

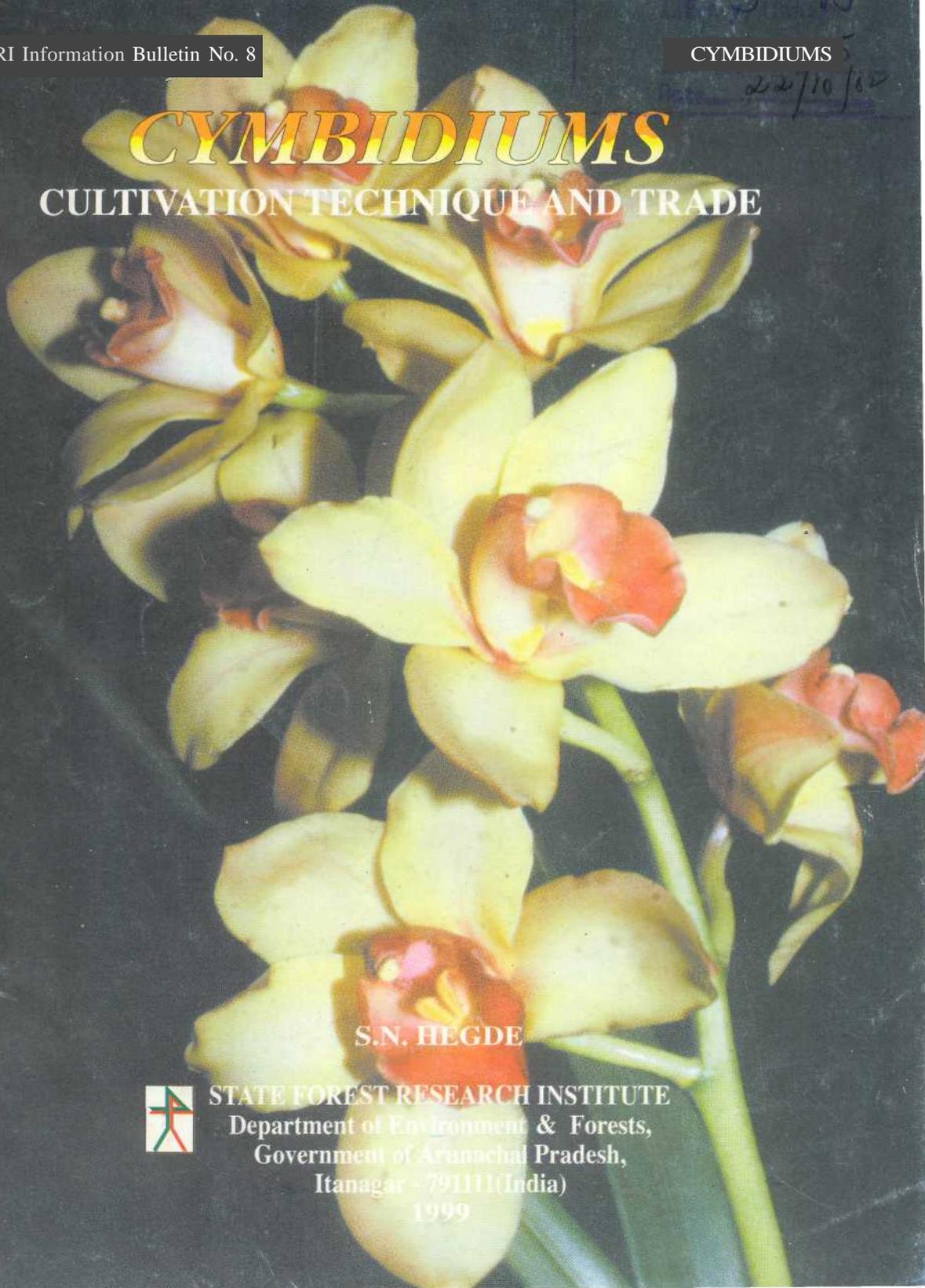
SFRI Information Bulletin No. 8

CYMBIDIUMS

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CYMBIDIUMS

CULTIVATION TECHNIQUE AND TRADE



S.N. HEGDE



STATE FOREST RESEARCH INSTITUTE
Department of Environment & Forests,
Government of Arunachal Pradesh,
Itanagar - 791111(India)
1999



Captions of the Photographs printed in :-

1. Front Cover — Cymbidium - "Valya", Craig "Sunset"
2. 2nd Cover — A view of the Orchid Farm at Hapoli.
3. 3rd Cover — Cymbidium - Showgirl "Cooks-bridge"
4. Back Cover — Cymbidium - "Red Heather".

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CYMBIDIUMS :
CULTIVATION TECHNIQUE AND TRADE

By

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Under the project support of
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State Forest Research Institute, Department of Environment &
Forests, Government of Arunachal Pradesh, Itanagar
1999

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FOREWORD

Arunachal Pradesh abounds with large number of species of orchids in almost all types of forests throughout the state. According to the recent survey, there are as many as 601 species in about 129 genera in Arunachal Pradesh which is the largest number for any state in India. Amongst the orchids as many as 150 species are ornamental and commercially important. Out of them, the genus *Cymbidium* commands special place both in terms of rich occurrence, as well as the export potential that it has.

Realizing its importance, the Orchid Division of the SFRI has been carrying out detailed survey and studies including conservation, cultivation, propagation — both *in vitro* and *in vivo*, breeding and farming technology for the past one decade and has successfully been able to demonstrate the cultivation technique and trade by involving some local entrepreneurs. This small booklet gives the details of the technique of cultivation of *Cymbidiums* with illustrations and enlightens how an eco-friendly trade could be developed in this hilly state as an alternative source of income in the jhum and wastelands of the local people. I am sure, the farmers, entrepreneurs and educated unemployed youths of the state would immensely be benefited by this information bulletin "***Cymbidiums* : cultivation technique and trade**" by Dr. S. N. Hegde, brought out by the State Forest Research Institute, Itanagar and would pave a way for the development of floriculture industry in Arunachal Pradesh.

29-08-1999
ITANAGAR

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CYMBIDIUMS :

CULTIVATION TECHNIQUE AND TRADE

Introduction

Arunachal Pradesh has more than 600 species of orchids occurring in various forest types and hence this state can rightly be called the "Orchid Paradise" of our country. Many of these orchids are rare, endangered and highly ornamental with long-lasting flower qualities. Among them, the genus *Cymbidium* Sw. is an important group distributed widely from the North West Himalayas passing through Arunachal Pradesh, Bhutan, China, Japan, Malaysia and extending upto northern Australia. There are about 44 species spread over these countries, with maximum concentration in the North Eastern region- especially Arunachal Pradesh with about 21 species. This very fact indicates the suitability of agroclimate for growing Cymbidiums in a profitable manner in Arunachal Pradesh.

Cultivation of Cymbidiums has been in practice in China for over 2500 years and is even today considered as a symbol of royalty. With the advent of hybridization in Europe in the later part of nineteenth century based on the Himalayan species, number of novel hybrids of commerce have been produced with long lasting, large-sized and brilliantly coloured and textured flowers, paving a way for the development of cut-flower trade world over. Today, Cymbidium cut-flowers are the most in demand and highly priced in the domestic and export markets ranging from Rs. 15 to 150 per stem depending upon the quality of flowers. For instance, U.K. imports + 2 million orchid cut-flowers annually, 80% of which are Cymbidiums. In 1985, France imported Ef 42.5 million Cymbidium cut-flowers and Dutch imported 94 million Guilders worth of Cymbidium cut-flowers. In the Dutch auctions, Cymbidiums fetch an average of \$ 3.42 per stem. Thus, there is a craze for growing Cymbidiums both hybrids and species in the sub-tropical and temperate regions of the world.

Native Species :

Arunachal Pradesh harbours largest number of Cymbidiums with about 21 species (including three species of *Cyperorchis*) occurring in varying climatic conditions such as :

- I. Tropical Climate (warm and humid Foot-hill areas upto 900m MSL).
- II. Sub-tropical climate (cool and humid, hills beyond 900m upto 1800m MSL)
- III. Temperate climate (beyond 1800m MSL experiencing snow/frost)

Table - 1 below provides details of species with habitat climate and status of various species found in Arunachal Pradesh.

Table 1 : Name of the species with habitat-climate and status

Sl. No.	Name of the species	Habitat-climate	Status
1.	<i>Cymbidium aloifolium</i> (L.) Sw.	Tropical	C
2.	<i>C. bicolor</i> Lindl.	Tropical	C
3.	<i>C. cyperifolium</i> Wall ex Lindl.	Sub-tropical	C,R
4.	<i>C. dayanum</i> Rchb.f.	Tropical	C
5.	<i>C. devonianum</i> Paxt.	Sub-tropical	C, R
6.	<i>C. eburneum</i> Lindl.	Sub-tropical	R, C
7.	<i>C. ensifolium</i> (L.) Sw.	Tropical	C
8.	<i>C. gammieanum</i> K. & P.	Sub-tropical	R
9.	<i>C. goeringii</i> (Rchb.f.) Rchb. f.	Sub-tropical to temperate	R
10.	<i>C. hookerianum</i> Rchb.f.	Temperate	R, C
11.	<i>C. iridioides</i> D. Don	Sub-tropical	R, C
12.	<i>C. lancifolium</i> Hook.	Sub-tropical	C
13.	<i>C. longifolium</i> D. Don	Sub-tropical	R, C
14.	<i>C. lowianum</i> (Rchb.f.) Rchb.f.	Sub-tropical to temperate	R, C
15.	<i>C. macrorhizon</i> Lindl.	Sub-tropical	R
16.	<i>C. munronianum</i> K. & P.	Tropical	R, C
17.	<i>C. eburneum</i> var. <i>parishii</i> Hook. f.	Sub-tropical to temperate	R
18.	<i>C. sinense</i> (Jack ex Andr.) Willd.	Sub-tropical to temperate	C
19.	<i>Cyperorchis cochleare</i> Benth.	Sub-tropical	C,R
20.	<i>C. elegans</i> (Lindl.) Bl.	Sub-tropical	C
21.	<i>C. mastersii</i> (Griff. ex Lindl.) Benth.	Sub-tropical	C,R

C=Cultivated, R=Rare and endangered,

The species of the genus *Cymbidium* are mostly epiphytic in nature growing on tree-trunks or rocky slopes. However, species like *C. cyperifolium*, *C. ensifolium*, *C. goeringii* and *C. macrorhizon* grow in humus rich porous soil. The latter, *macrorhizon*

however is a saprophyte. Further survey and search might unravel other species of the genus hitherto not recorded in Arunachal Pradesh.

These species are progenitors of number of modern day hybrids and it is worthwhile cultivating these species for breeding and improvement.

Hybrids: Cymbidium hybridization was recorded in the later part of nineteenth century between *C. lowianum* and *C. eburneum* in England. However, subsequently extensive breeding and cultivation seems to have taken place in Australia, Japan and then in New Zealand. Today, primary hybrids are no more in vogue and complex hybrids have taken precedence with unpredictable progeny characteristics especially in colours ranging from white, cream, yellow, bronze, green, gold or pink. There are many thousands of Cymbidium hybrids produced in the world today revolutionizing the cut-flower trade.

In India, some fifty different clones of Cymbidiums are available now in Sikkim, Darjeeling and Kalimpong. About 15 different clones have also been introduced in Arunachal Pradesh by the Orchid Division of the State Forest Research Institute, Itanagar maintained at Sessa, Dirrang and Itanagar. Recently, Nana-Koo Orchid Farm, Hapoli (Ziro), Lower Subansiri District in Arunachal Pradesh has also been registered for trade in orchid plants and cut-flowers where seedlings and back bulbs of *cymbidium* hybrids are available. Some of the important clones are.

I. White:

- | | |
|----------------------------|------------|
| 1. Jungfrau 'Dos Peublos' | 2. Camalex |
| 3. Show-girl "Cooksbridge" | |

II. Pink:

- | | |
|---------------------------|---------------------------|
| 4. Orkney "Pink Heather" | 5. Haley's Comet "Aurora" |
| 6. Rievaulx "Cooksbridge" | 7. Dream Valley "Gemini" |
| 8. Rotorua "Rose" | |

III. Yellow:

- | | |
|--------------------------------|----------------|
| 9. Angelica 'December gold' | 10. Hawtescens |
| 11. Highland sunset 'Plumpton' | |

IV. Green:

- | |
|---------------------------------|
| 12. Joyee Duncan 'Susan Hughes' |
| 13. Valley Zenith "Top spot" |
| 14. Amesbury "Frank slattery" |

Of course, there are many other latest hybrids produced elsewhere in the world which need to be introduced in Arunachal for improving our genetic stock. Some of the

top selling commercial large and bright coloured cymbidiums in the Dutch Auction are : Golden Fleece, Meike, No. 60, Nederhorst, Molly, Cascade, etc.

Morphological Features :

Cymbidiums are epiphytic herbs, (fig. 1) sometimes lithophytic or terrestrials. They bear thick cluster of spongy roots at the base. The stem is short, swollen, pseudobulbous and in closely set clusters. These clusters can be vegetatively propagated by separating them. Each pseudobulb is sheathed with 2-4 long leathery leaves which are grass-like. Inflorescence or flower spike is produced at the base of the pseudobulb bearing one to several flowers. They may be erect, arcuate or pendulous. Flowers are fairly large and variously coloured. Trimerous sepals and petals are placed on the resupinate pedicel-ovary. The lip (one of the petals) is hinged at the base of the column and its varying features are diagnostic of the species. The boat-shaped column is the distinguishing feature of the genus. Pollinia are situated at the tip of the column and the stigmatic cavity just below the pollinia. Seed pods contain numerous powdery seeds. (fig. 3.13)

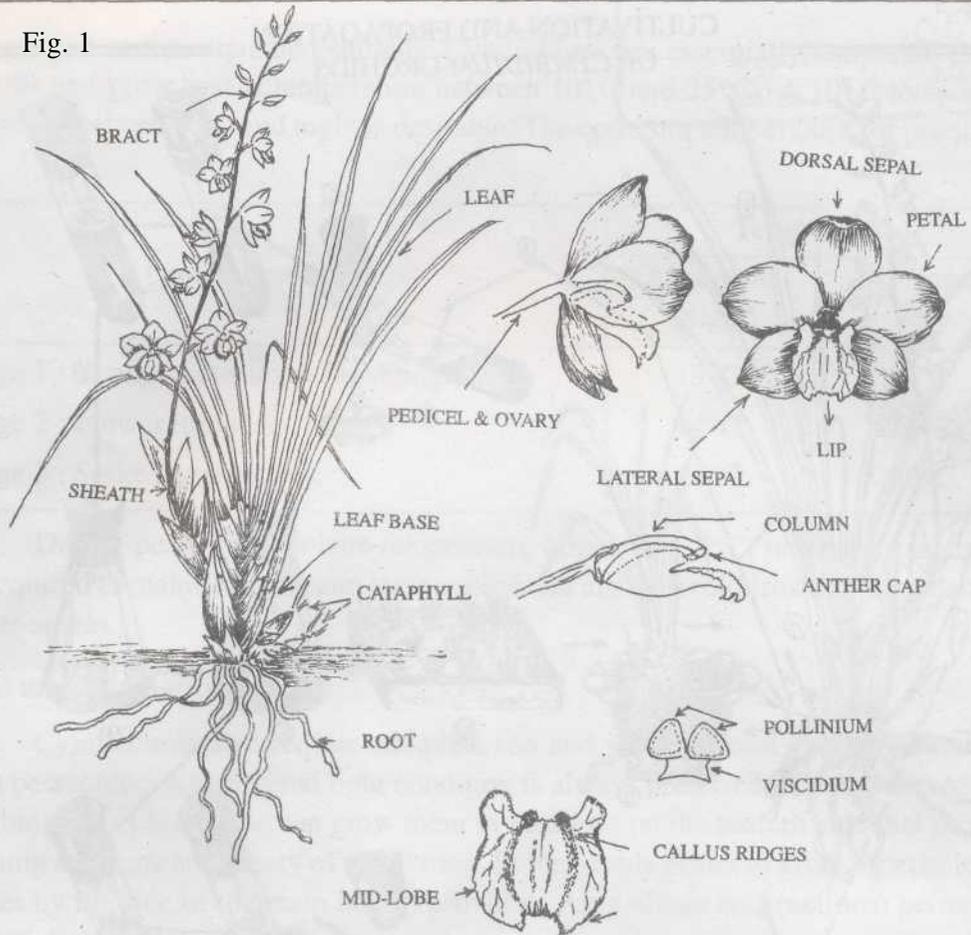
Technique of cultivation:

Whether species or hybrids, technique of cultivation (figs. 2 & 3) of Cymbidiums is the same. However, hybrids require heavy feeding with rich manurial compost with periodical spray of liquid nutrients and fertilizers. They can either be cultivated in pots, baskets or ground beds depending upon the type of species and the requirements. Cymbidiums like *aloifolium*, *dayanum*, *devonianium* and *pendulum* produce pendulous inflorescence. Hence, it is preferable to cultivate them in hanging baskets/pots. Others can however be cultivated in pots placed on benches or raised ground beds. In sloppy terrain, terraced ground beds can also be used. In commercial farming for export purposes, it is preferable to cultivate cymbidiums in pots placed on benches under the controlled environmental conditions of the modern green-houses to achieve perfection. However, this is cost intensive.

Agroclimate :

As can be seen from the distribution pattern of *Cymbidium* species, most of them occur in sub-tropical cool humid conditions in their habitat between 500-1800m MSL in Arunachal Pradesh. Large varieties of modern day hybrids of commerce also require cool and humid conditions with the temperature ranging from 8° C minimum in the winter to a maximum of 24° C in summer. In other words, ideal conditions for growth and blooms of *Cymbidiums* are warm and humid in growing period and cool climate in flowering seasons i.e. mostly in winter. Therefore, in Arunachal Pradesh, the places situated above 700m upto 2000m MSL with cool and humid climatic conditions are ideal for growing Cymbidiums. In other places however, temperature and humidity should

Fig. 1

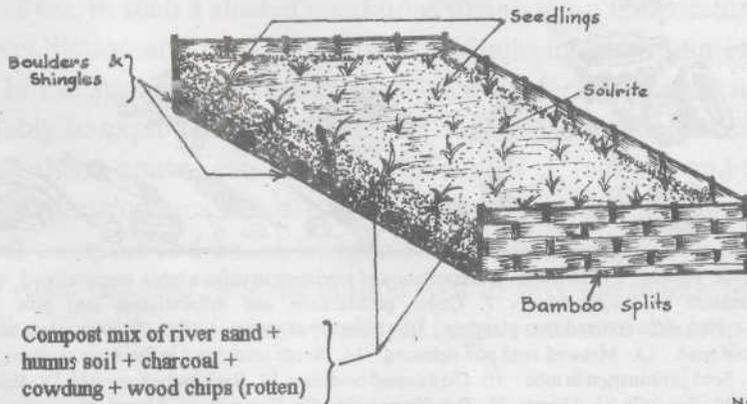


THE MORPHOLOGY OF *CYMBIDIUM* ORCHID

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Fig. 2

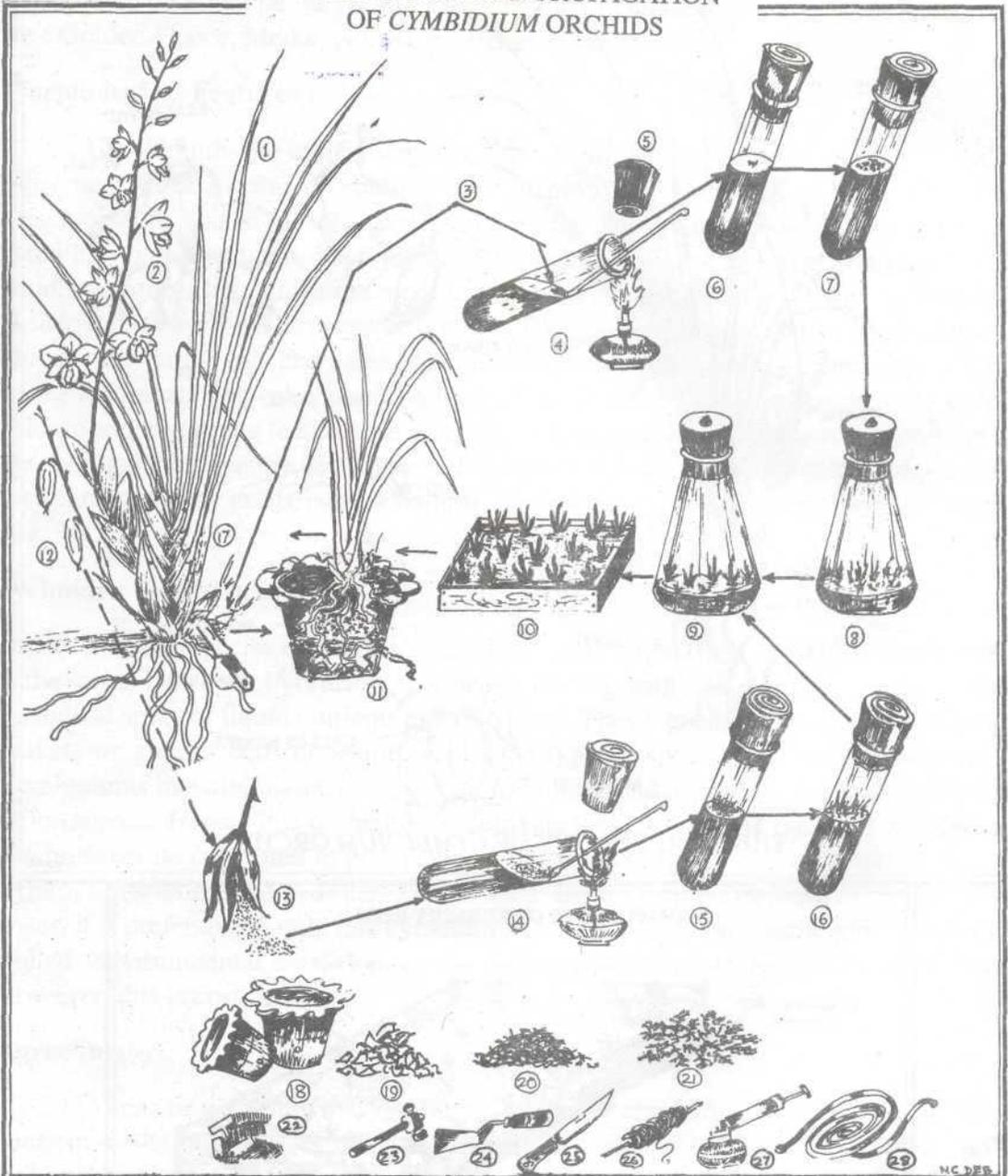
COMPONENTS OF NURSERY BEDS



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Fig. 3

CULTIVATION AND PROPAGATION
OF CYMBIDIUM ORCHIDS



1. Mother plant 2. Flower 3. Meristem 4. Inoculation of meristem in culture tubes aseptically 5. Cotton plug 6. Callus formation in culture tubes 7. Callus proliferation and differentiation into plbs 8. Plbs transflasked 9. Plbs differentiated into plantlets 10. Plantlets in trays 11. Growing plant in a compost pot 12. Matured seed 13. Matured seed pod dehiscent 14. Seeds inoculated in the Agar medium in test tube aseptically 15. Seed germination in tube 16. Germinated seedlings 17. Back bulbs separated 18. Empty earthen pots 19. Crocks 20. Top soils 21. Mosses 22. Tags/Name plates 23. Hammer 24. Khurpi 25. Knife 26. Nylon thread 27. Spray gun 28. Hosepipe.

be managed and manipulated suitably. Cymbidiums are essentially temperate crop of the hills and grow best at temperature between 10° C and 25° C. A 10° C temperature difference between day and night is desirable. The optimum temperature for production are:

Production Stage	Temperature	
	Minimum Night	Maximum Day
Stage 1 : Young plants up to flowering Size	15°C	25°C
Stage 2 : Flower initiation	14°C	21°C
Stage 3 ; Spike development	10° C	20° C

During peak winter where temperature falls below 8° C, heating arrangements are required to maintain optimum temperature and also to avoid frost-bite that damages flower-spikes.

Light and Ventilation :

Cymbidiums also require adequate sun and shade. Direct sun-light should always be avoided. A checkered light condition is always preferred. If one wants to grow Cymbidiums as hobby, he can grow them in verandas on the eastern side that provides morning sunshine and plenty of ventilation. Some people prefer to grow them in lean-to houses by the side of the main house, providing Agro-shade nets (netlons) permeating 60-70% light to pass-through.

In commercial farming, normally agro-shade nets or polythene/fibre-glass roofing is used to protect the plants and flowers from hailstorms, intensive rains and direct sunlight. However, in such a shaded conditions maintaining temperature and humidity with proper ventilation are to be carefully looked into by providing exhaust fans and humidifiers. In the sub-tropical belt of Arunachal Pradesh however, natural agro-climate can suitably be exploited by providing net-lon shade nets to protect from the direct sunlight. Such shade houses can be either flat-roofed or inclined and are made up of wooden/iron angle structures about 10' high from the ground. During summer, heavy rains leach off compost and cause damp off disease. Hence, polythene cover can be given as and when required over the net-lon roof to save the plants. Similarly, during peak winter also polythene/tuflon cover should be given to save the crop from frost-bite.

Compost:

While preparing a compost mix it should be borne in mind that the compost provides adequate aeration around the root system by being porous, sufficient nutrition,

adequate water supply and firmness to hold the plants in the container. It must also be seen that the compost is free from fungal spores and insects that damage the plants. Accordingly, a mixture consisting of humus soil + river sand + charcoal ($1/2$ to 1 cm size) is prepared in 1 : 1 : 1 proportion and heated up over a tin frying pan to remove undesired fungal spores and insect larvae. This mixture is also supplemented with half-burnt dry leaf chopping and charred wood-chips (1 cm size). The compost can be supplemented with N : P : K (30:10:10) fertilizers at an interval of 45-60 days during growth season (summer) and with a fortnightly spray of micro-nutrients and hormone. Slow release fertilizers like Osmocote/soil-rite greatly help in healthy growth. Cymbidiums can not tolerate high levels of fertilizers or salts and hence should be avoided.

Potting or planting :

The compost thus prepared is filled into the earthen or plastic pots up to $2/3$ rd of the container or nursery beds (0.40 x 1 x 6m size) which is already layered at the bottom with crocks consisting of brick bats or stones and pebbles to allow excess water to drain down avoiding stagnation of water (figs. 1 & 2). Then the plant with roots or back bulb is placed at the centre of the container and filled up with the same compost. In the nursery beds however, 6 seedlings can be planted up per m². After planting the compost is also supplemented with soil-rite in the top layer to give additional nutrition to the plants.

In case of young mericlones viz. seedlings just removed from or pricked out of the culture flasks, absolutely sterile medium consisting of perlite + soil-rite or charcoal + brickbats + tree-fern fiber should be used in protrays/poly pots or clay-pots. Seedlings also must be treated with fungicides to prevent infection. This medium should be sprayed with nutrient solution after planting up the seedlings and placed in the clean environment in the hardening house (polythene or fibre-glass house) maintaining humidity, temperature around 24° C and ventilation. The seedlings with the new growth of leaves and roots can be transferred to larger containers after hardening for 45-60 days. They should however be sprayed with nutrients, fungicides and pesticides periodically to avoid infections that damage the plant.

By the third year, the seedlings would have attained flowering size with minimum two back-bulbs and they normally start producing maiden flowering spikes on the 3rd year itself if the feeding and maintenance schedules are meticulously followed. On the fourth year, one can harvest 1-2 flower-spikes per plant which can be marketed. In order to attract the market, the flower spikes need to be trained right from the initiation of spike, by giving proper support and staking so that flowers are blemishless with proper shape and display, thus making it easy for packing and transporting.

Watering :

Watering must be done judiciously. Over watering causes dampness and diseases. Water-logging should never be allowed. The compost must be just wet. While watering, the whole plant with pot must be sprinkled over so that humidity is created around the plant. Through experience, one must learn to water just adequately. Too dry a condition retards growth. Quality of water is another important aspect. Neutral or slightly acidic water between pH 5.5 and 6.00 is good for orchids. Cymbidiums require lot of water during hot weather and humidity must be maintained at a high level by damping down. It is beneficial to use dilute liquid fertilizers while damping down.

Re-potting:

When the compost provided to the pot or bed becomes weak and the pot/bed gets filled with new shoots and roots-normally after 2-3 years, repotting/re-filling with fresh compost should be carried out. This operation should be done after flowering and during spring time when new growth begins. This is the time for vegetative propagation also.

Propagation :

Cymbidiums can be propagated vegetatively by division of back bulbs or by adopting aseptic culture technique of seeds and meristematic tissues.

- a. **Vegetative propagation :** By 3-4th year, Cymbidiums form a cluster which can be separated from the base by dividing it with the help of a sharp garden knife. It must be ensured that the back bulbs (pseudobulbs formed in the previous year) always have a new shoot emerging from the base along with roots (Fig. 3). Such divisions can be planted up with fresh compost as described earlier.
- b. **Aseptic culture:** Aseptic culture technique involves propagation under controlled conditions of the laboratory in an artificial nutrient medium in a clean and disease free environment. Seeds or meristematic tissues are inoculated into the flasks and allowed to propagate and differentiate into seedlings (fig. 3). This is an elaborate technique involving technicians for culturing and sub-culturing and when the seedlings attain 1-3" in size, they are transplanted in compots and hardened in controlled green-house/glass-house. After about 45-60 days they are transferred to larger pots or ground beds.

Pests and Diseases :

Maintaining clean environment, proper air-circulation, correct watering, weeding time to time and balanced compost would keep the pests and diseases away.

in addition to these, periodic application of chemicals like Fytolan, Hexoben-150, Rogor and Sumithion prevents incidents of pests and diseases. However, with the sudden change in the temperature and increase in humidity with alternate rains and sun, encourage incidents of pests and diseases. In such a situation, depending upon the symptoms, application of following chemicals are helpful to contain and control the same.

Table-2 : Common cymbidium pests and diseases, their symptoms and treatments.

Sl. No.	Symptoms	Pests and diseases	Treatments
1.	Leaves turning yellow, and finally dry off; appearance of black spots and scars on leaves	Scaly insects	Malathion, Sumithion, Rogor (one table spoon in one gallon water)
2.	Presence of waxy white cotton patches on leaves and stems	Mealy bugs	Malathion, Diazinone, Sumithion (one table spoon in one gallon water). Scrub the area with brush dipped in malathion.
3.	Yellow round spots on both sides of young leaves and buds	Aphids	As above and/or Nicotine sulphate, Benzene Hexachloride and lindane.
4.	Stippling, blanching and silvery spots	Mites	Cleaning the infected area with cotton dipped in mild soap water followed by spray by Kelthane or Dimite (1 or 2 tea spoonful in one gallon water) at 4-5 week interval.
5.	Bruises on flowers	Red spider mites.	Spray with malathion

6.	Black areas increasing in size	Bacteria/ fungus	Cut-off the diseased area and treat with Dithane M-45 or Contaf- SE.
7.	Blackened tips of leaves gradually increasing	Excess fertilizers of leaf die-back fungal diseases	Stop fertilizing and water thoroughly. Treat with fungicide Difolatan or Dithane-M 45 or Contaf- SE.
8.	Yellow spots on leaves, spreading all over causing leaf fall	Fungal disease	Remove affected leaves and spray Captan or Benomyl once a week.
9.	Roots rot	Fungal disease	Apply Captan or Contaf-SE.
10.	Damage to tender leaves and shoots eaten away	Snails	Snail-kill sticks to be placed near the plants.

Unit cost of production :

It has been observed that in an area of about 500 m² of land 2500 *Cymbidium* hybrids can be cultivated which start yielding 2500 cut-flower stems annually after attaining maturity after 3 years of their planting as seedlings with meticulous care and maintenance. The present market rate of *Cymbidium* cut-flower stems of standard size, colour, shape and longevity fetches Rs. 25 each. Hence, in 500 m² area, one can expect at the minimum, of Rs. 62,500 annually from flower stems only in addition to production of back bulbs in an increasing manner as shown in the table-3 which is certainly an attractive enterprising and an alternative source of income.

The following table of analysis of unit cost for the development of *Cymbidium* orchids in Arunachal Pradesh gives an idea of the total investment for a unit area of 500 m² with 2500 plants and the returns/income generated from the same, fourth year onwards in a profitable manner.

Table-3 : Unit cost for development of Cymbidium orchids in nursery beds in Arunachal Pradesh.

Unit size-500 m²; Number of seedlings = 2500

Planting materials = 1 year old seedlings.

A. Cost of Development:

Sl. No.	Particulars	Cost .			
		1 st year	2 nd year	3 rd year	Total cost
1.	Shed (20X25m):				
	a. Bamboos, 2000 nos. @ Rs. 10 each	20,000			20,000
	b. G.I. wire 150 kg. @ 35 kg.	5,250			5,250
	c. Netlon shade, 500 sq. m. @ Rs. 38	19,000			19,000
	d. Wooden post, 50 nos. @ Rs. 30 each	1,500 *			1,500
	e. Boulders stones and pebbles 5 trucks @Rs. 1000 per truck	5,000			5,000
2.	Compost Mixture :				
	a. Top soil, 4 trucks @ Rs. 800 per truck	3,200			3,200
	b. River sand, 2 trucks @ Rs. 1000 per truck	2,000			2,000
	c. Cow dung, 2 trucks @ Rs. 1000 per truck	2,000			2,000
	d. Charcoal, 1000 kg. @ Rs. 2.00 per kg.	2,000			2,000
3.	Labour for construction				
	a. Labour for construction, m.d. @Rs. 35.60 X 230 m.d.	8,188			8,188
	b. Site development including trenching, terracing and fencing, water facility	10,000			10,000
4.	Fertilizers and Flower boosters	1,000			1,000
5.	Chemicals, fungicide, pesticide etc. and equipment like sprayer	4,000	2,400	2,400	8,800
6.	Cost of planting materials : @ Rs. 11 each (for local former only)	27,500			27,500
7.	Maintenance With one D/L and other inputs		15,000	15,000	30,000
8.	Miscellaneous	2,000			2,000
	Total		17,400	17,400	1,47,438
9.	Interest @ Rs. 14% per annum		15,769	20,412	36,181
	Total	1,12,638	33,169	37,812	1,83,619

B. Yield and profit

10.	Yield							
	a. Year	1	2	3	4	5	6	7
	b. No. of spikes	—	—	—	2,500	5,000	7,500	10,000
	c. Back bulbs	—	—	—	2,500	—	2,500	2,500
	d. Farm gate price @ Rs. 25 per spike	—	—	—	62,500	1,25,000	1,87,500	2,50,000
	e. Back bulb @ Rs. 30/- per bulb	—	—	—	75,000	—	75,000	75,000
11.	Total earning	-			1,37,500	2,25,000	2,62,500	3,25,000
12.	Less payment of interest @ 14%	—	—	—	25,706	22,206	18,796	11,706
13.	Maintenance cost over the principal	—	—	—	17,400	17,400	17,400	17,400
14.	Return of loan/investment	—	—	—	25,000	25,000	50,000	83,619
15.	Total of repayments (item 12, 13 and 14)	—	—	—	68,106	64,606	86,106	1,12,725
16.	Profit	—	—	—	69,394	1,60,394	17,394	2,12,275
17.	Less (—) risk factors due to environmental causes pests disease etc. 20 %				13,878	32,078	35,278	42,455
18.	Net profit	—	—	—	55,516	1,28,316	1,41,116	1,69,820

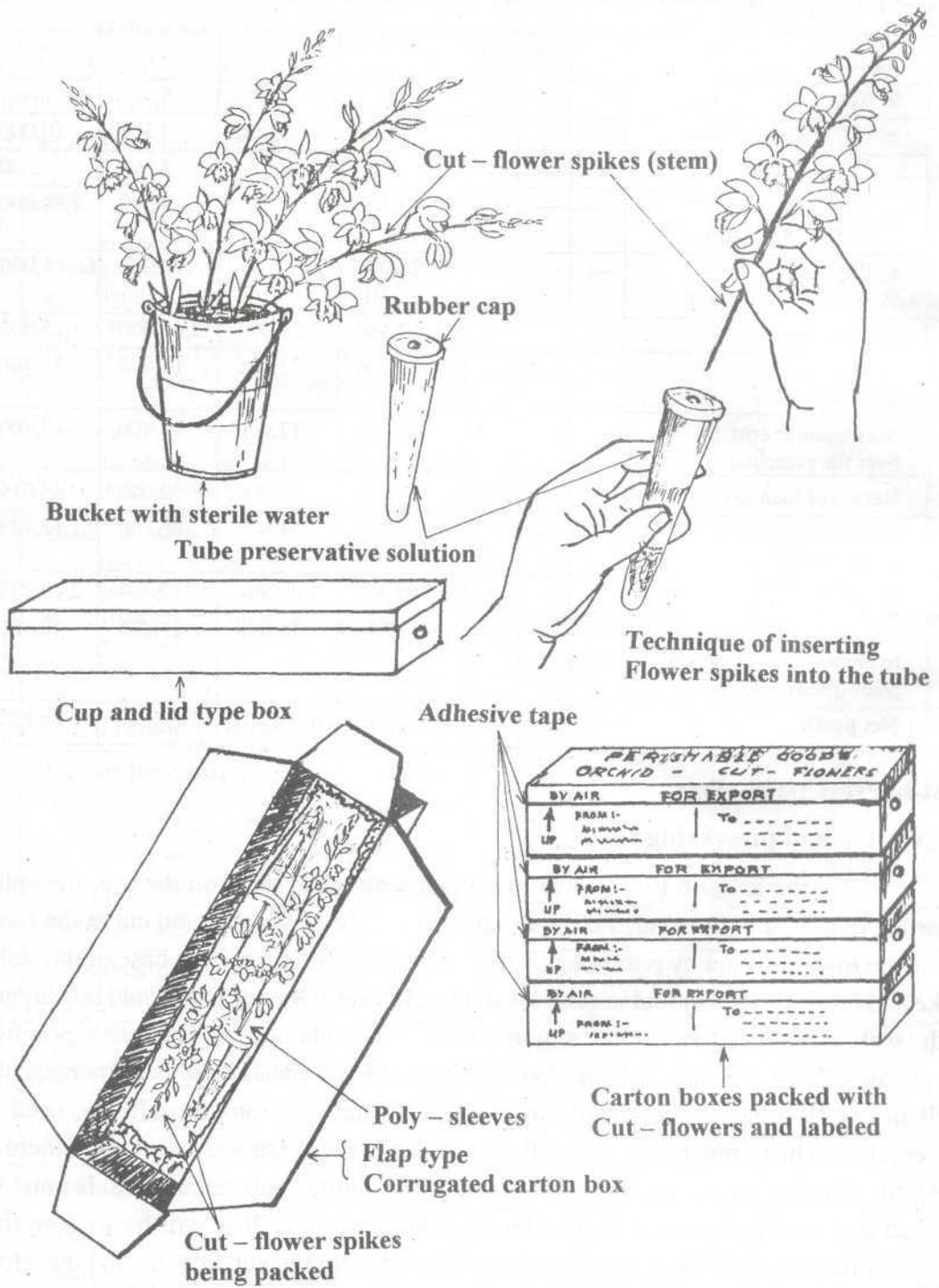
Post-harvest Technology

Harvesting and preserving :

When the lower 5 to 8 flowers are open with some buds on the top, the spike (stem) is ready for harvesting. Take a sharp sterile knife or scissors and cut at the base. Clean the lower portion by removing the sheaths/bracts clasping at the base of the stem/spike and immerse the cut-end in sterile water in a bucket. The cut-end should be plugged with wet sterile cotton or insert it in the tubes containing preservative solution (D-glucose, 2% + Sodium/Calcium hypochlorite, 0.5 % in water) so as to increase the shelf-life of flowers. Commercially available Chrystal solutions can also be used as preservative. Then immerse the entire flower spikes in clean tap water and place them in racks for draining down the water for about 5-10 minutes before packing. It must be ensured that the flowers are blemish-less and not damaged. It is worthy to note that Cymbidiums are sensitive to ethylene gas produced from the cut-flowers and therefore ethylene absorbent sachets should be placed in the boxes containing cut-flower spikes. These cut flower spikes can be preserved under low temperature, 0°C-4°C, for 15 days.

Fig.4

POST HARVEST TECHNOLOGY



Packing :

For packing the cut-flower spikes two types of corrugated or hard board boxes are used. They are : (a) Cup and lid type (b) Flap type. The former type of boxes are preferred as they do not easily sag due to weight of the cut-flowers and can withstand jerks during transportation. It is advisable to use 5 or 7 ply corrugated boxes for this purpose. The standard size of boxes for this purpose are :

	Length		Breadth		Height
1.	76cm	X	29cm	X	10cm
2.	98cm	X	48cm	X	20cm
3.	98cm	X	40cm	X	30cm

In addition to above, one must keep the following packing materials ready in hand :

1. Knife
 2. Scissors
 3. Absorbent cotton
 4. Stem holder tubes
 5. Rubber bands
 6. Gum
 7. Adhesive (cellophane) tapes
 8. Polythene sleeves
 9. Printed slips with captions :
- Cut-Flowers, PERISHABLES
10. Staples
 11. Preservative solutions (D-glucose+sodium hypochlorite)
 12. Blotters
 13. Bucket
 14. Marker pen.

Once the above materials are ready, start packing operation. First of all, the spikes placed in the racks are graded as per the market requirement depending upon size, colour, and number of flowers per spike. Then they are to be carefully blotted to remove excess water if any, pushed into polythene sleeves and placed in the corrugated/cardboard boxes (fig. 4). On an average 30 spikes can be packed in each box. It must be ensured that ethylene absorbent sachets are placed in between the packed cut-flower spikes before closing the box with its lid or flaps. Then they should be properly sealed and labeled as shown in the illustration (fig. 4).

Transportation :

Normally, the cut-flower boxes are transported in air conditioned vans from the farm to the nearest air port. However, in Arunachal Pradesh Cymbidiums are harvested in winter months and therefore they can easily be transported in vans without air conditioning. The nearest air-ports from the centre of production in Arunachal Pradesh are either Tezpur or Guwahati. From these air-ports the cut-flowers are sent by air to various

destinations like Calcutta, Delhi and Bombay as per the market demand. It has been observed that while the cost of production is Rs, 25/- at farm gate, the cost of transportation from Arunachal Pradesh to Delhi comes to about Rs, 20/-. In order to reduce the cost of transportation, the Indian Airlines are offering subsidies upto 40% of the cost of transportations from Guwahati, if the quantity of cut-flowers is sizable and regular at least for two-three months every year.

Marketing & Trade

Once the cut-flowers reach the dealers in Bombay, Culcutta and Delhi, they are distributed to the retailers spread all over these cosmopolitan cities. Today, cymbidium cut-flowers are sold by the retailers at a cost ranging from Rs. 45/- to Rs. 120/- each depending upon the quality, colour, number and size of cut-flower spikes. Further best quality cut-flower stems are separated out and then exported to various countries -especially Europe, USA and Japan. In fact, Netherlands and New Zealand are the largest producers of Cymbidium cut flowers in the world. New Zealand produces the cut flowers in the summer months from May to August. Whereas our crops are available from October to March. Hence, there is a good export market for Cymbidiums from India — especially from Sikkim, Darjeeling Hills, Arunachal Pradesh and other hill States of NE India which have conducive climate for producing Cymbidium cut-flowers. At present, hardly 30 to 40,000 cut-flowers are only produced from these areas whereas, there exists huge export demand as can be seen in the table — 4.

Table - 4 : Orchid imports in Europe (1994-95)

Rank	Country	Quantity (Million stems)	Cost (million US\$)	Exporting country		
				I rank	II rank	III rank
1.	Italy	75.3	24.4	Thailand (62.9 million stems)	Holland (10.6 million stems)	Singapore (0.65 million stems)
2.	Germany	29.7	18.8	Holland (16.6 million)	Thailand (11.7 million)	Singapore (0.99 million)
3.	Holland	17.5	4.1	Thailand (14.0 million)	Singapore (1.9 Million) New Zealand (0.22 million)	
4.	France	8.1	—	Holland (6.0)	Singapore (0.04 million)	Malaysia (0.01 million)
5.	United Kingdom	208.92 tones	—	Thailand	Holland	Singapore

Italy is the largest importer followed by Germany, Holland, France, and U.K. USA mostly imports Dendrobiums and some temperate orchids from Australia and New Zealand. India being in the strategic location in the world with ideal agroclimate for growing varieties of orchids should intensify its drive to increase its production by bringing large areas under the cultivation of tropical and temperate orchids to boost the export industry.

In fact, in the orchid industry, both plants and cut-flowers are traded with. Since plant trade is regulated under CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and Wild Life (Protection) Act of Government of India, it is mandatory to register the orchid farms under Wild Life Preservation offices, Ministry of Environment and Forests, Government of India through the Chief Conservator of Forests (Wild life) of the state concerned. All the orchids cultivated and subsequently propagated should be declared, registered and the stock position reported every quarter of the year to the Wild Life Authorities. Whenever, orchid plants are to be exported, it is necessary to obtain legal procurement certificates (LPC) from Wild Life authorities of the concerned state and the Regional authorities of the centre. However, it is pertinent to note that the flaked seedlings do not require LPC and can directly be traded with.

The hybrid seedlings of Cymbidiums produced through tissue-culture are also traded with at the cost ranging from Rs. 30/- to 400/- depending upon the age and quality of production. Kalimpong is an important centre for planting materials in India. In Arunachal Pradesh, seedlings of Cymbidiums can be produced from the Orchid Research Centre, Tipi under State Forest Research Institute at nominal cost. Seedlings can also be had from Nana-Koo Orchid Farm, Hapoli (Ziro). Other than the seedlings, pseudobulbs (back-bulbs) obtained after division from the mother plants can also be traded which costs between Rs. 30 to 50 each. Thus, a farmer having a plot of 500m² can earn Rs. 55,516 per annum from fourth year on wards in an increasing manner as can be seen in table —3.B.

Thus, cultivation of Cymbidiums is indeed a gainful venture that provides an alternative source of income to the local people and weaning them away from the activities that are detrimental to forests and environment.

Assistance :

Realizing the export potentials of cymbidiums in floriculture, Government of India has initiated assistance schemes under various organizations like Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board, NABARD, NEDFi etc. Individual entrepreneurs and NGOs who would like to establish floriculture unit for production and export of cut-flowers of orchids like

Cymbidiums and Dendrobiums can contact these agencies for financial assistance to set up their farms, in addition to local Government departments. Deputy Commissioner in each District can also extend help under various Rural development schemes. APEDA's Regional office at Guwahati maintains all the market informations and details on the financial assistance schemes to boost export. They have also set up a cold storage unit near Guwahati Air port to help the exporter to store their perishable items when required.

FLORICULTURE INSURANCE

Orchid being perishable item, there has always been an apprehension to take up orchid farming and related floriculture activities on a commercial scale. However, noting the global importance of floriculture in export, comprehensive floriculture insurance schemes have been introduced by four Insurance companies as given in the table - 5.

Table 5 : Comprehensive Floriculture Insurance Schemes

(Source : NABARD)

Sl. No.	Particulars	New India Assurance Co. Ltd.	Oriental Insurance Co.	United India insurance Co. Ltd.	National insurance Co.
1.	Applicability	Poly house/Glass house cultivation	Open or Glass house cultivation of roses	i) Green house/poly house cultivation ii) Marine transit insurance for import of seed material.	Green house/poly house cultivation
2.	Period of insurance		From the date of transplant till they attain 5 years	One year of crop period	One year i.e. annual policy
3.	Scope of cover	Insurance cover is available (a) Damage to poly house and its structure (b) Damage to irrigation system (c) Cover for death of plants (d) Cover for loss of inputs due to damage to flowers	Insurance cover is available only to plants with/without flowers	i) Flowering plants whilst growing in green house/poly house ii) Sapling/seed material/mother plants of the flower crop	Insurance cover will be applicable only to plants whilst growing in the farm/green house/poly house.
4.	Standard cover for perils indicated in the scheme	Fire, lighting, storm etc. flood, inundation, riot, strike, act of terrorism, earthquake etc. theft, landslide. Damage to machinery/	Fire, lighting, storm etc. flood, inundation, not/strike, act of terrorism, pests and diseases. Coverage of pests and diseases is "	i) Accident to aircraft/vehicle, fresh water rain water damage and damaged by other cargo, fire, lightning, terrorism,	Fire, lightning, storm etc. flood etc. riot, strike, act of terrorism, impact of damage by rail/road/air/animals. Additional cover for

Sl. No.	Particulars	New India Assurance Co. Ltd.	Oriental Insurance Co.	United India insurance Co. Ltd.	National insurance Co.
		pipelines, machinery break down cover etc. insects, mite, pests and diseases.	optional with additional premium.	not strike, storm, flood earthquake impact of damage by rail/road/air animal specified pests and diseases	drought and specific diseases for flower plants.
5.	Sum insured	1) For poly house sum insured will be on reinstatement value basis 2) For irrigation system sum insured will be on replacement cost basis 3) For cover for death of plants sum insured will be per hectare cost of sapling/input cost.	Actual cost incurred on raising the plant subject to some maximum limit year wise.	To the extent of input costs incurred upto the date of loss. Details of the input cost to be given by the insured Valuation will be fixed per plant of per acre basis.	For calculating the sum insured in the first year the following things will be taken into account, i) soil preparation. ii) fertilizer and manure iii) cost of seedlings/ plant/saplins iv) pesticides/ insecticides v) irrigation/labour charges vi) cost of planting/ sowing and pruning timing etc.
6.	Premium Rate	Standard premium rate of 5% on sum insured for all section	1.5% of S.I. for open cultivation and 1.25% of S.I. for green house cultivation	5% on sum insured (only to plants)	Glass house/Green house - 1.25% under open field - 2.5% Additional rate Pest & Disease under glass house - 0.75% Pest & Disease under open field- 1.50% Orchid- 1% under controlled condition - 1.5% under open field condition
7.	Important exclusions	War, nuclear reaction, overload experiments, gradual developing plants, wear and tear, wilful neglect non disclosure of any defect at the time of policy, where supplier or manufacturer is responsible by law	All general exclusions mentioned under the standard Horticulture/ plantation insurance policy	Loss or damage to the flowers, loss by theft, malicious acts, war and war like perils, nuclear radiation wilful negligence etc.	Nil.
8.	Franchise	The claim should be 10% or more of the sum insured.		The claim should be 10% or more of the suni insured.	The claim should be 5% or more of the sum insured per hectare or Rs. 1000 per affected area.

Sl. No.	Particulars	New India Assurance Co. Ltd.	Oriental Insurance Co.	United India insurance Co. Ltd.	National insurance Co.
9.	20% of the claim assessed for each and every loss will be deducted i.e. only 80% of loss shall be paid under the policy.	Insurer shall bear 20% of each and every assessed claim arising out of one incident and in any case not less than Rs. 25,000.	20% of the claim assessed for each and every loss will be deducted i.e. only 80% of loss shall be paid under the policy.	20% of the claim assessed for each and every loss will be deducted i.e. only 80% of loss shall be paid under the policy.	
10.	Remarks	There is an enabling clause for collecting higher premium.	As indicated in the list of exclusions scheme is not attractive.	The coverage of green house, irrigation system is considered on an individual basis.	

Following are some important contact addresses :

1. Assistant manager, APEDA, Bidhan Nagar, Calcutta-700 091.
2. Executive Director, National Horticulture Board, Ministry of Agriculture, GOI, 85, Institutional Area, Sector-18, Gurgaon-122 015 Haryana.
3. Manager, NABARD, BankTinali, P. B. No. 133, Itanagar-791 111.
4. General Manager, NEDFi, IDBI Building, G. S. Road, Guwahati.
5. DGM Cum ZM (NE), Tribal Co-operative Marketing Development Federation of India Ltd. (TRIFED), Ganeshguri, Kahilipara Road, Guwahati-781 006, Assam.
6. Director, Department of Horticulture, Government of Arunachal Pradesh, Naharlagun.
7. Executive Director, North Eastern Development Finance Corporation, Ltd. IDBI building (6th Floor), G. S. Road, Guwahati-781 005.
8. Field Officer, APEDA, AIDC complex, R. G. Baruah Road, Guwahati-24, Assam.
9. Shri H. Dhattatreya, Facilitator, CAPART, NEZ, P.B. No. 75, Tezpur - 784 001.

For Licensing and registration under CITES, please contact:

1. The Chief Conservator of Forests (Wild Life), Department of Environment and Forests, Government of Arunachal Pradesh, Itanagar- 791 111.
2. The Regional Deputy Director, Wild Life Preservation, Eastern Region, Ministry of Environment and Forests, Government of India, Nizam Palace, 2nd MSO Building, 6th Floor, Calcutta-700 020.

Following addresses of some orchid growers and traders are also useful

1. Udai Chandra Pradhan Orchid Laboratories, Abhijit Villa, (13th Mile) VPO, Ecchy, Kalimpong-734 301.
2. Ganesh Mani Pradhan, The Nursery, "Ganesh Villa", Kalimpong-734 301.
3. Dibya Pradhan, Barbote, Dr. B. L. Dikshit Road, Kalimpong, Pin-734 301, West Bengal.

4. ICL Flora Exotica, Noonmati, Guwahati-20, Assam
5. Madhu Farms, C-120, Greater Kailash-1, New Delhi-110 048
6. Himalaya Floritech, 1 A, Vansittart Row, 1st Floor, Calcutta-700 001
7. Natural Synergies, 3, Century Court, 8 II nd street, Kasturi Estars, Madras-600 086
8. Val Orchids Pvt. Ltd., 14 Glasswala Building, Guru Nanak Road, Bandra (W), Mumbai 400 050.
9. M/s. Sarbanand Impex Pvt. Ltd., 28 B- Shakespeare Sarani, Flat-9 A, "Neelamber" (9th Floor), Calcuta-700 017
10. Alpha Orchids, C-40, Gulmohar Park, 8-B, Bahadur Shah Zafar Marg, New Delhi-110 002

Orchid Societies (National & International)

1. Orchid Society Arunachal (OSA), State Forest Research Institute, Van Vihar, Chimpu, Itanagar-791 111, Arunachal Pradesh, India
2. The Orchid Society of India (TOSI), Botany Department, Panjab University, Chandigarh-160 014, India.
3. American Orchid Society Inc. 6000 S, Oliver Avenue, West Palm, Florida-33405, USA.

For other technical details people may contact:

Director, State Forest Research Institute, Van Vihar, P.B.No. 159, Itanagar-791 111, Arunachal Pradesh, India.

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