

Orchids

Orchids (Orchidaceae family) are the largest and most diverse of the flowering plants (Angiospermae) families, with over 800 described genera and 25,000 species. Some sources give 30,000 species, but the exact number is unknown since classification differs greatly in the academic world. Revisions of different genera occur on a monthly basis and this will increase with the growing use of genetic research and biochemistry. There are another 100,000+ hybrids and cultivars produced by horticulturists, created since the introduction of tropical species in the 19th century. The Kew World Checklist of Orchids includes about 24,000 accepted species. About 800 new species are added each year. Orchids, through their interactions with pollinators and their symbiosis with orchid mycorrhizal fungi, are considered by some, along with the grasses, to be examples of the most advanced (derived) floral evolution known.

All orchid species are protected for the purposes of international commerce under CITES as potentially threatened or endangered in their natural habitat, with most species listed under Appendix II. A number of species and genera are afforded protection under Appendix I, including all of *Paphiopedilum* and all of *Phragmipedium*. Many other species are protected by both international and national legislation, while hybrids are specifically exempted.

MORPHOLOGY

Growth Habit

Orchids are grouped according to two basic growth habits, namely: monopodials and sympodials.

Monopodials are orchids with one main stem with grow taller every year. The stem lengthens, adding new leaves to the top and aerial roots occasionally form along main stem. Flowers are always borne laterally (between leaves) and successively from older nodes towards young nodes. Monopodials include *Phalaenopsis*, *Arachnis*, *Vanilla*, *Aerides*, *Vandopsis*, *Vanda*, *Phyncostylis*, *Ascocentrum* and *Trichoglottis*.

Sympodials are orchids with creeping ground stem or rhizome which sends out shoot which eventually develops into stem and leaves. This new growth produces its own roots and leaves at maturity. Flowers are formed at the terminals or at the sides of the stem. After flowering, another shoot is formed at the base of the proceeding growth to repeat the cycle. The stem is sometimes thickened and fleshy, forming pseudobulbs. *Cattleya*, *Dendrobium*, *Oncidium*, *Coelogyne*, *Bulbophyllum*, are examples of orchid general with sympodial growth habit.

Flower

Despite the complexity of the variety of orchid flowers, the structure is like any monocot flower. There are three similar sepals and petals but one of the petals is highly modified into an attractive structure known as labellum or lip. The lip attracts pollinators and serves as landing platform for pollinating insects. In the center of the flower is an organ called gynostagium, gynandium, or column. On the inner side of the column is the stigma, a shallow depression which produces a sticky solution where pollinia are deposited.

Orchid Plants

Unlike seeds of other flowering plants, orchid seeds are so minute consisting of an embryo with little or no stored food. Orchid seeds are produced literally by the thousands or even millions (*Cattleya labiata*) but only a few develop into mature plants.

Life of orchid seed is very critical during early stages of germination. Unless a symbiotic relationship with a beneficial fungus is established, orchid seed will die. The fungal aid or mycorrhiza is a mass of fungus hyphae, usually of species *Rhizoctonia*. During germination, mycorrhiza infects the basal end of the seed and releases an enzyme which converts starch, an energy of germination and enhances further its development. Orchids are limited to the environment with suitable fungus, where sugar and amino-nitrogen compounds are readily available for seed germination.

GENERA/SPECIES/HYBRIDS

The family Orchidaceae consists of about 20,000 to 35,000 species distributed into 800 genera. This constitutes roughly 10% of all flowering plants in the plant kingdom. There are many hybrids and cultivated forms which continue to increase at an average rate of more than 1,000 per year.

Many endemic species are found in the Philippines, which have gained worldwide recognition by orchidists. There are about 130 genera and 941 species, of which 25 genera and 140 species based on consecutive estimates are of commercial value.

Dendrobium

The genus *Dendrobium* contains a very large number of heterogeneous species. It has erect, cane-type pseudobulb and bears flowers with relatively long vase-like.

This group is naturally distributed in warm and humid areas, thus resulting hybrids require warm and humid environment with abundant sunlight for optimum growth and development.

In the Philippines, the Dendrobium group includes among others Den. Taurinum Lindl., Den. Stratioles Reichb. f., Den. Superbeins Reichb.f., Den. Phalaenopsis Fitsp., Den Biggibum Lindl.

Hybrids

In the Philippines, the following Dendrobium hybrids appear promising for cutflower production: Purple: Den. Tomie, Jacquelyn Concert, Den. Norman Jackson, Den. Vera Patterson x Den. Betty Hecht; Off-White- Den. Jacquelyn Thomas; Yellow: Den. May Neal Crosses, Mary Mac, Bethy Ho; White: Den Water Oumme, Den. Neo Hawaii, Den. Jack Hawaii, Den. Multico White, Den. Jacqueline Thomas x Den. Alice Spalding, Den. Singapore White.

Vanda

This group is generally sun-loving and robust with colorful, beautifully-shaped flowers, heavy substance and long-lasting.

Vandas are divided into three: 1) strap-leaf; 2) terete; 3) semi-terete.

Strap-leaf Vandas - These are epiphytes with flat, channeled leaves. These include V. Sanderana, V. Luzonica, V. Lamellata, V. Coerules, V. Limbata. Some strap-leaf hybrids for cutflower have performed and flowered well locally. These are: V. Rotchildiana, V. Veraruth, V. Lenavat, V. Laurel Yap and V. Onomea.

Terete Vanda - Mostly terrestrial plants with cylindrical, pencil-like leaves. Most commercially important hybrid is V. Miss Joaquin.

Semi-terete Vanda - highly floriferous, making them desirable for cutflower. These are derived from crossing terete hybrid with strap leaf species/hybrid.

The following hybrids are found to flower well under local conditions: V. Josephine van Brero, V. Tanancy Yan, V.T.M.A., V. Patricia Low, V. Emma van Davente and V. Velthius crosses.

CATTLEYA AND ITS ALLIES

Modern Cattleyas consists of a complex group of hybrids created by combining cattleya species or hybridization with closely allied genera such as Laelia, Brassavola, Broughtonia. Known as "Cattleya Alliance", these are natives in Brazil, Columbia,

Central America and Mexico. Genus *Cattleya* is a very interesting diversified group of orchids with broad spectrum of colors and types.

Some of the more famous hybrids are:

Purple *Cattleyas*, like Lc. *Bonanza*, Blc. *Norman's Bay*, Bc. *Culminant*;
White *Cattleyas*, like C. *Bow Bells*, C. *Bob Betts*, C. *General Patton*, and C. *General Japhet*;
Semi-Alba *Cattleyas* - also called white with colored lip. Hybrids derived from C. *Mossiae* and C. *Warszewiczis* which are white with purple lips;
Yellow *Cattleyas* - Blc. *Malworth*, Blc. *Jane Helton*, Blc. *Malvern* and Lc. *Lorraine Shirai*; and
Red *Cattleyas* - Slc. *Falcon "Alwanderi"*, Slc. *Jewel Box*, Lc. *Desert Orange* and Lc. *Rojo*.

PHALAENOPSIS

The graceful bearing of the *Phalaenopsis*, whether native species or advanced hybrids is quite pleasing to the eye. The long, slender flower stalk bears the flower high and the arcs away from the leaves appearing fragile yet regal.

Some promising species are *P. Amabilis*, *P. Stuartiana*, *P. Schilleriana*, *P. Equestris*, *P. Leuddemania* and *P. Sanderara*.

The following hybrids are promising for cutflower production:

Large White - Phal *Anne Cavaco*, *P. Grace Palm*, *P. Dos Pueblos* and *P. Quisumbing*;
White with Red Lip - Phal. *Eva Lou*, *P. Queen Emma* and *P. Ruby lips*; and
White Stripes - Phal. *Percy Porter*

GROWTH REQUIREMENTS

Basically, the growth requirements of any plants are temperature, water, light, aeration and nutrition. These are the environmental factors which a good grower should try to stimulate for each type of orchids.

Temperature - cool-growing orchids prefer night temperature of 10°C to 18.3°C (50°F-65°F) and 15.6°C to 21°C (60°F-70°F) day temperature, like *Cymbidiums*, *Odontoglossums* and some *Phaphiopedilums*.

For the intermediate group like *Cattleyas*, some *Dendrobiums* and *Oncidiums*, night temperature needed is 12.8°C to 15°C (55°F-60°F) and day temperature ranges from 18.3°C to 21°C (65°F-75°F).

Most orchids grown in the Philippines are warm-growing where night temperature is below 18.3°C and day temperature rising to 21°C to 32°C. These temperatures are ideal for growing *Renanthera*, *Vandas*, *Phalaenopsis*, *Aerides*, *Trichoglottis* and *Dendrobiums*.

Light - sun-loving orchids are *Arachnis*, *Renanthera*, *Arandas*, and *terete* and semi-*terete Vandas*.

Partial shade orchids need lower light intensity for healthy growth. Example: *Dendrobium*, *Phalaenopsis*, *Cattleyas*, and strap leaf *Vandas*.

Orchid plants which receive enough light have short plump stems with yellowish-green leather leaves. Those receiving too much sunlight are yellowish, stunted and even scorched. Those under too much shade become green, soft and succulent with thin spindly stems.

Water - generally, orchids prefer an atmosphere where relative humidity ranges from 50% to 85%. A constantly saturated atmosphere (100% relative humidity) is just as harmful as constantly dry environment. High humidity and relatively low night temperature are conducive to the development of many diseases and pathogens especially soft rot. Growers often water the plants early in the morning so that before nightfall, the leaves are already dry. During sunny days, it may be necessary to increase humidity of the atmosphere by misting or wetting orchid house floor to enhance vaporization.

The need and frequency of watering depend on interacting factors, such as size of containers, potting media, temperature, light intensity and air movement. Orchids in large containers dry out more slowly than those in smaller pots. Plants in baskets, twigs and slabs require more water than those in pots. During drier months, more frequent watering is required. Plants suffering from lack of water become flaccid and stems and pseudobulbs become shrivelled.

Aeration - orchids must have free circulating air around them. Orchids are found where there is constant breeze. Stagnant air does not allow drying of potting medium and foliage.

Nutrition - apply fertilizer either through liquid or dry method. By liquid feeding, dissolve water soluble salts and apply resulting dilute solution to plant.

The amount and kind of fertilizer required by orchids depend upon growing conditions, potting media, species and stage of development.

Young seedlings are usually given dilute solution of nitrogenous fertilizers or complete fertilizers with higher nitrogen content plus phosphorous and potassium (4-1-1 or 2-1-1). Pig manures, chicken or fish emulsion may be prepared and applied once a week or once a month. As plant gets older, increase phosphorous and potassium level correspondingly.

Generally, under conditions of more frequent rainfall, practice more frequent fertilization as leaching is higher. When plants are dormant or inactive, do not fertilize plants. Plants exposed to higher light intensities also require higher fertilizer or nutrients than those grown under heavier shade.

Potting and Repotting - potting of orchids varies according to genera or species.

For Cattleyas, some growers use clay pots with charcoal as potting medium. Remember not to over pot them as medium remains wet for a long time in big pots. Place the bulb close to rim of pot with the lead towards center.

An old Cattleya needs repotting when the plant has overgrown its pot and when potting materials has deteriorated.

For Vandas and Ascocendas, small seedlings are potted with little osmunda fiber and a little charcoal. For older plants, coarse tree fern or charcoal maybe used for potting. Another method is by mounting them in twigs on driftwoods or by hanging them in wooden baskets.

For Dendrobium, pot them in clay pots or mount them on driftwoods. For large-scale production, clay pots with charcoal are ideal.

For Phalaenopsis, mount them in acacia or kakawati wood cuttings, or fern slabs. Or mount them in pots with charcoal and little osmunda fiber.

In potting, the general rule to remember is to allow quick and complete drainage of the potting medium.

Some types of orchids are planted directly in well-drained bed or in soil pots.

PROPAGATION

There are two groups of propagating orchids; asexual (vegetative propagation) and sexual (seed and embryo culture).

Asexual or Vegetative Propagation

Vegetative propagation can be done in any of the following methods:

Division - Cattleya, Dendrobium, Paphiopedilum and Cymbidium can be multiplied through division. Separate three to four canes or bulbs from mother plant to form new plants by cutting through rhizome and pot them individually.

Formulation of Keikis and offshoots - occasionally, a bud will give rise to a young plant at the top, side of pseudobulbs, canes or at the nodes of flowering stem. The Hawaiians call these young plantlets from vegetative or flowering stem 'keikis'. Filipinos call them 'anak'. Once the young new roots develop, remove plantlets and pot separately.

Top cutting - monopodial orchids, such as Vandas, Ascocendas, Arachnis, Renanthera, Trichoglottis, and even Phalaenopsis and Doritis, are best propagated by top cutting. When plant becomes leggy, cut off top part, retain few roots and pot it separately. New roots develop readily by top cutting.

Tissue Culture - Tissue culture is one of the most rapid methods of multiplying vegetative plant. It develops new plants in an artificial medium under aseptic conditions from very small parts of plants, such as shoots tip, root tip, pollen grain. Thousands or even millions of identical plants can be produced from a small tissue in a relatively short time.

Sexual Propagation or Seed Embryo Culture

Orchid sexual propagation is done through seed embryo culture. Orchid seed is so minute, devoid of stored food for seed germination. However, during germination, fungi infect orchid seeds and help convert complex starch to simple sugars, which serve as energy source. That fungi and orchids have symbiotic relationship during germination.

Under artificial or laboratory conditions, a sterile artificial medium with sugar and other nutrients is required. Through research, an excellent medium for growing seeds without fungi was developed. Inside the bottle where orchid seedling is grown is a miniature glasshouse which protect seedlings from unfavorable environmental conditions. Using artificial media has insured the growing of nearly all orchid seeds into mature plants.

Flasking and reflasking or protocorms - when orchid seed or embryo is planted in a culture bottle, numerous seedlings germinate in a very limited space with little available food. The first sign of successful germination is when orchid seed starts to swell and turns green. As growth continues, the embryo becomes bigger and assumes

a flattened top shape called protocorm. A small amount of seed sown produce hundreds of tiny photocorms growing in limited space. At this stage, transplant them into fresh medium and table for further development and rapid growth.

Composting and Repotting Seedlings - Orchid seedlings are ready to be transplanted from culture bottles when roots and leaves are fully developed. Dendrobiums may be potted after 4 to 6 months. Vandas, Phalaenopsis and Cattleyas in 6 to 8 months after reflasking before seedlings are ready for community pots. Seedlings should be potted only in sterile potting medium and pots to avoid damping-off.

Potting medium may consists of sterilized fine Osmunda fibers, charcoal, chopped tree fern (paslak).

After removing seedlings from bottles, wash out all agar from seedlings and wash them in fungicide suspension. Drain excess moisture and sort out seedlings according to size. Small seedlings are planted in community pots, while the bigger ones are potted individually in small pots.

FLOWERING

Like most plants, orchids must attain a certain degree of vegetative growth before they are capable of flowering. This is referred to as the stage of ripeness to flower.

For Phalaenopsis, the minimum number of leaves is 3 before they will flower, 8 in Vandas, and 14 in Aranda. Vegetative growth of seedlings can be accelerated to attain the stage of ripeness to flower. Optimum growing conditions such as high temperature, humidity, adequate and continuous light, frequent application of dilute fertilizer have shown hastening of flowering in Vanda and Phalaenopsis.

Factor affecting flower bud initiation

Photoperiodism - is the development of plants as conditioned by the length or duration of light. There are 3 orchid categories based on their response to photoperiod: 1) short-day; 2) day-neutral; and 3) long-day groups.

Temperature - for some orchids, low temperature is required to induce flowering. Temperature interacts with photoperiod as regards to flower induction. Some orchids required low temperature to induce flowering, as follows: Cymbidium, Cattleya Mossiae; Dendrobium, Phaphiopedium, Phalaenopsis, Schilleriana.

HARVESTING

Orchids flowers do not mature until 3 to 4 days after they open. It is important to know how old the blooms are before harvesting. Flowers cut before they mature will

not hold up nor last as long as the matured flowers. Spray-type orchid present no problem. Each floret opens 1 ½ to 2 days apart. If 3 or more flowers are open on the spike, the lower flower is mature and can be separated