

Organic Cultivation of *Cymbidium*



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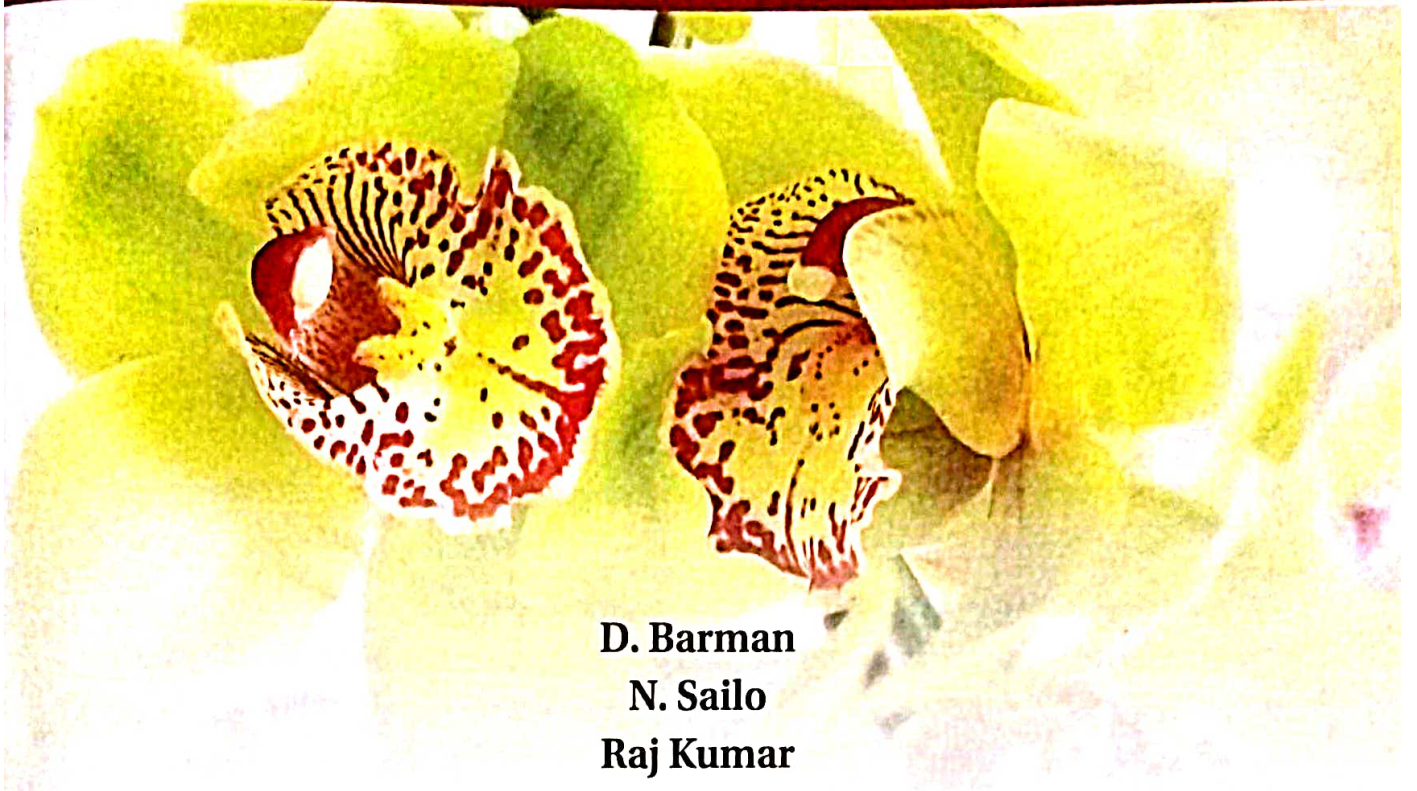


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Introduction

Cymbidium is the most fascinating and beautiful among all the orchids. It exhibits a wide range of diversity in form, size, colour and texture of flowers, very long vase life which is unimaginable. That's why it is considered as king of all flowers. Above all rarity in the market makes it most priced flower. *Cymbidium* cut flower ranks first among the orchids and in floriculture crops and accounts for 2.7 per cent of the total cut flower production of world trade. There are thousands of hybrids cultivated for cut flower as well as potted plants. This apart, *Cymbidium* is used in corsages, garlands and many more decorations. *Cymbidium* is excellent item for garden and can be grown in pot, hanging basket and tying in trees. *Cymbidium* is most attractive in indoor gardening.

In addition to floral beauty, *Cymbidium* has other uses also. Pseudobulbs of *Cymbidium madidum* are used as food. *Cymbidium* is used for medicinal purpose in ancient China and India to cure certain ailments and as tonic. The entire plant of *Cymbidium aloifolium* is used as purgative, emetic, tonic and in treating ear-ache. Decoction of roots of *Cymbidium ensifolium* in water is used in curing gonorrhoea; decoction of flowers is used in sore eyes. In the Khasi hills, juice from crushed leaves of *Cymbidium iridoides* is said to be utilized for clotting of blood in wound. In North Queensland, fruits and pseudobulbs of *Cymbidium canaliculatum* and *Cymbidium madidum* were used in case of dysentery. The seeds of *Cymbidium aloifolium* are also used for healing wounds. The native habitants in some areas use seeds of *Cymbidium madidum* as oral contraceptives. In Malaya *Cymbidium finlaysonianum* is used to sprinkle water to prevent the ghosts from hunting the livings.

Area and distribution

Cymbidiums are being cultivated in partially modified green houses covering 32 ha area. The areas are Upper Lingtham, Thingchim, Lingza-Phodong in North, Naitam-Paubuik, Kartok, Assam-Lingzey in East, Nagi, Tangzi, Bikmat, Jaubari and Tingrithang in South districts of Sikkim.

Botany

Cymbidiums are epiphytic, rarely terrestrial with short or sometimes elongated pseudo-stem covered with closely overlapping and alternating sheath leaf bases. Leaves are usually joined at the base with sheaths. Inflorescence is usually long, sub-erect and sometimes pendulous from base of the pseudo-stem. Peduncle is usually with loose numerous sheaths. The raceme is few to many flowered, erect or drooping, floral bract is various. Flowers are usually large and spreading. Sepals and petal sub equal, spreading or erect, various coloured. Lip is lobed, adnate to the base of column and embracing to it more or less by its convolute side lobes; the apical lobe decurved, often with undulate margin and the disc usually with ridges or lamellae. Column is long, foot absent or short. Anther is imperfectly two chambered. Pollinia are ovoid pyriform, cuneiform or globular more or less cleft, sessile or sheathed on a small or large often star shaped disc gland.

Species available in Sikkim are *Cymbidium aloifolium*, *Cymbidium cochleare*, *Cymbidium cyperifolium*, *Cymbidium dayanum*, *Cymbidium devonianum*, *Cymbidium eburneum*, *Cymbidium erythraeum*, *Cymbidium gammieanum*, *Cymbidium hookerianum*, *Cymbidium iridioides*, *Cymbidium lancifolium*, *Cymbidium longifolium*, *Cymbidium macrorhizon*, *Cymbidium mastersii*, *Cymbidium munronianum*, *Cymbidium pendulum* and *Cymbidium whiteae*.

Climate

Most of the orchid species have definite growth and flowering seasons. Plants of the same species may flower at different times of the year in different localities in the same country. Thus, the growth and flowering in tropical as well as temperate orchids are governed by environmental factors. The environmental factors required for growth and flowering of *Cymbidiums* is described below.

Temperature

Cymbidiums are found in a vast range of environments; the larger flowered species of most modern hybrids grow at higher elevations and prefer cooler conditions. Temperature is the most important 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 to 25°C. Temperature difference of about 10°C between day and night is desirable. Although they can withstand low temperature, it would be advisable to maintain night temperature of 11-13°C during winter to avoid the risk of injury. Bright and cool location inside is best during winter months. The critical temperature is 10°C at night in the late summer to early fall to set flower spikes and cool day time temperature in advanced bud stage to avoid overheating and bud drop. If *Cymbidiums* do not flower, it may be due to warmer night temperature during spike initiation. During cold spells, *Cymbidiums* should be given some protection in case the temperature drops below 7°C for prolonged period. The best way to reduce temperature of green house for *Cymbidium* is raising the vent and for increasing is closing the vent. In addition, cross ventilation also serves both air circulation and temperature of green house.

Light

Light is the most important factor in attaining good *Cymbidium* culture. Weak growth and no flower is observed without proper light. Good light also brings out the best in *Cymbidium* colors; shady conditions result in greener, muddier-colored blooms. *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 3000 to 4500 foot candles of light intensity as measured with a light meter. 50 per cent lath covering or 50 to 60 per cent shade cloth overhead provides this light intensity under most conditions. During 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 which is usually undesirable. High light while the buds form usually improves the color of yellow, pink, brown and red *Cymbidium* flowers, but can also 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 any extra shade has to be

given for the flowers, remember to remove it when the flowers fall so that the plant will grow best for next year.

The light inside the green house can be managed in different ways. The light intensity can be increased by providing incandescent bulb or by florescent light. Simultaneously, it can be regulated by pasting the covering sheet, roll up system painted with aluminum paint and putting shading net. The most convenient and cheaper method is to provide shading net.

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 per cent UV stabilized shade net is sufficient to protect the plant from scorching heat under mid hill situation (1500 m 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.

Humidity

Humidity plays a vital role for growth and flowering of *Cymbidium*. Adequate humidity is essential to protect the *Cymbidium* plant from the dehydration and stress, especially in summer months. In general, 70-80 per cent humidity needs to be maintained during the period of active growth. However, during winter the humidity requirement is less (40-50 per cent).

Under protected condition the easiest way to maintain 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, raise humidity levels. However, care should be taken to avoid excessive humidity to protect the flower from spotting usually caused by *Botrytis*.

Aeration

Cymbidium thrives well in ventilated house or where the atmosphere is fresh. Air circulation keeps the atmosphere clean and fresh. In warmer period more air circulation is required to reduce the leaf temperature. Further, it maintains humidity and temperature at the desired level, which ultimately decreases the incidence of pests and diseases. Flowers of Cymbidium are susceptible to Botrytis, a fungal infection disease if the green house is not properly aerated. This can be achieved by growing Cymbidium in open type house or arranging air circulating fan inside the house.

Varieties/hybrids

Selection of planting material

Cymbidium plants to be grown should be healthy. Healthy plants should have multiple roots. The roots should be creamy white and strong. Leaves should be turgid, upright and dark green and slightly glossy. Seedlings of Cymbidium should possess good vigor which will reflect the future growth. Cymbidium seedling must be strong; strong robust plants are capable of surviving quite extreme conditions. Their growth and flowering will be much better and more assured when their relatively simple basic requirements are provided. Plants should be disease and pest free. Planting materials should always be procured from the reputed nurseries/producers to ensure quality and authentic materials preferably from restricted nurseries.

Hybrids

S. No.	Names	Stand./Inter/Pot	Early/Mid/Late
1.	Cym. Valley Freestyle No. 3	S	M
2.	Cym. Soul Hunt-1	S	M
3.	Cym. Soul Hunt-6	S	M
4.	Cym. Forest King	S	E
5.	Cym. Christmas Beauty	S	M
6.	Cym. September Sunset	S	L
7.	Cym. Oklahama Tetraploid	S	M

S. No.	Names	Stand./Inter/Pot	Early/Mid/Late
8.	Cym. Mini Moon Tiger	S	E
9.	Cym. Golden Girl	S	E
10.	Cym. Hawtescens	S	L
11.	Cym. Volya Craig Sutherland	S	L
12.	Cym. San Francisco 'Monalisa'	S	L
13.	Cym. 'Dos Pueblos'	S	L
14.	Cym. Takaragaike	S	L
15.	Cym. Miss Sanders	S	L
16.	Cym. Hallis Comet Aurora	S	L
17.	Cym. 'San Francisco Stephenson'	S	L
18.	Cym. Karnu Lada Khan	S	M
19.	Cym. Sayonara Blazing Gold	S	E
20.	Cym. Red Star	S	E
21.	Cym. Margret Thatcher Perfection	S	E
22.	Cym. Black Flame	S	M
23.	Cym. Levis Duke	S	M
24.	Cym. Red Beauty Carman	S	E
25.	Cym. Mint Ice Glacier	S	E
26.	Cym. Break Out Flame	S	M L
27.	Cym. Margaret Thatcher Diplomat	S	E
28.	Cym. Valley Chianti Wine	S	M L
29.	Cym. Valley Inspiration Crystal	S	M L
30.	Cym. Valley Zenith Concord	S	M
31.	Cym. Magic Kiwi Winner	S	M
32.	Cym. Valley Champion Gorgeous	S	E
33.	Cym. Valley Zenith Discus	S	M
34.	Cym. Pure Jungle Grown.	S	M
35.	Cym. Hot Stuff "Kiwi Supreme"	S	E
36.	Cym. Kiwi Mint "Val Hansen"	S	E
37.	Cym. Kiwi Mint "Celebration Lorna"	S	E-EM

S. No.	Names	Stand./Inter/Pot	Early/Mid/Late
38.	Cym. Beautiful Kiwi "Super Duper"	S	M
39.	Cym. Magic Kiwi "Sue"	S	E
40.	Cym. Magic Kiwi "Double Delight"	S	M
41.	Cym. Princess Molly "Gorgeous"	S	E
42.	Cym. Princess Molly "Magnif"	S	EM
43.	Cym. Kiwi Ende "Birgit"	S	M
44.	Cym. Ammes bury	I	L
45.	Cym. Burggnium Sydney	I	L
46.	Cym. Helly Comet Ourora	I	M
47.	Cym. Show Girl Cooks Bridge	I	M
48.	Cym. Golden Girl	I	E
49.	Cym. Platinum Bird	I	M
50.	Cym. Jungfrau 'Snow Queen'	I	M
51.	Cym. Prince Elizabeth	I	L
52.	Cym. Show Girl Milly minor	I	L
53.	Cym. Golden Elf	I	L
54.	Cym. Pine Clash Moon Venus	I	E
55.	Cym. 'Velvet Green'	I	L
56.	Cym. Norella Jennifer Gale	I	L
57.	Cym. Platinum Bird	I	L
58.	Cym. Red Imperial Red Tower	I	L
59.	Cym. Yankalilla	I	M
60.	Cym. Angela December Gold	I	M L
61.	Cym. Luna Pink Champion	I	M L
62.	Cym. Stanley Fouraker 'White Magic'	I	M
63.	Cym. Ice Case Cade	P	E
64.	Cym. Mini Sarah Jean	P	E

S: Standard, I: Intermediate and P: Potted

Site selection consideration

Selection of site and altitudinal location for Cymbidium cultivation is very much important as it reflects the production. Cymbidium grower should keep in mind that all hybrids will not flower at one location. Some hybrids will flower at higher altitude while some in lower altitude that means specific temperature coupled with light is required for blooming of specific hybrid. In addition to that when choosing a site for Cymbidium farming consider the following characteristics of an ideal location:

- Land cost and property taxes are affordable
- Level topography with good drainage
- Presence of natural wind break (trees or hill)
- Bright sunlight
- Night temperatures should not drop down below 7-8°C
- Low to moderate rainfall
- Good air movement
- Good quality water
- Proximity to utilities and road

The site should be sufficiently large to accommodate growing structures, storage, office, loading and parking areas.

Growing structure

Green house are rigid structures with transparent coverings of fiberglass, fiberglass reinforced plastic or polyethylene plastic film. The big advantage of greenhouse coverings is that they allow total protection from rain. Irrigation is done at the discretion of the grower. Green house protected plants from all sorts of weather damages for production of market worthy spikes. Covering results in significant reduction of pests and diseases. The benefits include healthier plants with higher yield and less money spent on chemicals and labour costs. Greenhouse with all sides open is suitable for Cymbidium cultivation. In mid hill situation (above 4500 ft), simple bamboo/wooden structure with UV stabilized polyethylene on the top is generally used with success. However, structure with steel pipe and top covered with double layered polycarbonate and encircled with

50 mesh iron net is suitable for *Cymbidium* cultivation. Green house fabricated with galvanized steel pipe and covered with polyethylene is most often used for *Cymbidium* cultivation. It is somewhat less expensive. *Cymbidium* can be grown in cost effective cooled green house with automation system of temperature, light, humidity and aeration. In India, the direction of house should be North-South to trap the maximum sun light; however, in hilly terrain it is always possible to maintain direction of houses. The central height of greenhouse for *Cymbidium* should be 5-6 m and side height at least 4 m in mid hill situation. The height will decrease with increase in altitude. Ventilation and air movement inside the structure will improve in taller structure.

Benches

The ideal bench is made of galvanized iron pipe galvanized iron mesh of 50 meshes to stand the weight of sufficient number of pots. The benches can be made up of concrete or split bamboo also. It is always wise to keep the pots on the benches to provide proper aeration, check the soil borne diseases and avoid slugs, snails, ants, and insect pests. Besides giving easier access to the plants, benches also provide additional ventilation and assist with drainage of pots. Height of the bench should not be more than 75 cm and breadth not more than 90 cm otherwise it will be inconvenient for cultural operations.

Pot

The main purpose of using pot is to hold the 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. A year old plant (15 cm size) should be planted in 10-12 cm size pot. Thereafter, it needs to be transferred in to 15 cm size pot. Smaller plants of less than 15 cm size must be planted in the community pots to check the mortality. Pots should be cleaned before using for planting.

Growing media

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. The growing media should be durable at least for three years and free from water-logging. A number of combinations are being 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. Using of charcoal, osmunda fibre and sphagnum moss are banned in some states. For selecting any media combination one should be cautious to see whether the potting mixture keeps the roots moist but not wet, even drying of the mix, keeping the roots cool and avoiding large air pockets in the mix.

A healthy growth growing media containing leaf mould, coconut husk, rotten logs, and brick bits (1:1:1:1) is found to be beneficial. Leaf mould can be avoided as it invites diseases. 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 mhos/cm is good for growth.



Preparation of growing 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 must be cut to smaller-sized pieces and mixed thoroughly before sterilization. Some media require soaking over night *e.g.*, coconut husk to leach out undesirable chemicals. If heat treatment is used all the media components should be sterilized separately as they require different periods of heating. In case of chemical treatment, the potting components need to be stirred thoroughly, wet with formaldehyde @ 20ml/l and kept covered with polythene sheet for at least 72 h in bright sunlight. After opening, sun drying is required for few hours to evaporate the obnoxious gasses.



Mixing of sterilized growing

Potting

The potting should be done during active growth phase *i.e.*, during April to June in our country or after flowering. 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.

Re-potting

Cymbidiums generally need to be repotted about every three years under normal conditions. If the old mix is broken down, the plant should be repotted as soon as possible to minimize root rot. 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. Pot-bound *Cymbidiums* will often be under watered which can reduce the vigor and blooming capability. 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 conditions. Usually, it is best to divide the over grown plants by breaking the rhizome between the pseudobulbs. When dividing and repotting, a division should have 3 or 4 green bulbs and perhaps one back bulb. 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 bricks chips are placed at the bottom of the clean pot to assist the extra drainage and then put a light cover of compost on that. The plant, then, should be placed centrally and then add 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 be compressed 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 one year regular interval. However, before getting tempted to divide a large plant one should be bear in minds that larger the plant the more flower to spikes. All potting tools, knives or shears and potting sticks should be sterilized after each plant to prevent the transmission of disease. Tools may be sterilized by soaking in rectified spirit or a saturated solution of tri-sodium phosphate (TSP) for a few minutes.

Following are the various steps of repotting:



1



2



3



4



5



6

Care after potting

After dividing and repotting, the plants should be placed in an area with shade higher than normal, and should be kept cool and slightly on the dry side for several weeks. 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 growth is evident. Direct available NPK (4:4:4) of organic source at 2-3/l should be sprayed weekly only after being assured of new root growth. Very strong feed should be avoided to protect the immature root from burning. Once the new roots establish themselves regular watering and feeding programme can be adopted depending on the growing condition and the potting mixture used. Immediately after repotting systemic organic fungicide @1g/l can be used to protect the plant from fungal attack.

Spacing

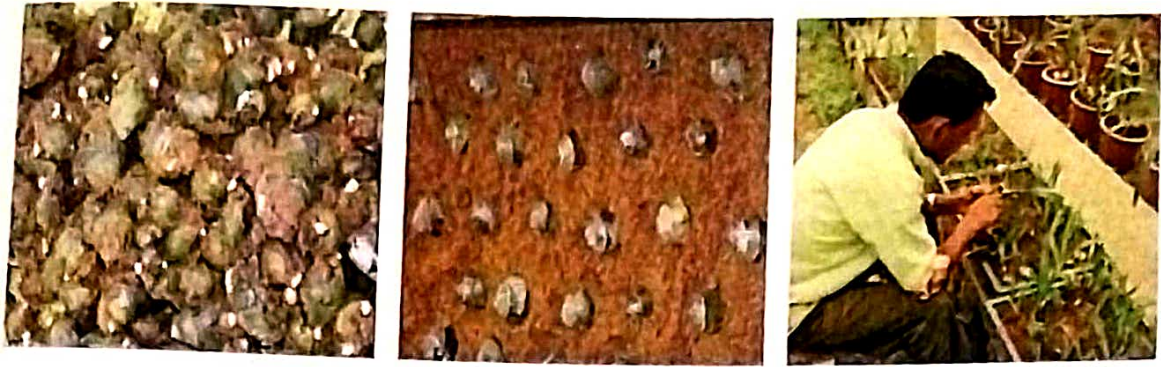
The plant density depends on the size of plant as well as pot. Keeping of same size pots together will ensure fair share of water, fertilizers and light. If pots are also kept in line with sufficient space it will facilitate watering, fertilizing, spraying and also air movement. At the initial stage of growth (1-1.5 year old), around 30 plants can be accommodated in a square meter area. The spacing will be wider as a plant grows and six to nine adult plants of 4-5 year age in 15 cm size pot can be accommodated. However, fully grown plants (7-8 year old) need more space for sufficient aeration and hardly three plants of standard type can be spaced in a square meter area. More plants can be accommodated in intermediate or miniature *Cymbidium*.

Propagation methods

Conventional: Cymbidiums are generally propagated by following conventional methods.

- 1. Division:** In this method large clump is divided into smaller units and can be used satisfactorily for Cymbidiums. There should be at least 8-12 pseudobulbs of odd size in the clump. The re-establishment will be quicker in case of bigger and healthy plants. Generally, after flowering, when the new shoots are healthy and roots are fresh, they should be separated with a clean knife without damaging the roots. The best season is May-June. After breaking keep the old leafless pseudobulbs separately. Dead roots should be trimmed out before treating the roots with fungicides. After repotting keep the plants in cool place for a period of 3-4 week in water stress to encourage new roots.
- 2. Back bulbs:** Back bulbs are selected for propagation from healthy mother plants. These back bulbs are collected while repotting of over grown plants. Back bulbs are cleaned by removing the dried leaf sheaths and roots. Back bulbs should be cleaned thoroughly in running water. After cleaning, bulbs need to be soaked for 10-15 minutes in organic fungicide solution. The back bulbs are then dried in shaded and airy place. The air-dried back bulbs require soaking for a period of 12 h. This will help in rooting of back bulbs. The treated back bulbs can be kept in sand, cocopeat or saw dust. New shoot and root will emerge within 30 to 45 days depending on the season.





Multiplication through Back-bulb

Micro propagation: Cymbidiums, the doyens among ornamentals are one of the few flowering plants of commercial value to be propagated *in vitro* both through seed and tissue culture. The modern methods of propagation have brought Cymbidium cultivation on par with other commercial crops. Mersitem propagation has been achieved to a commercially acceptable standard in Cymbidium and their hybrids, especially for virus-free plants. Plants produced by this method, when young are known as mericlones. The mericlones are used as the planting material for starting new plantations.



Mass multiplication through Tissue culture

Organic nutrient management

Cymbidiums are heavy feeders and like fertilizer to grow and bloom well. Many growers use high nitrogen fertilizer during the growing season (February to

August) and low nitrogen fertilizer during the blooming season and winter. Others get satisfactory results with balanced fertilizer all year long. Fertilizer is available in both water soluble and slow release forms. However, application of nutrition from organic source is age old practice. Organic matter is vitally important for the production of healthy plants as it provides carbon dioxide, increases the water holding capacity and aeration of the growing media, improves biological activities, increases fertility of growing media, allows root development and modify media temperature. Further, it slowly supplies all the nutrients required for the plants. Some organic manure e.g., neem cake acts against diseases and pests also.

Poultry manure consist 2.0-4.5 per cent N, 4.5-6.0 per cent P, 1.2-2.4 K per cent and majority micronutrients. During potting of *Cymbidium* seedling in 10-12 cm pot, application of dried poultry manure @ 10 g/pot as basal dose and weekly drenching of vermiculture wash (1:20) will help in growth and flowering of *Cymbidium*.

Organic manure comprised of mustard oil cake, dried fish and bone meal (8 kg: 0.5 kg: 4 kg) is also beneficial for *Cymbidium*. It contains 3.5 per cent N, 2.1 per cent P, 2.7 per cent K, 4.5 per cent Ca and 1.6 per cent Mg. The mixture was prepared by decomposing for 21 days in water followed by sun drying. 5 gm mixture of this organic manure at 6 monthly interval and weekly spraying of vermiculture wash is beneficial for 2-3 year old *Cymbidium*. The dose can be increased as the plant ages.

Water management

Irrigating the plants is the most difficult aspect of *Cymbidium* cultivation. It generally depends on the health of the plant, potting media, size and type of container and prevailing season. *Cymbidiums* like lot of water and prefer to be constantly moist, but not wet. On hot days, the plants benefit from overhead misting or sprinkling to lower the temperature and increase the humidity in the growing area. Irrigation should be done in the morning to wet the media thoroughly, which will supply water vapour for a longer period. Watering can also leach out excess salts and other harmful chemicals. During 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 two times weekly irrigation during this period are sufficient to maintain the growth. During 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. The moisture in the pot can be judged by poking a finger in to the compost and it can be easily understood whether media is dry or moist. Growing media should be completely wet down till excess water comes out from drainage holes. Watering should leach out the fertilizer salts that accumulate in the bottom of the pot. The accumulated salts damage the tender young roots. Root loss and bulb shriveling are caused more by over watering. Allowing of plants to dry out completely will cause sealing of root tips. Watering should be done always in the morning hours for complete drying of plants. The pH of water needs to be maintained between 5.5-6.5.

Weed management

Like other cultivated crops, *Cymbidium* also associated with several weed floras. These weeds not only extract nutrient from the growing media but also affect the growth of the plant. It is mainly due to orchid-weed competition for nutrients and free environment for growth. As the *Cymbidiums* are cultivated in pots with mixtures of coco pit, leaf mould, charcoal, brick pieces and the plants are re-potted with a mixture of new growing media in every third year; weeds are automatically eliminated and no special attention is given to weed management by either commercial or a mature orchid growers. However, growth of the *Cymbidium* plants is affected by severely grown or over crowded weed population in many instances. The weed spread through seeds or suckers along with potting media and air-borne light weight seeds. Weeds can be controlled manually by picking through hand and single tooth fork.

Table 1: Weed flora associated with *Cymbidium*s of Sikkim hills

Common Name	Botanical Name	Family	Annual/perennial	Mode of Spread
Wood Sorrel	<i>Oxalis corniculata</i> , <i>O. latifolia</i> and <i>O. stricta</i>	Oxalidaceae	Annual	Seeds
Creeping Wood Sorrel	<i>Oxalis acetosella</i>	Oxalidaceae	Annual	Seeds
Bitter Cress	<i>Cardamine hirsuta</i>	Brassicaceae	Annual or biennial	Seeds
Marsh cudweed	<i>Gnaphalium uliginosum</i>	Composite	Annual	Seeds
Wood cudweed	<i>Gnaphalium sylvaticum</i>	Composite	Annual	Seeds
Common Chickweed	<i>Stellaria media</i>	Caryophyllaceae	Annual	Seeds
Milk Witch	<i>Taraxacum officinale</i>	Asteraceae	Perennial	Seeds
Broad leaved plantain	<i>Plantago major</i>	Plantaginaceae	Evergreen perennial	Seeds
Pearlwort	<i>Sagina procumbens</i>	Caryophyllaceae	Perennial	Seeds
Hawksbeard	<i>Crepis biennis</i>	Composite	Perennial	Seeds
Black Nightshade	<i>Solanum nigrum</i>	Solanaceae	Annual	Seeds
Field Milkthistle	<i>Sonchus arvensis</i>	Composite	Perennial	Seeds
Pig weed	<i>Chenopodium album</i>	Chenopodiaceae	Annual	Seeds
Pennywort	<i>Hydrocotyle asiatica</i>	Apiaceae	Perennial	Seeds and Rootstock

Staking

Cymbidium spikes need to be trained as soon as they appear. A cane or bamboo split should be inserted behind the spike and into the growing media. Care should be taken to avoid any root injury. Once the spike has reached about 30 cm 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.

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 in the subsequent harvests. The spiking and number of flower per spike will vary depending on the species and hybrid and growing conditions. The spikes need to cut at the base of the stalk. The cut surface should be smooth and never be crushed. Sharp knife or secateurs is required to be sterilized repeatedly with spirit solution or liquid soap to avoid transmission of viral diseases after harvesting each plant. This will minimize the spread of virus disease between plants.



Flowers ready for Harvesting

Post-harvest management

Post-harvest operation

The harvested spikes need to be dipped immediately about 10 cm in a bucket of clean water till they are packed. The bucket should be cleaned thoroughly with liquid disinfectant. The water in the bucket should be replaced daily. In order to improve the quality of flower spike and vase-life pulsing with sugar (2-4 per cent) is given to the cut spike.

Care of flowers: If a viral disease is infected anywhere in the field, it is suggested to discard the plant and flower. If harvested by knife, it should be disinfected otherwise disease will spread through the knife. The knife can be disinfected by spirit lamp. If good sanitation and pest management have been practiced, it should not be necessary to disinfect always after each plant harvest.

If flowers have dust particle on them, rinsing with small amount of detergent is required to clean the flowers. Spike of flowers should be dipped in to a bucket of water keeping the cut end above the water. Then place the flowers in buckets of clean water and allow the flower to dry before packing.

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 since such cool stores are not necessary. However, if cool store is provided then the temperature should not be below 10°C, otherwise flower injury may occur.

The flowers should be checked before they are 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 the stem has water supply during transport. Instead of small water tube, cotton wrapping also serves the purpose. In this case, a piece of cotton needs to be soaked in water. After squeezing, cotton is to be wrapped all around the spike base. Then a piece of polythene is tied with rubber band. In order to check movement of spike within the box during transit, the base of the spikes may be tied to the base of carton by adhesive tape. The

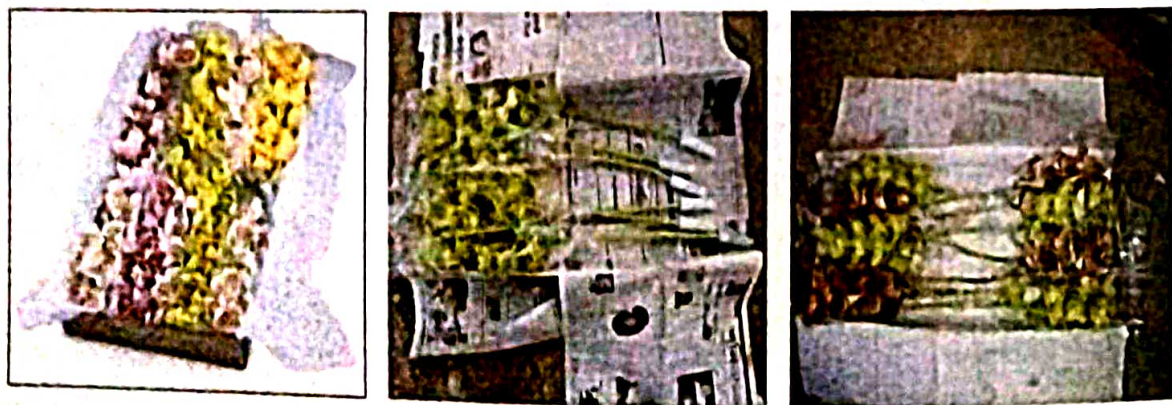


Fig: Packaging of *Cymbidium* cut flowers

spikes are usually packed in cartons or boxes. The size of carton depends on the length of the spike. The carton is provided with sufficient number of holes for aeration.

Diseases

a. Fungal diseases

1. Black rot (*Phytophthora palmivora*, *Phytophthora parasitica*, *Pythium ultimum* and *Pythium splendens*)

Symptoms

- The disease first appears as water soaked small brown spot on the aerial parts of plants, which quickly turn black.
- In moist weather the brown coloured spots/patches are soft but become dry and brittle in dry weather.
- The pseudobulbs and roots may sometimes become discolored with black necrotic lesions which may later spread upward resulting in complete defoliation of the plant.
- These pathogens also cause damping-off in seedlings.
- Leaf lesions caused by *Phytophthora palmivora* are usually irregular in shape, olive green to brown coloured with dark green water-soaked borders.



Black Rot of Cymbidium

Spread

- The pathogens spread through contaminated potting media or through water splash from adjacent infected plants or irrigation water.

Epidemiology

- High humidity and high temperature conditions favour rapid spread of the disease.
- Over-crowding of plants and poor air circulation are also favorable for the disease.

Management

- Diseased leaves, pseudobulb and if required whole plants should be removed and destroyed.
- Excessive watering and crowding of plants should be avoided.
- Use of contaminated pots and potting media are to be avoided.
- As soon as the symptoms are noticed the infected plants should be removed from rest of the population and treat the plant with biological agent like *Bacillus subtilis* or *Trichoderma viride/harzianum* or *Burkholderia cepacia* @ 2g/pot at monthly interval is effective against black rot.

2. Anthracnose (*Colletotrichum gloeosporioides* Telomorph (Perfect stage): *Glomerella cingulata*)

Symptoms

- Leaves are mostly infected but disease can occur on any aerial part(s) of the plants. Initial symptom appears as small oblong to circular oval, sunken and reddish brown to dark brown or grey coloured spots.
- On the spots black raised dots are found with target board appearance.
- Die-back of leaves are also observed if the leaf tip is attacked.
- The disease also infects floral spikes and leaf sheaths.



Anthracnose of *Cymbidium*

Epidemiology

- Damaged plants or weak plants suffering from poor growing or nutritional status are often attacked.
- Excessive fertilizing with nitrogen also makes the plants susceptible to the disease.
- The disease appears in epidemic form during rainy season.
- The disease spreads through air-borne spores and rain splash.

Management

- Eradication of all diseased organs or plant parts by burning before spraying with fungicides.
- Avoidance of plants' over exposure to direct sunlight is also recommended because sun burn may also predispose plants to infection.
- Maintenance of proper growing condition with adequate nutrition should be done.
- Spraying or drenching of *Trichoderma viride* / *harzianum* 2g/pot may be effective to control the disease.

3. Blossom blight/Petal blight (*Botrytis cinerea*)

Symptoms

- It is the most common disease of orchid flowers. The most prominent symptoms are water-soaked lesions and dense grey mold growing on infected tissues.
- The disease first appears as numerous small dark spots on petals, especially on older flowers.
- Sometimes shot hole effect is found in infected flower petals.
- The fungus also causes top leaf blight when new young leaves start to emerge.

Spread

- Spores of *Botrytis cinerea* easily get detached from the infected portion of flower by wind and disseminated by air-borne spores or rain splashes.

Epidemiology

- The disease favours cool and damp conditions.
- *Botrytis* sporulates heavily on dead and diseased flower.

Management

- Proper sanitation is a sound cultural practice.
- Removal and destruction of diseased plant parts and old flowers from flower spike are also advised.
- Application of biological agent like *Candida oleophila* I-182 or *Trichoderma harzianum* or *Streptomyces griseoviridis* K61 @ 2g/pot at monthly interval is effective against grey mould.

4. *Cymbidium* pseudobulb rot/Root rot (*Pythium* and *Fusarium*)

Symptoms

- The pseudobulbs/bulbs of infected plants become dark brown to black in colour and the rot also extends up to the leaves.

- In the later stage of infection the entire pseudobulb tissues get rotten.
- Chlorosis on leaf bases and root rot has also been noticed.



Cymbidium Pseudobulb Rot

Epidemiology

- Poor aeration.
- Low light intensity in the growing area.
- High and continuous rainfall.
- Temperature from 24.5 to 26.0°C.
- High density planting and poor aeration.

Management

- Ensure proper aeration in the polyhouse.
- Ensure proper design of polyhouse with appropriate height for proper entry of enough sunlight and free flow of fresh air over the crop canopy.
- During monsoon avoid excessive watering.
- Maintenance of proper drainage.
- Disinfection of potting mixture.
- Application of *Bacillus subtilis* MB 1600 or *Burkholderia cepacia* or *Trichoderma viride* or *Trichoderma harzianum* 2g/pot at monthly interval

and organic Bordeaux mixture 2g/pot during rainy season are effective to control the disease.

5. Wilt/Basal rot (*Sclerotium rolfsii*)

Symptoms

- The affected plants turn yellow and rot and eventually become brown and dry.
- Rapid collapse and rotting of roots and stems/pseudobulb also occurs as the infection advances upward and downward.
- Leaf base turn yellow and defoliated.
- Mycelial webs with numerous small white, later black sclerotia are usually encountered on the infected organs.

Spread

- The pathogen spreads through infected leaf mould or potting medium.

Epidemiology

- The disease favours 26-29°C temperature and relative humidity from 65-78 per cent.
- Mainly occurs during June-August.

Management

- Removal of the disease plants from the lots.
- Sterilization of potting mixture and leaf mould by heating, and re-potting of the plant with fresh sterilize potting mixture after fungicidal treatment of the plant.
- Application of *Coniothyrium minitans* or *Trichoderma harzianum* 2g/pot at monthly interval and organic Bordeaux mixture 2g/pot during rainy season are effective to control the disease.

b. Bacterial diseases

Soft Rot (*Erwinia carotovora* pv. *Carotovora* and *Erwinia chrysanthemi*)

Symptoms

- Deep greyish green lesions are first noticeable symptom on the leaves.
- It causes leaf spot; leaf soft rot and finally stem rot with foul/fishy smell.
- Progressive rot of pseudobulbs and bulbs leads to soft, shriveled and burnt like appearance to them.



Bacterial Soft Rot of *Cymbidium*

Spread

- Spread through rain splash and / or irrigation water.

Management

- Use of disease free planting materials.
- Destruction of diseased plants and maintain with careful sanitation
- Use of sterilized potting mixture.
- Spraying of *Pseudomonas fluorescens* @ 0.5ml/l is effective to control the disease.

C. Virus diseases

1. *Cymbidium* mosaic virus (CymMV)

Symptoms

- The virus produces symptoms like mosaic, necrosis, chlorotic flecks, water-soaked lesions and flower necrosis on different orchid hosts.
- It infects almost all species and hybrids.
- In *Cymbidium*, mild chlorotic mosaic or blotches occur on newly emerged leaves about 18-25 days after infection, which later turn black and necrotic.
- CymMV infection makes plant stunted. The spots sometimes appear in concentric rings with few spots breaking through to the dorsal leaf surface.



Cymbidium Mosaic Virus (CymMV)

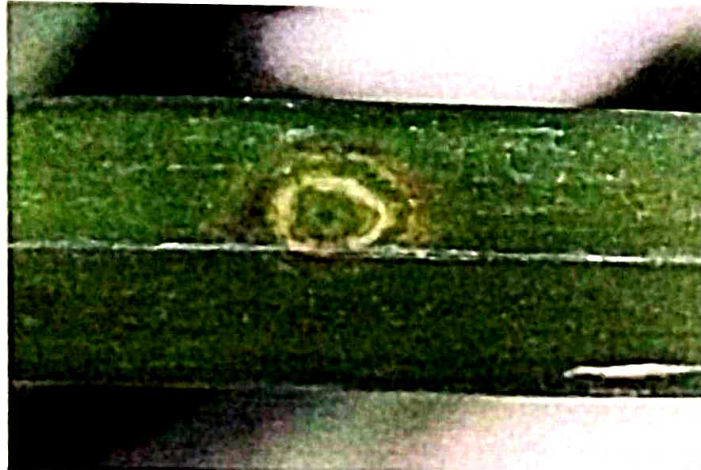
Transmission

- The virus is transmitted by only mechanical means like secateurs and scissors which are generally used to cut leaves or flower spikes.

2. *Odontoglossum* ringspot virus

Symptoms

- The virus produces diamond mottle on *Cymbidium*.
- It produces colour breaking, chlorotic streaking, mosaic and necrosis.
- The virus particles are rod shaped, not enveloped, straight having model length about 300 nm and 18 nm width.



Odontoglossum Ringspot Virus

Transmission

- This virus is also transmitted only by mechanical means.
- The virus is readily transmitted through knives or implements used during cutting, separation of bulbs and harvesting of flowers.
- The virus is highly stable and contagious and easily spread by touching.

Management

- Use of disease-free planting material from reputed sources.
- Destruction of diseased plants and maintain with careful sanitation.
- Use of sterilized potting mixture.
- Use of sterilized garden tools and always sterilized with a mixture of 2 per cent sodium hydroxide and 2 per cent formalin solution for cutting of leaves and spike from each plant.

Insects

1. Red spider mite (*Tetranychus urticae*)

Symptoms

- Nymph as well as adult feed on undersurface of leaves and flowers by sucking the cell sap from epidermal layer, especially along with midrib and the base.
- The loss of cell sap causes yellowing of leaves.
- The injuries due to feeding can be seen as silvery marks left on both the surface of leaves which usually turn brown or black after a period of time.
- In severe infestation, plants covered with webbing which help the insect to move from one plant to another plant.
- The infestation causes weaker plants, stunting, defoliation, under developed bud and abortion of flowers.



Red Spider Mite

Management

- Removal of the infested plant parts (leaves/flowers) and destroying them will reduce the further multiplication of mite.
- Clean cultivation, proper ventilation and application of balanced fertilizers and judicious irrigation will curtail the mite population.
- Sprays of Artemisia or Tobacco leaves extract (1:10), repellent reduce the population.
- In case of severe infestation, immediately spray the plants with plain water twice a day will reduce the mite population.
- Spraying of neem oil 0.03 EC (Azadirachtin) 5 ml/l or *Verticillium lecanii* @ 0.5ml/l or *Paecilomyces fumososeus* @ 0.5ml/l at weekly interval will reduce the mite population.

2. Scale insects: Ti scale (*Pinnaspis buxi*), Florida red scale (*Chrysomphalus aonidum*), Lecanium scale (*Lecanium* spp.), Soft brown scale (*Coccus hesperidum*), Boisduval scale (*Diaspis boisduvali*)

Symptoms

- All the five species of scale insects suck the juice from leaves, petioles, pseudobulbs, flowers and cause loss of vigor and deformation of infested plants.
- Heavy scale infestations, however, can reduce overall plant health and cause yellow leaves, leaf drop and stunted new growth.
- Some of the scale insect secretes sticky honeydew which attracts sooty mould and dust particles that are difficult to remove.



Ti Scale Insects

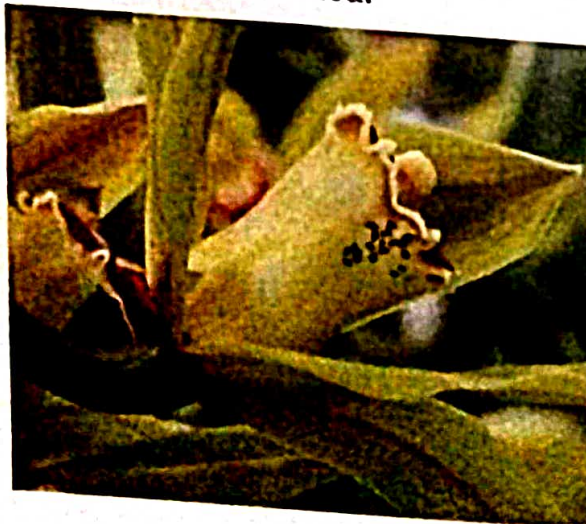
Management

- Cleanliness and regular care is necessary.
- Prompt pruning and burning of infested part reduces further spread, isolate infested plants from others to prevent the scales from moving one plant to another.
- Scales can be removed by rubbing the scurf encrustation with toothbrush or cotton swab dipped in 70 per cent Isopropyl alcohol or spirit.
- If scales infestation is found on root, re-potting should be done to eradicate harboring eggs and crawlers and after gentle cleaning, roots should be sprayed with neem oil 0.03 EC (Azadirachtin) 5 ml/l or drenching with *Metarrhizium anisopliae* @ 0.5ml/l at 15 days interval are effective.

3. Black aphid (*Toxoptera aurantii*)

Symptoms

- Both the nymphs and adults suck the cell sap usually from spikes, buds and flowers.
- Small, irregular shaped spots appear on the petals and sepals.
- Aphids also excrete honeydew on which sooty mould developed that affect the photosynthesis. High humidity and cloudy weather hasten the population buildup.
- The affected plants become retarded.



Black Aphid

Management

- Sprays of Artemisia or Tobacco or Datura leaves extract (1:10), repellent, reduce the population.
- Initially spray the plants with tobacco leaf extract (10 ml/l) or neem oil 0.03 EC (Azadirachtin) @ 5 ml/l or Servo Agrospray @ 6 ml/l water to reduce the aphid population.
- Application of *Beauveria bassiana* @ 0.5ml/l at weekly interval is effective to control the aphids.

4. Thrips (*Dichromothrips nakahari*)

Symptoms

- Both nymphs as well as adults suck the cell sap from tender portion of plants.
- Leaves of become curled, wrinkled and discoloured.
- Severe infestation causes malformation of leaves, buds and flowers.
- Plants become stunted and may finally dry up.



Thrips

Management

- Immediately remove the infested plant parts or whole plant (if required) and destroy them to reduce the incidence.

- Sprays of Artemisia or Tobacco or Datura leaves extract (1:10) act as repellent and reduce the population.
- Application of neem oil 0.03 EC Azadirachtin @ 5 ml/l or *Beauveria bassiana* @ 0.5ml/l at weekly interval is effective to control the pest population.

5. Mealy bug (*Pseudococcus* spp.)

Symptoms

- Both young and adult stage suck the cell sap from the leaves and petioles or any jointed portion of plants as a result plants become weakened.
- They also secrete honeydew that attracts ants.
- In case of severe infestation sooty mould develop on infested plants parts.



Mealybug

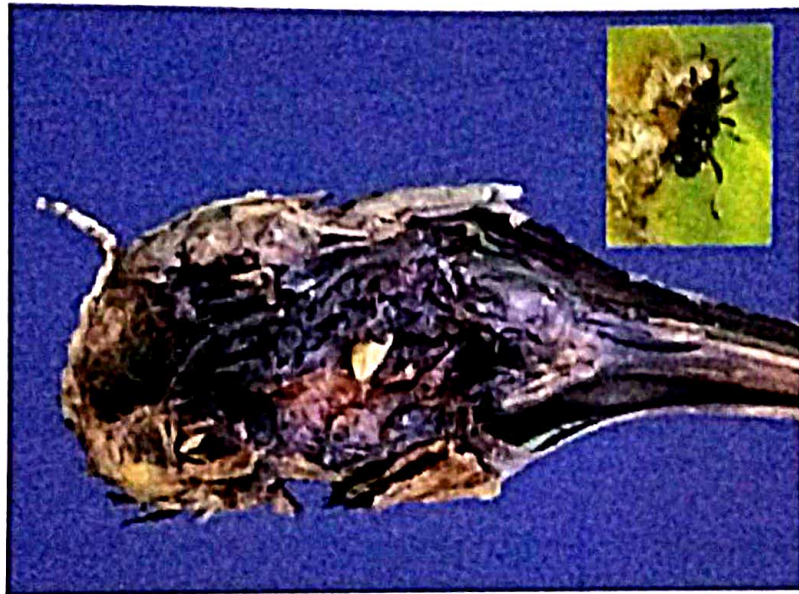
Management

- Removal and destruction of infested plant parts is one of the cultural methods to reduce the population of mealy bug.
- Further proper spacing also helps in reduction of pest infestation.

6. Black weevil (*Sipalinus* spp.)

Symptoms

- The newly born larvae feed on young leaves, exudates come out from the puncture on which *Fusarium* fungus develop.
- Fungus helps in diseasing adjacent portion.
- The larvae enter into the shoot and thereafter, feed on pseudobulbs resulting rotting of pseudobulbs and thereby further growth is arrested.



Black Weevil

Management

- Collection and destruction of adult weevil is a common cultural practice to control the population.
- Spraying of neem oil 0.03 EC (Azadirachtin) @ 5 ml/l or Pongamia oil 1.5ml/l is effective to further spread of weevil.

7. Grasshopper (*Hieroglyphus banian fabricius*)

Symptoms

- Grasshoppers are polyphagous in nature.
- The greatest amount of damage is caused during rainy season (August-

September) when nymphs and adults feed on foliage of grasses before attacking the main crop (*Cymbidium*).

- They feed on young leaves, un-opened flower buds and flowers by cutting them in irregular shape with their biting and chewing type of mouth parts and ultimately flower quality gets affected.



Grasshopper

Management

- Field sanitation should be done to maintain the grass hoppers population below economic threshold level.
- Removal of weeds from the surroundings reduces the attack of grass hoppers.
- Hand picking of nymphs and adults with the help of insect collecting net and kill them by putting in kerosene to reduce the population.

8. Nematode (*Helicotylenchus microcephalus* Sher.)

Symptoms

- Severe necrosis and swelling on roots.
- Infected plants have fluffy root system.
- The leaves of infected plants were showing bending, twisting and unusual enlargement.



Nematode infested roots of *Cymbidium*

Management

- Control of plant-parasitic nematodes is achieved with nematode-free planting material, cultural practices that limit spread, and the application of Nematicide like *Verticillium lecanii* @ 0.5ml/l is quite effective to control the nematode.
- The use of tissue cultured propagation material followed by planting in sterile media effectively controls nematode damage.
- Hot water treatment of propagative material has eliminated plant-parasitic nematodes from many plant species.
- Mustard oil cake, neem oil cake can be incorporated with the media.

Period of works

The scientific studies related to production of *Cymbidium* were performed during 1998 to 2015.

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Cost of Cultivation for growing Cymbidium organically for cut flower production

Unit Size: 500 sq. m.

Hybrid: Mint Ice Glacier

Item	Quantity	Rate(Rs)	Amount(Lakh)	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th
Plants	1800nos	100/plant	1.80										1.80
Pots (Nursery bag)	2000nos	1000/1000	0.02										0.12
(i) 22x 10x8cm													
(ii) 25x 13x10cm													
(iii) 30x15x15cm	2000nos	2000/1000	0.04										
Potting mixture	2000nos	3000/1000								0.06			
(i) Coco-chips	700kg	30/kg	0.03								0.12		
(ii)Coco-peat	350kg	40/kg	0.05								0.04		0.35
Organic nutrients(Mustard Oil Cake, Neem Cake, Poultry manure, Vermi wash etc.)	10t	7000/ton	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.08	0.10	0.12
													0.70

Organic PP Chemicals																				
(i) Fungicides																				
15kg	1000/Kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.35	
(ii) Insecticides																				
20l	1000/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
Labour Charges	1	6000/Mth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	1.08	1.08	1.08	1.08	1.08	1.08	1.08	9.0	
Electricity	10yr	500/yr	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	
Irrigation	1000/yr	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.10	
Post Harvest																				
(i) Packing																				
100/Pkt												0.02	0.03	0.10	0.30	0.40	0.40	0.40	1.55	
(ii) Transportation																				
3000-5000/yr												0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	
Repairing & Maintenance	5000/yr											0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.35	
Total												2.695	0.795	0.945	0.855	0.915	1.325	1.645	1.775	14.37

A. Recurring

Item	Quantity	Rate(Rs)	Amount(Lakh)										Total(L)
year			1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	
Greenhouse	1	1600/m ²	8.0										8.0
Land development	600m ²	250/m ²	1.50										1.50
Irrigation system	500m ²	150/m ²	0.50					0.25					0.75
Benches (Bamboo) Size: (3.3 x1x0.75m)	150nos	1000/pc	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10	0.10	0.10	1.50
Sprayer	2	6000/nos	0.06				0.06						0.12
Implements (Secateurs, trowels etc)			0.02				0.03						0.05
Any other items (Staking)	5000	50/each					0.25						0.25
Miscellaneous			0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.20
Total			10.20	0.12	0.12	0.12	0.46	0.77	0.22	0.12	0.12	0.12	12.37

B. Non- Recurring (Capital)

YEAR WISE TOTAL EXPENDITURE: (Rs. In Lakhs)

Item	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Non-recurring (Capital)	10.20	0.120	0.120	0.120	0.460	0.770	0.220	0.120	0.120	0.120	12.37
Recurring	2.695	0.795	0.945	0.855	0.915	1.325	1.645	1.645	1.775	1.775	14.37
Total	12.895	0.915	1.065	0.975	1.375	2.095	1.865	1.765	1.895	1.895	26.74


PRODUCTION AND SALE

Item	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
No. of spikes/ plant	-	-	-	0.75	1	1.25	2	3	3	4	
Total production				1125	1500	1875	3000	4500	4500	6000	22,500
Price (Rs/spike)				150	150	200	200	200	200	200	
Total gross income (Lakh Rs)				1.687	2.25	3.75	6.00	9.00	9.00	12.00	43.687
Expenditure	12.895	0.915	1.065	0.975	1.375	2.095	1.865	1.765	1.895	1.895	26.740
Net profit (Lakh Rs)	-12.895	-0.915	-1.065	0.712	0.875	1.655	4.135	7.235	7.105	10.105	16.947

TOTAL EXPENDITURE AT THE END OF 10TH YEAR: Rs. 26.74L

GROSS INCOME AT THE END OF 10TH YEAR: Rs.43.687L

NET PROFIT AT THE END OF 10TH YEAR: Rs. 16.947L



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