ANTHURIUM (*Anthurium* spp.)

Anthurium is one of the important economic flowers of export potential. There are more than 500 species and several varieties. Few of them are commercially important.

Anthurium andreanum, *A. veitchii* and *A. scherzerianum* are the economically viable species. Many of them are partially epiphytic in growth habit. Plants prefer to grow under shade. The tolerable level of light in the tropical region during summer is 20-30 per cent. Excess light causes yellowing and scorching of leaves. Very low light intensity causes excessive vegetative growth and low flowering. It is preferable to grow anthurium in the open, under artificial shade structures for better growth and yield. A shade level of 80 percent is ideal for maximum growth and flower production. Plant prefers to grow under a relative humidity of not less than 60 per cent and a temperature of not more than 18-28ºC.

Propagation

Anthurium is multiplied by seed and vegetatively by stem cuttings or by separation of basal sprouts. Propagation by seed is not recommended as a commercial propagation method as it results in high variability. Plants can be multiplied in large number by micro-propagation techniques from the tender leaf bits.

Vegetative propagation

Plants are propagated vegetatively by separating suckers from flowering plants as and when available and planted in the medium. Cutting the thick main stem into 3-4 cm long discs and then into vertical bits can also be done. Each bit should have minimum two lateral buds. Cut-pieces are treated with a fungicide solution and planted on a medium of clean river sand. Cuttings will take 1-2 months for sprouting.

Seedlings and sprouted cuttings of 5-10 cm height are transferred to the main field or pots. Planting in pots is preferred in the plains. Cultivation in beds is good at higher altitudes (about 1000 m above MSL). A loose medium above the ground is suitable for anthurium. Old and chopped coconut husk (3 cm size) mixed with brick pieces and charcoal are filled in narrow trenches 10 cm below and above ground level.

Pots can also be filled with the same mixture. An ideal pot should be 30 cm diameter at top with 3 large holes at the bottom on sides. One plant can be planted in a pot. On ground, the spacing is 45 to 60 cm depending upon the variety. Fresh cowdung or neem cake mixed with 10-15 times of water, kept for 4-5 days, can be sprayed on the plants after filtering. Cow's urine can be sprayed or drenched after mixing with 25 times of water. Water soluble fertilizer (19:19:19) 2 g / l is applied in the medium once a week. Slow release fertilizers, if used, need be given only once in 2-3 months. Pruning of older leaves, removal of suckers at young stage, cleaning of crown before rains etc. are other operations to be carried out in order to have a better growth and flowering.

Varieties

The economic varieties suitable for Kerala condition are Lima White, White King, Cuba, Agnihotri, Liver Red, Can Can, Tropical, Nitta, Sunburst, Tinora, Acropolis, Gino Orange and Midori.

Varieties recommended for different agro climatic zones of Kerala

Flower type	Agroclimatic zones	
	Plains	Hills
Cut flower	Benicito, Titicaca and Chichas, Tropical	Esmeralda, Benicito, Titicaca and Jewel, Tropical
Pot plant	Diablada, Bonina, Condor, Excellent, Coralis, Mia, Inti and Trampolino	Diablada, Bonina, Condor, Trampolino, Mia

Plant protection

Diseases

The two major diseases are bacterial blight and anthracnose. Blackening of the stem and decay of leaf axils are the symptoms of bacterial blight. Spraying a mixture of turmeric powder and sodium bi carbonate in the proportion 10:1@ 0.15 per cent at weekly interval from the initiation of the disease is effective for the management of bacterial blight of anthurium.

Tiny circular black spots appear on leaf and spadix in case of anthracnose. Spraying mancozeb 0.3 per cent or carbendazim 0.05 per cent can control the disease.

Root rot caused by *Pythium* and *Phytophthora* can be controlled by the application of potassium phosphonate 0.3 per cent.

Pests

The major pests are scales and bugs, which are controlled by spraying malathion @ 2 ml per litre of water. Snails also cause damage to young roots. Use of metaldehyde can prevent the attack of snails.

Harvesting and post harvest handling

The flowers are harvested with its long stem when $1/4^{th}$ to $3/4^{th}$ flowers on the spadix are open, indicated by the change of colour. Colour change varies with the varieties.

Protocol developed for the post-harvest handling of Anthurium

Stage of Harvest

50-75% flowers opened on spadix

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Pre Cooling

4°C for 3 hours

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Pulsing

BA 150 ppm, for 8 hours

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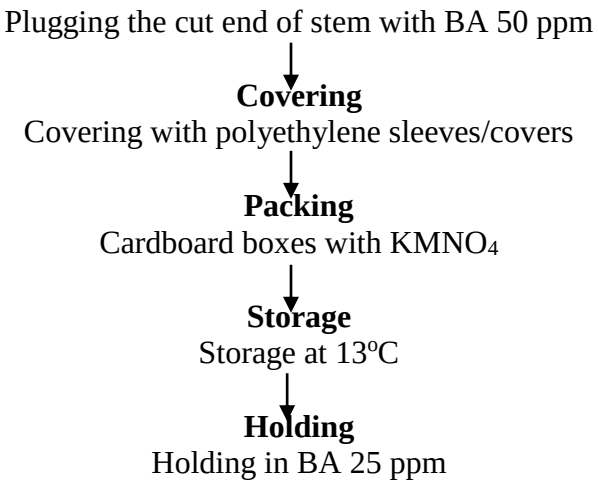
Plugging


Plugging the cut end of stem with BA 50 ppm
Covering
Covering with polyethylene sleeves/covers
Packing
Cardboard boxes with KMNO4
Storage
Storage at 13°C
Holding
Holding in BA 25 ppm

ORCHIDS

Orchids are noted for their bewitchingly beautiful, long lasting flowers, widely differing in shape, size and colour. They belong to the family Orchidaceae, reported to comprise over 600 genera, 30000 species and about 1.5 lakhs man made hybrids. They have varying habitats but epiphytic orchids dominate the trade. They are also classed as monopodials (stems having a vertical growth, non branching, with aerial roots) and sympodials (stems having a horizontal growth, producing pseudobulbs in clusters, no aerial roots).

The ideal location for orchid growing is in the open conditions, under appropriate level of shade. In Kerala certain orchids are grown under the shade of old coconut trees.

Most attractive orchids belong to the group of epiphytes, which require free moving air at all times. They produce aerial roots, which absorb water and nutrients from the atmosphere. Both terrestrial and epiphytes grow under varying levels of shade. Plants grown under deep shade will have good vegetative growth and poor flowering. Hence shade and light regulations are very important operations for better flowering. A humid and warm atmosphere is congenial for the growth of most of the tropical orchids. Better results are obtained when the atmospheric humidity is 50 to 80 per cent. Orchids require proper temperature for good growth and flowering. Accordingly there are tropical, subtropical and temperate orchids.

Genera / varieties

The popular genera of orchids that are suitable for growing in Kerala are *Arachnis, Aranthera, Vanda,Phalaenopsis (monopodials); Aranda, Mokara (inter-generic monopodials); dendrobium, Cattleya,* and *Oncidium (sympodials).*Dendrobium is the most popular genus of Kerala.

Important varieties of dendrobium grouped according to colour

Purple and white: Sonia 17, Sonia 28, Sonia Bom Jo and Earsakul
Purple: Renappa, New Wanee, Sabine Red, Jurie Red, Master Delight and Velvet Soft
White: Emma White, Fairy White, Kasem White and Snow White
Pink: Sakura Pink, New Pink, Lemon Glow and Pink Cascade
Yellow: Sherifa Fatimah, Kasem Gold and Tongchai Gold
Magenta: Deep Blush

Varieties of *Vanda* suitable for various purposes

Cut flower production and as pot plants

V. Pathum Gold, *V*. Lumpini Red x *V*. Taweewan, *V*. Pachara Delight Pink, *V*. Apec Blue, *V*. Prapauan, *V*. urbchitri x *V*. Bitz's Heartthrob and *V*. Thailand Beauty

Cut flower

V. Pranermprai x *V*. Tessellate, *V*. Katsuura and *V*. Anek Delight

Pot plants

V. Red Gem and *V*. Anek Delight

***Phalaenopsis* varieties for different purposes**

Cut flower	Pot plant
P. Chin Shang Strip	*P.* Magic Kiss
P. Kathleen Ai	*P.* Medium Pink
P. Taisuco Confidence	*P.* Lin Jessica
P. Roxane	*P.* Carlotta
	P. Mimi
	P. Goldie

Propagation

The conventional method of propagation is by vegetative means. Monopodial orchids are propagated by stem cuttings. Terminal cuttings with one or two healthy aerial roots are ideal as planting material. Basal cuttings of 30 cm length with a few roots and leaves are also good. But they take longer time to sprout and grow. Sympodial orchids are propagated by separation of pseudobulbs. A plant with minimum two or three pseudobulbs with the basal root is ideal for planting. Some of the sympodial varieties produce sprouts at the top of pseudobulb called as keikis. Keikis when fully grown can be separated and planted. Besides, back-bulbs or spent canes (shoots that have ceased to produce flowers) before they get shrivelled can be severed from the mother plant and placed horizontally over the medium to stimulate sprouting of new shoots. Seed propagation is possible only under aseptic conditions. Seedlings produced by embryo culture will take 2-5 years for flowering, depending on the genus.

Meristem culture is very effective in large scale propagation of orchids.

Planting

Terminal cuttings of monopodial orchids are planted loosely on old coconut husks at a spacing of 30 cm between plants and 45 cm between rows in long beds. There can be two or three rows in a bed. Basal cuttings will sprout within a period of two months. Partial shade up to 50 per cent is required for sprouting. Basal cuttings are planted close to each other in nursery beds for sprouting. After sprouting they are planted at the recommended spacing. Monopodial orchids can be grown on ground above soil level. A thick bed of 15-20 cm height is loosely arranged. Well dried coconut husks are better than fresh husks. *Phalaenopsis* can be planted in brick + charcoal medium and grown in a rain shelter or in a pad and fan greenhouse for maximum number of better quality flowers.

Sympodial orchids are grown on benches above ground level or suspended from above. Slotted wooden baskets filled with small pieces of dried coconut husk or partially burnt charcoal is good for plant growth. Planting is done above the medium with a support for proper anchorage. Planting can also be done in pots or other containers. Mud pots of 10-20 cm diameter with several large holes on the side and bottom, filled with tile bits, chopped coconut husk or charcoal are used for planting. A clear solution of fresh cowdung can be used for irrigation for a few days. Dipping in fresh cowdung solution before planting also gives good results.

Manuring

Monopodial orchids grown on ground can be given cowdung slurry once in a month. One kg fresh cowdung mixed in 5 litres of water is sufficient for one square metre. Two to three applications can be given in a year. Sympodial orchids are sprayed with the supernatant liquid of cowdung slurry. Nutrition of plants from the natural sources is not sufficient to support the plants for

economic production. Hence additional feeding is required.Foliar feeding is very effective in orchids. Fertilizer mixture of $N:P_2O_5:K_2O$ 3:1:1 can be applied during vegetative period and 1:2:2 can be applied during flowering period. The usual dose of such mixture is 2-3 g per litre of water, applied twice a week.

Plant protection

Major fungal diseases of orchids and their control measures

Sl. No.	Diseases	Causal organism	Control measure
Phalaenopsis			
1.	Fusarium wilt	*Fusarium oxysporum*	Saaf (2g/l)
2.	Collar rot	*Sclerotium rolfsii*	
3.	Soft rot	*Erwinia chrysanthemi*	*Dilhane 2-3 g/l*
Basket Vanda			
1.	Leaf spot	*Botryodiplodia* sp.	Kocide 1 g/l
Mokara			
1.	Leaf spot	*Alternaria alternata*	Kocide 1 g/l
Arachnis			
1.	Leaf spot	*Fusarium* sp.	Saaf (2g/l)

Pests

The common pests attacking orchids are thrips, aphids, spider mite, soft scale, mealy bugs, orchid weevil, ants etc. Other very serious pests of orchids are snails and slugs. They feed on the tender young shoots, roots and buds. Hand-picking is effective, if the number of plants is less. They move out during late night and hide before early morning. Damage is caused during this period. All the pests can be controlled by application of contact and systemic insecticides at appropriate concentration.

Dendrobium

Dendrobium orchids under protected cultivation were infected by flower beetles, thrips, maggots, mites, snails, slugs and birds.

Phalaenopsis

Snails, mites and mealy bugs were the most important pests observed in *Phalaenopsis*.

Major pests of orchids observed under protected cultivation and their control measures

Sl. No.	Pests observed	Nature of damage	Season	Effective control measures
1.	Orchid beetle	Grubs and adults feed on flowers and flower buds	June- Oct	Ekalux or Carbaryl (0.2 %)
2.	Mite	Nymph and adult feed on under surface of leaves and flowers and suck sap. Leaves appear yellow and scraped.	Dec-Jan	Confidor 0.003%
3.	Snails and slugs	Adult and young ones feed on roots, leaves flower buds and flowers. Prevalent in night time. More in monsoon. Prefers wet media	Through-out, more in rainy season	Hand picking and killing, Spreading 5% salt powder or Metaldehyde 1% on floor
4.	Thrips	Nymphs and adults suck sap from tender portions. Malformation of leaves, flower buds and flowers	Dec-April	Confidor 0.003% Neem oil 0.03 EC 5ml/l
5.	Mealy bugs	Adults and young ones suck sap from leaves and petioles	Jan-March	Malathion 50 EC or Confidor 0.003% at 10-15 days interval

Harvesting and post harvest handling

The spikes are harvested before the opening of all the buds of the spike, depending on the genus.