Technical Bulletin-IV

Cymbidium Cut Flower Production

D. Barman, V.S. Nagrare, K. Rajni, T.K. Bag, S.K. Naik and R.C. Upadhyaya

National Research Centre for Orchids
Indian Council of Agricultural Research
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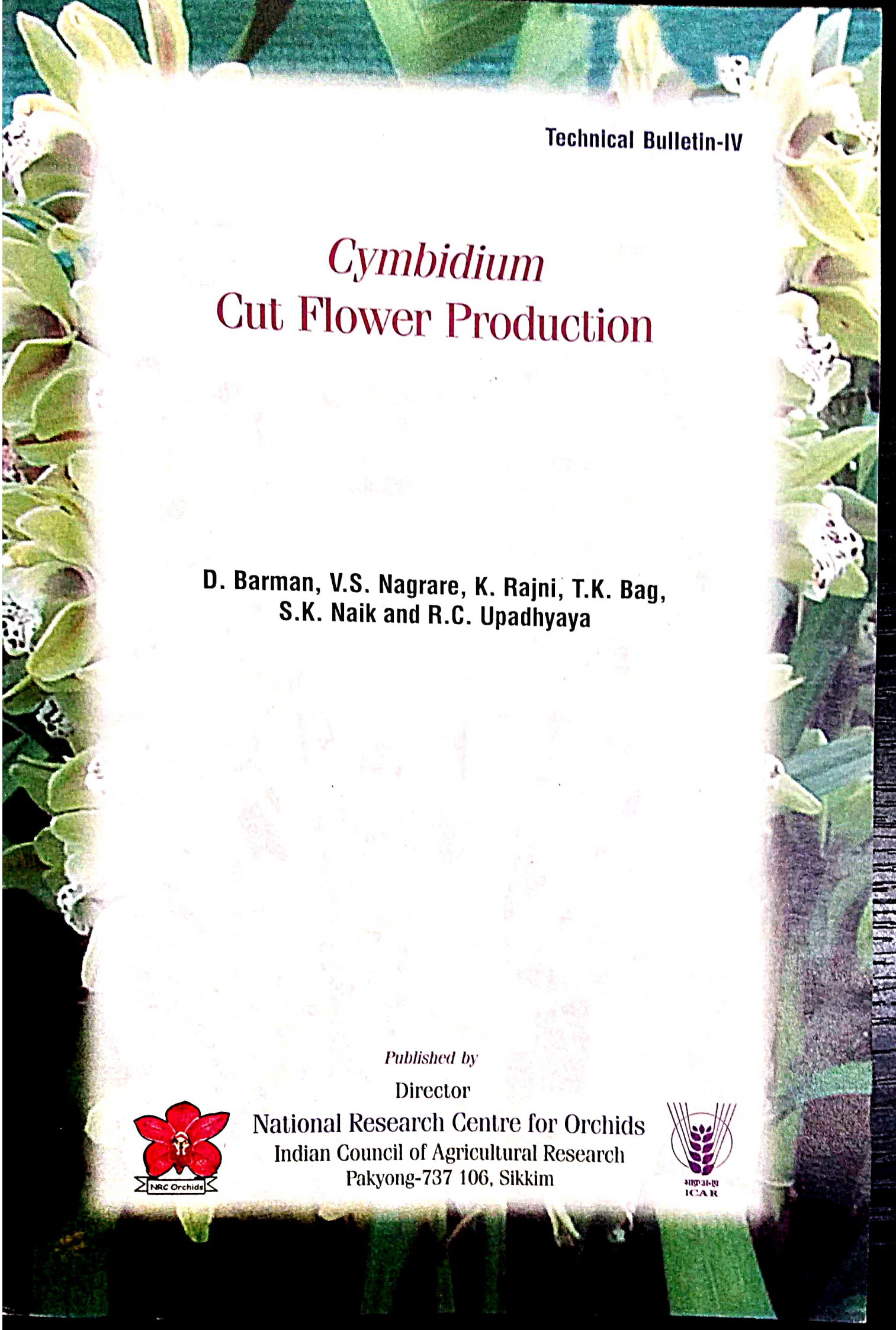

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Introduction

The production of rich *Cymbidium* cut flower depends on the shape and colour of the flower, longevity of bloom in freshness, higher productivity, right season, ease in packaging and transportation with minimum injury, quicker transportation and large scale production with low cost. North-Eastern India although endowed with diverse and congenial environment is yet to embark on a significant cut flower trade. With outstanding *Cymbidium* species and hybrids, North-Indian India could develop significant cut flower industry and may generate rural employment and earn foreign exchange if suitable infrastructure created. Though some government and private agencies in the region have experimented *Cymbidium* cut flower production in a sporadic manner with scanty scientific knowledge, observations showed that lack of innovative approach and in depth study have widened the gaps and growth could not take place up to expectations. In this technical bulletin an attempt is made to diffuse scientific knowledge on *Cymbidium* cut flower production so that growers can be benefited.

Cymbidium Cultivation

Selection of planting materials

It is much easier to maintain the health of a well-established plant. Healthy plants should have multiple roots. The roots should be white and strong. The total length of all of the roots added together should be more than 18 inches if growing in the house, more than 12 inches if growing in a greenhouse. If you cannot inspect the roots, give the plant a gentle tug. A plant with healthy roots will feel solid in the vase.

Once the plant unpacked, needs to put it in a moist area that receives filtered sunlight during most of the day. Maintain a regular watering schedule and look at the plant during its watering schedule to see if it responds to the new environment as to whether the leaves remain upright and dark green and slightly glossy. It may take three or four weeks for new plant to adapt to its environment. Planting materials should always be procured from the reputed nurseries/producers to ensure the quality and authentic materials preferably from restricted nurseries.

List of *Cymbidium* hybrids

1. Ammesbury
2. Arabian Night
3. Soulhunt 1–6
4. Show Girl 'Cook's Bridge'
5. Platinum Bird
6. Red Beauty Carmen
7. Hawtescens
8. Rievaulx
9. Close Melody Freak Out
10. Burgadium Sydney

11. Jungfrau 'Dos Pueblos'
12. Sparkle Late Green
13. Jung Frau Snow Queen
14. Volya Craig Sutherland
15. Sanfrancisco Monalisa
16. Takarajoke
17. Miss Sanders
18. Canon Colour
19. H.C. Aurora
20. Red Imperial Red Tower
21. Red Star
22. Yankillila
23. Angelia December Gold
24. Luna Pink Champion

Temperature

It is the most critical factor in blooming *Cymbidiums*. *Cymbidium* will survive in good health and bear regularly in the places where the summers are moderately warm and bright, however, autumn and winter nights are sufficiently cool. They are most suited in temperature regime of 10°C and 25°C. A temperature difference of about 10°C between day and night is desirable. Although they can withstand low temperature, it would be advisable to maintain a night temperature of 11–13°C during winter to avoid the risk of injury. A bright and cool location inside is best for winter months.

Light

Cymbidiums grow best under partial shade-partial sun conditions. Adequate light is the most important factor to grow and flower well. The plants grow best with 3,000 to 4,500 foot candles of light intensity as measured with a light meter. 50% lath covering or 50% to 60% shade cloth overhead provides this light intensity under most conditions. During the summer, the leaves should be a yellowish green, not a deep green. Plants grown in too much shade will usually be a dark, lush green and will usually not flower well. When the plants are in bud, some additional shade will improve the color of most green and white *Cymbidium* flowers.

Too much light results in a brown or red stain on the exposed sections of the sepals which may give the flower a muddy color and is usually undesirable. High light usually improves the color of yellow, pink, brown and red *Cymbidium* flowers while the buds form, but can also usually cause the color to fade after the flower opens. Providing additional shade after the flowers open will hold the color and increase the flower life as well. If provide extra shade for the flowers, remember to remove it when the flowers fall so that the plant will grow best for next year.

Humidity

Adequate humidity is essential to protect the *Cymbidium* plant from the dehydration and stress, especially in summer months. Under protected condition the easiest way to maintain the humidity is damping the pathways. Overhead misting can be used in protected as well as open house to lower the leaf temperature, at the same time, rise humidity levels. However, care should be taken to avoid excessive humidity to protect the flower from spotting usually caused by *Botrytis*. In general, 70–80% humidity needs to be maintained during the period of active growth. However, during winter the humidity requirement is less (40–50%).

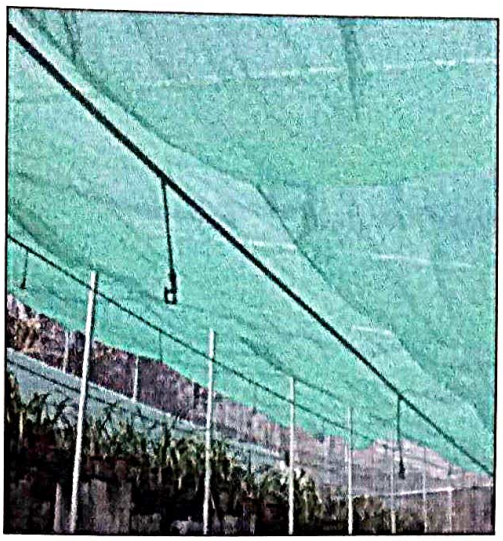
Air

Cymbidium thrives well in ventilated house or where the atmosphere is fresh. Air circulation keeps the atmosphere clean and fresh. Further, it maintains humidity and temperature at the desired level, which ultimately bring down the incidence of pests and diseases. This can be achieved by growing *Cymbidium* in open type house or in fan & pad cooling system in closed green house.

Shading

Shading of plant is an important component to regulate growth and flowering of *Cymbidium*. The extent of shade requirement may

vary from location to location or altitude and seasonal variation of light and temperature. In the hot summer, particularly April to June, the intensity of light is very high. Higher light intensity coupled with higher temperature also prevails in rainy season. Usually 50% UV stabilized shade net is sufficient to protect the plant from scorching heat under mid hill situation (5,000 ft. msl) of North East region. Shading is not required in cloudy weather. The best system of shading is rolling or movable type so that it can be used as and when required. Care should be taken not to provide excessive shading which will inhibit the flowering partially or completely.



Shade net spread

Growing structure

Plants should be protected from all sorts of weather damages for production of market worthy spikes. Greenhouse with all sides open is suitable for *Cymbidium* cultivation. In mid hill situation (above 4,500 ft), simple bamboo /wooden structure with UV

***Cymbidium* cultivation in polyhouse**

Low-cost polyhouse for *Cymbidium*

stabilized polythene on the top is generally used with success. However, structure with steel pipe and top covered with double layered polycarbonate and encircled with 11gauge iron net is most suitable for *Cymbidium* cultivation. *Cymbidium* can be grown in cost effective cooled green house with automation system of temperature, light, humidity and aeration.

Growing medium

The main purpose of growing media is to hold the plant in place and supply sufficient amount of nutrients and water. *Cymbidium* prefers fairly open compost. A number of combinations are being

Potting media

used and found successful. Commonly used materials in the compost mixture are tree bark, peat, moss, charcoal, osmunda fibre, pumice, perlite, bricks chips and coconut husk. For selecting any media combination one should be cautious to see whether the potting mixture is keeping the roots moist but not wet, even drying of the mix, keeping the roots cool and avoiding large air pockets in the mix. A mixture of peat and perlite is recommended for use in controlled green house condition. An even more open mix would be preferable for growing *Cymbidium* in shade house. Whatever may be the mix, the thumb rule for any potting media is that it should be free from water logging. A healthy growing media containing Leaf mould, FYM, Charcoal, Coconut husk, Rotten logs (2 : 1 : 1 : 1 : 1) is found to be beneficial. The pH of the media should be acidic and it ranges from 5.5 to 6.5. The electrical conductivity (EC) also plays a vital role for growth and flowering. EC 1.05 m mhos/cm is good for growth.

Bench

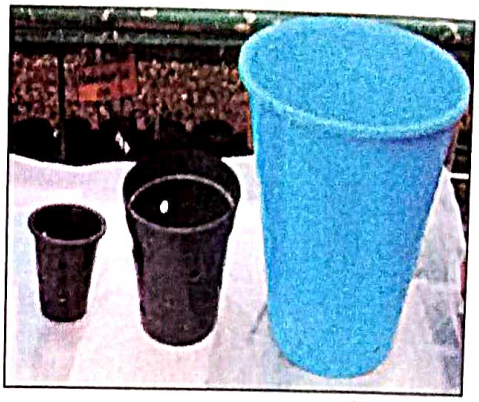
It is always wise to keep the pots on the benches to provide proper aeration and check the soil borne diseases. The benches can be made up of iron mesh, concrete or split bamboo. Height of the bench should not be more than 2 feet 6 inch and breadth not

Benches

more than 3 feet otherwise it will be inconvenient for cultural operations.

Pots

The main purpose of using pot is to hold media. The most commonly used are earthen or plastic pots. The pots should have sufficient number of holes for aeration to root zone and draining out excess water. The plastic pots are economic, long lasting, and convenient and above all require less frequent watering. If clay pot is used, it should not be painted with permanent paint, which may seal the pores. The new clay pots need to be soaked in water for few hours before use. The size of pot depends on the growth and size of plant. One year old plant (6 inches size) should be planted in 4 inches size pot. Thereafter, it needs to be transferred in to 6 inches pot. Smaller plants of less than 6 inches size must be planted in the community pots to check the mortality. Pots should be sterilized in boiling water or Trisodium phosphate.



Plastic and clay container

Spacing

The plant density depends on the size of plant as well as pot. At initial stage of growth (1.5 year old), around 30 plants (4″) can accommodate in a square meter area. The spacing will be wider as a plant grows and nine adult plants of 4–5 year old can be accommodated in 6″ size pot. However, fully grown plants

Plants in different sizes of pots

(7–8 year old) need more space for sufficient aeration and hardly three plants can be spaced in a square meter area.

Preparation of potting media

Sterilization of media is an integral part of *Cymbidium* growing. Most of the diseases get entry through media itself. Potting media requires sterilization and mixing homogeneously before filling in the pots. The commonly used methods for sterilization are heating and chemical treatment. The media needs to be cut smaller sized pieces and mixed thoroughly before sterilization. Some media require soaking over night e.g. Coconut husk to leached out undesirable chemicals. If heat treatment is used all the media components should be sterilized separately as they require different period of heating. In case of chemical treatment, the potting components need to be stirred thoroughly, wet with formaldehyde @ 20 ml/litre and kept covered with polythene sheet for at least 72 hours. After opening, sun drying is required for few hours to evaporate the obnoxious gasses.

Potting

The potting should be done during active growth phase i.e. during

April to June. Crocks or bricks chips should be placed at the bottom of the pot. The plant then placed centrally and sterilized media need to be placed all around the plant. Care should be taken to avoid any large unfilled cavities while potting.

Repotting

Repotting every alternate year or more frequent is beneficial if there is fungal infection or rotting. It is required when the plant out grows the existing containers. It should be completed before the new growth commences or after the completion of flowering. Generally, March to June is the actual period for repotting of *Cymbidium* in Indian condition. Usually, it is best to divide the over grown plants by breaking the rhizome between the pseudobulbs. The best way of repotting would be shaking of excess compost, especially if it has begun to decompose. If the roots are firm to touch and tightly entwined, then the plant is healthy and will only need to be potted into the next size pot. However rotten or dead roots, if any, should be cut before repotting. Generally, crocks or polystyrene or bricks chips are placed at the bottom of the clean pot to assist the extra drainage then put a light cover of compost on that. The plant, then, should be placed centrally and then added fresh and dampened compost. Stakes if necessary should be placed before filling the pots to avoid any root damage later while staking. Care should be taken to avoid any large unfilled cavities; however, compost should not compress too densely. Over-potting and repotting in too large pot should be avoided, which instead of encouraging growth increases the risk of the rotting. Young and small plants respond to repotting at regular interval at three to six months with enhanced growth. The practice can reduce the time to maturity and flowering by six to twelve months or so. However, before getting tempted to divide a large plant one should be bear in minds that larger the plant the more flower to spikes one can expect. Following are the various steps of repotting:

Care after potting

Immediate watering of newly potted or planted plant should be avoided, possibly up to two or even three weeks, which will encourage the new root to grow in the fresh compost. Only plain water is advocated for irrigation until new root grow in evident. Water soluble fertilizer (19 : 19 : 19) at 1g/litre should be sprayed weekly only after being assured of new root growth. Very strong feed also should be avoided to protect the immature root from

burning. Once the new roots establish themselves a regular watering and feeding programme can be adopted depending on the growing condition and the potting mixture used.

Watering

Irrigating the plants is the most difficult aspect of *Cymbidium* growing. It generally depends on health of the plant, potting media, size and type of container and prevailing season. *Cymbidiums* like lots of water and prefer to be constantly moist, but not wet. Allowing the plants dry out and not leaching will cause the leaf tips to die back. On hot days, the plants benefit from overhead misting or sprinkling to lower the temperature and increase the humidity in the growing area. The irrigation should be done in the morning to wet down the media thoroughly, which will supply water vapour for a larger period. Watering can also leach out excess salts and other harmful chemicals. During the period of March to June *Cymbidium* starts new pseudobulbs and this is a time of increased activity when they require plenty of water to maintain their development. Generally 2–3 times weekly irrigation during this period are sufficient to maintain the growth at 5,000′ msl. In rainy season (July–September) watering at 10–15 days interval depending on the weather condition is sufficient to maintain growth. During the winter, *Cymbidiums* need less water, but should never be allowed to dry out completely. Best way to water is in the form of fine spray. The pH of the water needs to be maintained between 5.5–6.5.

Feeding

Cymbidiums are heavy feeders and like fertilizer to grow and bloom well. Many growers use a high nitrogen fertilizer during the growing season (February to August) and a low nitrogen fertilizer during the blooming season and winter. Others get

satisfactory results with a balanced fertilizer all year long. Fertilizer is available in both water soluble and slow release forms. The plant fertilized with 5 gm of Gold-N, organic fertilizer ($N_{03}P_{0.5}K_{0.3}$) at six monthly intervals on one year plant or a nutrient schedule comprised of N_{200ppm} P_{100ppm} K_{100ppm} at fortnightly intervals are beneficial for better growth of *Cymbidium*. Generally, Nitrofoska or Polyfeed (19 : 19 : 19), water soluble fertilizer at 2 g/litre/week are beneficial for growth and flowering of *Cymbidium*. Application of BA and GA_3 @ 100 ppm each during growth phase will initiate more number of shoots.

Training of spike

Cymbidium spikes need to be trained as soon as they appear. A cane or bamboo split should be inserted behind the spike. Care should be taken to avoid any root injury. Once the spike has reached about 30 cm in length, a tie should be applied. Tying of the spike should be secure and firm with the cane. Great care must be taken, as the growing spikes are brittle and a jolt or rough handling will break them.

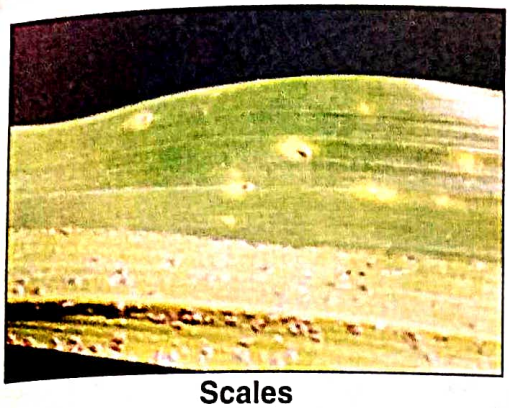
When the buds have begun to form, a second tie should be given just below the first bud. An extra tie also will be needed below the tip to keep the spike straight.

Pest and Diseases

The important pests and diseases of the *Cymbidium* and their control measure are given in the Table 1.

Table 1 Important pest and diseases of *Cymbidium* and their remedy

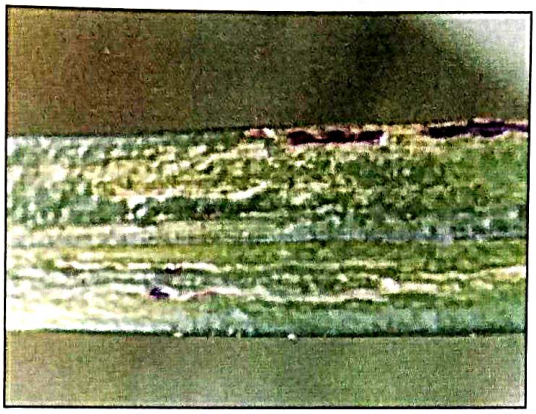
	Symptoms	Remedies
	Pests	
Aphids	Attack young seedling and emerging flowering spikes. Honeydew secreted by them attracts ants and fungus.	Infested plants should be treated with imidacloprid 17.8 SL 1.5ml/l or dimethoate 30 EC 1.6ml/l or malathion 1ml/l of water at 15 days interval.
Red spider mite	Exhibit severe mottling and wilting, produce fine webs on the under sides of the leaves, growth stunted.	Eradication of heavily infested plants, treat plants with Dicofol 85 EC 0.6ml/l or wetable sulphur 1g/l or neem oil 1.5 ml/l at 10 days interval.
Scale	Suck sap from the plant, plant loss vigour, flower quality deteriorate.	Mannual removal of scales with cotton wool swabs soaked with 50: 50 solutions of water and methylated sprit. Spray of malathion 50 EC 1 ml/l or dimethoate 1.6 ml/l or monocrotophos 1.2 ml/l.
	Diseases	
Black rot	The pseudobulb/ bulbs of infected plants become dark brown to black in colour and the rot also extend up to the leaves.	Isolate infected plants immediately, treat the plants with captan or zineb 2 g/l
Soft rot	Deep grayish lesions noticed, leaf spot, leaf soft rot, and finally stem rot with foul/ fishy smell.	Treat the plant with Streptomycin or Oxytetracyclin solution before planting.
Viruses	Recognized by yellow or white distinct molting or streaking on the leaves	Rouge infected plants, use sterilized tools. Procure virus free planting material.



Scales

Mite infestation

Black rot



Virus

Yield and harvesting

An understanding of the correct stage of harvesting becomes more important because it influences the keeping quality attraction of the harvested spike and yield for the next year. The spikes should be harvested when all the flowers are open. While harvesting utmost care should be taken to see that pollen caps of the flowers remain intact. The plant will produce only one spike at the first harvest which gradually increases up to three in the subsequent harvest. Number of flower per spike will vary from 10–15 depending upon the species and hybrid. The spikes need to cut at the base of the stalk. The cut surface should be smooth and never be crushed. A sharp knife or secateur is required to sterilize time to time with antibiotic-fungicide solution to avoid transmission of diseases.

Grade standards

The grade standard at international market as follows:

1. Standard type (Large flower)
2. The minimum flower on the export should be 8. However ideal are 12 to 15 flowers. Usually an eight stem box is preferred. In general, for European market each box should contain 100 blooms, whereas in Japan the box must looks full with 80 to 100 blooms.
3. Intermediate stems: These are sold as 10 stem per box. The grade is mainly depended on stem length. Minimum acceptable length is 60 cm.
4. Grade box: The auction market prefer an eight stem box with two white, two pink, two yellow and two green stems.

Stem for export market should meet the following standard

1. Minimum eight standard blooms per stems.
2. Flower must be clean, unblemished and evenly colored.
3. Stem must have flower evenly arranged along and around the stem.
4. Two third of the stem should be covered with flowers.
5. Flowers must have a firm texture and luminescent sheen.
6. Stems must be held up and not bend from the vertical.
7. The minimum base diameter of the stem should be of 10 mm.

Post harvest operation

The harvested spikes need to dip immediately in a bucket of water till they are packed. In order to improve the quality of flower spike and vase-life, the cut spike are given pulsing with sugar (2–4%).

Packing Sheds and packaging

Flower should not be packed in green house to avoid risk of contamination. Usually the ambient temperature of packing sheds should be 12 to 15°C, as such cool stores are not necessary. However, if cool store is provided then temperature should not be below 10°C, otherwise flower injury may occur.

The flowers should be checked before they sleeved. Cushioning material should be put in the back of the sleeve to avoid any injury during transport. The ideal export box for *Cymbidium* would be two-piece boxes. Each stem in the box should be put in the tube containing water, thus stem has water supply during transport. Instead of small water tube, cotton wrapping also served the purpose. In this case, a piece of cotton needs to soak in water. After squeezing the cotton is to be wrapped all around the spike. Then a piece of polythene is tied with rubber band. Before the lid is placed box are spread with an aerosol insecticide. This would ensure final precaution against any possible insects in the box. In oder to check movement of spike within the box during transit, the base of the spikes may be tied to the base of cartoon by adhesive tape. The spikes are usually packed in cartons or box. The size of cartoon depends on the length of spike. The cartoon is provided with sufficient number of hole for aeration.

Post harvest life

A well grown *Cymbidium* will have a vase life of 4 to 6 weeks at the consumer ends, provided proper handling was maintained after harvest. A number of floral preservatives are also in use to prolong the shelf-life of the flower. A combination of biocide, sugar and hormone remarkably enhance the post harvest life of the *Cymbidiums*. "Purafil" a commercial product, HQC, HQS and several other can also increase the vase life.

Trouble shooting in *Cymbidium* cultivation

Indication	Probable Causes	Corrective Measures
Flying Roots	Roots too warm	Increase thermal mass in mix.
	Infrequent watering	Inspect roots, if dry increase watering frequency.
	Irregular watering	Inspect roots, look for irregular width. If present either increase watering frequency or add mix with better water retention.
	Insufficient water	Ensure that water flows from pot for at least ten seconds during watering.
Leaves have a distinct kink along edge	Insufficient watering	Inspect roots, if short and dry increase watering frequency.
	Severe root rot due to over watering	Inspect roots, trim rotted roots, treat with sulfur, repot with drier mix.
	Humidity too low	Increase humidity minimum 50% in winter, 75% in summer.
	Root structure under developed	Inspect roots, they should be white thick and long, firm to the touch, plants grown in bark may have brownish roots but they should remain firm.

Indication	Probable Causes	Corrective Measures
Leaves fold and droop	Not enough light	Move to an area that gets more light. Decrease density of shade cloth.
	Not enough fertilizer	Check fertilizer strength and frequency, increase slightly during spring growth stage.
	Too much fertilizer	
	Insufficient length of light period	If plant sits in an area that does not receive sun part of the day move it to a location that receives sun evenly throughout the day.
Plant does not flower	Pot too large	There should be no more than 1½″–2″ from the plant to the rim of the pot
	Pot too shallow	Pot depth should be two to three times the diameter.
	Infrequent fertilizing	Correct fertilizing frequency and strength.
	Plant overheated during growth season	Plants that are exposed to high heat must be shaded and have increased air circulation in order to bloom.

Indication	Probable Causes	Corrective Measures
Bud Blast, flowers dry and fall off	Low humidity	Keep humidity 40-60% for winter flowering plants
	High humidity	Keep humidity below 80% for summer flowering plants, increase air circulation.
	Insufficient air circulation	Air should be constantly moving while not blowing on plant.
	Drafts	Cold drafts from windows etc. Move plant to less drafty location.
	High fertilizer strength	Fertilizer strength should be checked particularly during the blooming stage.
Flowers turn brown	Humidity too high	Check humidity.
	Flowers getting wet during misting or watering	Ensure flowers do not get watered or misted.
	Too frequent watering	Reduce watering frequency.
Roots have brown rings and are irregular	Infrequent watering	Water more frequently the roots are drying out between watering.
	Irregular watering	Water in a regular pattern.
	Mix water retention not high enough for climate	Augment mix with higher water retentive media.

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