

A cultivation guide for *Cymbidium* growers

Orchid flowers are very popular and have very high demand in the national and international market. Orchids rank sixth among the topmost traded cut flowers, and *Cymbidium* ranks first among the internationally traded orchids. *Cymbidium* cultivation and trade is a multimillion dollar business to many countries. North eastern part of India is having huge potential to cultivate it with very low cost. Thus farmers of this region can draw massive economic benefits from national and international markets by cultivating this crop. This article deals with the procedure of growing *cymbidium* orchids successfully.

CYMBIDIUM may be epiphytic, lithophytic or semi-terrestrial to terrestrial plants. Sometimes it may also be leafless saprophytes. This orchid genus consists of ~60 species of tropical and subtropical Asia. It is among the most popular winter and spring blooming semi-terrestrial orchids. It has originated from tropical and subtropical Asia covering North Eastern India, China, Japan, Malayasia, Philippines, Borneo Islands and North Australia. It usually grows in cooler climates at high elevations. The important *Cymbidium* growing countries in the world are Australia, New Zealand, Japan, Netherlands, USA and England. These countries have upgraded this crop cultivation business to a multimillion dollar business. India has a huge potential for cultivating this crop, especially the North Eastern part of the country. The temperature and high level of humidity, and other climatic requirement in most places of North Eastern India especially in Arunachal Pradesh, Sikkim and Meghalaya are very much congenial for growing *Cymbidium*. Thus, without incurring very high initial cost involving high cost polyhouses, the farmers from this region can grow *Cymbidium* in low cost polyhouses and gain huge amount of earning. But as the crop is epiphytic to semi-terrestrial in nature, it needs some special growing condition and

care. This article discusses about the small details and the important cultivation practices on which the growers should focus for successful cultivation of *Cymbidium* orchids.

Botanical description

Cymbidiums are evergreen perennial herbs having sympodial growth habit. In most species, pseudobulbs are present, which are modified stems. Some species are also found to have thin stems. The plants are characterized by short and stout pseudobulbs ensheathed by encircling leaf bases. Leaves are long, ribbon shaped, leathery or soft and linear to linear-oblong. Nearly three to twelve leaves remain arranged in two levels around the pseudobulb. Mature bulbs with leaves generally produces flower. These bulbs, after the withering of leaves, gets converted to back bulb. The withered leaves form a sheath around the pseudobulb. Flower spikes generally arise from the base of the mature pseudobulbs; very rarely flower spikes come from leaf axil. Flower spikes are unbranched, erect, arching or pendulous and arranged with 2 to 15 flowers. The individual florets are 1 to 12.5 cm across and are of various shades of colour. *Cymbidiums* are famous for its beautiful spikes derived from species and



C. bicolor



C. devonianum

Table 1. Botanical and floral characteristics of *Cymbidium* species

Cymbidium species	Native to	Botanical description	Floral description
<i>Cymbidium aloifolium</i>	Sri Lanka, Peninsular India, Indo-China and East Indies	The leaves are fleshy, rigid, linear or linear ligulate, obtuse and 30-45 cm long	The floral spikes are 60-75 cm long, pendent and arranged with up to 30 flowers. The flowers are waxy, segmented with edged yellow and reddish brown middle part and produced in May-June
<i>Cymbidium devonianum</i>	Himalayas of Sikkim and Meghalaya	Pseudobulbs are short and hidden by persistent leaf bases. The leaves are long petioled, thick, coriaceous and oblanceolate	The inflorescence is stout, pendulous, many flowered and compact. The flowers are heavily textured, long lasting, 2.5 to 4.5 cm across and segmented with purple lips and produced in May-June
<i>Cymbidium eburneum</i>	India, Himalayas, Thailand and Indo-China	The pseudobulbs are round, clustered and furrowed. The leaves are dark and glossy green	The flowers are fragrant, long lasting, ivory white with pink dots and produced in late winter and springs
<i>Cymbidium elegans</i>	Meghalaya and Manipur	The leaves are narrow, many, 60 cm long. The plants are devoid of pseudobulbs	The flower spike is arching with 20 to 40 flowers. The flowers are straw yellow, long lasting, 5 cm across and produced during October-November
<i>Cymbidium finlaysonianum</i>	Thailand, Malaya Peninsula, Philippines, Sumatra, Java, Borneo, Laos and Cambodia	Plants are short, stout stemmed with thick and leathery leaves	The flower spike is 60 to 120 cm long, pendulous and loosely arranged many flowered. The flowers are heavily textured, yellowish green with olive tints, rosy wine purple lips and produced during summer and spring season
<i>Cymbidium ensifolium</i>	China, Japan, Indo China, Sumatra and Java	The plants are devoid of pseudobulbs, with long grass like leaves	The flower spikes are erect, 40 cm long and arranged with 4 to 8 greenish yellow flowers with brown and reddish markings. The flowers are fragrant, long lasting, 5 cm across and produced during May-June
<i>Cymbidium giganteum</i>	Nepal, Bhutan, Khasia Hills, Sikkim, Indo-China and Burma	The pseudobulbs are ovoid, clustered and compressed. The leaves are ~90 cm long and linear ligulate	The flower spike is stout and 8 to 20 flowered. The flowers are scented, long lasting, 10cm across and yellowish green in colour with yellow reddish tip. The flowers are produced during September and October
<i>Cymbidium lancifolium</i>	Sikkim, Meghalaya, Arunachal Pradesh and Nagaland	The stems are fleshy, fusiform. The leaves are oblanceolate, 20 cm long	The spikes are 6 to 8 flowered, 4 to 5 cm across. Segments are white ended greenish yellow with white reddish lip. The flowers are produced during June
<i>Cymbidium lowianum</i>	India and Burma	The pseudobulbs are ovoid, clustered and compressed. The leaves are linear ligulate	The inflorescence is pendent, 120 cm long and arranged with 10 to 25 apple green flowers having greenish yellow markings and purple yellow lip. The flowers are produced during November to February
<i>Cymbidium longifolium</i>	Sikkim, Meghalaya and Nagaland	The pseudobulbs are short with linear, acuminate leaves	The inflorescence is stout and many flowered. The flowers are pale green, brown and whitish, 6 cm across with white lip having purple spots and produced during November to February
<i>Cymbidium tracyanum</i>	Burma and Thailand	The pseudobulbs are clustered, ovoid and compressed with ensiform, acute and long leaves	The inflorescence is 90 cm long, arching with many flowers. The flowers are 10-12.5 cm across, greenish yellow streaked with brown red and the lip is yellow marked with purple. The flowers are produced during October-November
<i>Cymbidium munnronianum</i>	Arunachal Pradesh and Sikkim	Pseudobulbs are small, ovoid with erect and linear leaves	Inflorescence is stout, erect and 7-12 flowered. The flowers are 2.5 to 4 cm across, fragrant, straw purple brown in colour and produced during October-May
<i>Cymbidium hookerianum</i>	Sikkim, Meghalaya and Arunachal Pradesh	Pseudobulbs are ovoid with linear –elliptic leathery leaves	Inflorescence is robust, arching and 5-20 flowered. Flowers are highly fragrant, apple green with red spotted white yellow lip. Flowers are produced during February–March
<i>Cymbidium tigrinum</i>	Manipur and Nagaland	A dwarf species, pseudobulbs are ovoid-globose with 3 to 5 broad coriaceous lanceolate leaves	The inflorescence is semi-arching and 3-6 flowered. The flowers are 5-6 cm in diameter, strongly fragrant, yellow to olive green in colour and produced during April

hybrids. Among the orchids, *Cymbidium* ranks first and in floricultural crops as it accounts for 2.7% of the total cut flower production. The sepals and petals are more or less similar to each other and usually thick and fleshy. The highly modified third petal is called labellum. The labellum is significantly different from the other petals and sepals. It contains three lobes, the side two lobes erect, sometimes surrounding the column and the middle lobe often curving downwards.

A plant has three types of bulbs.

Old back bulbs: These bulbs act as a reserve of water and nutrient supply for emergencies. These are leafless bulbs. Back bulbs can make new plants but they may take years to flower.

Old bulbs with leaves (Mature bulb): These bulbs support the new growth and may produce flowers for a number of years depending on the variety.

New leads or bulbs: These are the youngest bulbs on the plant where flowers and most new growths come.

Classification of *Cymbidium* hybrids

Cymbidium hybrids are classified into three groups namely i) Standard, ii) Intermediate and iii) Miniature hybrids. Standard and Intermediate hybrids produce 90 to 120 cm long spikes with 8 to 15 flowers per spike. Miniature hybrids produce green, yellow or brown coloured flowers, 30 cm long spike that contains 30-40 flowers of 2.5 to 8.5 cm across. Novelty or Intermediate hybrids have been evolved by crosses between Miniature and Standard hybrids.



C. ensifolium

Cymbidium Species

Out of all the species mentioned above, *Cymbidium devonianum*, *Cymbidium ensifolium*, *Cymbidium lancifolium*, *Cymbidium lowianum*, *Cymbidium tracyanum*, *Cymbidium munnronianum* and *Cymbidium tigrinum* may be most suitable to grow in India as potted plants and beautiful flowers of these species has huge potential to create market demand. Out of them, *Cymbidium tracyanum*, *Cymbidium munnronianum* are scented also. Their sweet fragrance can give added advantage to sell them in markets. *Cymbidium ensifolium* can also be used as cut flowers.

Cymbidium varieties

The famous and important *Cymbidium* varieties, segregated as per their flower colour, are:

White varieties: Jungfrau 'Snow Queen', Jungfrau 'Dos Pueblos', Camalex, Showgirl 'Cooksbridge', Showgirl 'Marion Miller', Swallow var. 'Takarazuki', 'Powder Puff', 'Saina White'.

Pink varieties: Lilian Stewart 'Coronation', Lilian Stewart 'Party Dress', Orkney 'Pink Heather', Ensikhan, 'Alpha Orient', Pacific Rose 'Swansea', Soulhunt Series, Valley

Paradise 'Shangriila', Rievaulx 'Cooksbridge', Rincon Fairy 'Pink Perfection', 'Rocky Creek Pebbles', 'Everett Stockstill Bullai', 'Buthurey Pink'.

Yellow varieties: Angelica 'December Gold', Highland Sunset 'Plumpton', Mini Sarah 'Artisan', Hawtescens, Gwen Sherman, 'Arthur Fetzter', San Francisco 'Mona Lisa', Valya Craig 'Sutherland', Luana 'Imperial', 'Satin Doll', 'Valley Legend Steffy', 'M-27'.

Green varieties: Joyce Duncan 'Susan Hughes', 'R. D. Hughes', Miretta 'Mcbean', Lucense, Tricia Allen 'The Globe', Sparkle 'Late Green', Levis Duke 'Belle Vista', Sparkle 'Late Green', Amsebury 'Frank Slattery', 'Valley Zenith 'Top Spot', 'Madrid Forest King'.

Red varieties: Chief Joseph 'Pathfinder', Sensation 'Chianti' 4N, Terama 'Robin', Barushka 'Dos Pueblos', Khyber Pass 'Rowes Red', James Toya, 'Fire Storm Blaze', 'Bob Marlin Lucky', 'Red Beauty Evening Star', 'Fire Storm Ruby'.

Among hybrids; **White:** Powder Puff or Lol Cherry, **Yellow:** Valley Legend Staff or PCMV, **Pink:** Rocky Creek Pebbles or Buthurey Pink, **Red:** Fire Storm Blaze or Bob Marlin Lucky, **Green:** Winter Beach Sea Green or Levis Duke Bella Vista may be most suitable in India.

Growing requirements for *Cymbidium*

In India, its cultivation is limited to Sikkim and the surrounding region of West Bengal covering Kalimpong, Darjeeling and Mirik. Other North Eastern states like Nagaland and Arunachal Pradesh are also promoting this flower. Higher elevations of 1500-2000 m with cool summer night and monsoonal summer rain are ideal for *cymbidium* cultivation.

Planting: *Cymbidiums* should be planted at the end of February or beginning of March. This time will provide most favourable condition for early establishment of the plant roots, thus better growth and development. It is a healthy practice to culture *Cymbidiums* in pots of 10" diameter with 18" height. The planting density for *Cymbidium* will be 3-4 pots/m² with a spacing of 60 cm × 60 cm. Thus, there will be ~30,000-40000 plants/ha. *Cymbidium* should be kept at a height of 2 to 3 feet from the ground so as to mimic epiphytic condition for the plants and better air circulation for the roots. Growers can make bamboo, wood metal or cemented table of 2 to 3 feet height and keep the pots on them. These must be cultured under shelter by providing poly-cover to obtain quality blooms. Some shading (about ~50 %) is essential to avoid direct sunshine.

Cymbidium orchids are potted in soil less potting media like brick pieces, leaf mould, and cocochips etc. (detail is given in the potting media section). Thus, after 2-3 years, the plants need to be repotted with fresh potting media.



C. lowianum

Potting media, un-potting and repotting of the Cymbidium plants

Potting media

Orchid potting media the plant in place and keeps it straight; holds sufficient moisture for orchid and provide favourable environment for better root growth (aeration) and supply nutrients to some extent. The materials such as tree bark, sphagnum moss, tree fern, coconut chunks, coconut fibre, lava rock, charcoal, pieces of cork, peat moss, rock wool, brick pieces, leaf mould etc. can be used as potting media. As a general recommendation, brick pieces : coco chips : leaf mould at a ratio of 1:1:1 can serve the purpose. While preparing the potting mixture, they should be moistened slightly. A one inch layer of brick or stone pieces should be placed at the bottom of the pot. It will ensure optimum drainage of excess water while watering the plants.

Un-potting

After every two to three years, grower need to repot their cymbidium, when the potting media become blackish to grey in colour, and turns into granular form or very small pieces. During repotting, the plant should be un-potted carefully. For un-potting, one should water the potting media first because it makes it easier to remove the old potting material. Then retrieve the plant from the pot and remove all the old potting material, trim dead roots with sterilized shears or scissors and repot the plant.

Repotting

While repotting un-potted orchids, following points should be considered and followed

- Place the roots 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.
- Center the plant and hold it so that the junction of roots and lower leaves flush on the top of the plastic pot on the potting media. For sympodial orchids like Cymbidium, the new growths will be very close to the base of the old growth(s), forming sort of a circle around the older growths, that's why the plant should be placed at the centre of the pot.
- For best results, potting media should be well moist (but not dripping wet).
- 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.
- Yellow, shrivelled leaves and parts of leaves with spots should be trimmed.
- If necessary, stake the plants so that it does not wobble.
- After two or three months, pull out the stakes without disturbing the plant.

Repotting is as shocking to plants as major surgery to humans. So for a few weeks after repotting a plant, it is required to nurture it a bit.

- Their leaves should be sprayed (misted) lightly twice a



C. erythraceum

day for two weeks for healthy plants, up to four weeks for weak and ailing plants. Spraying should be done early in the day and again not later than mid-day. Watering should not be done after 12 noon in winter.

- Addition of 2 or 3 drops of superthrive and 2 or 3 drops of a rooting solution to misting water will be very beneficial. In absence of rooting solution, a pinch of phosphorus rich fertilizer may be added to the misting water.
- For 3-4 weeks, the newly repotted plants should be placed at less light than what they usually get. The lower light levels will reduce the stress caused by the repotting shock and will help the plants recover better and faster.
- Plants should be watered lightly (just enough to get the potting material moist, for one week). Enough water should not be applied to run through the drainage holes. After one week, watering thoroughly once a week is recommended.
- The plants should not be fertilized just after repotting at least for two weeks.

Light: A full morning sun or bright dappled afternoon shade during summer and full sun in winter is ideal. Mature plants need 50-55% shade during hot weather. During growing season, they require up to 5000-6000 f. c. light whereas in flowering season up to 2000-3000 f. c. light. Foliage receiving optimum light should be yellowish green in colour. Direct sunlight should be avoided, growers are suggested to provide ~50% shade net on their orchid houses.

Temperature: In general, cymbidiums can tolerate as low as 7°C temperature. In vegetative stage, plantlets grow best at temperature of 18°C at night and 24-30°C during the day time. A temperature of 10-15°C is required for initiation of flower spikes. During the winter season (Late October to late February), a temperature of 7-12°C at night and 18-24°C during the day is desired. Miniature hybrids can withstand 5°C higher temperature than standard cymbidiums. The crop can bear $\pm 5^\circ\text{C}$ temperature out of optimum range, but one should keep in mind that it will perform best at optimum temperature only.

Watering: In cymbidium, watering is required all the year round to keep the plants, especially the pseudobulbs, green and healthy. During summer, watering should be done 2-3 times per week; during

autumn, it should be done once or twice a week; in winter, once a week and during spring time, it should be done once or twice a week. Watering frequency can be adjusted as per the requirement of the plant. Potting media should remain moist and it should not be bone dry or too wet. One can insert finger inside the potting media and feel it; if the potting media is moist, there's no need to water the plant; if it is dry, it should be watered.

Relative humidity: An optimum range of relative humidity is 50-80% and important for good growth and flowering. During hot weather, mist down the plants and the surrounding floors and benches to maintain humidity. Humidity prevents crinkling of leaves.

Air circulation: Fresh air and good circulation are essential for orchid production. Leaves should move gently in a light breeze. Cymbidium roots need good aeration, lot higher aeration as compared to other crops. Potting media should be sufficiently porous to supply optimum moisture to the orchid roots.

Fertilization: Fertilizer recommendations as per growth stage are given below.

1. *For young plants (1st year):* N:P:K-30:10:10 @ 0.05% should be applied. To prepare the fertilizer solution, 0.5 g fertilizer having N:P:K composition as 30:10:10 should be dissolved in one litre water, then the solution should be sprayed on the plant and potting materials at an interval of 15 days.
2. *For intermediate growth stage (2nd year):* N:P:K-20:20:20 or 19:19:19 @ 0.05% should be applied. To prepare

the fertilizer solution, 0.5 g fertilizer having N:P:K composition as 20:20:20 should be dissolved in one litre water and sprayed on the plant and potting materials at an interval of 15 days. Along with this, calcium nitrate @ 0.05%, magnesium sulphate @ 0.1%, iron sulphate @ 50 ppm, boric acid @ 50 ppm, zinc sulphate @ 50 ppm at 60 days interval should be applied. For this, 0.5 g calcium nitrate, 1 g magnesium sulphate, 0.25 g iron sulphate, 0.28 g boric acid and 0.22 g 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 onward)*: Apply nutrients as 2nd year until flower initiates. The difference is that at 3rd year, from February to May, 30:10:10 NPK will be applied at a rate of 1g/litre at an interval of 15 days and from June to August, 20:20:20 NPK will be applied @ 1g litre at an interval of 15 days. After flower initiation (August to January), 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 should be dissolved in one litre water and sprayed on the plant and potting materials at an interval of 15 days.

Pre-harvest foliar sprays with micronutrient mixture (0.05%), glucose (0.1%) and mustard cake (1 kg/50 litres of water) were found promising in terms of number of inflorescence/plant (1 to 2) and number of flowers/spike (8 to 10) followed by GA₃ (50 ppm). After flower initiation, frequency of fertilizer solution application should be reduced so as to minimise the damage to the flowers.

Training :

Cymbidiums may be trained with bamboo sticks and yoyo to keep the spikes in upright position. Also tying the inflorescence to pull the inflorescence upwards with some weight hanging at opposite direction on other side of the rope can upright the spikes.

Harvest, economics and market potential

The orchid flowers should be harvested at proper stage for getting quality flowers and maximum vase life. Morning is the best time for harvesting. Flowers are cut sharply with a

knife or secateur and dipped immediately in a bucket of water. In most of the commercial orchids, the optimum harvesting stage is fully opened and mature flowers. A matured healthy plant in 10" pot under good management will produce about 4–6 flowers per year. A healthy well grown orchid will produce flowers spikes every year and a plant 10 years old can produce from 10 to 20 flower spikes. In standard Cymbidium, 12-15 flowers are kept per spike. The cost of one spike ranges from ₹ 100 to ₹ 200. A Cymbidium grower can earn approximately ₹ 40 lakhs in 10 years from an area of 500 m² accommodating 1,500 plants after investing 10 lakhs and selling of 55,000-60,000 cut spikes, provided that the grower should capture proper marketing channel and business strategies.

Fifty-one countries in the world export orchid cut flowers and potted plants to about 103 countries. The top ten exporters of orchid cut flowers in 2019 were the Netherlands, Thailand, Singapore, New Zealand, Vietnam, China, Malaysia, Republic of Korea, Belarus and Costa Rica. The Netherlands and Thailand exported orchid cut flowers worth US\$77.65 million and US\$70.07 million, respectively, in 2019. Japan, the USA, China, Italy, Vietnam, Germany, United Kingdom, France, Australia and Singapore were the top ten importers of orchid cut flowers. Japan imported cut flowers worth US \$62.43 million and the USA US\$22.86 million. In addition to

cut flowers and potted plants, there is a large market for planting material for cut flowers and potted plants. India imports orchid cut flowers, potted plants and planting material of orchids from Thailand, Malaysia, Indonesia, New Zealand, Australia and Netherlands. India imported cut flowers worth ₹ 3425.7 lakhs in 2015-16, and ₹ 1584.4 lakhs in 2019-20. Export of orchid cut flowers from India is negligible. There are ample opportunities to replace the import and export of cut flowers and planting material from the North-eastern and hilly states of India for National and International markets.

Insect, pests, diseases and their management

Insect pests

Mites, thrips, scales, aphids, mealy bugs, grasshoppers and shoot



Potted plant of *C. aloifolium*

borers are common insect pests of *Cymbidium*. The active stages (nymph and adult) of mite feed on under surface of leaves and flowers by lacerating and sucking the cell sap from epidermal layer, especially along with midrib and the base. The loss of cell sap causes yellowing of leaves. Sulphur 3% in wettable or colloidal form, satisfactorily controls the nymph and adults of this pest.

There are five predominant species of scale insects, viz. ti scale, *Pinnaspis* bux; florida red scale, *Chrysomphalus aonidum*; lecanium scale, *Lecanium* sp; soft brown scale, *Coccus hesperidum* and boisduval scale, *Diaspis boisduvali* which cause damage on *Cymbidium* orchids round the year. Both the stages of scale insects suck the cell sap from leaves, pseudobulbs, flower buds and flowers, causing yellowing of leaves, vigour loss and stunted new growth. In case of heavy infestation, infected plants become deformed, sticky honeydew excreted which attracts sooty mold on which dust particles deposit, as a result photosynthesis rate gets affected. Chemicals like acephate 75 SP or carbaryl 50WP @ 0.03-0.05% can be used against aphids, scale insects and mealybug.

Two species of aphids, yellow aphid, *Macrosiphum luteus* and black aphid, *Toxoptera aurantii* mainly cause damage to orchids. The nymphs and adults suck the cell sap usually from new flower spike and foliage. They also excrete honeydew on which sooty mold developed that affect photosynthesis. Thrips, *Dichromothrips nakahari* suck cell sap from tender portion of plants and on leaves, that become discoloured and shrivels. Both young and adult of mealy bug (*Pseudococcus* sp.) suck cell sap from the leaves and petioles or any joint portion of plants and as a result plants become weakened. Grasshopper (*Hieroglyphus banian*) feed on young leaves, un-opened flower buds and flowers by cutting in irregular shape with their biting and chewing type of mouth parts and ultimately affects flower quality.

The insect damage can be controlled by providing adequate insect nets all over the polyhouses, proper removal of weeds, avoiding moisture stress and clubbing of pots that prevents aeration. Sucking pest incidence can be minimized by prophylactic spray with azadirachtin 00.03EC @ 5 ml/litre once in fortnight. Prompt pruning and burning of infested plant parts prevents scales infestation. Tobacco leaf extract @ 100 ml/litre helps to reduce thrips and aphids attack. Avoiding placing plant pots over ground prevents snail attack.

Treating insects with insecticides

- While using commercially available pesticides, the directions on the label should be followed and all required precautions should be taken.
- One should not use more than the recommended doses of the pesticide.
- A safe, effective insecticidal soap can be prepared by mixing one teaspoon of a mild dishwashing liquid to a litre of lukewarm water.
- Many insecticides kill only the adult insects, not necessarily the eggs or the larvae (immature insects). Insects develop resistance to insecticides. That means, some of them are not affected by the insecticide and will reproduce. Treating these with the same

insecticide will not kill them. To avoid insecticide resistance, growers should rotate insecticides, the first application will be made with one insecticide, the second application with another and the third one either with the first insecticide or with a new one.

- Rotating is not necessary with the insecticidal soap solution, because this insecticidal soap works by suffocating the insects. The growers need to apply it frequently so that insects coming out of eggs are also controlled.
- If the infestation is not excessive, spraying can be done thoroughly on the new growths, leaves (both sides), flower stem, back of buds and flowers with the insecticidal solution. If the infestation is widespread, the whole plant can be dipped for 15 minutes or so in the insecticide solution.
- For the treatment to be effective, the growers have to treat the plants (spraying or immersing) at least three times, at an intervals of one week (at an intervals of 3-4 days for aphids). More than one application should be done because the insecticide will kill the adults and a few days later the eggs will hatch, and the cycle will restart, unless the grower apply insecticide again to kill them too.

Diseases

Black rot, Crown rot or heart rot (*Pythium ultimum*, *P. splendens*, *Phytophthora palmivora* and *P. parasitica*): Water soaked small brown spot on the aerial parts of plants, especially on the collar region, which quickly turn black. Fungicides spray viz. Captan @ 2 g/l or Zineb @ 2 g/l water controls it.

Anthracnose (*Colletotrichum gloeosporioides* and *C. orchidacearum*): Initial symptom appears as the small oblong to circular oval, sunken and reddish brown to dark brown or grey coloured spots. Die back of leaves are also observed if the leaf tip is attacked. Spraying of Carbendazim @ 1 g/l in 10 days interval checks the disease.

Blossom blight (*Botrytis cinerea*): The pathogens produce numerous small dark spots on petals, especially on older flowers. Sometimes shot hole effect is found on infected flower petals. Spraying with Carbendazim @ 1g/l liter or indofil Z @ 2g/l at 7 days intervals are effective.

Bacterial soft rot (*Erwinia corotovora* pv. *corotovora* and *E. chrysanthi*): Deep greyish lesions on leaves. It causes leaf spot, soft rot and stem rot with fishy smell. Treating of infected plants with streptomycin or oxy-tetracycline solution before planting can be effective against this disease.

Cymbidium mosaic virus (Potexvirus): The virus produces variable symptoms on different hosts. It produces mild or severe mosaic symptoms followed by necrosis. Start with certified and virus free plant material. Proper sterilization of tools used in cultural practices, proper distance among plants and proper sanitation of the growing area has to be maintained to avoid virus infection. Growing area should be kept free from plant debris.

Odontoglossum ringspot virus (Tobamovirus): It produces ringspot, diamond mottle symptoms. Start with certified and virus free plant material, proper sterilization

of tools used in cultural practices, proper distance among plants and proper sanitation has to be maintained to avoid virus infection. Growing area should be kept free from plant debris.

There is no cure to the viral diseases, so preventive measures should be taken. New plants should be quarantined before adding to the old stocks. Infected plants or plant parts can be isolated and buried in soil or burnt immediately after observation of any viral symptoms.

IPM/ Biological control

Diseases can be managed by providing adequate air circulation and shade for the plants with optimum moisture level. Procurement of reliable source, disease free and sanitized planting materials, proper sterilization of the growing media, providing proper aeration with adequate spacing, giving ample irrigation and avoiding direct exposure of plants to sunlight prevents the onset of the diseases. Amendment of *Trichoderma viride* @ 10g/pot brings effective control against root diseases. In general, spray of Copper Oxy Chloride (COC) @ 0.5% helps in the prevention and management of all the diseases in Orchids.

Propagation

Cymbidiums are propagated sexually through seeds and asexually through division or back bulbs. Division means splitting the plants into two to three parts, each with one new shoot and each will produce an individual plant. Propagation through back bulb is a slow process which will take three to four years to give a flowering size plant.

Cymbidiums grow by developing new growth from the base of the plants, after several years, they may have 5, 6, 10 or more growths. By subdividing such plants, we can get two or three plants out of the original one. For subdividing one plant to two or more individuals, it should be considered that each of the new individuals should have at least one back bulb, one old mature bulb and one young bulb. If we remove the older growth or old pseudobulbs of these plants and sow them separately, they will generate new growths. Plants resulting from divisions and back bulbs are also entitled to be recognized by the same variety name as the original. The resulting plants will be identical to the plant we divided or from which we removed the pseudobulbs. Fully mature but not shrivelled back bulbs will be removed from the plant (provided that sufficient number of bulbs should be there with the original plant for nourishing the plant with moisture and nutrients). Separated back bulb should be planted in sand/ or coco peat and watered at a regular interval to keep it moist. After two to three months, new growths will come out of it.

As cymbidium seeds are devoid of endosperms, they very rarely germinate in nature with the help of fungal association. Thus, tissue culture is the only way to produce millions of disease-free and true-to-the-type plants in shortest time. In this method, callus (amorphous masses of cells), meristems and organs (root, leaf, flower, embryo, ovary, fruit, seeds etc.) are isolated and cultured aseptically

in laboratory supplied with defined media containing sugars, inorganic salts, vitamins and growth regulators.

Postharvest management

A good quality cut flower of Cymbidium should have the following characteristics

- Minimum eight standard blooms per stem.
- Flowers must be cleaned, evenly coloured and free from physiological disorders.
- Stem must have flowers evenly arranged and around the stem.
- Two-thirds of the stem should be covered with the flowers.
- Flowers must have a firm texture and a luminescent sheen.
- Stems must be firm when held up.
- The minimum base diameter of the stem should be of 10 mm.

Stage of harvest: In Cymbidium, flowers having 75% bloom stage or two buds opened stage with the spike length of 60-90 cm is harvested.

Grading: Cymbidium orchids are graded in the following way.

Category	Grade	Flower count	Spike length
Standard	AAA	12-15	1.25 m
	AA	8	90 cm
Miniature	XL	> 15	65 cm
	L	12-14	55-64 cm
	M	8-11	40-54 cm
	S	<5	30-39 cm

Packing: After harvest, the flower stems are bunched into 5 or 10 and wrapped in a specialized polythene cover and at the base of the stem, a slant cut is made with a sharp knife. The stem bottom is inserted in a plastic plug containing clean water. This will keep the flowers fresh during transportation. In absence of the plug, moistened cotton wrapped with a piece of polythene can do the job for domestic market. After plugging or wrapping with moistened cotton, the flower stems are placed in corrugated boxes and readied for dispatch to market.

Floral preservatives: In Cymbidium hybrid 'Red Princess', pulsing with 5% sucrose increases vase life up to 56 days followed by sucrose @ 8% (54.78 days). In Cymbidium, 1-MCP and AVG are superior than STS in prolonging the vase life of cut flowers. In Cymbidium hybrid, 'Red Princess', 75% open flowers with 200 ppm 8-HQS showed highest vase life along with cent percent opening. In Cymbidium 'Ensikhan' and 'PCMV', 4% sucrose + 100 ppm salicylic acid and 4% sucrose + 100 ppm $Al_2(SO_4)_3$ are used as bud opening chemicals. 2% sucrose + 200 ppm 8-HQS is also used as holding solution. Cymbidium flowers are long lasting, at least 6 weeks when cut and up to 10 weeks on the plant.

Importance and uses

Cymbidiums are highly valued for genetic resources,

cut flowers, hanging baskets, potted plants and herbal medicines.

Table 2. Genetic resources for hybridization

Name of species	Uses
<i>Cymbidium iridioides</i> , <i>C. eburneum</i> , <i>C. hookerianum</i> , <i>C. sanderae</i> , <i>C. lowianum</i> , <i>C. tracyanum</i> , <i>C. insigne</i> , <i>C. erythrostylum</i>	Development of standard cymbidium hybrids
<i>Cymbidium ensifolium</i> , <i>C. devonianum</i> , <i>C. tigrinum</i>	Development of miniature cymbidium hybrids
<i>Cymbidium atropurpureum</i> , <i>C. finalaysonianum</i>	Development of cascading cymbidium hybrids

Cut flowers: Both standard and novelty hybrids are used as cut flowers

Potted plants: Species like *C. ensifolium*, *C. aloifolium*, *C. devonianum*, *C. eburneum*, *C. lancifolium*, *C. lowianum* and *C. mastersii* are used as potted orchids. Other miniature orchid hybrids can be used as potted plants are Autumn Beacon Geyserland, One Tree Hill Solstice Gold B/CSA, Wakakusu Delight, Minneken Khobai, Kusada Fantasy Carioca, Phar Lap, Gladys Whitesell, Summer Love.

Hanging baskets: Cascading hybrids are ideal for hanging baskets, e.g., Sarah Jean Ice Cascade Ad/CSA, Nicoles Valentine Geyserland HCC/AOS, Dorothy Stockstill Forgotten Fruit.

Herbal medicines: In India, orchids have been used in indigenous system of medicine since Vedic period. In general, orchids throughout the world are used for curing

rheumatism, malaria, tuberculosis, cuts, wounds, burn injuries, asthma, bronchitis and several other ailments.

Table 3. Cymbidium orchids used in Indian medicine system

Botanical name	Parts used	Therapeutic uses
<i>Cymbidium aloifolium</i>	Rhizomes	Salep; used as nutrient and demulcent; as emetic and purgative
<i>C. ensifolium</i>	Rhizomes and flowers	Eye sores, stomach pain
<i>C. longifolium</i>	Pseudobulb	As emetic and demulcent
<i>C. giganteum</i>	Leaf juice	Blood clotting

Other related information

Interested growers can avail quality planting materials and other required inputs from several authenticated nurseries such as Pradhan Nursery, Kalimpong; Darjeeling Garden, Siliguri; Mainaam Garden, Sikkim etc. The technical support such as trainings, study materials can be availed from ICAR-National Research Centre for Orchids, Sikkim. Mission for Integrated Development of Horticulture (MIDH) is a centrally sponsored scheme for the holistic growth of the horticulture sector that covers floriculture including Orchid growers.

For further interaction, please write to :

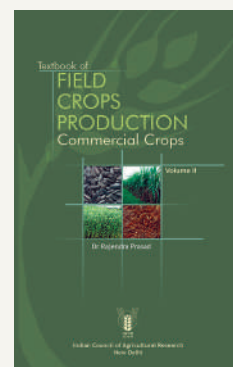
Siddhartha Sankar Biswas (Scientist), ICAR-National Research Center for Orchids, Pakyong, Sikkim 737 106. *Corresponding author's email: siddsac20475@gmail.com

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Business Manager

Directorate of Knowledge Management in Agriculture
Krishi Anusandhan Bhavan I, Pusa, New Delhi 110 012
Tel: 011-25843657, Fax 91-11-25841282; e-mail: bmicar@gmail.com