREPLANTING TREATMENT: treat with mild rooting hormone

PLANTING DEPTH: insert base 1–2" into medium

CUTTING ROOTING TIME: 2–3 weeks under mist

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, silty clay loam

SOIL PH: 6–6.5

LIGHT: full sun; long days produce more flowers

WATER: moderate irrigation (1"/week); allow to dry between waterings; water entire root system

TEMPERATURE: 80–90°F (days), 70–80°F (nights); if night temperatures drop below 70s, flower number and size will be adversely affected; temperatures in low 60s will cause plants to cease flowering until higher temperatures return; one night of low temperature may shut down flowering for as long as 1–2 weeks



ELEVATION: 10–25' ideal; cool night breezes in valleys may retard flowering and reduce amount and size of blossoms; can be grown at higher elevations (500')

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate (wind may damage flowers)

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 1–1½' within rows, 5–6' between rows; grown as a hedge

ADAPTATION TO GROWING IN CONTAINERS: not recommended

PRUNING: prune to increase branching and flowering (flowers emerge from terminal tips) and to facilitate easy harvesting; suckers should be pruned, because they are unproductive

SPECIAL CULTURAL HINTS: long days and high temperature favor high production and large flowers, while short days and cold temperature reduce flower size and amount of flowering

pikake

Plant characteristics

HEIGHT: 6'

SPREAD: 24–36" wide

GROWTH RATE: moderate to slow in winter

GROWTH HABIT: shrub with some runners or suckers

FLOWERS

SIZE: ½–¾"

COLOR: cream-white

SHAPE: oval bud (unopened), star-shaped (open)

FRAGRANCE: distinctive, very strong, sweet; used for flavoring teas (jasmine tea) and as a perfume

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: under natural conditions, moderate flowering can be expected during the months of March–September; long days produce more flowers

TIME TO FLOWERING: bushes are pruned back with hedge trimmers to 1-year-old wood, or leaves are stripped by hand, causing plants to flower in 30 days during the hottest months and 45 days during spring and late summer; this flowering will continue for 7–12 days, and if plants are very healthy, it will continue for up to 20 days

INDUCING AND MAINTAINING FLOWERING: force flowering during winter months by enclosing plants in a plastic structure to increase temperature; warm air is captured in the structure, inducing flowering by increasing night temperatures; covering should be closed at least 1–2 hours before sunset; covering should be opened by early to mid-morning to avoid overheating; flowers grown in covered area will be larger and whiter than open field-grown plants



PESTS

COMMON DISEASES: powdery mildew, mosaic virus, nematodes; root rot and southern blight can be a problem with clay soil, poor drainage, and high rainfall

OTHER PESTS: Hawaiian flower thrips, blossom midge, broad mite, carmine spider mite, whiteflies; because buds are produced at tips, broad mite damage can severely decrease the amount of flowers produced; flower thrips and blossom midge attack buds and can affect postharvest quality

Harvesting considerations

WHAT IS HARVESTED: flower buds (opened flowers are not usually sold for lei)

HARVESTING TECHNIQUES: pick at bud stage; avoid handling too much (the delicate flowers are easily bruised)

BEST TIME OF DAY TO HARVEST: early to mid-morning, depending on time of year

BEST WAY TO TRANSPORT FROM PICKING AREA: cloth, paper bag, or paper box

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: no water

STORING RAW LEI MATERIALS: store in sealed plastic container and refrigerate at 40°F for up to 3 days

PREPARING FOR USE IN LEI: remove calyx (green, leafy base), then sew

STORING A COMPLETED LEI BEFORE WEARING: wrap lei in wax paper, place in sealed plastic container, and refrigerate; no water

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Leonhardt, K.W., and G.I. Teves. 2002. "Pikake, a Fragrant-Flowered Plant for Landscapes and Lei Production." University of Hawai'i, CTAHR, OF-29.

pincushion protea

OTHER COMMON NAMES: sunburst, Hawaiian sunflower

SCIENTIFIC NAME: *Leucospermum saxosum*, *L. erubescens*, *L. bolusii*, *L. oleifolium*, *L. mundii*, *L. muirii*, *L. parile*, *L. rodolentum*

FAMILY: Proteaceae (protea family; includes macadamia)



NATURAL SETTING/LOCATION: South Africa; adapted to cool, dry areas of Maui and Hawai'i above 1500 feet elevation

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: tip cuttings 6" long, taken in Sept.–Oct. after growth stops

PREPLANTING TREATMENT: use a medium-strength rooting hormone

PLANTING DEPTH: insert base of cuttings 1½–2" into medium

CUTTING ROOTING TIME: 2–3 months under mist

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 5.5–6.5

LIGHT: sunny location

WATER: twice weekly for established plants, more often for new plantings

TEMPERATURE: 40–90°F

ELEVATION: 1500–4000'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate to good



MANAGEMENT

FERTILIZER NEEDS: light; fertilize sparingly; sensitive to P

RECOMMENDED SPACING: 4–6' apart in field, depending on species

ADAPTATION TO GROWING IN CONTAINERS: yes, 5-gallon tubs

PRUNING: prune after flowering to maintain size, remove dead or diseased wood, and stimulate vigorous new shoots

SPECIAL CULTURAL HINTS: cuttings are slow to root, and intermittent mist is essential for successful propagation; rooted cuttings are moved to 4–6" pots and grown for 4–6 months before transplanting; in the field, specialized "proteoid" roots are matted near the soil surface and can be damaged by shallow cultivation

SUGGESTED COMPANION PLANTINGS: any low-growing, cool-climate perennials

pincushion protea

Plant characteristics

HEIGHT: 2–3', depending on species

SPREAD: 3–5', depending on species

GROWTH RATE: reaches ideal production size 3 years after transplanting

GROWTH HABIT: mounding shrub

FLOWERS

SIZE: single flowers up to 2½" for *L. saxosum*; other species have 1–1½" flowers singly or in clusters

COLOR: much variation among species; yellow-orange, pink, red, yellow-green, and cream-white can occur

SHAPE: most species have “pincushion” shape

FRAGRANCE: in *L. bolusii*, *muirii*, *parile*, *rodolentum*

FLOWERS IN FIRST YEAR: under optimal conditions, flowers within 1 year after transplanting to the field

FLOWERING PERIOD: fall–winter–spring

INDUCING AND MAINTAINING FLOWERING: 3–4 weeks of 50°F winter night temperature results in best flowering

PESTS

COMMON DISEASES: root rot, collar rot, leaf spots, *Botrytis*, root-knot nematode

OTHER PESTS: aphids and scales if plant is under stress, otherwise relatively free of insects and mites

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUE: cut or pluck

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic bag



The protea used in the lei shown is *Leucospermum oleifolium*; the lei also contains flowers of *Grevillea wilsonii* and *Lambertia inermis*.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse, hat

CLEANING OF PLANT MATERIALS: for single-strand lei, trim off stems close to flower head; for haku or wili style, remove stems if too thick or stiff

STORING RAW LEI MATERIALS: cover flowers with moist paper towels or stick stems in water-soaked “oasis,” refrigerate at 40°F, store for 5–14 days, depending on species

PREPARING FOR USE IN LEI: for single-strand lei, stringing can be easier after drilling through center of flowerhead; for haku or wili style, wire flowers together for easier handling

STORING A COMPLETED LEI BEFORE WEARING: wrap in moist paper towels and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Kepler, Angela K., and Jacob Mau. 1988. *Proteas in Hawaii*. Honolulu: Mutual Publishing.

Rousseau, F. 1970. *The Proteaceae of South Africa*. Cape Town: Purnell and Sons, Ltd.

plumeria

OTHER COMMON NAMES: frangipani, make-man, melia, pua melia, temple tree

SCIENTIFIC NAME: *Plumeria* species and cultivars

FAMILY: Apocynaceae (dogbane family)



NATURAL SETTING/LOCATION: native to tropical America

CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: many named cultivars, some with better flower shelflife than others

Growing your own

HANDLING CAUTIONS: milky sap may irritate eyes and skin

PROPAGATION

FORM: tip cuttings 6–36" long; seeds (seedlings take longer to flower)

PREPLANTING TREATMENT: allow end of cutting to air-dry at least 24 hours; mild rooting hormone speeds rooting

PLANTING DEPTH: sow seeds ¼–½" deep in medium; insert base of cutting 2–4" into medium, or more if large

GERMINATION TIME: 2 weeks

CUTTING ROOTING TIME: 2 months

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: keep moist

TEMPERATURE: 60–90°F

ELEVATION: 10–2000'

SALT TOLERANCE: moderate

WIND RESISTANCE: good (if tree is healthy)



MANAGEMENT

FERTILIZER NEEDS: medium to heavy; varies among cultivars

RECOMMENDED SPACING: 6–10' within the row and 12–15' between rows

ADAPTATION TO GROWING IN CONTAINERS: yes, large containers

PRUNING: easiest in winter, but it sacrifices spring flowering; prune back for easier flower harvest

SPECIAL CULTURAL HINTS: keep on dry side, especially in container; in field, plant branched cuttings with axils set low to the ground for low branching and easier flower harvest; provide 5–7 gallons/day irrigation water per tree, covering whole root system

SUGGESTED COMPANION PLANTINGS: during the first few years, annuals can be planted between trees

plumeria

Plant characteristics

HEIGHT: to 30'

SPREAD: 30'

GROWTH RATE: fast

GROWTH HABIT: round-headed, small tree

FLOWERS

SIZE: average 2–3" in diameter

COLOR: white, red, yellow, pink, multiple

SHAPE: tubular flower with 5 petals

FRAGRANCE: most varieties highly fragrant, with different scents

FLOWERS IN FIRST YEAR: from cutting: 1 year; from seed: 3 years

FLOWERING PERIOD: most cultivars flower March–October

TIME TO FLOWERING: maturity after about 5 years

INDUCING AND MAINTAINING FLOWERING: in dry areas, irrigation will promote flowering; defoliation in fall with ethephon will stimulate emergence of inflorescences as early as December

PESTS

COMMON DISEASES: plumeria rust, *Colletotrichum* leafspot and shoot blight, powdery mildew on leaves, fungal rots

OTHER PESTS: ants, blossom midge, long-horned beetles, mites, scales, thrips, whiteflies

Harvesting considerations

WHAT IS HARVESTED: open flowers

HARVESTING TECHNIQUES: grasp individual flowers at base and tug gently

BEST TIME OF DAY TO HARVEST: early morning



The lei shown also contains dendrobium orchid.

BEST WAY TO TRANSPORT FROM PICKING AREA: paper box or bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: soak the flower in clean water for no more than 10 minutes

STORING RAW LEI MATERIALS: place flowers in a bowl or sink, cover container with a light-weight, damp towel; can be refrigerated or left at room temperature

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off all excess water, drip dry, then place in paper box; can be refrigerated for 2 days or left at room temperature for 1 day

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

- Chinn, James T., and Richard A. Criley. 1982. *Plumeria Cultivars in Hawaii*. University of Hawai'i, CTAHR Research Bulletin 158.
- Criley, Richard. 1998. "Plumeria." University of Hawai'i, CTAHR, OF-24.
- Criley, Richard. 1994. "Enhanced Winter Flowering of Plumeria with Ethephon." *Acta Horticulturae* 394: 325–330.
- Eggenberger, Richard M., and Mary H. Eggenberger. 1994. *Handbook on Plumeria Culture*. 3rd ed. Houston, Texas: The Plumeria People.
- Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.
- Watson, Donald P., James T. Chinn, Horace F. Clay, and James L. Brewbaker. 1965. *Hawaiian Plumerias*. University of Hawai'i, CTAHR, CES Circular 410.

pohutukawa (New Zealand Māori)

OTHER COMMON NAMES: New Zealand Christmas tree

SCIENTIFIC NAME:
Metrosideros excelsus

FAMILY: Myrtaceae (myrtle family)

NATURAL SETTING/LOCATION: coastal zones of New Zealand



CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: various

Growing your own

PROPAGATION

FORM: seeds; semi-hardwood cuttings; air layering

PREPLANTING TREATMENT: air-dry capsules, allow seeds to fall from them; use medium to strong rooting hormone on cuttings

PLANTING DEPTH: sow seeds on surface; insert base of cutting 1–2" into medium

GERMINATION TIME: 30–60 days at 60–70°F

CUTTING ROOTING TIME: 9 months or more; best results with bottom heat



PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: tolerates most soil types

SOIL PH: less than 6.5

LIGHT: full sun

WATER: keep moist; somewhat drought-tolerant once established

TEMPERATURE: 40–90°F

ELEVATION: 10–3000'; best along coast; sensitive to dry air

SALT TOLERANCE: good; will tolerate both salt spray and saline soil

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 20' apart if tree form is desired

ADAPTATION TO GROWING IN CONTAINERS: yes, when young, in large containers

PRUNING: prune to reduce size and induce low branches; prune after flowering

SUGGESTED COMPANION PLANTINGS: low-growing plants

pohutukawa (New Zealand Māori)

Plant characteristics

HEIGHT: more than 30'

SPREAD: 20–30'

GROWTH RATE: slow

GROWTH HABIT: broad, oval, evergreen tree or large shrub

FLOWERS

SIZE: 1½"

COLOR: dark crimson (rare yellow and white forms exist)

SHAPE: staminate, pompom-like

FRAGRANCE: none

FLOWERS IN FIRST YEAR: no

FLOWERING PERIOD: summer

TIME TO FLOWERING: from seed, 5–7 years; from air layer, 1 year; no information for cutting

FOLIAGE

TEXTURE: extremely variable, from smooth and waxy to fuzzy

COLOR: dark gray-green on top, silvery underneath

SHAPE: simple, oval to ovate

FRAGRANCE: none

PESTS

COMMON DISEASES: none serious

OTHER PESTS: none serious



The lei shown also contains goldenrod.

Harvesting considerations

WHAT IS HARVESTED: branch tips (liko), flowers, and bud clusters

HARVESTING TECHNIQUES: cut

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in paper box in refrigerator at 40°F for up to 14 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei for 5 minutes, drip dry, place in paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry flowers; liko and bud clusters cannot be preserved

References and further reading

Editors of Sunset Books and Sunset Magazine. 1995. *Sunset Western Garden Book*. 6th ed. Menlo Park, California: Sunset Pub. Corp.

Metcalf, Lawrie. 1995. *The Propagation of New Zealand Native Plants*. Auckland, New Zealand: Godwit Publishing Ltd.

Neal, Marie C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Honolulu: Bishop Museum Press.

pua kenikeni

OTHER COMMON NAMES: ten-cent flower

SCIENTIFIC NAME: *Fagraea berteriana*

FAMILY: Loganiaceae
(logania family)



NATURAL SETTING/LOCATION: native to South Pacific islands

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: air layering (most commonly used); seeds

PLANTING DEPTH: sow seeds ½" deep in medium

GERMINATION TIME: 30–90 days

AIR LAYERING ROOTING TIME: 6–8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: keep moist

TEMPERATURE: 60–90°F

ELEVATION: 10–1000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate



MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 15' x 15'

ADAPTATION TO GROWING IN CONTAINERS: yes, 5-gallon tubs or larger

PRUNING: prune to keep within picking height and to produce new shoots for flowering

SPECIAL CULTURAL HINTS: flowers on new growth; don't overfertilize

SUGGESTED COMPANION PLANTINGS: low-growing shade plants

pua kenikeni

Plant characteristics

HEIGHT: up to 25'

SPREAD: 15'

GROWTH RATE: fast

GROWTH HABIT: upright, small tree or shrub

FLOWERS

SIZE: 2½" long to 1" wide

COLOR: cream colored, changing to orange

SHAPE: tubular

FRAGRANCE: sweet

FLOWERS IN FIRST YEAR: yes, from air layering

FLOWERING PERIOD: year-round, heaviest in summer

TIME TO FLOWERING: 9 months from air layering, at least 5 years from seed

INDUCING AND MAINTAINING FLOWERING: withhold water to induce flowering

PESTS

COMMON DISEASES: leaf spots, fungal root rots, root-knot nematode

OTHER PESTS: mealybugs, scales, thrips

Harvesting considerations

WHAT IS HARVESTED: flowers and calyx (green, leafy base)

HARVESTING TECHNIQUES: break stem with flower, leaving calyx on the blossom

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: basket lined with ti leaf

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

CLEANING OF PLANT MATERIALS: no water

STORING RAW LEI MATERIALS: store at room temperature for up to 1 day for orange flowers, 2 days for yellow, and 3 days for white; no water; to remove thrips from flowers, wrap in wet newspaper, then seal in plastic container and place in ice-cold water

PREPARING FOR USE IN LEI: depends on style; clip bottom at 45° angle, then sew lei, or clip calyx and sew

STORING A COMPLETED LEI BEFORE WEARING: lay wet cloth or paper towel over lei or put lei in plastic bag and float over cold water; do not refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Neal, Marie C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Honolulu: Bishop Museum Press.

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

rose

OTHER COMMON NAMES: loke, lokelani, loke-lau (green rose), roselani (heavenly rose)

SCIENTIFIC NAME: *Rosa* cultivars

FAMILY: Rosaceae (rose family)

NATURAL SETTING/LOCATION:
Asia, Asia Minor



CURRENT STATUS IN THE WILD IN HAWAII:
not found

CULTIVARS: many new cultivars can out-perform old-fashioned standards; choose from miniature roses, floribunda, shrub roses, polyantha, and landscape types for lei flower use; check commercial catalogs for available cultivars

Growing your own

HANDLING CAUTIONS: thorns on stems

PROPAGATION

FORM: cuttings; air layering; grafting

PRETREATMENT: treat cuttings with medium rooting hormone

PLANTING DEPTH: insert base of cutting 1–2" into medium; set grafted plants with graft union above soil level

CUTTING ROOTING TIME: 1 month or longer, depending on type

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich in organic matter, well drained, sandy to sandy loam; in pots, medium in 1:1:1 ratio of soil, sphagnum or peat moss, and perlite or coarse cinder

SOIL PH: 6.0–6.5

LIGHT: full sunlight to partial shade

WATER: keep moist

TEMPERATURE: 50–90°F

ELEVATION: 10–3500'

SALT TOLERANCE: poor

WIND RESISTANCE: moderate (strong winds dehydrate plants)

MANAGEMENT

FERTILIZER NEEDS: medium to heavy; varies among types

RECOMMENDED SPACING:
2' apart in rows

ADAPTATION TO GROWING IN CONTAINERS: yes, 3-gallon tubs or larger

PRUNING: as flowers are harvested, the stem usually is cut back to the second 5-leaflet leaf above its point of origin; when plants get too tall or aisles too narrow, renewal pruning is practiced by heading them back; pruning to keep the plant's center open lets sunlight in and prevents black spot and other blights



SPECIAL CULTURAL HINTS: various production difficulties; a crop for the experienced grower

rose

Plant characteristics

HEIGHT: to 6'

SPREAD: to 4'

GROWTH RATE: depends on cultivar

GROWTH HABIT: shrub

FLOWERS

SIZE: buds are from $\frac{3}{8}$ – $1\frac{1}{4}$ "; flowers borne 1 per stem or in clusters

COLOR: pink, white, red, yellow, lavender, green bi-color

SHAPE: bud pointed to urn-shaped

FRAGRANCE: yes, varies

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round

TIME TO FLOWERING: from transplants and cuttings, flowers are produced on new shoots about 45–55 days after the shoot develops from a pruning cut

INDUCING AND MAINTAINING FLOWERING: approximately 55 days from pruning to flower

PESTS

COMMON DISEASES: powdery mildew, downy mildew, blackspot, root rot, rust, anthracnose, nematodes, viruses, *Botrytis* blight (flowers), stem canker

OTHER PESTS: aphids, caterpillars, Chinese rose beetle, flower thrips, grasshoppers, mealybugs, spider mites, scales

Harvesting considerations

WHAT IS HARVESTED: buds or partially open flowers, with or without stems

HARVESTING TECHNIQUES: cut



The lei shown also contains heliconia and 'ōhi'a lehua.

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID MIXING WITH THESE PRODUCTS/CONDITIONS: smoke, car exhaust, ripening fruits, and wilting flowers; avoid excessive heat

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 6 days

CLEANING OF PLANT MATERIALS: place in clean, warm water (105–110°F) after harvesting

STORING RAW LEI MATERIALS: place in sealed plastic bag or container and refrigerate at 32–35°F for up to 14 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei; pick off damaged outer petals

STORING A COMPLETED LEI BEFORE WEARING: soak lei, shake off excess water, store in sealed plastic bag or container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry buds only

References and further reading

There are many cultural guides for cut-rose production. The American Rose Society publishes a monthly magazine and annual yearbook, available in some libraries.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Pemberton, H.B., J.W. Kelly, and J. Ferare. 1997. *Production of Pot Roses*. Portland, Oregon: Timber Press.

Sascal, John N. 1993. *Cut Flowers, Prolonging Freshness*. Batavia, Illinois: Ball Publishing.

Watson, D.P., P.E. Parvin, and R.A. Criley. 1972. *Rose Growing in Hawaii*. University of Hawai'i, CTAHR, CES Circular 468.

shinobu

OTHER COMMON NAMES: davallia, rabbit's foot fern

SCIENTIFIC NAME: *Davallia* species

FAMILY: Davalliaceae (fern family)



NATURAL SETTING/LOCATION: Eastern Hemisphere tropics

CURRENT STATUS IN THE WILD IN HAWAII: not found

Growing your own

PROPAGATION

FORM: rhizome cuttings

PREPLANTING TREATMENT: rooting hormone not needed

PLANTING DEPTH: place on surface

CUTTING ROOTING TIME: 8 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained, organic soil

SOIL PH: 5.5–6.5

LIGHT: partial shade

WATER: regular, deep watering

TEMPERATURE: 50–90°F

ELEVATION: 10–2000'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: light

RECOMMENDED SPACING: 2–3' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, baskets with hāpu‘u or sphagnum moss

PRUNING: remove old fronds



SPECIAL CULTURAL HINTS: mature fronds last longer than if the delicate, immature ones are used

SUGGESTED COMPANION PLANTINGS: tall trees for shade

shinobu

Plant characteristics

HEIGHT: 20"

SPREAD: 5–8'

GROWTH RATE: moderate

GROWTH HABIT: running fern

FOLIAGE

TEXTURE: fine

COLOR: dark green

SHAPE: fern-like

FRAGRANCE: none

PESTS

COMMON DISEASES: crown and foot rot, lesion nematodes

OTHER PESTS: fern caterpillar



The lei shown also contains cup-and-saucer plant and statice.

Harvesting considerations

WHAT IS HARVESTED: fronds

HARVESTING TECHNIQUES: cut, don't pull

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: none known

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: either refrigerate in sealed container at 40°F for up to 14 days or soak stems in water without refrigeration

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, place in sealed container, and refrigerate or place in damp newspaper and store in room temperature

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry (becomes brittle)

References and further reading

Hoshizaki, Barbara J. 1976. *Fern Growers Manual*. New York: Alfred A. Knopf.

Keeble, T., H. Clay, D. Crater, and G. Smith. 1975. *Growing Ferns*. University of Georgia, CES Bulletin 737.

shrimp plant (white and yellow)

OTHER COMMON NAMES: squirrel's tail

SCIENTIFIC NAME: *Justicia betonica* (white); *J. brandegeana* (yellow and red)

FAMILY: Acanthaceae (acanthus family)



NATURAL SETTING/LOCATION: Malaysia westward to Africa

CURRENT STATUS IN THE WILD IN HAWAII: *J. betonica* found naturalized along roadsides, *J. brandegeana* not found

Growing your own

PROPAGATION

FORM: cuttings; seeds (only *J. betonica*)

PRETREATMENT: none

PLANTING DEPTH: sow seeds on surface or slightly ($\frac{1}{8}$ ") below; insert base of cutting 1–2" into medium, use mild rooting hormone

GERMINATION TIME: undetermined

CUTTING ROOTING TIME: 10–21 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well-drained soils; tolerant of many soil types

SOIL PH: 6.0–7.0

LIGHT: full sun to partial shade

WATER: keep moist

TEMPERATURE: 60–90°F

ELEVATION: 10–500'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 2–3' apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 1-gallon tubs or larger

PRUNING: established plants will tolerate severe cutback



SPECIAL CULTURAL HINTS: white shrimp plant has potential of becoming a serious weed if left unchecked; do not plant near native landscapes

shrimp plant (white and yellow)

Plant characteristics

HEIGHT: 2–5'

SPREAD: 2–3'

GROWTH RATE: moderate

GROWTH HABIT: weak-stemmed shrub

FLOWERS

SIZE: flower spike to 6" long

COLOR: *J. betonica* has green and white bracts, *J. brandegeana* has red or yellow bracts

SHAPE: oval, pointed

FRAGRANCE: none

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest in summer

TIME TO FLOWERING: from cutting, 3–4 months

INDUCING AND MAINTAINING FLOWERING: flowers on terminals or new growth; prune to keep plants in bounds and encourage new growth

PESTS

COMMON DISEASES: none

OTHER PESTS: none serious

Harvesting considerations

WHAT IS HARVESTED: new, short inflorescences or tips of longer ones

HARVESTING TECHNIQUES: the plant is brittle; use snips to cut the flower spikes

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers



The lei shown also contains bougainvillea.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: wrap in damp newspaper and refrigerate at 40°F for up to 5 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp newspaper, store in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

Odenwald, Neil G., and James R. Turner. 1980. *Plants for the South: A Guide to Landscape Design*. Baton Rouge, Louisiana: Claitor's Publishing Division.

ALERT: *Justicia betonica* can be an invasive species and cause problems in agricultural areas in Hawai'i. It scores a rating of 12 on the Hawai'i-Pacific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai'i or similar Pacific islands, and is about 95% accurate. Any score above 6 indicates the potential for invasiveness, though there are varying levels of concern. The HPWRA score does not necessarily mean you should remove established plants from urban landscapes or avoid planting them at all, but *Justicia* species should not be introduced to areas where they are not already growing. *J. betonica* already naturalized in some places on all the major islands. The plant spreads by seed. If fertile material is used, lei should not be discarded in areas where *J. betonica* is not naturalized and where the seeds can germinate and grow. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

Spanish moss

OTHER COMMON NAMES: Dole's beard, hinahina, 'umi'umi-o-Dole

SCIENTIFIC NAME: *Tillandsia usneoides*

FAMILY: Bromeliaceae (pineapple family)



NATURAL SETTING/LOCATION: Florida, Central and South America

CURRENT STATUS IN THE WILD IN HAWAII: typically not found

Growing your own

PROPAGATION

FORM: vegetative clump divisions

PLANTING DEPTH: none; drape on tree branches or hangers

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: none; an epiphyte (air plant)

LIGHT: full sun to partial shade

WATER: daily misting

TEMPERATURE: 40–90°F

ELEVATION: 10–3000'

SALT TOLERANCE: moderate

WIND RESISTANCE: moderate

MANAGEMENT

FERTILIZER NEEDS: none required, but a very diluted liquid fertilizer can be applied occasionally as a foliar spray

RECOMMENDED SPACING: on hangers spaced 18" apart

ADAPTATION TO GROWING IN CONTAINERS: can be grown on trees or hanging from artificial supports such as clothes hangers

SPECIAL CULTURAL HINTS: provide good air movement and daily misting; can be harvested in 3–6 months

SUGGESTED COMPANION PLANTINGS: can be hung on trees or grown above smaller plants

Plant characteristics

HEIGHT: hanging clusters up to 15' long

SPREAD: up to 1' in diameter

GROWTH RATE: fast

GROWTH HABIT: mosslike, herbaceous

FOLIAGE

TEXTURE: fuzzy

COLOR: silver with bluish cast

SHAPE: short, needle-like

FRAGRANCE: none



PESTS

COMMON DISEASES: rot can develop in thick bunches where there is poor air circulation; fungal root rot

OTHER PESTS: none known

Spanish moss

Harvesting considerations

WHAT IS HARVESTED: clumps

HARVESTING TECHNIQUES: cut or pull

BEST TIME OF DAY TO HARVEST: any time

BEST WAY TO TRANSPORT FROM PICKING AREA: brown paper or cloth bag

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: spray with water.

STORING RAW LEI MATERIALS: place clumps on damp newspaper in paper or plastic container and refrigerate at 40°F for up to 30 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak, drip dry, place on damp newspaper in paper or plastic container, and refrigerate; or, leave hanging outside in well-ventilated area, spray with water

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry



The lei shown also contains pua kenikeni.

References and further reading

Clay, Horace F., and James C. Hubbard. 1977. *The Hawaii Garden: Tropical Exotics*. Honolulu: University of Hawai'i Press.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Rauh, Wermer. 1979. *Bromeliads for Home, Garden and Greenhouse*. Dorset, England: Blandford Press.

ALERT: *Tillandsia usneoides* could be an invasive species and cause problems in natural areas in Hawai'i. It scores a rating of 12 on the Hawai'i-Pacific Weed Risk Assessment (HPWRA). The HPWRA predicts whether any given plant is at low or high risk of becoming invasive in Hawai'i or similar Pacific islands and is about 95% accurate. Any score above 6 indicates the potential for invasiveness though there are varying levels of concern. The HPWRA score does not necessarily mean you should

remove established plants from urban landscapes or avoid planting them at all, but *T. usneoides* should not be introduced to areas where it is not already growing. Eight species of *Tillandsia* have already naturalized in some places on O'ahu and Maui. Wind and birds can spread the seeds, and the plant can reproduce by runners. If *T. usneoides* is used in lei, seeds should be removed first if possible. If fertile material is used, lei should not be discarded in areas where *T. usneoides* is not naturalized and where the seeds can germinate and grow. Use of native plants or non-native, non-invasive species in lei will minimize the spread of weeds. See the Plant Pono website for more information about potentially invasive species: <http://www.plantpono.org>.

statice

OTHER COMMON NAMES: sea lavender

SCIENTIFIC NAME: *Limonium latifolium* (perennial); *L. sinuatum* (annual)

FAMILY: Plumbaginaceae (plumbago family)



NATURAL SETTING/LOCATION: southeast and central Europe, Mediterranean

CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: Fortress series, 'Avignon'

Growing your own

PROPAGATION

FORM: seeds (purchase from a seed source); division (of perennial form)

PLANTING DEPTH: sow seeds on medium surface (or slightly below); keep division root crown just below soil level

GERMINATION TIME: 5–15 days at 65–70°F for *L. latifolium* and 60°F for *L. sinuatum*

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well drained and high in calcium

SOIL PH: 6.5–7.5

LIGHT: full sun

WATER: keep moist

TEMPERATURE: 60–90°F

ELEVATION: 10–3500'

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 14–18" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, 2-gallon tubs or larger, but planting in the ground is better

PRUNING: not necessary



SPECIAL CULTURAL HINTS: start with seedlings with 5–6 leaves; good drainage is critical; cool temperature will induce flowering in *L. sinuatum*

SUGGESTED COMPANION PLANTINGS: bedding plants

statice

Plant characteristics

HEIGHT: *L. latifolium* to 24",
L. sinuatum to 24–36" at flowering

SPREAD: 12–24"

GROWTH RATE: *L. latifolium* slow, *L. sinuatum* fast

GROWTH HABIT: upright clumps

FLOWERS

SIZE: ¼", borne in 3–5" clusters

COLOR: *L. latifolium*: blue, white, pink;
L. sinuatum: blue, lavender, white-pink

SHAPE: cup-shaped

FRAGRANCE: none

FLOWERS IN FIRST YEAR: *L. latifolium*, few flowers first year (3–4 years to maturity); *L. sinuatum* will flower in first year

FLOWERING PERIOD: *L. latifolium* summer; *L. sinuatum* April–October

TIME TO FLOWERING: *L. sinuatum* 3–5 months after sowing

INDUCING AND MAINTAINING FLOWERING: cool temperature required for young plants to flower

PESTS

COMMON DISEASES: root rot in wet soils; leaf spots (various diseases); *Botrytis* in flowers in wet areas

OTHER PESTS: aphids, chewing insects

Harvesting considerations

WHAT IS HARVESTED: flowering stems from base of plant

HARVESTING TECHNIQUES: harvest when most flowers are open and showing color



The lei shown also contains hydrangea, baby's breath, panax, and bougainvillea.

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic container with water

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: place stems in water; dust off field dust and clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING RAW LEI MATERIALS: refrigerate at 40°F for up to 14 days

PREPARING FOR USE IN LEI: cut flowers with stems about 1–2" long and place in paper container with no water; do not wet heads

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place on dry newspaper in paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: air-dry

References and further reading

Armitage, Allan M. 1993. *Specialty Cut Flowers, The Production of Annuals, Perennials, Bulbs, and Woody Plants for Fresh and Dried Cut Flowers*. Portland, Oregon: Varsity Press and Timber Press.

Harada, Daijiro. 1998. "Limonium." In: *The Ball RedDook*, 16th ed., p. 630–633. Batavia, Illinois: Ball Publishing.

Sascalis, John N. 1993. *Cut Flowers, Prolonging Freshness*. Batavia, Illinois: Ball Publishing.

Stevens, Alan B. 1997. *Field Grown Cut Flowers, A Practical Guide and Sourcebook; Commercial Field Grown, Fresh and Dried Cut Flower Production*. Edgerton, Wisconsin: Avatar's World.

Still, Steven M. 1994. *Manual of Herbaceous Ornamental Plants*. Champaign, Illinois: Stipes Publishing Co.

stephanotis

OTHER COMMON NAMES: floradora, Madagascar jasmine, pua male, waxflower

SCIENTIFIC NAME:
Marsdenia floribunda

FAMILY: Asclepiadaceae
(milkweed family)



NATURAL SETTING/LOCATION:
native to Madagascar

CURRENT STATUS IN THE WILD IN HAWAII:
not found

Growing your own

PROPAGATION

FORM: seeds; cuttings of semi-mature wood (roots form at nodes)

PRETREATMENT: remove fiber from seeds; treat cuttings with medium rooting hormone

PLANTING DEPTH: sow seeds ¼" deep in medium; insert base of cutting 1–2" into medium

GERMINATION TIME: 2 weeks

CUTTING ROOTING TIME: 4–6 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: rich, well drained

SOIL PH: 5.5–6.5

LIGHT: full sun

WATER: keep moist

TEMPERATURE: 65–90°F

ELEVATION: 10–1000'

SALT TOLERANCE: moderate

WIND RESISTANCE: good



MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 36" apart in rows

ADAPTATION TO GROWING IN CONTAINERS: yes, large containers

PRUNING: older plants may become straggly, therefore prune to manage size and shape and to induce flowering

SPECIAL CULTURAL HINTS: provide trellis or other support; let dry between waterings

stephanotis

Plant characteristics

HEIGHT: limited to height of support

SPREAD: 6–15', limited by length of support

GROWTH RATE: slow to establish, fast when established

GROWTH HABIT: vine

FLOWERS

SIZE: to 2" long

COLOR: white

SHAPE: tubular

FRAGRANCE: sweet, strong

FLOWERS IN FIRST YEAR: from cutting, yes; from seed, no

FLOWERING PERIOD: April–July and sporadically during the rest of the year; flowering can be forced with lights

TIME TO FLOWERING: 10–12 weeks after pruning if night temperature remains above 72°F

INDUCING AND MAINTAINING FLOWERING: to induce winter flowering, provide light as a night-break interruption for 4–6 hours at 20 watts per square yard of vine for 8 weeks in October–November

PESTS

COMMON DISEASES: root-knot nematode

OTHER PESTS: aphids, mealybugs, spider mites, scale, thrips

Harvesting considerations

WHAT IS HARVESTED: flowers

HARVESTING TECHNIQUES: pinch from vine

BEST TIME OF DAY TO HARVEST: early morning



BEST WAY TO TRANSPORT FROM PICKING AREA: paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store in sealed plastic container and refrigerate at 40°F for up to 7 days

PREPARING FOR USE IN LEI: cut blossom stem to length desired for lei fullness

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Anonymous. 1979. "Seasonable Suggestions." *Florists' Review* 164 (4259):97–98.

Evans, Michael. 1993. "Stephanotis." *GrowerTalks* 57(1):17.

Ide, Laurie S. 1998. *Hawaiian Lei Making: Step-by-Step Guide*. Honolulu: Mutual Publishing.

Kofranek, Anton M., and John Kubota. 1981. "The Influence of Pruning and of Extending the Photoperiod on the Winter Flowering of *Stephanotis floribunda*." *Acta Horticulturae* 128:69–78.

Kofranek, Anton M., and Richard A. Criley. 1983. "Photoperiod and Temperature Effects on *Stephanotis* Flowering." *Acta Horticulturae* 147:211–218.

Wikesjo, Karl. 1982. "Cultivation of the *Stephanotis*." *Florists' Review* 170 (4409):44, 156.

tree heliotrope

OTHER COMMON NAMES: beach heliotrope, messerschmidia, tahinu

SCIENTIFIC NAME:
Tournefortia argentea

FAMILY: Boraginaceae
(borage family)



NATURAL SETTING/LOCATION: Indian and Pacific Ocean coastal areas

CURRENT STATUS IN THE WILD IN HAWAII:
common in coastal areas

Growing your own

PROPAGATION

FORM: seeds; cuttings 6–12" long (hardened wood or green wood, but green wood is more prone to rotting); air layering

PREPLANTING TREATMENT: use medium rooting hormone on cuttings

PLANTING DEPTH: sow seeds ¼" deep in medium; insert base of cutting 2–4" into medium

GERMINATION TIME: 2–4 weeks

CUTTING ROOTING TIME: 3–6 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: sandy, well drained

SOIL PH: 6.0–7.5

LIGHT: full sun

WATER: drought tolerant

TEMPERATURE: 65–95°F



ELEVATION: 10–50'

SALT TOLERANCE: good

WIND RESISTANCE: good

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 15' apart

ADAPTATION TO GROWING IN CONTAINERS:
not recommended

PRUNING: prune to keep within picking height and induce branching; do not prune into old wood

SPECIAL CULTURAL HINTS: do not overwater

SUGGESTED COMPANION PLANTINGS: low-growing beach plants

tree heliotrope

Plant characteristics

HEIGHT: 10–15'

SPREAD: 15'

GROWTH RATE: slow at maturity

GROWTH HABIT: round-headed, small tree

FLOWERS

SIZE: small (individually), forming clusters

COLOR: white

SHAPE: tubular

FRAGRANCE: none

FLOWERS IN FIRST YEAR: from cutting, yes; no information for seed or air layer

FLOWERING PERIOD: year-round

TIME TO FLOWERING: several years from seed, 1–2 years from cutting and air layer

INDUCING AND MAINTAINING FLOWERING: always flowering

FRUITS

SIZE: 1/5"

COLOR: pale green to brown

SHAPE: round

FRAGRANCE: none

TIME TO FRUITING: many years from seed

FRUITING PERIOD: late summer

PESTS

COMMON DISEASES: root rots if too wet, leaf and flower spots

OTHER PESTS: ants, mealybugs



The lei shown also contains aster, rose, and 'ūlei.

Harvesting considerations

WHAT IS HARVESTED: flowers and fruit clusters

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: paper or cloth bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: put stems in water and refrigerate at 40°F for up to 10 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: soak lei, drip dry, wrap in damp newspaper, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

Reference and further reading

Rauch, Fred D. 1996. *Tropical Landscape Plants*. 3rd ed. Battle Ground, Washington: Hawaii Floriculture.

tuberose

OTHER COMMON NAMES: azucena, kupaloke, nardo

SCIENTIFIC NAME: *Polianthes tuberosa*

FAMILY: Agavaceae (agave family)



NATURAL SETTING/LOCATION: native to Mexico

CURRENT STATUS IN THE WILD IN HAWAII: not found

CULTIVARS: 'Excelsior', 'Pearl'

Growing your own

PROPAGATION

FORM: corms (1½–2" diameter)

PREPLANTING TREATMENT: dip corms in insecticide for corm mealybugs

PLANTING DEPTH: plant corm 1½" deep in medium

CORM ROOTING TIME: 10 days

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: well-drained, loamy soil to minimize incidence of soil-borne fungi and damping off organisms

SOIL PH: 6.0–6.5

LIGHT: full sun

WATER: high water requirement; don't allow corms to dry out

TEMPERATURE: 68–90°F to develop flowers of large size, amount, and good keeping quality; for optimum root growth, average soil temperature should be above 68°F



ELEVATION: 10–1000'; prefers moderate elevations, such as conditions found on slopes of Haleakalā on Maui or in Waimea on Hawai'i; has done well in lowlands, such as 300' in Ho'olehua during winter and spring months

SALT TOLERANCE: poor

WIND RESISTANCE: moderate (but flower stalks can be blown over in strong winds)

MANAGEMENT

FERTILIZER NEEDS: medium

RECOMMENDED SPACING: 6–8" in rows, 8" between rows, or 1' square or triangle; many different planting systems are used for production

ADAPTATION TO GROWING IN CONTAINERS: yes, pots 8" or larger

PRUNING: cut stalk to base after flowering

SPECIAL CULTURAL HINTS: grow on mounds for good drainage to avoid root rot; sterilize soil to avoid nematodes; use corms 1" or larger in diameter

tuberose

Plant characteristics

HEIGHT: plant: up to 2'; flower stalk: 2–5'

SPREAD: 12"

GROWTH RATE: fast in summer, slow in winter

GROWTH HABIT: low growing, herbaceous

FLOWERS

SIZE: 2–3" long, 1–1½" diameter

COLOR: white

SHAPE: star-shaped tubular flower with rounded petals (only double-petalled flowers used for lei)

FRAGRANCE: very sweet

FLOWERS IN FIRST YEAR: yes

FLOWERING PERIOD: year-round, heaviest in spring and summer

TIME TO FLOWERING: 4–6 months, depending on temperature and time of year

INDUCING AND MAINTAINING FLOWERING: regular fertilizer and irrigation

PESTS

COMMON DISEASES: *Pythium* root rot fungus, bacterium, southern blight, *Botrytis* blossom rot, foliar and root-knot nematodes

OTHER PESTS: ants, aphids, blossom midge, carmine spider mite, mealybugs, slugs, thrips

Harvesting considerations

WHAT IS HARVESTED: majority of flowers open

HARVESTING TECHNIQUES: grasp individual flowers at base and give a gentle tug

BEST TIME OF DAY TO HARVEST: early morning



The lei shown also contains shinobu.

BEST WAY TO TRANSPORT FROM PICKING AREA: brown paper bag

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, and wilting flowers

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle, horse

VASE LIFE: 7 days if flowers on stalk

CLEANING OF PLANT MATERIALS: cold water soak

STORING RAW LEI MATERIALS: store flowers in paper box and refrigerate at 40°F for up to 4 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, wrap in damp paper towel, place in paper box, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Armitage, Allan M. 1993. *Specialty Cut Flowers, The Production of Annuals, Perennials, Bulbs, and Woody Plants for Fresh and Dried Cut Flowers*. Portland, Oregon: Varsity Press and Timber Press.

Benschop, M. 1993. "Polianthes." In: *The Physiology of Flower Bulbs*. A. Deltortogh and M. LeNard, eds., p. 589–601.

Horton, Alvin, and James McNair, 1987. *All About Bulbs*. San Ramon, California: Ortho Books.

Trujillo, E. 1961. *Diseases of Tuberose in Hawaii*. University of Hawai'i, CTAHR, CES Circular 427.

Yadav, L.P., and R.G. Maity. 1989. "Tuberose." In: *Commercial Flowers*. L.P. Bose and L.P. Yadav, eds., p. 519–543. Calcutta, India: Naya Prokash.

violet

OTHER COMMON NAMES: Australian violet (*Viola hederacea*), sweet violet (*V. odorata*), waioleka

SCIENTIFIC NAME: *Viola hederacea*, *V. odorata*

FAMILY: Violaceae (violet family)



NATURAL SETTING/LOCATION: *V. odorata*: Eurasia and Africa; *V. hederacea*: Australia

CURRENT STATUS IN THE WILD IN HAWAII: *V. odorata* naturalized in some wet areas on Lānaʻi and Kauaʻi

Growing your own

PROPAGATION

FORM: seeds (*V. odorata*); division; cuttings (taken in spring, rooted in sand)

PREPLANTING TREATMENT: none

PLANTING DEPTH: sow seeds 1/16–1/8" deep, barely covering with medium; keep division root crown just below soil level; insert base of cutting 1–2" into medium

GERMINATION TIME: 10–20 days at 70°F

CUTTING ROOTING TIME: 3–4 weeks

PREFERRED PRODUCTION CONDITIONS

GENERAL SOIL CHARACTERISTICS: light, sandy soil, well drained

SOIL PH: 6.0–7.0

LIGHT: partial to heavy shade

WATER: high-quality water, applied deeply once a week

TEMPERATURE: 60°F (day), 50°F (night); tolerates warmer

ELEVATION: 1000–3000' (*V. odorata*); 200–500' (*V. hederacea*)

SALT TOLERANCE: poor

WIND RESISTANCE: poor

MANAGEMENT

FERTILIZER NEEDS: very light

RECOMMENDED SPACING: 6–8" apart

ADAPTATION TO GROWING IN CONTAINERS: yes, raised beds

PRUNING: not necessary; remove old leaves

SPECIAL CULTURAL HINTS: plants vegetate at high temperature, so keep cool; *V. hederacea* grows and flowers year-round in Hawaiʻi, while *V. odorata* flowers in spring only; too much sunlight causes burning; mulch to keep soil cool and moist; becomes chlorotic at high soil pH; water from bottom rather than from top to protect fragile flowers



Plant characteristics

HEIGHT: 4–6"

SPREAD: 12–20"; forms mat or runners

GROWTH RATE: 6–10" a year

GROWTH HABIT: low growing, herbaceous

violet

FLOWERS

SIZE: ½–1¼"

COLOR: violet, white, yellow; *V. hederacea*: blue-violet and white

SHAPE: 5-petalled

FRAGRANCE: sweet (*V. odorata*), none (*V. hederacea*)

FLOWERS IN FIRST YEAR: yes, depending on when propagated; *V. odorata* flowers in first year if started from seed in early spring

FLOWERING PERIOD: *V. odorata*: 8–12 weeks in spring; *V. hederacea*: year-round

TIME TO FLOWERING: perennial; less likely to flower in long days of summer and early fall

PESTS

COMMON DISEASES: root rot (*Phytophthora*, *Pythium*, *Rhizoctonia*), leaf spots (*Colletotrichum*, *Spaceloma*), black root (*Thielaviopsis basicola*), root-knot nematode

OTHER PESTS: aphids, mealybugs, mites, slugs

Harvesting considerations

WHAT IS HARVESTED: flowers with 1–2" of stem

HARVESTING TECHNIQUES: pinch stems

BEST TIME OF DAY TO HARVEST: early morning

BEST WAY TO TRANSPORT FROM PICKING AREA: plastic container

AVOID CONTACT WITH THESE PRODUCTS: smoke, car exhaust, ripening fruits, wilting flowers



The lei shown also contains leatherleaf fern, goldenrod, German statice, baby's breath, and statice.

Notes on lei making

BEST FOR WHICH TYPE OF LEI: neck, head, wrist, ankle

VASE LIFE: 3–7 days

CLEANING OF PLANT MATERIALS: stick stems in water

STORING RAW LEI MATERIALS: place in sealed plastic container or glass vase and refrigerate at 40°F for up to 7 days

PREPARING FOR USE IN LEI: clip off wrinkled, limp, or poor-quality areas before adding to lei

STORING A COMPLETED LEI BEFORE WEARING: mist lei, shake off excess water, place in sealed plastic container, and refrigerate

PRESERVING A LEI FOR LONG-TERM STORAGE OR DISPLAY: cannot be preserved

References and further reading

Post, Kenneth. 1950. *Florist Crop Production and Marketing*. New York: Orange Judd Publishing Co. Inc.

Rowell, Raymond J. 1992. *Ornamental Plants in Australia: Annuals, Soft-wooded Perennials, Bulbous and Climbing Plants*. Kensington, Australia: New South Wales University Press.