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A practical guide for successful orchid cultivation

Commercially grown orchids are mostly epiphytes. Thus they require different growing conditions as compared to other normal flower plants. As a result of this, domesticating them as a potted plant is quite difficult. They require special management practices and special care. In this article we will discuss about the good agricultural practices for orchids that can make orchid cultivation as a potted plant easier and help the growers to overcome the difficulties faced during growing orchids.

ORCHIDS generally require good aeration for their roots, at the same time, scarcity of water will hamper the growth and vigour of the plant. So someone growing orchids should be careful about providing good aeration to the orchid rots and at the same time sufficient moisture. For that, orchid growing media need to be porous with good water holding capacity. ICAR-NRCO recommend brick piece/stone, leaf mould, coconut husk and semi rotten logs in the ratio of 1:1:1:1 for potting of orchids. They supply proper aeration, and will retain good quantity of moisture. Thus help proliferation of roots and support the plant to stand erect. With this combination repotting will be done once in every two years.

Potting comprises of two parts, viz. Unpotting the plant from the old container and grooming the plant; Re-potting the plant and staking it if necessary.

Unpotting the plant from the old container and repotting

1. Water the plant first as it makes it easier to remove the old potting material.
2. Retrieve the plant from the pot and remove all the old potting material.
3. Trim dead roots with sterilized shears or scissors.
4. Repot the plant.

Potting monopodial orchids

In contrast to horizontally growing sympodial orchids, monopodial orchids grow vertically. These types of orchids have a single main stem that produces a series of leaves; leaves grow alternately on either side of the stem, like Vanda.

1. Orchid roots will be placed in the pot. The plastic pot size should be just large enough to accommodate the roots. To use a clay pot, use a one size larger pot than the plastic pot, a little more to use clay orchid pot.
2. The plant will be centred and held in the pot, so that the junction of roots and lower leaves flush on the top of the pot.
3. For best results potting media will be well moist (but not dripping wet).
4. When done the base of the plant should be just a little higher so that leaves do not touch the potting media and the top of the roots are just a little bit exposed.
5. Yellow, shrivelled leaves and parts of leaves with spots need to be removed.
6. If necessary, the plants should be staked so that it does not wobble.
7. After two to three months, the stakes should be removed without disturbing the plant.

Cultivated orchids in pots

Potting sympodial orchids

These orchids have a rhizome (main stem) at the base (usually horizontal, at least when they are grown in pots), with a series of growths developing upward from it. On some sympodial orchids such as Cymbidiums, Jumeleas, Paphiopedilum, Phragmipedium, etc., the new growths will be very close to the base of the old growth(s), forming sort of a circle around the older growths. The potting procedure for these type of young plants is similar to monopodial orchids, but for many sympodial orchids, such as Cattleyas, Dendrobiums, Oncidiums, etc. the new growths develop along a rhizome and usually tend to grow in the opposite direction of the old growths. The procedure for potting these is the same as for monopodial orchids except that instead of centring the plant in the pot, one should place it close to one edge of the pot, leaving room on the opposite side of the pot for the new growths.

Care after repotting of orchids

Re-potting is similarly shocking to plants as major surgery is to humans. So for a few weeks after re-potting a plant it is required to nurture it a bit.

1. Their leaves should be sprayed (misted) lightly twice a day for two weeks for healthy plants, up to four weeks for weak and ailing plants. The plant should be sprayed early in the day and again not later than mid-day. Plants should not be watered after 12 noon in the winter.
2. Addition of 2 or 3 drops of superthrive and 2 or 3 drops of a rooting solution to misting water will be very beneficial. If the grower do not have rooting solution, he or she may add a pinch of phosphorus rich fertilizer to the misting water.
3. The newly re-potted plants need to be placed at less light than what they usually get; for 3-4 weeks. The lower light levels will reduce the stress caused by the repotting shock and will help the plants recover better and faster.
4. Plants should be watered lightly (just enough to get the potting material moist, for one week), grower should not add enough water to run through the drainage holes, After one week, the plants will be watered thoroughly once a week. Rooting solution should be used instead of fertilizer for the first 3 or 4 watering after repotting.
5. Plants should not be fertilized just after repotting.

Light requirement for growing orchids

The foliage of the orchids will provide the information regarding light, whether the available light is sufficient for the plant or not or if it is too high?

1. If the leaves of the orchids stay green, crisp and firm, then the light is most probably optimum.
2. If the foliage is dark green, then the light availability is too low.
3. If the foliage shows purplish coloration, then the light is probably too high. Sometimes if the light is too high, the leaves tips will dry up.

Most orchids will not tolerate direct sunlight, except maybe for an hour or two after sunrise and an hour or two before sunset. Orchids should be provided with some shade, at least for the brightest part of the day. Surrounding trees or tall buildings may provide enough shade. There is a substantial reduction in the light from summer to winter. More light and less shade should be provided at winter (from mid of October to mid of February) to compensate for this natural reduction of light. Although the plants will adapt to changing environments, they will adapt better with less stress, if the plants gradually ease into the new conditions (such as summering them in bright outdoors light). Orchids will adapt to the environment, to some degree. Orchids will tolerate higher levels of light (of their respective light range) if they are provided with more water (more frequent watering), more fertilizer and better air movement (if possible) to keep their leaves a little cooler. More frequent watering means, the orchids will be watered on every five days or so instead of every seven days. This does not mean growers should subject their plants to excessive light. If orchids get too much light but not enough water and fertilizer, they will be stressed. Stressed plants have less deficiencies against pests and diseases, they will be easily attacked by the insects and pests, finally the reproductive growth will be hampered.

Signs of stress

Plants will show several symptoms when they are stressed, like-shrivelling pseudobulbs and/or leaves, drying buds, prematurely wilting flowers, yellowing of leaves etc. This kind of stress can also be resulted from improper potting, decaying potting material and insufficient watering.

Temperature for orchids

Orchids are classified into three basic groups, on the basis of their temperature requirement. Their classifications and favourable temperature are given in the table below:

Orchid group	Day time temperature (°C)		Night time temperature (°C)	
	Winter	Summer	Winter	Summer
Warm growing orchids	20	30	15	25
Intermediate temperature growing orchids	18	27	13	21
Cool growing orchids	15	25	10	18

Orchid may adapt and acclimate to grow pretty well a few degrees outside of these ranges. Some of the examples of orchids of each group are provided below:

Examples of warm climate orchids

Phalaenopsis (with 60% shade cloth should be provided), Phragmipedium (50% shade cloth should be provided), Cttleya (40% shade cloth should be provided), Catasetum (50% shade cloth should be provided), Vanda and Ascocenda (20-30% shade cloth should be provided), Angraecum and Aerangis (20-30% shade cloth should be provided), Calanthe (40% shade cloth should be provided).

Examples of intermediate climate orchids

Oncidium (20-30% shade cloth is required), Warm tolerant *Cymbidium* (30-40% shade cloth is required), Miltonia and Miltoniopsis (30% shade cloth is required), Paphiopedilum (50% shade cloth is required), Lycaste and Anguloa (50% shade cloth is required), Bulbophyllum (50% shade cloth is required).

Examples of cool climate orchids

Cymbidium (30-40% shading should be provided), *Odontoglossum alliance* (60-70% shade cloth should be provided), *Disa uniflora* (50-70% shade cloth should be provided), *Pleione* (50-60% shade cloth should be provided), *Zygopetalum* (40% shade cloth should be provided), *Dendrobium* (30% shading should be provided), *Masdevallia* (70% shading should be provided), *Coelogyne* (50% shading should be provided).

Shed cloths of green colour are generally preferred.

Humidity for growing orchids

Most of the orchids require 60% to 80% humidity. These humidity levels are necessary for the plants for best flowering and increasing longevity of the flowers. Even, these levels may be slightly higher; they are in fact well within the comfort zone for human, which are 40% to 70% of relative humidity. In the summer time, the natural humidity is usually sufficient to meet the needs of orchids, except on bright, sunny, dry days. Air conditioning in the summer and artificial heat in the winter, especially from forced air heating and electrical baseboard heating, will dry the air well below the need of orchids. Plants placed in the path of air conditioning or in the path of forced air heating or next to a radiator or next to a heat source can get quickly desiccated and lose their buds and even their leaves in just few days. A hygrometer can help to evaluate humidity of the air of the orchid poly house.

Procedures to increase humidity around orchids

If the humidity levels are consistently too low, growers need to buy a humidifier to increase the humidity level. Another way of increasing humidity is by setting orchid pots on trays filled with pebbles or gravel and with water, but plants should not be in contact with the water. The trays must be wide enough so that the leaves of orchids are over the tray (from where the humidity will raise). A tray for a single plant will not be of much help as the little humidity rising from it will disperse very fast. It is better to have have a dozen or more plants grouped together, they will create a micro climate with higher levels of humidity. The humidifier is the better solution. But mist should not blow directly on your plants as this will eventually wet them and promote bacteria and fungus growth that may kill the infected plants.

Methods of watering your orchids

The quality of water is extremely important for good culture; rain water is acceptable for watering orchids. Well water or underground water is acceptable if its content of total dissolved Solids (TDS) is below 120 ppm. Hard water (water with mineral contents TDS above 120 PPM) will create hard deposits on the leaves of plants. This may clog the pores on the leaves of plants. If your water is hard it may be beneficial to periodically (once to twice a year) clean the leaves with distilled water. The best water is water processed through a reverse osmosis system which will remove most of the minerals from the water.

Some general rules for watering potted orchids

1. While watering, grower should be careful to look after the matter that, the potting material should never be soggy. Potted plants must be sufficiently watered to prevent them from becoming bone dry.
2. In general, watering once in a week is optimum, but small pots (5" or less) need more frequent watering than large pots (6" or more).
3. Different potting materials and different sized potting materials will dry at different rates. Clay pots will evaporate more water than plastic pots when other factors are constant, so clay pots will dry faster than plastic pots. Clay orchid pots, because of their openings, will dry out faster than regular clay pots. So orchid pots needs regular monitoring, by regular monitoring one can gain experience and can provide optimum water to orchids.
4. Finally, temperature, light, air conditioning and heating will influence the drying rates of potting material. Watering habits should be adjusted, as the season changes.
5. By a thumb rule method, one can insert his/her finger an inch or two in the potting media and feel the moisture condition of it, it should be moist not soggy, if not moist, need to add water to moisten it, and if it is soggy; it should be kept for drying.
6. During watering, some water may get in between leaves or new growth. If this water stays there overnight, it may promote the growth of bacteria and fungi that may harm or kill orchids or the new growth of the orchid. To reduce this risk, sound watering practices should be adopted, like
   - Orchid should be watered only on sunny days. If the weather is cool, cloudy or rainy, wait for a day or two before watering.
   - Watering should be done early in the day. This will allow water (that got in between leaves or new growth) to evaporate before nightfall. Watering should be stopped before 2 PM in the summer, before 12 noon in the winter and before 1 PM in the spring.
   - Orchids should be watered with room temperature water or lukewarm water. Because a difference of 10 degrees or more between the temperature of the water and the room temperature may cause injuries to the plants.
7. Watering should be done from the top, and it should continue till the water runs freely through the drainage holes, or the plant may be immersed in water up to 1/2" or so below the rim and it may be allowed to absorb water for 10 minutes or so.
8. Water splashed on the leaves or in between the leaves should be wiped out. Using a straw is a convenient way to flow air and blow out water from in between leaves.

Phalaenopsis orchid flower on cultivated plant

Common method of fertilizing orchids

In a 30-10-10 fertilizer formulation, 30% of the total content is nitrogen 10% phosphorous and 10% potassium. Nitrogen derived from urea is not readily available to orchid plants, so urea should not be used as an N source to orchids. Also organic fertilizers are not well suited for orchids. Application of silicon to orchids improves heat and drought tolerance. Orchid requires higher amount of Ca and Mg as compared to common plants. For young plants N application is high, for intermediate growth stages N, P, K applied at a balanced and equal rate, before flowering the rate of P and k need to be increased as compared to the N.

1. For young plants (1st year) 30:10:10 @ 0.05% should be applied; dissolving 0.5 g fertilizer having N:P:K composition as 30:10:10 in one litre water will prepare the solution. The prepared solution should be sprayed on the plant and potting materials at an interval of 15 days.
2. For intermediate growth stage (2nd year), 20:20:20 @ 0.05% should be applied; dissolving 0.5 g fertilizer having N:P:K composition as 20:20:20 in one litre water will prepare the solution. The prepared solution should be sprayed on the plant and potting materials at an interval of 15 days. Also, calcium nitrate @ 0.05%, magnesium sulphate @ 0.1% , Iron sulphate @ 50 ppm, boric acid @ 50 ppm, zinc sulphate @ 50 ppm should be applied, at 60 days interval. For this, 0.5 g calcium nitrate, 0.5 g magnesium sulphate, 1 g iron sulphate, 50 mg boric acid, and 50 mg zinc sulphate should be dissolved in one litre water and sprayed on the plant and potting materials at an interval of 60 days.
3. At late growth stages (3rd year on word), N, P, K will be applied as 15:25:25 @ 0.1%; for this 1g of fertilizer having N:P:K composition as 15:25:25 or 10:26:26 should be dissolved in one litre water and sprayed on the plant and potting materials at an interval of 15 days.

Pests of orchids

Prevention is the best way of defence so plants must be checked periodically for pest and diseases.

Insects and their management

Scale insects are very small organisms (1–2 mm), they secrete a waxy coating for defence and resemble scales. Hard scale looks like tiny turtles. Soft scales may be found in dried sheaths at the base of pseudobulbs of Cattleya or similar plants. Hard scale will usually be under the leaves of Phalaenopsis or Cattleya, sometimes hiding in the pot. Those insects should be removed as much as one can see, then an insecticide may be applied.

Mealybugs are white and look sort of cottony, may be 1/4" in size. They can be on or under the leaves, on flower stems, on buds, behind flowers, in the pot. Those insects should be removed as much as one can see, then an insecticide may be applied.

Aphids are most persistent, reproduce on a 3 day cycle, small sap-sucking insects, varies in colour and they can fly too. They are found on new growth, new leaves, on flower stems and flower buds. In warm sunny weather the plant should be taken outside and shaken by garden hose to remove them from plants. Then the plant may be treated with an insecticide.

Fungus gnats look like small black flies. They will remain hiding in the pot, and got attracted by potting material that stays damp, decaying plant material (dead roots, leaves). They may attack roots, especially those of Cymbidiums. They may be treated by immersing the pot in an insecticide solution.

Spider mites are very small and cannot be seen individually without a magnifying lens. They are found under the leaves, in tiny silvery pits, where they suck the plant juices. They can be managed by maintaining proper humidity, and treating them with an insecticide or miticide. The pot may be immersed in an insecticide / miticide solution.

Thrips are minute slender insects with fringed wings. They are having length of 1 mm or less. They are found in deformed or spotted flowers. They are difficult to eradicate because they tend to lodge in the flower buds and under sheaths where they are protected from insecticide sprays. Deformed or spotted flowers should be removed and destroyed.

For sucking insects stated above, insecticides like, acephate, dimethoate, imidacloprid etc insecticides could be used @ 1 g /l solution.

Slugs are known to emerge at night. They may be found anywhere. Sluggo available in liquid or granular form, may be used to control them. Or they may be removed physically and destroyed.

Treating insects with an insecticide

1. While using commercially available insecticides, one should always follow the directions on the label, and take all possible precautions to avoid poisoning him or herself and others around them.
2. One should never use more than the recommended doses of the pesticide.
3. Safe and effective insecticide may be prepared at home. Soap solution prepared by mixing one teaspoon of a mild liquid dishwashing detergent to a litre of lukewarm water.

4. Many insecticides kill only the adult insects, not necessarily the eggs or the larvae (immature insects). Insects may also develop resistance to insecticides. That means, some of the insects are not affected by the insecticide and they will reproduce again. Treating those insects with the same insecticide will not kill them. To avoid resistance, one can rotate insecticides, that is-first application with one insecticide, the second application with another and the third one either with the first insecticide or with a third one.
5. Rotating is not necessary with the insecticidal soap solution prepared in home, because this insecticidal soap works by suffocating the insects. Only thing is that, the soap solution need to apply frequently so that insects coming out of eggs are also controlled.
6. If the infestation is not excessive, insecticide solution will be sprayed thoroughly on the new growths, leaves (both sides), flower stem, back of buds and flowers. If the infestation is widespread the plant should be dipped in insecticide solution for 15 minutes.
7. For the treatment to be effective one should treat the plants (spraying or immersing) at least three times, at an interval of one week (at an interval of 3-4 days for aphids). More than one application should be made, because the insecticide will kill the adults and a few days later the eggs will hatch and the cycle will restart, unless treatment is repeated again to kill them too.

There are lots of insecticides available on market, some of them are- Chlorpyrifos-methyl, Imidacloprid, Acetamiprid, Dinotefuran, Thiamethoxam, Malathion, Pirimicarb, Carbosulfan, Lambda-cyhalothrin, Es-fenvalerate, Pymetrozine and Diafenthiuron.

Precaution

- Plants should be immersed in a solution only on sunny days; if the weather is cool, cloudy or rainy, the day must be avoided.
- It should be done early in the day. This will allow any water that got in between leaves or new growth to evaporate before nightfall.
- The solution should be prepared with room temperature water or lukewarm water.

Diseases of orchids

Viruses

- Occasionally the growers may come across a plant that has a virus. This may manifest itself by concentric or elongated black or brown or discoloured circles on the leaves or black streaks on flowers and leaves.
- These will be repeated on all leaves / flowers. New leaves / flowers will appear free of it at first, but as they age the virus will manifest itself.
- Unfortunately nothing can be done to manage viral diseases. The plant must be discarded. The plant or infected plant part should be removed and burned or destroyed.

Bacterial and fungal diseases

- These will appear if water stays in between leaves or if the potting material stays soggy, especially when the night temperatures are cooler (winter, spring).
- Grower can treat these with fungicides (Ridox, Phentom, Compass, etc.), but the best way is to avoid these problems by practicing proper cultural practices.
- Copper oxychloride (blitox) @ 3 g/l solution can be used against fungus as well as bacteria. Carbendazim @ 1 g/l solution can be used against fungus.

Cultural problems which are common to most of the orchids and their probable remedies

Leaves

1. *Leaves are dark green, look very healthy, but plant does not bloom:* Probably due to insufficient light, shade should be decreased and the light level must be increased.
2. *Leaves are not as lustrous, eventually they shrivel:* Plant is not absorbing enough water. The root system must be checked. If roots are abundant, healthy, firm and white, then the plant is being under watered. If the root system is not healthy, the plant should be re-potted as soon as possible.
3. Yellowing of leaves (chlorosis), it may be due to excessive light and/or deficiency of nitrogen and /or sulphur, shade must be provided, nutrient should be applied.
4. Clear or watery spots on leaves, usually result from fungal/bacterial infection. The plant should be re-potted, the plant may be treated with fungicide (Ridox, Phentom, Compass, etc.), and it should be kept relatively dry for a few weeks.
5. Discoloured area on top of curled leaves on leaf area exposed to light, it appears most probably due to sunburn or excessive light. Sufficient shade should be provided.

Leaves or new growth

1. Soft, rapid growth may appear due to excessive nitrogen, the application rate of N should be adjusted and reduced.
2. New growths are smaller and stunted, not as plump than previous ones, not growing upright, one should understand that the plant is under stress, either because of weakened root system or insufficient light or too extreme temperatures, deficiency in nitrogen, or a combination of these. Light, temperature levels and fertilizer dosage should be checked. If needed repotting should be done. Sufficient shade and humidity should be provided to the stressed orchids.
3. No or limited new growth may result from nitrogen and/or phosphorous deficiency, or damage / rotting of growth or setback if the plant was divided and left with only one growth. N and P fertilizer should be applied.

Buds, flowers and flower spikes

1. Buds become yellow and drop, reasons may be extreme temperature, extreme or insufficient light, too dry air, inadequate watering, micronutrients deficiency or weak root system. Temperature and light should be adjusted at optimum level, and proper fertilizer

Cymbidium orchid flower on cultivated plant

management practice as specified earlier must be followed. If root system got too weak due to decaying potting materials then the plant should be re-potted as soon as possible.

2. Flowers do not open up fully, this condition may appear due to genetics, or by too low temperature, or may be due to too low humidity or thrip damage. The humidity and temperature should be adjusted. If it is thrip damage, treat the plant with an insecticide as described earlier.
3. Flowers are too small; colours are not as strong as before, this type of flowers comes most probably due to insufficient light, and or too extreme temperatures. The light and temperature should be adjusted.
4. Flowers fade too fast, this situation may be caused by too high or too low temperature, exposure to direct sunlight, too low humidity, micronutrients deficiency, inadequate watering or poor condition of the root system. Adjusting temperature and light at optimum level, following proper fertilizer management practice as specified earlier may manage the situation. If root system got too weak due to decaying potting materials then the plant should be re-potted as soon as possible.
5. Too few flowers may appear due to weak plant, too low light, phosphorous deficiency. Adjusting the light and following proper fertilizer application procedure will solve the problem.
6. Brown streaks or mosaic patterns on flowers, may be due to presence of a virus.
7. Poor display of flowers reduce the attractiveness of orchid flowers, when buds start to form on the flower spikes, one should not change the orientation of the flower spike so as to get the best possible display of flowers.

Roots

1. Black or brown roots indicate damaged or rotten roots (root rot fungus). Damaged and rotten roots should be cut. Plant may be re-potted, and kept a little drier for few weeks. If rotten roots are many in number, fungicide may be applied.
2. Chewed or missing tips appear due to chewing by pests (millipedes, sowbugs, snails or slugs), an insecticide should be used to control those insects.
3. Dead root tips may be caused by salt built-up due to too hard water or excess fertilizer application or due to not leaching medium regularly. Regular leaching of the media, good quality water application, maintaining proper fertilizer doses can solve this problem.
4. Deformed root may appear due to chlorine deficiency. Stunted roots may appear because of micronutrients deficiency. Proper fertilizer management may solve these problems.

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