



William T. Kemper Center for Home Gardening

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Orchids: Culture

The history of orchid growing dates back to the late 18th century when British horticulturist became fascinated with these plants. At that time, many ships were sent to explore the tropics. Among the discoveries were many orchids that were quite different from the native European forms. Soon, wealthy plant collectors commissioned explorers to gather orchids from tropical and subtropical areas. These plants were then boxed and sent back to Europe where a large demand was created and plants were sold for high prices. Only the hardiest plants survived the long trip back in crates. Once they arrived, growers put them into dark, hot greenhouses which they believed mimicked the tropical conditions where they were collected. Few plants survived these growing conditions which added to the fascination and mystery of these plants. Knowledge about growing orchids became closely guarded secrets and only the wealthy, who could afford greenhouses, were able to fully enjoy the diversity of this plant family.

Orchid blooms are among the most delicate and interesting flowers in the plant world. Early study of orchid flowers revealed their complexity in form and specialized mechanisms for attracting insect pollinators. Charles Darwin was one of the first scientists to observe the pollination of orchid flowers by insects. He suggested that many flowers resemble potential insect pollinators and postulated that they are attracted by this mimicry and smells given off by the flowers.

Nearly one in 8 plants of the known plant species in the world today is an orchid. We recognize over 30,000 species of orchids with new ones being discovered each year. The majority the species grow in tropical climates of Central and South America, Africa and Asia with 150 species native to North America. Orchid culture changed dramatically in the early 1900s, when orchid growing expanded through the discovery of how to germinate orchid seed. Up to this point, orchid growers relied upon collections from the wild to supply plants. Thousands of plants could be grown, hybridized and new types produced. Now, many home gardeners are enjoying the hobby of raising and growing orchids. Much of the renewed interest and success can be attributed to more home gardener greenhouses, use of artificial lights and increased accessibility of information about how to raise orchids.

The Flower Structure

Orchid flowers are very intricate and specialized. They have three petals and three sepals which may look like petals with equally bright colors or be modified and appear quite different. The two uppermost petals are commonly brightly colored and distinctive. The lower petal is called the labellum (lip) and is typically highly modified. The labellum may take on many different forms. Sometimes it is pouch-like or it may be fanned out, multicolored and quite large. At the center of the flower are the reproductive organs. Orchids are unusual in that both the female and male parts are fused together in a column called the rostellum. This arrangement promotes cross pollination with other flowers. The rostellum can be highly modified with wings and caps and overall, may be the most interesting part of the flower. Most orchids are pollinated by insects like bees, flies, moths, and butterflies. When pollinators come to visit the flower, they eventually

come into contact with specialized pollen sacs called pollinia. Instead of the powdery pollen we are familiar with, these pollinia are waxy sacks at the ends of a line string-like filament and contain compacted pollen. While visiting the flower, these pollen sacks become attached to the pollinator's body and are subsequently transported to other flowers to cross fertilize other plants.

Getting plants to flower can be a challenge. Many will flower only after receiving a 4 to 6 week period of night temperatures 10 to 15 F degrees below the daytime temperatures. This is why winter is the likely period of flowering for many orchid varieties. While orchid flowers look delicate, many are quite durable and long-lasting. Waxy types may last for several months before withering. Others will continue to produce flowering spikes for up to six or eight months. Once the female flowers are pollinated, they will fade and set seed. Only deliberate pollination by hand or by insects will do this indoors.

Growth Types

There are two broad types of orchids based upon where they are naturally found in nature. The terrestrial orchids live on the ground and can be found either in open areas or on the forest floor where little light filters through. The competition for light is intense in tropical areas; thus many orchids have become adapted to life in the trees. These are known as epiphytes and were once thought to be parasitic on their living supports. These orchids produce distinctly thickened roots that are composed of spongy tissue allowing them to quickly take up water and hold it for considerable periods of no rainfall. Some types will also develop pseudobulbs (swollen stems) which can store water and nutrients. Furthermore, there are types which fall in between the terrestrial and epiphytic habit. Knowing how to recognize terrestrial from epiphytic types is helpful for understanding the growth requirements and general culture.

Within the two broad types of orchids, another common distinction has to do with the pattern of growth; there are again two types. Monopodial orchids have a main stem which grows upward producing new leaves at the tip and flowers from the leaf axil at the main stem. Two common monopodial types include Phalaenopsis and Vanda orchids. The other is the sympodial type which produces a stem (rhizome) growing parallel to the ground. Upward growing shoots are developed from this stem and roots will grow out from the underside in contact with the soil. Flower spikes may come either from the horizontal stem or from the axils developing from upright shoots. Two common sympodial types include Cattleya and Paphiopedilum.

Conditions for Growing Orchids

Members of the orchid family are found in a large number of habitats even though we think of them as being mostly from the tropics. Orchids are not that difficult to grow if the conditions for development are defined and you select plants which will be successful under those conditions. Perhaps the best place to begin is with studying the atmospheric conditions for growth including temperature, light, humidity and air circulation. Next, cultural conditions like watering practices, fertilizer, repotting and propagation will be discussed.

Temperature

An understanding of indoor temperature conditions is important especially as it relates to flower initiation. Plants grown without fluctuations in day and night temperatures commonly produce only foliage but not flowers. Therefore, it is important to select an area where you can manipulate the daytime highs and nighttime lows. The best way to accurately determine the maximum and minimum temperature is by using an inexpensive day/night thermometer. This will allow you to monitor temperature fluctuations and characterize the growing space.

Temperature requirements can be classified in one of three categories: warm, intermediate or cool. Orchids grown under warm conditions prefer a daytime temperature of 75-85 F and a night temperature of 65-75 F. This shifts slightly for intermediate orchids; 65-75 F daytime and 55-65 F nighttime. Cool orchids are best grown at temperatures which are atypical for the indoor living space. Nighttime lows should consistently reach into the 50s. Basements with good window exposure or cool storage areas equipped with artificial lights are the most likely spots for these orchids.

Generally, most orchids are very comfortable in the intermediate range including the common *Cattleya*, *Oncidium* and mottle-leaf *Paphiopedilum*. However, if you keep your home warm, select an orchid which does better under warmer conditions like *Ludisia* or *Phalaenopsis*.

Light

The indoor light requirement for orchids is nothing extraordinary beyond that for other types of houseplants. Generally, the brightest position is the best place to start. More tolerance to bright light exists than to dim light. The light in the prospective exposure needs to meet the minimum requirement for the chosen orchid. Windows vary tremendously in the amount and duration of light received. Because of this, generally it is not enough to advise a south, west or east window. Perhaps the best way to tell is by direct measurement with a light meter. The conventional unit of measurement is the footcandle. Outdoors on a bright, sunny day the light intensity is about 10,000 footcandles. A window facing south may have around 5,000 footcandles at the sill. The light drops off very abruptly adjacent to the window and may only be about 500 footcandles.

Unfortunately, our eyes do not judge light intensity well and that is why a light meter is the best indicator of the amount of light in the exposure. If conditions are dim, in the range of 500 to 1,000 footcandles, choose an orchid like *Phalaenopsis* which does well under low light conditions. Light requirements for other orchids are listed in Table 1.

Plants that are placed in light too low for adequate growth will appear lanky, perhaps slightly yellow and generate flowers with faded blooms. Moving plants closer to the window or supplying artificial light may solve this problem. On the other hand, plants receiving too much light may become sunburned. Symptoms of too much light may appear as bleached areas on stems, slight yellowing or reddening. This is much more likely during summer when light intensity outside is very high and plants are placed next to the window where it can become quite hot. If this is the case, simply move the plant back from the window a foot or two or screen it from direct light by using a shade or screen.

Table 1

Nighttime Temperature and Light Requirements

<i>Cattleya</i>	55-65 F	2,000-3,000
<i>Cymbidium</i>	50-60	1,500-3,500
<i>Dendrobium</i>	50-70	1,500-4,000
<i>Epidendrum</i>	50-70	1,500-3,500
<i>Laelia</i>	55-65	2,000-3,500
<i>Ludisia</i>	60-70	1,000-2,000
<i>Odontoglossum</i>	50-55	1,000-2,000
<i>Oncidium</i>	55-65	2,000-4,000
<i>Paphiopedilum</i> (green-leaf)	50-60	1,000-2,000
<i>Paphiopedilum</i> (mottle-leaf)	55-65	1,000-2,000

<i>Phalaenopsis</i>	60-70	1,000-1,500
<i>Phragmipedium</i>	55-65	2,500-3,500
<i>Vanda</i>	55-70	2,500-4,000

Another way to ensure that sufficient light is provided is to set up a good lighting system. Properly done, there are some real advantages in using artificial lights including the fact that with even lighting conditions, plants become more uniform, produce rich colorful blooms and are guarded from injury due to intense heat. Similarly, artificial lights can be set up almost anywhere and are relatively inexpensive to use.

The good lighting system should consist of a 48-inch long four-bulb fixture equipped both cool and warm fluorescent bulbs or special grow lights. In both cases, the idea is to deliver the right quality of light to promote growth and flowering. This amounts to creating a balance between blue light emission by the cool bulbs and red light by the warm bulbs. Special grow lamps will emit both types of light but are generally more expensive.

There should be plenty of room below the fixture so that plant foliage can be placed within 4 to 6 inches from the bulbs. The intensity of these lights and their ability to supply enough light to initiate flowering requires close placement. The intensity is known to drop off abruptly near the ends of the bulbs and at distances greater than one foot below.

Day length also affects blooming and plants should be under the lights for less time in winter and more in summer. The lighting period can be adjusted by using an inexpensive timer. In addition, pay attention to the number of hours each bulb is on. They will burn bright for a while then lose intensity. It is best to rotate bulbs once or twice each year and replace half of them annually.

Humidity

One of the most confusing factors for indoor gardeners is understanding and adjusting the humidity of the growing space. Orchids, like many other houseplants, do well with humidities of 40 to 70%. No one ever complains about their plants doing poorly because of too much humidity. Instead, we battle low humidity of 20 to 30%, especially in the winter when the furnace is on.

Humidity is very difficult to effectively modify in the home without the aid of specialized appliances like portable room humidifiers or furnace humidifiers. Misting the plant does little more than provide a temporary rise in local humidity for a couple hours. However, you may consider raising the humidity by grouping of plants together and/or placing them on gravel-lined trays in which water has been added. Specialized rock is available for this purpose and works to absorb water, releasing it gradually over time to the air. If the home is very dry, then this may not solve the problem. At this point, consider enclosing plants loosely in plastic or building a plexiglass or glass container with the top left open. The latter may be very effective for small orchid plants.

Air Circulation

Ventilation and air movement is important to proper orchid culture. Generally, this is not of great concern if moderate air movement or periodic window/door opening occurs. It is perhaps more an issue in greenhouses which can become quite stale if not properly vented. Basically, air movement ensures good exchange of carbon dioxide required for growth and serves to evaporate free moisture which can otherwise promote disease development on stems and leaves. At the other extreme, plants should not be placed in the direct line of drafts and winds. This will surely cause more rapid drying of leaves and lead to a condition called scorch. This symptom appears with the browning of leaf tips, then margins and eventually shrinking

of stems. More frequent watering, movement away from direct light and other heat sources should help avoid this problem.

Watering Practices

Over-watering is probably the fastest way to kill an orchid. The majority of orchids require good air circulation around their roots. In natural habitats, epiphytic plants which cling to the tree trunks produce roots which are exposed to the air continuously. While rainfall would generally be thought to be quite prevalent in the tropics, dry periods do occur especially if plants are growing in the tops of trees and rely upon water running down the trunks. To prevent desiccation, roots have a specialized spongy tissue which functions to quickly absorb and retain water. As indoor plants, they should be kept on the dry side. Again, this pertains particularly to epiphytic orchids. Terrestrial orchids can be kept moister.

You should determine if plants need watering by lifting the container and learning what a dry potted plant feels like compared to one just watered. The common practice of using a finger to test the soil moisture is not very practical for many orchids. Epiphytic orchids with pseudobulb type stems and orchids with fleshy, thick leaves should be watered when the soils have nearly dried out. Other orchid types should be watered so that the soil stays evenly moist during all periods. Obviously, the water requirement for each plant differs with many factors. When it is time to water, the best place to do it is in the sink or other location where enough water can be added to allow it to drain completely through the container or support. This will flush any accumulated salts out and prevent a build-up which eventually can lead to salt injury. In addition, it is best to use tepid water which will dissolve salts, not spot leaves nor shock the plant roots.

Fertilization

Orchids are efficient users of fertilizer. For potted orchids, fertilize every third or fourth watering during the growth period from late spring through early fall. Thereafter, fertilizer applications should be reduced to once each month at watering, especially during the low-light winter period when growth is going to be slow. If you are using artificial lights, fertilize once or twice each month when you water. A fertilizer with a nitrogen/phosphorous/potassium ratio of 3:1:1 is ideal. Use a solution half the strength of that stated on the product label. It is better to fertilize more frequently with a dilute form than supply all the fertilizer at once. Fertilizer injury may show up as a burning of the leaves and roots. Symptoms appear similar to water deficiency with leaf tip burn and browning of margins. This makes it particularly confusing with other disease and cultural disorders.

Repotting

Orchids that have been doing well will simply outgrow their containers and need repotting. In addition, after several years the potting medium will decompose changing the water retention and aeration characteristics. The time to repot is after flowering and when some stubby root initials have begun to emerge from the stem.

Unlike repotting most other houseplants, repotting orchids may seem like a bruising experience. Once the plant is dislodged from its container, the objective is to remove as much of the old potting medium as possible by shaking and washing the root system under a stream of water. Darkened roots should be removed with a sterilized knife or pruning shears (heat over a flame or rinse with 1 part bleach to 9 parts water). The plant is then divided by cutting the stems or rhizomes. Monopodial and sympodial types of growth differ in respect to how the plant is divided.

For sympodial orchids which produce a horizontal rhizome, simply cut the rhizome in sections leaving three or more upright leafy stems attached to each section. Cut out shriveled, dark growth and repot by positioning in a container to one extreme side. This is because the horizontal stem will grow in one

direction and enough room must be present so that the container does not become filled with roots and stems too fast. Your container should be big enough to accommodate at least two years of growth.

For monopodial orchids which produce an upright stem, the time to repot is when the plant becomes too tall and tends to make the container unstable. Simply select a node where leaves and aerial roots have formed and make a cut just below this node. Place this section in a suitable container with fresh soil or potting mix.

Container size is important because most orchids will flower well if kept moderately pot-bound. For sympodial orchids, the container should be big enough to grow for two years before the rhizome contacts the other side of the pot. For monopodial types, choose a container which just accommodates the root system and does not require bending or wrapping the roots to fit the plant inside. The choice of which container, plastic or clay, depends upon the grower. Plastic pots retain moisture longer, are lightweight and inexpensive. Clay pots will tend to dry out the soil medium quicker and become discolored over time. One advantage of clay is the weight. For bulky orchids which produce a lot of top growth, clay is best to anchor the plant down.

Potting Medium

Repositioning the division in the new pot is followed by working in the potting medium. The composition of the medium will vary with the type of orchid and the grower's preference. However, most orchid growers use fir bark as the basic component, sold in one of several grades. Medium bark gives the right mixture of air and water for the majority of common epiphytic orchid plants. Terrestrial forms like *Paphiopedilum* and those which grow in moist media prefer finer bark mixes.

It may be just as easy to buy a specially prepared potting medium for orchids. Commercial orchid mixes typically combine fir bark and a number of other components like coarse peat moss, redwood fiber, charcoal, osmunda fiber or tree fern fiber. If you want to mix your own, try a 50/50 blend of fine fir bark (less than 1/4-inch size chunks) and charcoal for *Paphiopedilum* and terrestrial orchids with small roots. For epiphytic types and orchids with larger roots, use a 50/50 mix of medium to coarse fir bark (1/4-inch to 1/2-inch chunks) and charcoal. Buy quality fir bark and not landscape mulch.

Propagation

The process of division involves cutting a large plant into smaller ones and rooting the new plants. With sympodial orchids, keep the old pseudobulbs which have withered and pot them in peat moss. Soon they will sprout new growth and generate new plants. For monopodial forms, many produce offshoots called keikis which grow from the stems or below ground. To make new plants, wait until they produce roots and then cut them off and pot in fine bark.

Seed culture is quite different than propagation from vegetative stems. It requires specialized conditions and materials and is not generally recommended for the casual hobbyist. In addition, orchids can be propagated by taking small pieces of actively growing stem tips. When placed in specialized liquid media with nutrients and hormones, they will grow into tiny plants. Orchid propagators are now using this method for mass-scale generation of plants.

Orchid Selection

To begin growing orchids, the most important thing to understand is that these plants can be quite diverse in growth requirements depending upon the specific plant you choose. The best advice given by professionals is to start with relatively tough hybrids and not species orchids. Hybrids represent plants which have been selected from breeding efforts and are likely to be vigorous under indoor conditions. It

also means that you are not unknowingly supporting the collection of wild orchid populations. Overall, deal with a reputable nursery and don't be afraid to ask if their orchid plants are collected or nursery propagated.

Phalaenopsis

For the beginning orchid grower, the easiest and most frequently recommended is the moth orchid, *Phalaenopsis*. Members of this genus are native to tropical Asia. They produce fleshy, alternate leaves on an upright stem. The plants tend to be wider than tall. The flower spike with several blooms may be quite long and arching. The flower colors are white, white with red or pink, pale or vivid pink, yellow or salmon with other combinations of stripes and spots. These plants generally require about the same amount of light as African violets and will perform well in an east or slightly shaded south window. Daytime temperatures of up to 90 F can be tolerated. Nighttime temperatures should be between 60 and 70 F. Holding plants for several weeks at nighttime temperatures between 55 and 60 F will initiate flowering. Flowers should last for 2 to 3 months.

Paphiopedilum

The lady slipper orchid, *Paphiopedilum*, is another good orchid for beginning growers. These sympodial orchids require about the same light as moth orchids and produce flower spikes much shorter making them easier to position under artificial lights and in areas with height restrictions. These plants are terrestrial orchids and require constantly moist soils. They should be potted in a fine fir bark mix and watered several times each week during dry periods in summer and winter. There are two types recognized: the plain-leaved and the mottled-leaved orchids. They will require a night temperature of about 60 F to initiate flowering. The most distinctive feature of the flower is the pouch-shaped lip that looks like a slipper, thus giving the plant its common name.

Cattleya

Called the corsage orchid, *Cattleyas* are of the most recognizable and popular epiphytic orchids to grow. They produce large blooms from large plants and are often considered too big for indoor gardening spaces. Perhaps a better choice within this group is the miniature *Cattleya*. The mini-cats are hybrids products of *Laelia* and *Sophranitis* orchids. These plants can be easily grown under artificial lights. Mini-cats require more light than either moth or lady slipper orchids so should be placed in southern exposures for winter and outside in a bright but partially shaded spot for summer. *Cattleyas* should be allowed to go dry between waterings. Fertilize the mini-cats twice each month at watering with a half-strength fertilizer mix during the growth period through bloom. Reduce watering and fertilizer during the dormant period after flowering. Repot when the plants outgrow their containers and become top-heavy. Use a medium fir bark with charcoal for both large and mini-cats. Seek temperatures of 50 to 60 F to set flower buds.

Pest and Other Problems

Orchids are amazingly free of many pest and disease problems. Due to their thick leaves and stems, they are not prime targets of most sucking insects. The most common insect problems that may arise are scale and mealybug infestations. The latter can be handled by rubbing them off the foliage, paying particular attention to colonization within the leaf axils. Scale presents a more formidable problem, but can be managed if caught early and wiped with a small amount of alcohol on a cotton swab or by using an insecticidal soap product.

Overwatering and excess water retained in the potting media, which reduces air circulation around the roots, may lead to top dieback and root rot. Pay attention to the water status of each plant and the condition of the potting media. If the plant becomes off-color, yellowed and looks weak in spite of fertilizer

applications and correct watering, shake the plant out of the pot and check the roots. They should be beige or white. Black roots are a sign of root rot fungi or bacteria. At this point, plants should be divided, the rotted materials discarded and repotted in new bark media.

For more information about growing orchids, contact the American Orchid Society,
6000 S. Olive Ave., West Palm Beach, FL 33405