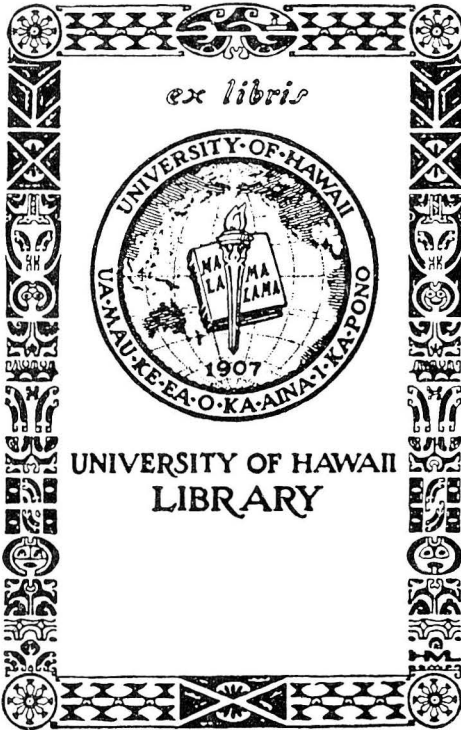


Cooperative Extension Service · College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa · CIRCULAR 452

SIMPLE ORCHID CULTURE

Kenneth W. Leonhardt





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This circular is an expansion of Circular 452, “Anyone Can Grow Orchids”, by Donald P. Watson, 1971. This circular identifies several orchid genera commonly grown in Hawaii and provides information on their history, cultural requirements, and pest control measures in such a manner that even the most inexperienced novice can successfully cultivate and enjoy orchids.

Illustrations by June Saito

Photographs courtesy of K and E Orchids

Cover Photo: *Laeliocattleya* Copper Charm ‘Kathie’

SIMPLE ORCHID CULTURE

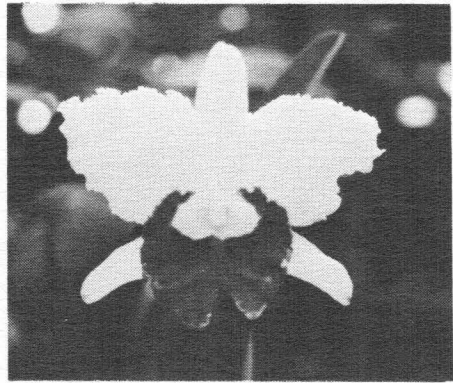
Kenneth W. Leonhardt

ORCHIDS ARE EASY TO GROW

If you aren't growing orchids you are missing a lot of fun.

Hawaii has the perfect climate for orchids as garden plants. You won't need a glass-house, fern-house, slat-house, or other structures to grow orchids in your garden. All you need is a place to grow them, a little basic information and understanding, some imagination, and love of things that grow. If you can grow a hibiscus or papaya, you can succeed with orchids.

The orchid family is large. Individual members require different food, climate, and physical surroundings. For example, cattleya will grow on a tree branch. It is one of the epiphytes (rock or tree dwellers), and this is its natural site. It is not a parasite—it just uses the tree for support—so it requires food and water. In its natural setting these come from bird droppings, accumulated vegetative compost, and rainfall.



Lc Jane Warne 'Alii' AM/AOS-AOS

In Hawaii, the climate is perfect for growing certain orchids on trees. All you need to know is what kind of orchids, where to put them on the tree, and how to attach them. Then you must provide water, food, and protection from insects by occasional spraying.

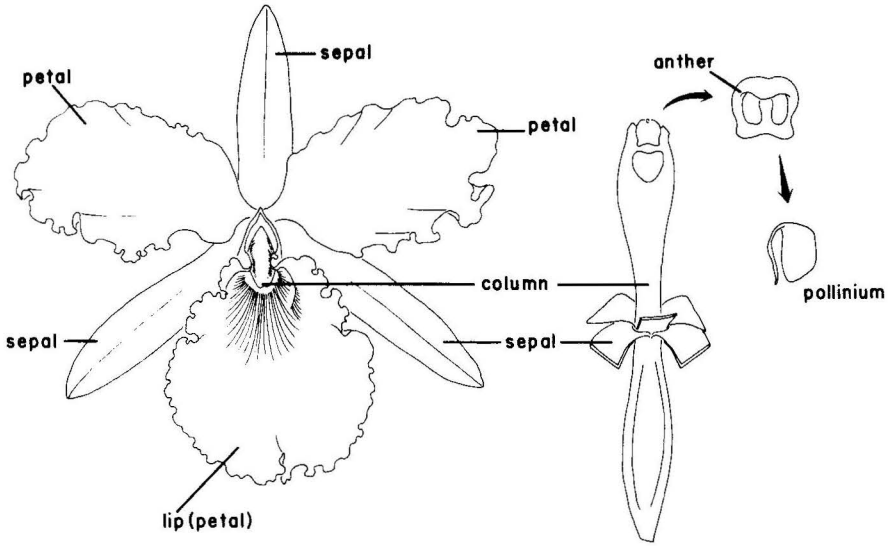
These rock and tree dwellers will also grow in pots, beds, or other containers, if you provide proper material for anchorage for the root system and to hold water and

food. Some of the materials used are osmunda fiber, hapuu or tree fern, gravel, cinder, rocks, and fir or redwood bark.

WHAT ARE ORCHIDS?

The over 25,000 described species make the orchid family possibly the largest family of flowering plants. The crossing of both wild and cultivated forms by hobbyists and commercial growers has produced perhaps as many as 50,000 hybrids since the first hybrid was made in 1852. Orchids range in size from plants only a

fused or reduced. One of the petals, the labellum or lip, differs from the others in being usually enlarged and elaborate. An additional feature orchids have in common is the fleshy, club-shaped column, a fusion of male and female reproductive organs, which projects from the flower center. At the column tip is the anther which holds 2 to 8 masses of pollingrains, called pollinia. Below the anther is the stigmatic surface on which pollinia are deposited during pollination. Below that point from which sepals, petals and column originate is the ovary which once fertilized, enlarges



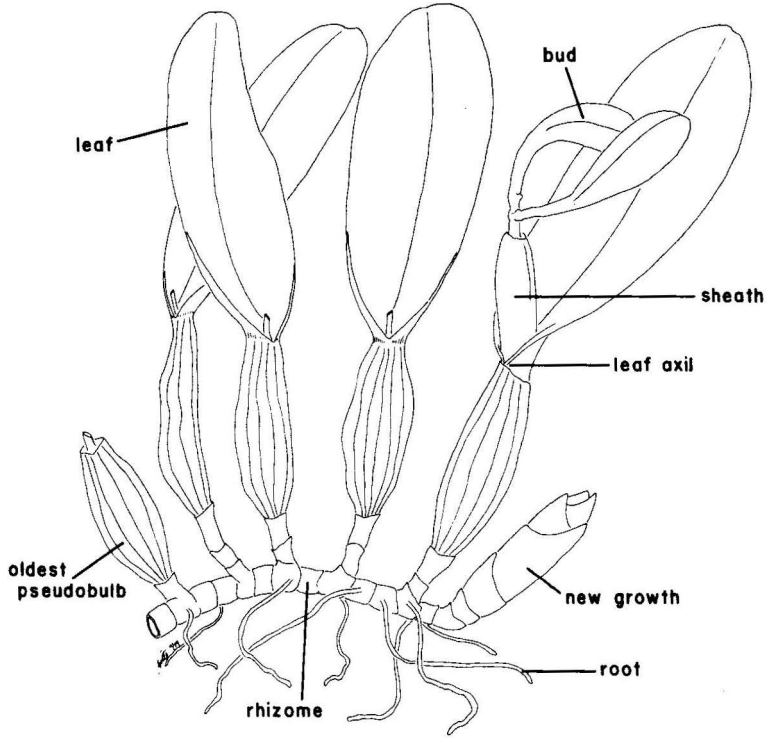
fraction of an inch tall to those with up to 10 foot stems and 15 foot tall inflorescences. What do these many thousands of species and hybrids of such varying dimensions and descriptions have in common that they should all be called orchids?

Similarities in floral structure are the common denominator. All orchid flowers have 3 sepals and 3 petals although in some species some of these parts may be

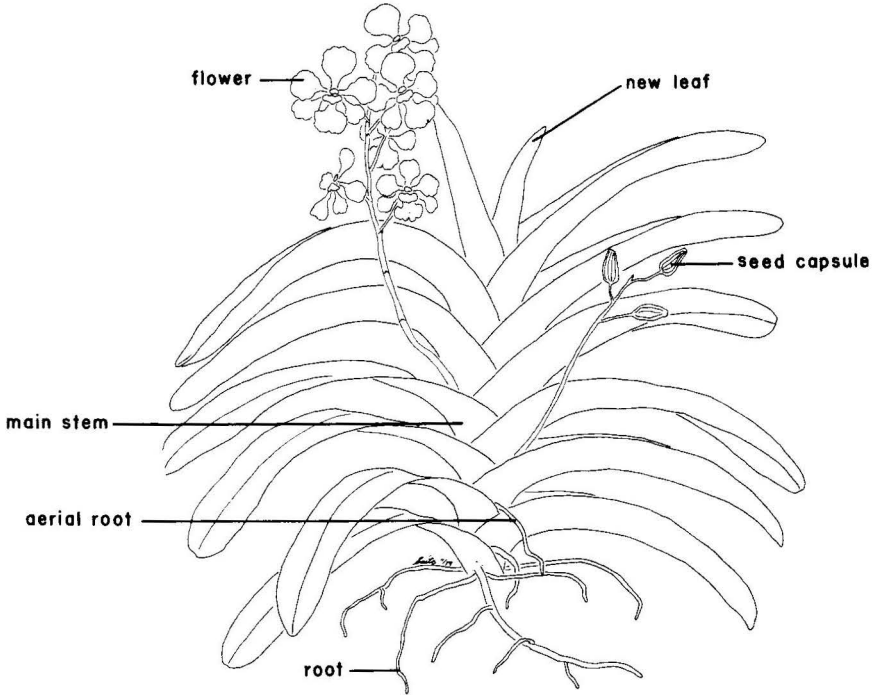
to become the seed pod which may contain over a million seeds at maturity.

Orchids are in the taxonomic class *angiospermae* or flowering plants with ovules (unfertilized eggs) enclosed in an ovary. The orchid family is further placed in the subclass *monocotyledoneae* or angiosperms having a single seed leaf (cotyledon), parallel leaf veins, and flower parts in 3's or 6's. Other monocots include

SYMPODIAL



MONOPODIAL



palms, grasses, bananas, ti, anthurium, lilies, and taro. The family *orchidaceae* is divided by Dr. Rudolf Schlechter, an orchid taxonomist, into 88 subtribes, over 660 genera and over 25,000 species. This circular discusses 9 genera popular in Hawaii and comments on several others.

There are 2 patterns of growth among orchids, sympodial and monopodial. Sympodial orchids such as *cattleya*,

cymbidium and *dendrobium*, have a main stem which terminates growth at the end of each season. A new shoot then grows from the base forming its own bulbous and thickened stem called a pseudobulb which eventually flowers. Monopodial orchids such as *phalaenopsis*, *renanthera*, and *vanda* have a main stem which continues to grow year after year, producing inflorescences from the leaf axils.

CARE OF ORCHID PLANTS IN FLOWER

In Hawaii, one of the least expensive and most beautiful plants is a potted orchid in flower. Few other flowers will give you as much enjoyment for the money you spend.

Here are some suggestions to help maintain orchids in good condition:

Light—Do not place a plant in direct sunlight. Indirect light all day is ideal. If you want to feature your flowering orchid in a place that is well lighted, use several plants and rotate them every 3 days.

Water—An orchid in flower should be watered regularly, usually once a day. Less frequent watering is required if the plant is brought indoors while in flower. Water just as often as the plant dries.

Drafts and wind—Try not to place the plant in a direct draft or where the wind will constantly blow on it. Wind dries the flowers and reduces their keeping quality.

Insects—When insects first appear, carefully remove them by hand or wash them off with water. Insecticides applied when the plants are in flower will damage the petals.

After flowering—Cut off the old flower spike with sharp shears at the base of the spike. Place the plant in the garden or on your lanai where it will flower again.

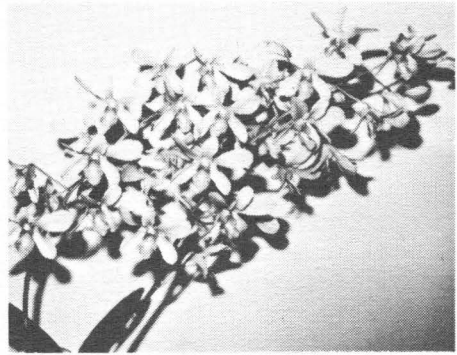
Orchids most suitable as pot plants for the house are cattleyas, dendrobiums, vandas, cymbidiums, and lady slippers. Examine them at your garden shop; enjoy their beauty in your home.

DENDROBIUMS (CANE ORCHIDS)

In Hawaii, dendrobiums are called "cane orchids." All dendrobiums are basically epiphytes (rock or tree dwellers) but will adapt themselves to bed, pot, or

log culture. First, decide where in the garden you want to use them, then select the most suitable culture.

Cane orchids require plenty of sunshine. In a valley, plant them where they will get full sun all day. In regions such as Wahiawa, Kaneohe, Kailua, and Makiki, they should have morning sun. In the very hottest locations, such as Koko Head, Kalihi, and Waikiki, partial shade during the heat of the day is ideal.



D. Roy X D. schulleri

If you are going to grow them in a pot, use shredded hapuu, osmunda fiber, rough fir, or redwood bark, volcanic cinder, or crushed blue rock as a potting medium.

You also can mount them on hapuu logs—either a half log lying horizontally or a full log standing upright. Bore a hole in the log and place a seedling in it firmly. It will root quickly into the log and, in a short time, produce a solid mat of roots over the surface of the log. Log culture is ideal for the valleys and plains. In the very hot regions, you must provide water every hot day.

Cane orchids grow beautifully in beds, preferably hollow-tile beds raised above the surface of the ground to assure perfect drainage. The bed should be 12 to 14 inches deep. Fill the bottom 6 inches with

rough rock or large pieces of coral for drainage. Fill the top 6 to 8 inches with gravel about the size of a lima bean or a small kukui nut. To place the plants, scoop out a hole, lift the plant out of the pot, leaving all the material on the roots, put the plant in the hole and place gravel firmly around the plant to anchor it. It will quickly root into the gravel bed. Such beds have perfect drainage and dry quickly. Heavy watering is needed—the warmer the region, the heavier the watering schedule.

During the hot months, it is advisable to put a mulch of peat moss, shredded hapuu, or similar organic material on top of the gravel. This holds moisture and cools the rock surface so the heat will not prevent new root growth.

Water by hand or with an automatic sprinkler; saturate the entire bed as often as it gets dry.

Dendrobiums are beautiful as potted plants. Either a clay or cement pot is suitable. The plants grow to a large size so you will need a big pot. Repot them frequently, always allowing enough room for growth. Materials suitable for pot culture are shredded hapuu fiber, cinder, rock, or bark. When using bark, place the plant in a pot with the back end at the rim and the growing portion toward the center. Hold the base of the plant so that it is 1½ to 2 inches below the pot rim. Fill the pot with bark, pressing it in firmly so that the plant is well anchored. Large plants may need staking until they root firmly into the new material.

Shredded hapuu is an excellent material although a little more difficult for the novice to use than bark because the material must be packed tightly into the pot with a stick. Hapuu takes on a spring-like characteristic when compressed. If

you try to force it in the pot, it will pop right out. Place the plant in the pot, then add the hapuu fiber. Work from the center out to the pot rim, pressing the fiber until it is firm and solid. Hold the plant in place during this operation or the force used in placing the fiber will move the plant from side to side.

POLYPLOID

DENDROBIUM PHALAEOPSIS

Orchids that have the characteristics most persons desire are often polyploid. Polyploid means "many sets of chromosomes." Chromosomes are found in the cells of all living things; in plants they determine the kind of flower. Normally orchids are diploid (two sets). A polyploid may have three (triploid), four (tetraploid), or more sets.

Long before the science of cytology (the study of chromosomes), orchid growers noted the fine characteristics of some orchids but did not associate them with chromosome counts. Scientists finally found the answer. The University of Hawaii played an important role in this work.

Polyploid *Dendrobium phalaenopsis* types were developed from three basic parents: No. 1) *Dendrobium* 'Diamond Head Beauty,' No. 2) *D. phalaenopsis schroderianum* 'Ruby,' and No. 3) *D. phalaenopsis* 'Giganteum.'

Crosses were made between parents No. 1 and No. 2, and between parents No. 1 and No. 3. The result of these crosses was *Dendrobium* 'Lady Hamilton.' Cytological studies of parents and progeny proved that all were tetraploids (four sets of chromosomes). Thus, where once there

were only three parents with these fine qualities, today there are many in the forms of 'Lady Hamilton' and later hybrids.

The plants flower during fall and winter. They are easy to grow and ideal for the warmer parts of the Islands, especially dry regions such as Kahala, Koko Head, Kaimuki, Kalihi, Waianae, Kailua, and Waimanalo. If you live in a wet region, you must protect them from rain.

They are best handled as potted plants. Pot them in either hapuu or fir bark. Pot when the new growth starts in late spring and new roots are just starting on the new growth.

During spring and summer (the growing season), water and fertilize freely. They start to flower after maturity in the fall and continue blooming during fall and winter. After flowering, keep the plants on the dry side and let them rest until new growth starts in spring. Then repot them and start the cycle over.

PENDULANT-TYPE DENDROBIUMS

A large number of dendrobiums are suitable as tree dwellers and make beautiful spots in the garden when in full flower. The cane orchids are not the best dendrobiums for tree culture, as they require more light than most trees permit, and plant growth is so heavy that the surface rooting on a tree is sometimes not sufficient to keep the plant firmly anchored.

The best plants for tree culture are the pendulant types of dendrobiums and many of the dainty miniature species. The common 'Hono-Hono' is a good example of the pendulant type; others are *D. nobile* and its varieties and hybrids, *D. pierardii*, and most of the Indian species.

When planting any orchid on a tree, you must first select the best position on the tree. You should consider: 1) direction of prevailing wind and rainfall, 2) direction of the sun—will the position get morning sun, afternoon sun, or filtered light all day, 3) a position that will allow you to water, fertilize, and spray your plant as it needs it.

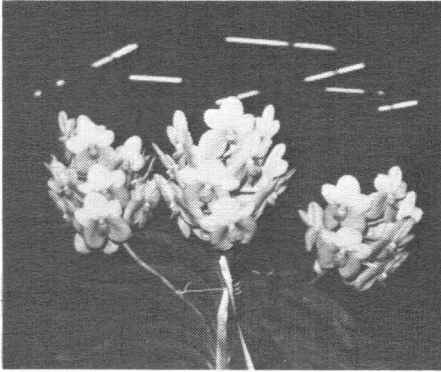
Once you have selected the proper site, it is a simple matter to "pot" the plant on the tree. Place the plant firmly against the selected spot, leaving a good ball of compost on the roots. With plastic-covered wire and staples, form a network of support that will not allow the plant to move in any way. The plant must be attached firmly so that winds cannot move the plant and tear the new root system before it has a chance to form a solid mass in the new environment. Remember, you can't attach the plant too firmly.

Water the plant freely until it is established, then only when it becomes dry.

STRAP-LEAF VANDAS

This group of orchids has become quite common as garden plants. A few years ago they were rare and expensive.

The strap-leaf vandas are epiphytes (rock or tree dwellers). The large number of hybrids here all stem from a few wild orchids: The two most important are *V. sanderiana* from the Philippines and *V. coerulea* from Asia and India. *V. sanderiana* has a fine, flat flower with an upright, large ball or head of flowers. *Vanda coerulea* is responsible for the lovely blue colors in this group of hybrids. Other important species are: *V. luzonica*, *suavis*, *sumatrana*, *insignis*, *limbata*, *tessellata*, *lamellata*, and *tricolor*.



V. sanderana alba 'Constance'
AM/HOS

The majority of strap-leaf vandas are large plants that do well in baskets, pots, or prepared beds in the garden. In the right situation, they also can produce a marvelous effect on a tree. Tree culture does not differ from that of other types of orchids.

To pot in a basket or pot, use hapuu or fir bark. Hapuu should be coarse with little or no dust in it. Pot firmly but in a manner that will allow quick and complete drainage. Some growers prefer to mix small pieces of charcoal with the hapuu to increase drainage. Strap-leaf vandas grow well in pieces of charcoal or in well-washed gravel, particularly in regions where the rainfall is heavy. Volcanic cinders, either red or black, also will provide a good medium. The main points to consider are a large container, firm potting, and good anchorage.

For bed culture in the garden, select a position with proper light—one that gets full morning sun but not the hot sun of noon or early afternoon. Strap-leaf vandas are subject to sunburn that causes unsightly foliage. Lack of light will cause poor flowering.

Dig the bed 14 to 16 inches deep. Or you may raise the bed the same distance

above ground. It may be held in place with tile, cement, or lumber. On the bottom 4 to 5 inches, place large pieces of coral, rock, or crushed cement to allow good drainage. Fill the bed with either a mixture of gravel and tree fern, gravel and fir bark, or volcanic cinders. Either tree fern or fir bark may be added for the hot regions with low rainfall; these materials will help hold and conserve moisture in the bed. For tall plants, use a piece of tree fern as a backing to support the plant and allow additional rooting surface. To plant, dig a hole to fit the rootball of your plant. Remove the plant from the pot, place it in the hole, and firmly press the medium around the sides.

Strap-leaf vandas require plenty of water and should be given a good soaking daily except on rainy or cloudy days. Water early so no water will remain in the leaf axils to rot bud spikes. Vandas also require plenty of fertilizer.

As a garden plant or as a pot plant, strap-leaf vandas are one of the most exciting garden plants.

TERETE VANDAS **(PENCIL-LIKE LEAVES)**

Vanda 'Miss Joaquim' (the common vanda known as the lei flower) found its way into Hawaii via Singapore.

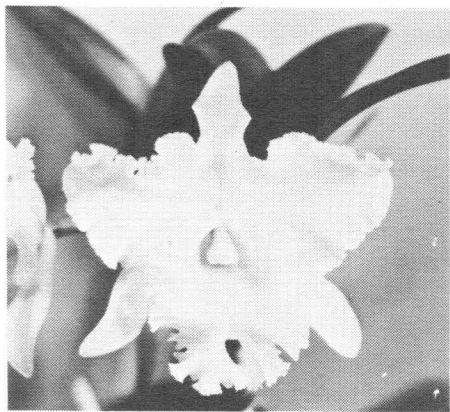
Cuttings of the original plants were sent to various gardens in the Islands. They are probably the flower most used for leis. This vanda is easy to propagate. All you need to do is cut pieces about 8 inches long, plant them in a box of shredded tree fern or wood shavings, keep them moist, and you soon have another plant for the

garden. This takes about 4 or 5 months under ideal culture. Thus, starting with a 2-foot piece, you have three plants on the first cut. Six months later you can cut each of these in half and you have 6 plants—another year 24, another 100, another 424, etc., so that in 4 years of intensive propagation you can build up a stock of more than 400 plants from one 2-foot cutting.

These vandas are grown in the full sun in a well-drained bed with a mulch of wood shavings or tree fern. Water heavily every day, fertilize once a week, and cut flowers to your heart's content.

CATTLEYA AND ALLIED HYBRIDS

To most people, the word orchid is synonymous with the genus *Cattleya*. These large-flowered orchids are used by florists for corsages.



BLC Meditation 'Classic'

Cattleya orchids are really a complex group of hybrids created by combining a number of closely allied species and genera from many parts of the tropical world. All of the wild orchids making up the hybrids originally came from South or Central

America or from islands or land masses in these regions. Combined with the genus *Cattleya* in modern hybrids you may find the following genera: *Brassovola*, *Laelia*, *Sophronitis*, *Epidendrum*, *Broughtonia*, *Schomburgkia*, *Diacrium*, and a few lesser ones. Thus, when a plant is named on the tag you will find it as *Lc. (Laeliocattleya)*, *Bc. (Brassocattleya)*. A plant may be given a name honoring a person in place of a long and complicated name such as where several genera are in the ancestry.

New colors came from the *Laelia*, large lips from *Brassovola*, interesting new shapes from *Epidendrum* and *Schomburgkia*, red color from *Sophronitis* and *Broughtonia*. Man is never satisfied and must always try to bend nature to his own standards. So the cattleyas you buy and grow in your gardens are a far cry from their ancestors that grew in the jungles of the tropical Americas. Cattleyas are all epiphytes. They are easy to grow on trees, rocks, or tree fern stumps, or as potted plants in baskets or pots.

Media for potted plant culture vary from grower to grower. Any of the following media will be fine if you provide the other factors necessary for good culture: redwood or fir bark, tree fern or hapuu, osmunda fiber, and gravel or sand mixes, including volcanic cinders. Osmunda fiber has been used longer than any other medium. It is excellent and can be used either as shredded fiber, chunks, or as slabs for mounting a plant. Bark is the easiest to use, costs are moderate and, if you water and fertilize enough, grows excellent plants. Gravel cultures are easy to use, cost little, but require lots of water and fertilizer.

Cattleyas need protection from the sun. They can be grown in full sun, but

an expert is needed to select such a location. On an average, cattleyas require from 25 percent to 50 percent shade, depending on whether you live in a moderate or a very hot location. For the valleys and well-shaded plains, 25 percent shade is fine. Open exposures, low plains, and beach regions require 50 percent shade.

Cattleyas, being true epiphytes, require the basic principle of watering for this group—a complete soaking followed by drying. The time to do this varies from place to place, plant to plant, and time of year. If you know that your plant is saturated from the rain, leave it until it gets dry; you will be watering properly.

Cattleyas are not fast-growing plants and their food requirements are not as great as many other types of orchids. Liquid feeding twice monthly and a side-dressing of orchid organic fertilizer once every 2 or 3 months is adequate.

Cattleyas come in a wide range of colors and varieties. Names mean little unless you are a collector or show-grower. The best way to select plants in flower is at your garden shop.

Cattleyas are attacked by a number of insects, and a careful spray program is essential. Consult the orchid pest control guide in this circular.

EPIDENDRUMS

Between 400 and 500 known species of epidendrums are found, chiefly in Mexico, Central America, the West Indies, and south of Brazil. In their native locations they are such rank growers that they can be con-

sidered weeds in the pastures.

In Hawaii they are widely used as garden plants. Although epidendrum infers that they grow on trees, many of the species grown locally are terrestrial (soil grown) in their habit. They can be highly recommended to the beginner because they are so easily managed.

After a year or two, the clumps may be divided after flowering. Small buds arising on the stem will develop into young plants.

Epidendrums may be grown in full sunlight or light shade. They prosper from sea level to higher altitudes. Less shade is needed where temperatures are lower.

Most species flower more during the warmer part of the year. During the actively growing periods they require plenty of water on the roots. Water less during the winter to help prevent the development of black spots on the leaves.

Good growth may be assured by liquid feeding with orchid fertilizer twice a month and a supplement of orchid organic every 2 or 3 months.

Although they will grow in a variety of soils, the common terrestrial types will respond to a mixture of ground hapuu and small stones. In pots they will produce more leafy foliage if the plants are crowded. In beds or borders they may be planted closely and will produce a large number of flowers.

Although there are many species of epidendrums, the small-flowering types are most popular as garden plants. Many flowers on the stem over a long period provide orange, red, lavender or yellow flowers—perfect miniatures of cattleyas. Epidendrum hybrids crossed with other members of the genus or with other orchid genera are available for more advanced growers.

RENANTHERA—THE FIRE ORCHID

The renanthera group of orchids is predominantly red. They are easy to grow and make ideal garden plants.

The wild types from which our modern hybrids were developed came from the Philippine Islands, India, and parts of Asia. By selective breeding we have developed new and more robust types that make ideal garden or potted plants.

Potted plants can be grown in either a cement or red clay pot. Use either fir bark, Hawaiian tree fern fiber, or a mixture of fiber and gravel.

To plant in the garden, dig a hole about 18 to 26 inches deep and fill with gravel about the size of a small walnut. Place the plant, with a ball of medium as it comes from the pot, into the gravel bed so that the medium is just level with the gravel. As the plant grows tall, place a tree fern log behind it so that it can root into the log.

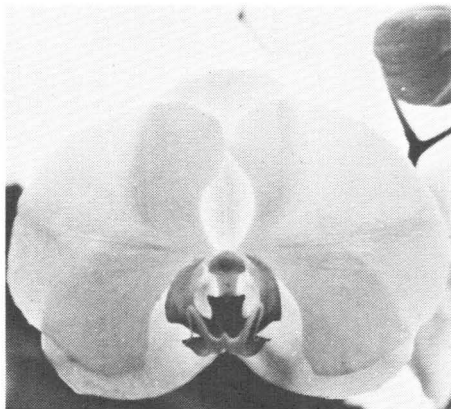
These plants require light and should have full morning sun. Water daily and fertilize regularly with orchid fertilizer according to the directions on the container.

A grouping of several of these plants will provide a colorful accent in your garden.

PHALAEENOPSIS

These orchids, commonly called Philippine moth orchids, are among the loveliest of all spray orchids. They are primarily white, pink, or lavender, but some of the novelty crosses are producing lovely pastel shades.

In nature, moth orchids are true tropicals and epiphytes. They are ideal plants for the low levels in Hawaii. They require heat, shade, and plenty of water, except



Phal. Anne Cavaco

at night—one of the easiest ways to kill phalaenopsis plants is to put them where they will get night rains.

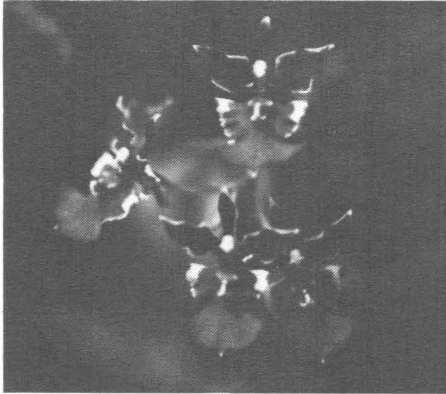
The foliage is soft and will easily sunburn. They require at least 50 percent shade. Roof covering of plastic or painted glass, or diffused light in a lanai or patio is ideal. Never allow your plants to get direct sun.

Phalaenopsis require more water than most epiphytic orchids. They should never become dry. In most locations, water daily in all good weather.

Phalaenopsis grow rapidly. They have a high level of food requirements and benefit from weekly applications of liquid fertilizer.

Thrips and red spider mites on the undersides of leaves are common on phalaenopsis. Consult the orchid pest control guide in this circular.

Phalaenopsis are among the easiest orchids to grow if you can provide warm conditions, 50 percent shade, protection from rain, particularly at night, and good cultural practices in watering, fertilizing, and pest control. If you have a tendency to be forgetful, do not grow phalaenopsis. If neglected, they quickly deteriorate.



Oncidium Potpourri

ONCIDIUMS

Oncidiums are called “dancing ladies.” Notice their puffed sleeves, full skirts—really formal ladies.

The three basic types of oncidiums are miniature forms, nonbulbous, and large-growing bulbous.

Miniature forms: ‘Delight,’ ‘Golden Glow,’ ‘Agnes Ann,’ ‘Twinkle,’ are some of the good ones.

Grow them in small pots, keeping the plants crowded. Medium can be fir bark, osmunda, or hapuu. Water only as often as they are dry. Fertilizer requirements are limited as these plants are small and slow-growing. Liquid feeding once a month is ample. Ideal light is 25 percent shade to full sun in the valleys.

These miniatures are wonderful plants to naturalize in the garden. They do very well attached to branches of plumeria, citrus, ti, or other woody treelike shrubs. Be sure the tree or shrub does not provide dense shade. Simply tie the small plants to the branches, with very little material on the roots. Water daily until established.

Nonbulbous oncidiums: The term nonbulbous is deceiving, as they do have tiny

bulbs; but their much larger leaves serve the same purpose as a pseudobulb in most orchids. The leaves may be terete (pencil-like) or broad and flat. These are some of the best orchids to grow in a hot dry climate.

They may be grown in pots with either tree fern, osmunda, or fir bark as a medium. Be sure to pot so that the drainage is good. Water only when dry—fertilize once a month with liquid solutions.

This group of oncidiums also does well mounted on slabs of tree fern or attached to trees. Firmly attach the plant with wire or staples and keep watered until well established—much the same as in pot culture.

Large-growing bulbous oncidiums: Except for the cane-type dendrobiums, no other group of orchids is quite so easy to grow. They take a lot of room but return much in a beautiful display of flowers. Most of them will grow in anything. There is actually one “hedge” of these growing in Honolulu in a hillside garden where the soil is basically black sand. They seem to thrive on it.

For pot culture, you can use any material that will grow epiphytic types of orchids: fir bark, osmunda, hapuu, black sand, gravel, rocks, volcanic cinders, or wood chips. Just be sure the pot is large enough to accommodate them and is well drained.

They need full sun, except for the very hottest regions where 25 percent shade is advisable.

Water them as often as they get dry. Fertilize every week with liquid fertilizer.

Spray once every 2 weeks with all-purpose garden spray to keep insects under control.

Oncidium orchids are for everyone. Select those that complement your garden.

MILTONIAS

Most wild types of miltonias come from regions in South America where the temperatures are similar to those found in Hawaii.

Miltonias produce sprays of good-sized flowers in a wide range of colors. They are among the best of the newer orchids for cut flowers, corsages, table decoration, or pot plants.

These plants are closely related to the genus *Oncidium* and their cultural requirements are similar. In the valleys they need morning sun. As you move toward the beach, more shade is required. In warm regions with intense light, such as Diamond Head, Kalihi, or Waikiki, 50 percent shade is required.

In nature they stand considerable dryness, so allow them to dry out between waterings. For pots, use a well-drained porous medium. Good potting media are rough Hawaiian tree fern or hapuu, and a coarse grade of bark compost.

Miltonias also grow exceptionally well on fern slabs or logs. To grow in this fashion, select a good piece of hapuu, shaped as you want it. It should be neither hard nor soft—just flexible enough to give

with finger pressure. Place the plant on it and attach it firmly with staples and plastic-covered wire. It is most important that the plant be held absolutely firm. If the plant can move, new roots will be torn away each time the plant is disturbed. Remember that log culture requires much more water than pot culture. When you do not have a pot to retain the moisture, the surface of the compost is exposed and dries quickly.

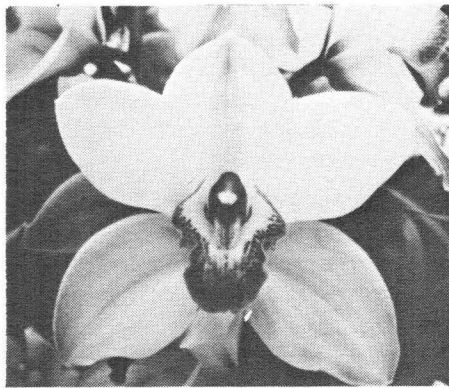
CYMBIDIUMS

Cymbidium is an exciting genus with hybrids flowering in a wide range of colors including pink, red, yellow, green, maroon, bronze and, white, in bold and vibrant tones as well as more delicate pastels and art shades. Their tall, erect, arching, or hanging sprays, durability and longevity, ease of cultivation, and usefulness as a potted plant, landscape plant, or commercial cut-flower have led to tremendous worldwide popularity.

Except as a florist corsage flower and to the small number of commercial growers in the Volcano area the Cymbidium orchid is little known in the Hawaiian



Miltonia hybrids



Cym. Peri 'Rodgers'

Islands. Conventional (also called "standard" or "cut-flower") varieties require cool evening temperatures of about 55°F during the late fall and winter months for good flowering to take place. Such conditions occur naturally in Volcano, Kamuela and upper Kona on the Island of Hawaii, Kula on Maui, Kalae on Molokai, Pupukeya on Oahu, Waimea on Kauai, and other scattered areas, mostly above 1500 feet elevation, around the state.

Ample sunlight is one of the most important factors in the successful flowering of Cymbidiums. A minimum of 4,000 foot candles of light should be provided during the growing season, 5,000 to 7,000 foot candles being preferred. A characteristic of plants grown under sufficient sunlight is yellowish-green, rather than deep green, foliage.

Commercial growers in Volcano grow their plants in full sunlight during the non-flowering season and bring them under protective cover during the flowering season, generally November through May for most of the varieties grown in Hawaii. Generally 1,500 to 2,500 foot candles is sufficient during this period. This subdued light condition minimizes bud drop, affords better flower color and helps prolong the life of the flower spray. Once the flowers are harvested, or fade naturally, the plant should be returned to higher light conditions to stimulate vegetative growth and insure quality blooms for the next flowering season.

Cymbidiums require heavy watering, especially during the active growing season. During this period the growing medium should be kept in a moist but never saturated condition. During the flowering season when conditions are darker, cooler and little growth is taking place much less water is required, but

never allow the medium to dry out completely.

Cymbidiums are moderately heavy feeders. A balanced (10-10-10, 30-30-30 type) fertilizer should be provided throughout most of the year. A higher nitrogen (20-5-10, 30-10-10 type) fertilizer should be provided once new vegetative growths begin to appear and should be continued for about 4 months. Organic and inorganic fertilizers in liquid or granular forms may be used. Excellent results are obtained with dilute liquid fertilizers applied at each watering. One half to one teaspoon of a soluble 30-10-10, or roughly equivalent, fertilizer per one gallon of water (1 to 2 cups per 100 gallons) makes an appropriate concentration for regular watering. This continuous light feeding prevents burning damage to roots, and provides an even supply of nutrition.

Potting mixes may be composed from a variety of materials. A good mix provides rapid and even drainage, supports the plant well in an upright position, lasts for 3 seasons with little decomposition, and can be readily and inexpensively made with available materials. Materials such as hapuu, macadamia hulls, wood or bark chips, cinder, perlite, coarse peat moss and coarse compost have been successfully used in cymbidium mixes. A common mix is 3 parts coarse materials to 1 part medium grade materials. In very wet areas all coarse materials are often used. If peat moss is used, lime should be added at the rate of ½ cup for each cubic foot of peat moss added. The preferred pH range for a cymbidium mix is 6.0 to 6.5.

Cymbidium plants need to be divided and repotted when they become overgrown in their pots or when media decomposes to a point where drainage is impeded. The best time to divide and repot

is soon after flowers have been removed. If developing vegetative growths are disturbed by repotting, they often fail to flower. The procedure is simple.

Remove the plant from its pot and shake, rake, or wash off the old growing medium. Remove the old leafless backbulbs and separate the plant into flowering size divisions of 3 to 5 pseudobulbs, each having several green leaves. A sharp knife or clippers may be helpful in severing the thick rhizome which connects the pseudobulbs at their bases. Remove dead roots, clean wounded areas and coat with an asphalt base sealing compound. Place new divisions in a pot or tub large enough to contain them for about 3 years. Spread the roots and fill the container with potting mix such that the lower 1/3 of the pseudobulbs are buried. Firmly tamp mix about the roots. Water lightly to settle mix. Place newly potted plants in a shaded area and sprinkle foliage periodically. Do not water mix until roots begin to emerge from new growths. Once new growths begin to develop, plants may be returned to their normal growing environment. Leafless backbulbs may be similarly handled.

Cymbidiums for the garden should be planted in semi-sunny locations, being careful that trees and houses do not cast too great a shadow. Work into the garden soil about 50%, by volume, coarse organic materials. Slightly mound the planting spot. A mulch around the base of the plant will help conserve moisture and discourage weeds. Fertilize monthly with your regular garden fertilizer. Be sure to follow manufacturer's labeled directions.

Red spider mites and scale are the most common pests of cymbidium plants while aphids and thrips are occasional problems on the blooms. Follow recommended

control measures provided in this circular.

MINIATURE CYMBIDIUMS

The species and hybrids of miniature Cymbidiums require basically the same growing conditions as the larger conventional types. A major cultural difference is that most of the miniatures do not require temperatures nearly so cool as their larger relatives. The preferred temperature range for "minis" is 70° to 80°F during the day followed by a 10°F drop at night, a condition much easier to achieve in Hawaii's lowland areas than that required by the conventional types.

Not all miniature Cymbidiums will flower in Hawaii but recent research at



C. Starbright

the University of Hawaii indicates that the species *chloranthum*, *devonianum*, *ensifolium*, *hoosai*, *lancifolium*, *madidum*, *sinense* and *soshin* and hybrids having one of these species as a parent are most likely to flower reliably in Honolulu and areas of similarly warm temperatures. The miniature species *pumilum* requires conventional Cymbidium conditions to flower; however, many of its hybrids with conventional Cymbidiums can be bloomed under much warmer conditions. From over 150 species and hybrids of cymbidium recently evaluated at the University of Hawaii, Manoa Campus, Cymbidium Peter Pan 'Greensleeves' was rated as the most adapted to Honolulu conditions, flowering twice a year for three consecutive years during the evaluation. Flowers are lime-green with a red lip, pleasantly fragrant and borne 8 to 10 on an erect spike. This is a favorite clone among Cymbidium growers on the U.S. Mainland and can usually be obtained from mainland Cymbidium nurseries.

ORCHID PEST CONTROL GUIDE

Insects

Aphids.

Cattleya types, *Cymbidium*, *Dendrobium*, *Vanda*, and others are affected. Three aphids are found on orchids in Hawaii. The fringed orchid aphid is black with a white fringe around it and looks more like a scale than an aphid. It is often protected at the base of the plants by earthen tents made by the big-headed ant. The orchid aphid is pale green and may be found on the flower, foliage, and terminal shoots. The bean aphid is dark

brown to black and is often found on young flower spikes.

Control.

Effective chemical controls include Cygon, Diazinon, Malathion, Orthene and Sevin.

Mealybugs.

Nearly all orchid genera are affected. These soft-bodied insects covered with white powdery wax and white filamentous hairs are common greenhouse pests which occasionally infest orchids. Although there are live bearing species, most mealybugs lay eggs in cottony sacs which adhere to any plant surface.

Control.

Effective chemical controls include Cygon, Diazinon, Malathion, Orthene and Sevin.

Orchidfly.

Cattleya types including *Brassovola*, *Epidendron* and *Laelia* are affected as are some other genera. The orchidfly is a small, black wasp about 3/16-inch long. The female lays her eggs directly in orchid tissue. The eggs hatch and the young larvae bore inside the pseudobulb, causing an enlarged, swollen appearance. When larvae feeding is completed, the insects pupate within the pseudobulb and emerge through a small exit hole as adult wasps.

Control.

Effective chemical controls include Malathion and Methoxychlor.

Orchid weevils.

Arachnis, *Cattleya* types, *Cymbidium*, *Dendrobium*, *Grammatophyllum*, *Phalaenopsis*, *Renanthera*, *Spathoglottis*, *Vanda*

and others are affected. The orchid weevil and the lesser orchid weevil are found in Hawaii. Both are small, black, snout beetles ranging from 1/8-inch to 1/4-inch long. The adults drill holes in the orchid tissue with their snouts and lay eggs in the holes. The hatched weevils bore into the tissue. The plant parts are damaged internally, and the tissues are blackened.

Control.

Effective chemical controls include Cygon, Malathion, and Methoxychlor.

Scale.

All orchid genera are affected. Four scale insects are commonly found on orchids in Hawaii. These sucking insects do not move around after the first active stage. The red orchid scale is circular and reddish brown. The Boisduval scale is circular, thin, flat, and white. The hemispherical scale is brown and rounded like a tortoise. The variable shaft scale is very thin and delicate with a smaller and larger section in the front, and white transparent at the back.

Control.

Effective chemical controls include Cygon, Diazinon, and Malathion.

Thrips.

Cattleya types, *Cymbidium*, *Phalaenopsis*, *Vanda* and others are affected. The commonest thrips on orchids are the Hawaiian thrips and the vanda thrips. These are small, narrow active insects. The Hawaiian thrips cause silvery feeding symptoms on the leaves and the damage looks like a flower-breaking virus on the flowers.

Control.

Effective chemical controls include Cygon, Diazinon, Malathion, and Orthene.

Mites

Spider mites and false spider mites.

Cattleya types, *Cymbidium*, *Odontoglossum*, *Oncidium*, *Phalaenopsis* and others are affected. Mites are hard to see with the naked eye. They have eight legs and thus are more closely related to spiders than insects. The spider mite is most frequently found on the undersides of *Cymbidium* leaves. It can be recognized by its bright red color. False spider mites are black and red, and include the Pacific spider mite which is often found on *Phalaenopsis*. Other false spider mites feed on *Oncidium*, *Odontoglossum*, *Dendrobium* and others. Mite damage silvers the undersides of the leaves. In unusual cases the uppersides may be affected.

Control.

Effective chemical controls include Acaraben, Kelthane, Vendex, and wettable sulfur.

Fungal Diseases

Anthracnose caused by *Gloeosporium affine*, *Collectotricum cinctum* and *C. gloeosporioides*.

Many genera are affected. These organisms can attack any above ground portion of the plant. Plants most often attacked are those that have been weakened due to injury or disease. Initial symptoms are slightly sunken brown, green or yellow round to irregular spots. Spore-bearing fruiting structures of the fungus appear in advanced stages. As the

disease progresses, spots may coalesce to cover all or most of the blossom.

Control.

Avoid wetting leaves. Provide better growing conditions. Effective chemical controls include Benlate, Captan, Dithane, Ferbam, Manzate and Zineb.

Black rot and seedling damping-off caused by *Phytophthora palmivora* and *P. parasitica*.

Cattleya types, *Cymbidium*, *Dendrobium*, *Vanda* types, *Vanilla* and others are affected. Foliar symptoms start as small, water-soaked spots which can advance rapidly leaving affected tissues black. Infected roots and rhizomes will rot. If unchecked, rotting will advance into pseudobulb. The damping off of seedlings in community pots is caused by *Pythium ultimum*, small, water-soaked spots may start on any seedling in the pot and spread to all others.

Control.

Avoid overhead irrigation and provide good aeration. Steam or chemically treat growing media and used pots. Effective chemical controls include Banrot, Captan, Dexon, Ferbam, Thiram, Truban and Zineb.

Leafspots caused by *Cercospora dendrobii*, *C. odontoglossi*, *Septoria selenophomoides*, *Phyllostictina pyriformis* and *Pseudomonas* sp.

Arundina, *Bulbophyllum*, *Cattleya* types, *Coelogyne*, *Cymbidium*, *Dendrobium*, *Odontoglossum* and others are affected. Infection begins as small round to irregular, brown, yellow or black sometimes sunken spots or lesions on either leaf surface. As the disease progresses

entire leaves or pseudobulbs may be infected. Seedlings and weakened plants often succumb to advanced leafspot infections.

Control.

Remove and destroy infected leaves. Avoid excessive or prolonged wetting of foliage. Effective chemical controls include Benlate, Captan, Ferbam, Thiram and Zineb.

Petal blight caused by *Botrytis cinerea*.

Cattleya types, *Cymbidium*, *Dendrobium*, *Oncidium*, *Phalaenopsis* and others are affected. A common disease during cool and damp weather where there is inadequate air circulation and especially where old and fading flowers persist. First appearance is small, circular brown spots on petals and/or sepals. As disease progresses, spots become darker brown, may enlarge slightly, and may show a light pink margin. Woolly, gray fungus spores develop on flowers if kept moist.

Control.

Remove old flowers. Remove plant debris from growing area and surrounding areas. Reduce humidity if possible. Effective chemical controls include Banrot, Benlate and Bravo.

Root rot caused by *Pellicularia filamentosa* and *Rhizoctonia soloni*.

Cattleya types, *Cymbidium*, *Oncidium*, *Paphiopedilums*, *Phalaenopsis*, *Vanda* types and others are affected. Primarily a root rotting disease but may advance into rhizomes. Affected parts are rotted and brown in color. Mature plants decline gradually; leaves become yellow, shriveled, thin, and twisted. New growth are stunted.

Control.

Remove all affected roots and rotted areas of plant. Repot in clean pot with fresh media and adequate drainage. Effective chemical controls include Banrot, Captan, Ferbam, Terrachlor, Thiram, and Zineb.

Rust caused by many species of *Ureda* and *Sphenospora* fungi.

Nearly all orchid genera may be affected by 1 or more of the many rust diseases. General symptoms include pustules of powdery, yellow or orange spores, usually on the undersides of leaves.

Control.

Remove and destroy infected leaves. Avoid wetting the foliage. Effective chemical controls include Captan, Dithane, Ferbam, Maneb and Zineb.

Bacterial Diseases

Bacterial brown rot caused by *Erwinia cypripedii*.

A disease of *Paphiopedilum* which, although only occasionally found, is very infectious and injurious. Symptoms are small, round to oval, water-soaked, yellow spots near the middle of the leaf which enlarge in all directions and turn a dark chestnut brown.

Control.

Disinfect knives and clippers between cuts with a solution of 1 part Chlorox to 9 parts water. Effective chemical controls include combinations of tribasic copper and Maneb, and tri-basic copper and Dithane.

Bacterial brown spot caused by *Pseudomonas cattleyae*.

The most severe disease of *Phalaenopsis* in both seedling and adult plants, it also attacks *Cattleya* types, *Dendrobium*, and others. The first symptom on *Phalaenopsis* is a soft water-soaked lesion which becomes brown or black as rotting progresses. Diseased parts exude an infectious glutinous substance which can infect nearby plants. On *Cattleya* types the symptom is sunken black spots with well-defined margins.

Control.

Avoid overhead watering and provide good aeration. Observe strict sanitation. Keep benches clean and dry, and painted with copper naphthenate.

Bacterial soft rot caused by *Erwinia caratovora*.

Cattleya types, *Cycnoches*, *Cymbidium*, *Oncidium*, *Phalaenopsis* and others are affected. The pathogen is a secondary invader and enters the plant through wounds. It spreads rapidly in leaves and roots but slower in rhizomes and pseudobulbs. A soft, foul-smelling, watery rot is the characteristic symptom.

Control.

Disinfect knives and clippers between cuts with a solution of 1 part clorox to 9 parts water. Effective chemical controls include combinations of tri-basic copper and Maneb, and tri-basic copper and Dithane.

Virus Diseases

Blossom necrotic streak (may be due to combination of viruses).

Many orchid genera are affected. Brown spots or streaks become visible on blossoms about 1 week after opening. Long, yellowish, irregular streaks may develop on leaves.

Cattleya flower-break.

Cattleya types are affected. Flowers less variegated than when infected with severe cattleya color-break and there is no distortion. Leaves show only mild mosaic symptoms, difficult to detect.

Cymbidium mosaic.

This is the most common orchid virus disease in the world. *Aerides*, *Angraecum*, *Cattleya* types, *Cymbidium*, *Chysis*, *Dendrobium*, *Lycaste*, *Miltonia*, *Oncidium*, *Opsisanda*, *Phaius*, *Phalaenopsis*, *Rodri-quezia*, *Spathoglottis*, *Vanda* and others are affected. Symptoms vary considerably depending on host and stage of disease. Initial symptoms are often small, inconspicuous, elongate, chlorotic areas. As the disease progresses the chlorotic areas enlarge, often forming a pale chlorotic path down the leaf blade. In advanced stages black spots and streaks may appear on the underside of leaves. Such leaves usually drop prematurely.

Leaf necrosis.

Many genera are affected. Irregular, elongated streaks of dead tissue on the undersurfaces of the older leaves. Some leaves may be killed or develop patterns of sunken, black tissue. Infected plants may show no symptoms. No flower variegation or distortion.

Odontoglossum ringspot.

The genus *Oncidium* is affected. Symptoms appear only on mature leaves as round to irregular, slightly sunken areas

of various sizes on both leaf surfaces. Spots on each surface develop independently of those on the opposite side. With age these spots develop a necrotic margin often forming rings or partial rings.

Severe cattleya color-break.

Cattleya types, *Cymbidium* and *Oncidium* are affected. Variegation of flower color. Also may cause distortion of sepals and petals. Leaves mottled with streaks of light- and dark-green tissue. Dark-green areas raised somewhat, producing ridges and humps.

Symmetrical flower-break.

Many genera are affected. Variegation of the pigment occurs along the margins of the sepals except in the middle area. Leaves may develop an inconspicuous mosaic mottle.

Tobacco mosaic, "Orchid" strain.

Cattleya types and *Phalaenopsis* are affected. Symptoms, when they appear, are usually light yellow chlorotic patches. Infected *Phalaenopsis* often do not show visible symptoms.

Vanda mosaic and flower-break.

Vanda and related genera are affected. Variegation of flower color, distortion of petals and sepals, inconspicuous mosaic mottle of leaf tips.

Vanda ringspot.

Vanda and related genera are affected. Slightly raised, yellow, concentric rings always on the upper leaf surface and often on both surfaces are the normal symptoms. With age these ringspots become purple-black.

Control.

All the virus diseases are propagated with the plant. Once infected, plant remains so for life. Destroy infected plants. Control insects. Disinfect tools between cuts by soaking 1 minute in Clorox diluted 1 cupful to 9 cupfuls of water, or heat-sterilize in a flame. There are no chemical controls.

Nematode Diseases

*Yellowbud blight caused by *Aphelenchoides ritzema-bosi*.*

This is a nematode disease common to Vanda 'Miss Joaquim'. Infected unopened buds become yellow then turn brown, become shriveled and fall off. Entire inflorescences may become infected and cease to produce flower buds.

Control.

Remove and destroy by burning all diseased material. Immerse infested cuttings in water at 115°F for 10 minutes. Parathion provides an effective chemical control; however, the material is not registered for this use in Hawaii.

Snail and Slug Pests

All orchids are affected by snails and slugs. The Giant African Snail, small garden snail, the black slug and the garden slug all attack orchids.

Control.

Apply a snail bait containing metaldehyde and/or calcium arsenate or hand pick.

Chemical Pesticides

The following chemical pesticides are cited in this circular as being effective against certain pest problems of orchids. The accompanying dilution ratios are known to be effective against those particular pest problems cited. Recommended dilution ratios, methods of application, application frequencies, and use clearances may change periodically as new information about pest control is generated. Carefully read and observe the directions, cautionary statements and other information appearing on the label of the pesticide container. If dilution ratios on the label differ from those presented in this circular, follow the labeled and only the labeled directions. Before using any pesticide first determine that it is cleared for use on orchids and for control of the particular pest problem you have. It is a violation of Federal law to use pesticides in a manner inconsistent with their labeling. Chemical pesticides by their very nature are toxic materials and every precaution should be taken for their safe handling. Storage, access and use of these and all agricultural pesticides should be strictly controlled to prevent or minimize possibilities of accidents.

Insecticides

Cygon (dimethoate) 23.4% EC, 2 tsp in 1 gallon of water
Diazinon 50% EC, 2 tsp in 1 gallon of water
Malathion 57% EC, 2 tsp in 1 gallon of water
Methoxychlor 50% WP, 2 tsp in 1 gallon of water
Orthene (acephate) 75% SP, 1 to 1½ tsp in 1 gallon of water
Parathion 4 E, ½ tsp in 1 gallon of water¹
Sevin (carbaryl) 50% WP, 2 tbl in 1 gallon of water

Miticides

Acaraben (chlorobenzilate) 25% WP, 1 tbl in 1 gallon of water
Kelthane (dicofol) 35% WP, 1 to 1½ tbl in 1 gallon of water or 18½% EC, 1 to 1½ tsp in 1 gallon of water
Morestan 25% WP, 1 tsp in 1 gallon of water
Plictran 50% WP, 1/8 tsp in 1 gallon of water
Vendex 50% WP, 1½ tsp in 1 gallon of water or 18% EC, 2 tsp in 1 gallon of water
Wettable sulfur 95%, 3 tsp in 1 gallon of water

Fungicides

Banrot 40% WP, 1 to 1½ tsp in 1 gallon of water
Benlate (benomyl) 50% WP, 1 tbl in 1 gallon of water
Bravo (chlorothalonil) 75% WP, 1 tbl in 1 gallon of water
Captan 50% WP, 2 tbl in 1 gallon of water
Dexon 70% WP, ½ tbl in 1 gallon of water
Dithane M-45 80% WP, 1½ to 2 tbl in 1 gallon of water
Dithane Z-78 (Zineb) 75% WP, 1 tbl in 1 gallon of water
Ferbam 76% WP, 1 tbl in 1 gallon of water
Maneb 70% WP, 2 tbl in 1 gallon of water
Manzate 80% WP, 1½ to 2 tbl in 1 gallon of water
Terrachlor 75% WP, 1½ tbl in 1 gallon of water
Thiram 75% WP, 1 to 2 tbl in 1 gallon of water
Tri-basic copper, ¾ tbl and Dithane M-45 80% WP, ½ tbl in 1 gallon of water²
Tri-basic copper, ¾ tbl and Maneb 70% WP, ½ tbl in 1 gallon of water²
Truban 25% WP, 1 to 1½ tsp in 1 gallon of water

¹Although listed in this circular for control of yellow bud blight caused by a nematode, Parathion is principally an insecticide. Parathion is *not* registered or otherwise cleared for this use in Hawaii.

²Although tri-basic copper and Dithane M-45, and tri-basic copper and Maneb are listed in this circular for control of certain bacterial diseases they are fungicides. Their bacteria controlling properties are realized only if used in the stated combinations. Chemical pesticides should not be used in combination unless their labels state approval of such uses.

APPENDIX

DENDROBIUM CULTURE CHART

- Light:* Dendrobium orchids require sunlight. In the valleys: full sun; lower plains: full morning sun; hot regions: light shade.
- Water:* As often as they get dry, except for species and *D. phalaenopsis* types. Keep dry when dormant—late winter to spring. Protect from rain at this time.
- Potting media:*
- For pots: Hapuu shredded, fir or redwood bark, cinder, rock, osmunda fiber; pot firmly.
 - For beds: Cinder or gravel; in hot areas mulch the top surface.
 - On logs: Hapuu logs; drill a hole and place plants in it firmly.
 - On trees: Attach firmly to the tree, in a location with good light. Keep some media on the roots until well established. Use wire and staples to attach. *They must be firmly attached* to establish themselves.
- Fertilizer:* At least twice a month; use liquid orchid fertilizer according to manufacturer's directions.
- Repotting:* Repot as often as the medium decomposes or plant overgrows the pot.

VANDA CULTURE CHART

- Light:* Full morning sun; partial shade after noon.
- Water:* Soak thoroughly every day, except on cloudy or rainy days.
- Potting media:*
- For pots: Shredded hapuu, fir bark, gravel, volcanic cinder; pot firmly.
 - For beds: For hot regions, mixtures of gravel or volcanic cinder plus hapuu or fir bark. For wet regions, straight gravel or volcanic cinders.
 - On trees: Attach firmly with good ball of medium until well established; a crotch of a limb is ideal as it affords more support.
- Fertilizer:* At least once a week with liquid orchid fertilizer.
- Repotting:* Pot as often as plant outgrows its container, or when medium deteriorates.

CATTLEYA CULTURE CHART

- Light:* 25 to 50 percent shade.
- Water:* Saturate, then let them dry completely before repeating.
- Potting media:*
- For pots: Redwood or fir bark, osmunda fiber, hapuu or tree fern, gravel or volcanic cinder.
 - On trees: Attach firmly with good ball of medium until well established. Water more frequently than for pots.
- Fertilizer:* Liquid every 2 weeks; orchid organic once every 2 or 3 months.
- Repotting:* As often as it needs a larger container, or when medium deteriorates.

READ THE LABEL ON THE PESTICIDE CONTAINER
HEED THE LABEL ON THE PESTICIDE CONTAINER

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