J. Orchid Soc. India, 27 (1-2): 1-8, 2013 ISSN 0971-5371

ORCHIDS-A WONDERFUL CROP FOR DIVERSIFICATION

L C De, Geetamani Chhetri, and R P Medhi

NRC for Orchids, Pakyong-737 106, Sikkim, India

Abstract

Orchids comprise one of the largest family of flowering plants with 25,000 species belonging to 600-800 genera. They are prized for their incredible diversity in the size, shapes and color and attractiveness of their flowers and high keeping qualities even upto 10 wks. Most of the orchids have originated from tropical humid forests of Central and South America, India, Sri Lanka, Burma, South China, Thailand, Malayasia, Philippines, New Guinea and Australia. Brazilian *Cattleya*, Mexican *Laelia* and Indian *Cymbidium*, *Dendrobium* and *Vanda* have played a major role in developing present day beautiful hybrid orchids which number more than 2,00,000. Orchids are found in nearly every environment in the world. Epiphytic orchids like *Aerides, Aranda, Aranthera, Bulbophyllum, Calanthe, Cattleya, Coelogyne, Dendrobium, Laelia, Phalaenopsis*, and *Thunia* with thick leaves and succulent stems have CAM and are drought tolerant with higher water use efficiency. Orchids are organically viable and grown easily in locally available media including fir bark, coconut husk, sphagnum moss, tree fern fibers, coco peat, saw dust and perlite, and frequently a mixture of two or three of these materials. Orchidscaping in the specially prepared beds or attached to trees, shrubs or rocks in combination with other traditional ornamentals such as palms, ferns, flowering perennials, shrubs, trees and herbs *etc.* create some of the most interesting and beautiful gardens. Several local species of *Ascocentrum, Calanthe, Cymbidium, Dendrobium, Paphiopedilum, Vanda, etc.* are in great demand in international market for breeding materials. Among the cut flower crops, *Aeridovanda, Arachnis, Aranda, Cattleya, Cymbidium, Dendrobium, Mokara, Odontoglossum, Oncidium, Paphiopedilum, Phalaenopsis, Renanthera, Rhyncocentrum, Rhyncovanda Vanda, Vascostylis, etc.* are important. Important orchid genera used as potted plants in the international market are *Ascocenda, Brassia, Cattleya, Cymbidium, Dendrobium, Epidendrum, Miltonia, Oncidium, Paphiopedilum, Phalaenopsis*, and *Vanda*. Orchids are rich in alkaloids, flavonoids, glycosides, carbohydrates and other phytochemicals and play an important role in herbal preparations. Orchids are distributed from tropical to alpine zones in forest trees, secondary vegetations, river banks, bamboo and palm thickets, forest floor, grassy slopes and rocky areas.

Introduction

ORCHIDS COMPRISE one of the largest family of flowering plants with 25,000 species belonging to 600-800 genera. They are prized for the incredible diversity in the size, shapes and colors of their flowers and long shelf life even upto 10 wks. Most of the orchids have originated from tropical humid forests of Central and South America, India, Sri Lanka, Burma, South China, Thailand, Malayasia, Philippines, New Guinea and Australia. Brazilian *Cattleya*, Mexican *Laelia* and Indian *Cymbidium*, *Dendrobium* and *Vanda* have played a major role in developing present day beautiful hybrid orchids which number more than 2,00,000. In India, it comprises 140 genera and 1,300 species which grow upto an elevation of 5000 m. Indian terrestrials are located in humus rich moist earth under tree shades in NorthWestern India. Western Ghats harbor the small flowered orchids. Epiphytic orchids are common in NorthEastern India which grow upto an elevation of 2000 m from sea level. Indian orchid species having high ornamental values are *Aerides multiflora, A. odorata, Arachnis, Arundina graminifolia, Bulbophyllum, Calanthe masuca, Coelogyne corymbosa, C. elata, C. flavida, Cymbidium aloifolium, C. devonianum, C. hookerianum, C. lancifolium, C. lowianum, Dendrobium aphyllum, D. chrysanthum, D. densiflorum, D. farmeri, D. fimbriatum, D. jenkinsii D. moschatum, D. nobile; Paphiopedilum hirsutissimum, P. insigne, P. spicerianum, P. venustum; Phaius wallichii; Pleione praecox;, Renanthera imschootiana; Rhyncostylis retusa; Thunia alba; Vanda coerulea, V. coerulescens*, and *V. cristata* (Singh, 1990). In India, some of native genera like *Arachnis, Cymbidium, Dendrobium, Paphiopedilum*, and *Vanda* are cultivated on a large scale for cut flower production. The *Cymbidium* is mainly grown in NorthEastern Himalayan Region, Sikkim, Darjeeling hills, Arunachal Pradesh and Assam. Tropical orchids are cultivated in Kerala and some parts of Tamil Nadu. The species which flower during winter and spring months should be preferred for export purposes so as to export their flowers to temperate regions from December to May. The orchids have taken a significant position in cut flower industry due to their attractiveness, long shelf life, high productivity, right season of bloom, easy packaging and transportation.

Orchids Adapted to the Diversified Climate

Orchids are found in nearly every environment in the world. They are usually epiphytic *i.e.*, grow on the trees, or lithophytic *i.e.*, grow on rocks. Orchids originating from temperate regions of the world are generally terrestrial *i.e.*, grow in the soil. Orchids are quite resilient, and can survive many years at the

Received: August 23, 2012; Accepted: December 5, 2012

home with proper care. Epiphytic orchids like *Aerides, Aranda, Aranthera Bulbophyllum, Calanthe, Cattleya, Coelogyne, Dendrobium, Laelia, Phalaenopsis, and Thunia* with thick leaves and succulent stems have CAM and are drought tolerant with higher water use efficiency. Orchids are classified into three main categories based on temperature: Warm orchids like *Aerides, Rhynchostylis, Vanda* and some *Dendrobium* species grow at day temperature upto 32.2°C and 15.5°C for a minimum night temperature; Intermediate species like *Brassovola, Cattleya, Laelia, Miltonia, Oncidium etc.* prefer 26.6°C days and 12.8°C nights; Cool species such as *Cymbidium, Cypripedium, Odontoglossum etc.* prefer 24°C days and 10°C nights. Most of the orchids require a lower night temperature for both robust growth and initiation of blooms. A night temperature of 10-13°C is ideal for initiation of flowering in *Cymbidium*. Most orchids generally prefer indirect or filtered light. Although, it varies from species to species, growth habit and habitat, as the rule of the thumb, 50% shading is always advised for most of the commercial orchids. Under enough light, orchid plants have short, plump stems with bright green leathery leaves and yellowing, stunting and scorching of plants occurs under too much of light whereas under too much shade, plants have dark green, soft and succulent leaves with thin and spiny stems. Low light orchids are classified as 1200-2000 f.c. (Foot Candle) of light intensity originated from dense forests *e.g,. Calanthe, Phalaenopsis etc*. Medium light orchids grow at the top of the tree canopies and prefer 2000-3000 f.c. of light intensity. *Cattleya* and related genera and hybrids fall into this category. High light orchids grow in full sun habitats and need 3000 f.c. or more light intensity. Cymbidiums and Vandaceous plants like high light to flower well. The single dominant factor which affects the cultivation of orchids is humidity which should be as high as 75-85%. It varies from species to species depending upon their habit of growth, light, temperature and ecotypes. Monopodial orchids require higher humidity than sympodial ones. As rule of thumb, at high temperature, humidity should be kept high. Provisions of misting units or foggers or even humidifiers will ensure adequate humidity. Standing water beneath the benches may also be kept to improve humidity.

Orchids-Organically Viable

Each orchid genus has different requirements for potting media collected from locally available organic sources. It is very important to have the correct medium for each type of orchid, depending on whether it is terrestrial or epiphytic. Growing media commonly include fir bark, coconut husk, sphagnum moss, tree fern fibers, coco peat, saw dust and perlite, and frequently a mixture of two or three of these materials. All orchids potted in a typical bark medium need to be repotted every 18 to 24 months, depending on the requirement of the individual plant.

Landscaping with Orchids

Orchidscaping is the use of orchids permanently planted into specially prepared beds or attached to trees, shrubs or rocks in the appropriate spot in the garden and combined with other traditional ornamentals such as palms, ferns, flowering perennials, trees, shrubs, herbs *etc*. It is easy to create some of the most interesting and beautiful gardens imaginable, depending upon the cost involvement and microclimatic factors.

Many orchids can be grown on rocks and logs for placing in the landscape. They are attached to either cut wooden logs, coconut logs or living trees and shrubs. Once the orchids are established, they will attach to the trees and logs (Teoh, 2005).

There are two main reasons for growing orchids in beds.

(i) For landscaping

(ii) To grow large numbers of a type for the flower market. In order to create the visual impact in landscaping, the orchids should be planted in a single bed of one type and of one colour. If somebody has only one or two plants of a type, it is advisable to grow them in pots. Almost all spider orchids (*Arachnis* and their intergeneric hybrids, terete and semi-terete *Vanda*, *Phaius tankervilliae*, *Calanthe* spp. and Lady's Slippers perform well, if they are grown on the ground in full sun with liberal watering and fertilization. Sloping or flat ground with good drainage provides the ideal location for orchid beds. The bed size should be of 2m length and 1m breadth. The best size for planting out in beds is when they reach a height of 70cm. Each cutting should have at least two strong roots. The newly planted orchids require some shade from direct sunlight and need watering twice a day, morning and evening. They are fertilized with dilute fertilizers at least twice a wk. When the plants are established, controlled release fertilizers or powdered bone meal can be scattered over the ground cover. Ground orchids are extremely hardy and respond well to fertilizers.

Orchids As Genetic Material for Breeding and Species Trade

Several local species of *Ascocentrum, Calanthe, Coelogyne, Cymbidium, Dendrobium, Paphiopedilum, Phalaenopsis, Vanda, etc.* are in great demand in international market for breeding materials (Table 1).

Table 1. Orchid species suitable for breeding

Arachnis cathcartii	*C. hookerianum*	*D. parishi*	*P. mannii*
Ascocentrum ampullaceum	*C. iridioides*	*D. pendulum*	*Pleione hookeriana*
Bulbophyllum leopardinum	*C. lancifolium*	*D. primulinum*	*P. humilis*
B. putidum	*C. longifolium*	*D. wardianum*	*P. maculata*
Calanthe chloroleuca	*C. lowianum*	*D. williamsonii*	*P. praecox*
C. herbacea	*C. munronianum*	*Paphiopedilum fairrieanum*	*Renanthera imschootiana*
C. masuca	*C. tigrinum*	*P. hirsutissimum*	*Spathoglottis plicata*
C. plantaginea	*C. tracyanum*	*P. insigne*	*Thunia alba*
C. triplicata	*C. whitese*	*P. spicerianum*	*T. marshalliana*
Coelogyne barbata	*Dendrobium bensonae*	*P. venustum*	*T. venosa*
C. corymbosa	*D. candidum*	*P. villosum*	*Vanda coerulea*
C. cristata	*D. densiflorum*	*Papilionanthe teres*	*V. coerulescens*
C. fuscescens	*D. farmeri*	*Pecteilis gigantea*	*V. cristata*
C. nitida	*D. formosum*	*Phaius flavus*	*V. pumila*
C. ochracea	*D. gibsonii*	*P. tankervillae*	*V. stangeana*
Cymbidium devonianum	*D. infundibulum*	*Phalaenopsis decumbens*	*V. tessellata*
C. eburneum	*D. nobile*	*P. lobii*	*V. undulata*
			Vandopsis undulata

Orchid Species and Hybrids for Cut Flowers

Amongst the cut flower crops, orchid genera *i.e., Aeridovanda, Arachnis, Aranda, Cattleya, Cymbidium, Dendrobium, Mokara, Odontoglossum, Oncidium, Paphiopedilum, Phalaenopsis, Renanthera, Rhyncicentrum, Rhyncovanda Vanda, Vascostylis, etc.* are the important ones (Bhattacharjee and De, 2005).

A good quality cut flower of a *Cymbidium* orchid is desired to have the following characteristics

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

Orchids- As Potted Plants/Hanging Baskets/ Trays

Potted orchids last for longer than cut flowers, their shelf life being three wks to four months depending upon species and hybrids (Nagrare and Ram Pal, 2008). Tall growing monopodial orchids are best grown in large clay pots upto 30cm in diameter. Terrestrial and semi-terrestrial plants like *Cymbidium* and *Paphiopedilum* perform better in deep pots. Orchid plants as a rule grow to be near one another to aid a microclimate higher in humidity. Basket culture is useful for those orchids like *Arachnis, Rhyncostylis,* and *Vanda* with pendent flower spikes and long dangling roots. Clay pots are best suitable for terrestrial orchids whereas plastic pots are used for epiphytic ones. Slabs or logs of tree fern are effective for cool growing orchids. A potting media of terrestrial orchids should have equal parts of leaf mould, soil and sand. Clay soil, bone meal, sawdust, charcoal dust, manure, wood savings *etc.* are also used in various proportions for satisfactory growth of terrestrial orchids. A potting medium consisting of charcoal, brick

pieces and coconut fiber in equal proportions is ideal for vegetative growth and flowering of epiphytic orchids like *Aerides, Dendrobium etc*. Under low humid conditions (30%), plastic pots with a mixture of bark/ perlite/sphagnum moss or osmunda are used. Under average humidity (35-50%), it is advisable to use plastic pots with a mixture of bark and sphagnum moss. Under high humidity (55% and above), clay pots are used with bark, stone culture, charcoal or tree fern. Important orchid genera used as potted plants in the international market are *Ascocenda, Brassia, Cattleya, Cymbidium, Dendrobium, Epidendrum, Miltonia, Oncidium, Paphiopedilum, Phalaenopsis, and Vanda* (Lopez and Runkle, 2005).

Colour Scheme with Orchids

To develop an orchidscape, one gardener should be aware of the flowering period of each orchid. Some gardeners enjoy seasonal burst of colour. For them, cymbidiums and dendrobiums which flower from winter to spring should be the first choice (Friend, 2004).

Winter flowering orchids: *Bulbophyllum hirtum, B. putidum, Cymbidium lowianum, C. mastersii, Eria bambusifolia, Paphiopedilum fairrieanum, P. insigne, P. spicerianum, Pleione maculata, P. praecox.*

Spring Flowering Orchids: *Ascocentrum ampullaceum, Calanthe plantaginea, Coelogyne cristata, Cymbidium devonianum, C. eburneum, Paphiopedilum hirsutissimum, P. villosum, Phalaenopsis lobii, Pleione humilis.*

Summer Flowering orchids: *Coelogyne corymbosa, C. cristata, C. nitida, C. ochracea, Cymbidium aloifolium, Dendrobium fimbriatum, D. heterocarpum, D. nobile, Phalaenopsis mannii, Phaius flavus, P. tankervilliae, Pleione hookeriana, Renanthera imschootiana, Rhynchostylis retusa, Spathoglottis plicata, Vanda coerulea, V. cristata, V. stangeana, V.tessellata.*

Orchids in Balcony Gardens

In Balcony gardens, lithophytic orchids can be grown by attaching them in free standing rocks or to the balcony's masonry walls. Genera suitable for shady location may include *Bulbophyllum, Coelogyne, Eria, Maxillaria*, some Oncidiums, *Sarchochilus* hybrids, *Phalaenopsis* and *Cattleya* hybrids.

Orchid Tree

An orchid tree is a variation on mounting orchids except the placement of many orchids on a branch or branches to give a completely natural look (Taylor, 2009). It is used in those areas of the country where orchids are grown outdoors, most of the year. Usually, the larger plants are attached to the bottom and the smallest on the upper portions for aesthetic reasons and to provide extra weight at the bottom to balance the weight of the structure. It is better to select those plants which require similar light, temperature, and humidity conditions. Another factor that has to be considered is flowering time to get different colors on the tree throughout the year. The chosen plants are mounted on the tree with sphagnum moss and fishing wire. Thorough misting and maintenance of humidity are essential for a month to establish the plants on the structure.

Herbal Garden with Orchids

Tribal people of NorthEastern hill region use wild orchids for a variety of folk medicine as orchids are rich in alkaloids, flavonoids, glycosides, carbohydrates and other phytochemicals (Table 2).

Fragrant Orchids

Fragrant orchids are delightful in the outdoor living areas. *Brassovola* species are perfumed at night and the Australian native dendrobiums perfume the air on warm spring mornings. Other aromatic orchids are *Aerides multiflora, A. odorata, Aeranthes, Bulbophyllum odoratissimum, Cattleya maxima, Coelogyne cristata, C. ochracea, Cymbidium ensifolium, Dendrobium nobile, Epidendrum cristatum, E. floribundum, E. nocturnum, Lycaste, Oncidium spaceolatum, Phaius tankervilliae, Rhynchostylis retusa, Vanda cristata, V. tessellata, Zygopetalum intermedium.*

Orchids-As Food

Leaves, tubers and pseudobulbs of different species are used for edible purposes. *Vanilla*- a major spice crop and source of vanillin comes from *Vanilla planifolia* and related species. *Anoectochilus* leaves are used as vegetables in Indonesia and Malaysia. Pseudobulbs of *Cymbidium maladimum* and *Dendrobium speciosum* and tubers of *Caladenia carnea* and *Microtis uniflora* are eaten. The popular beverage called as 'Faham' or 'Madagascar Tea' on the islands of Mauritius and Madagascar is prepared from orchid *Jumellea fragrans*. The tubers from the orchid genera like *Acianthus, Dipodium, Glossodia, Lyperanthus, Prasophyllum* and *Thelymitra* have been used as food by the inhabitants of Australia. In Africa, the tubers of *Cynorchis, Disa, Eulophia, Habenaria* and *Satyrium* are used as food or to extract juice from them. Roots, tubers or rhizomes of *Eulophia, Gastrodia, Habenaria, Orchis, Pholidota, Platanthera* and *Spiranthes* are used as food in Asia.

Orchids- An Item for Value Addition

Cilindra - a gift of a glass flute containing a flowering mini *Cymbidium*.

Stylish Setting - Festive packaging for special occasions like Birthday.

Orchids- For Festivals and Special Uses

People of Assam and Arunachal Pradesh use *Aerides odorata, Papilionanthe teres, Rhynchostylis retusa, Vanda roxburghii,* and many *Dendrobium* species in their religious and cultural festivals. In Assam, the flowering spike of *Rhynchostylis retusa* known as 'Kopou Phul' is used by the girls to adorn their hair during the spring festival. The flowers of some other orchids like *Vanda roxburghii* and *Coelogyne nitida* are also used to adorn hair of girls of Assam and Arunachal Pradesh in local festival. The flowers of *Papilionanthe teres* are offered to Lord Buddha and spirits by the Khamtis and other Tai ethnics of Assam and Arunachal Pradesh. In Kameng district of Arunachal Pradesh, *Dendrobium gibsonii, D. hookerianum*, and *D. nobile* are considered as the symbol of purity and sanctity by the local people. Monpas consider the flowers of *Cymbidium grandiflorum* as important for holy worship. The young Naga women of Manipur wore the orange flowers of *Dendrobium densiflorum* behind their ears. Similarly, the flowers of *Vanda coerulea* are used by the women of Manipur in hair during the autumn puja festival. In several countries, orchid species and hybrids are used as National Flowers. For example, *Vanda* Miss Joaquim in Singapore, *Peristeria elata* in Panama and *Lycaste Skinneri* var. *alba* in Guatemala. Orchids are depicted on stamps of several countries like Venezuela, USA, New Zealand, Australia, Indonesia, India, Singapore, Japan, Russia, Thailand, Malaysia and many others. Orchids are distributed from tropical to alpine zones in forest trees, secondary vegetations, river banks, bamboo and palm thickets, forest floor, grassy slopes and rocky areas and can be considered as an element in Farming System Research (Table 3).

Table 2. Common medicinal orchids of NorthEastern himalayan region.*

Species	Uses
Acampe papillosa	Roots are used for curing Rheumatism, Sciatica and uterine diseases
Aerides odorata	The ground fruit used for healing wounds. Juice of leaves is used to heal boils in ear and nose
Arundina graminifolia	Bulbous stems are used to heal cracks
Cymbidium aloifolium	Ground plant to cure chronic illness, weakness of eyes, vertigo and paralysis
Dendrobium densiflorum	Leaves crushed into paste with salt and applied on fractures to set bones
D. nobile	Fresh and dried stems used in preparation of chinese drugs for longevity and as aphrodisiac, stomachic and analgesic
Habenaria acuminata	Roots are used as tonic
Phaius tankervilleae	Pseudobulbs are used to heal swellings of hands and legs, poultice to soothe pain of abscess
Pholidota imbricata	Psedubulbs are mixed with mustard oil and applied on joints for rheumatic pain
Rhyncostylis retusa	Roots are effective against rheumatism, asthma, tuberculosis, cramps, epilepsy, vertigo, kidney stone, menstrual disorder
Vanda coerulea	Leaf juice is used against diarrhoea, dysentery and external application for skin diseases
V. cristata	Leaves are used as tonic and expectorant
V. teres	Leaf paste to reduce temperature in fever

*Source: Rao (2004)

Orchid diversity increases towards the tropic where the epiphytic species predominate that almost constitute 73% of the family. Germination of orchid seeds fully depends on a symbiotic association with soil-borne fungi, usually Rhizoctonia spp. In contrast to the peaceful symbiotic associations between many other terrestrial plants and mycorrhizal fungi, this association is a life-and-death struggle. The fungi always try to invade the cytoplasm of orchid cells to obtain nutritional compounds. On the other hand, the orchid cells restrict the growth of the infecting hyphae and obtain nutrition by digesting them. It is likely that antifungal compounds are involved in the restriction of fungal growth (Shimura *et al.*, 2007). Most cultivated orchids are native to the tropics. In their natural habitat, they attach themselves to the bark of trees, or the

Table 3. Climatic zones of orchids in NorthEast India.

Climatic Zone	Season	Temperature	Vegetation	Species
Tropical (250-800 m)	Summer	Day-30-38°C Night-20-27°C	Trees (*Mangifera, Ficus, Shorea, Cassia, Bombax and Artocarpus*)	*Ascocentrum ampullacum, Cymbidium aloifolium, Dendrobium. jenkensii, D. formosum*
	Winter	Night-10°C	Secondary vegetation	*Bulbophyllum* spp., *Eria* spp., *Phalaenopsis mannii, P. lobbii*
			River banks	*Anoectochilus roxburghii, Calanthe* spp.
			Sandstone outcrops and cliffs	*Arundina graminifolia, Diplomeris hirsuta, Eulophia* and *Habenaria* spp.
Sub-tropical Zone (800-1800m)	Summer	Day-25-32°C Night- 10-15°C	Trees (*Quercus, Prunus, Magnolia, Schima, Alnus, Bauhinia, Leucospermum*)	*Bulbophyllum* spp., *Cymbidium* spp., *Esmeralda cathcartii, Oberonia* spp,, *Pleione maculata*
			Bamboo and palm thickets	*Eulophia* spp., *Calathe* spp, *Paphiopedilum venustum, Phaius* spp,.
			Bamboo and palm thickets	*Eulophia spp., Calathe spp, Paphiopedilum venustum, Phaius spp,.*
			Forest Floor	*Anthogonium gracile, Bulbophyllum leopardinum, Habenaria spp., Paphipedilum fairrianum,*
Sub-temperate to temperate *Zone* (1800-3500m)	Summer	Day-18-21°C Night-10-15°C	Trees *(Alnus, Acer, TAbies, Pinus, Quercus, Magnolia and Rhododendron)*	*Cymbidium elegans, C. grandiflorum, Coelogyne cristata, Dendrobium candidum, D. hookerianum, Pleione hookeriana, Vandopsis undulata*
	Winter	Day-10°C Night –Freezing point	Forest Floor	*Goodyera fusca, Jewel Orchids, Calanthe chloroleuca*
			Grassy Slopes	*Habenaria spp., Liparis spp., Satyrium nepalense*
			Rocky Outcrops	*Anthogonium gracile, Pleione humilis, Satyrium nepalense, Spathoglottis ixioides*
Alpine Zone (>3500m)			Open Grassy Meadows	*Herminium, Orchis*
			Rocky banks	*Cypripedium spp., Satyrium nepalense*
			Rhododendron and *Conifer*	*Cypripedium spp., Listeria*

Table 4. Host-tree and orchid species specificity.

Host tree		Orchid Species
Common name	Botanical name	
Angeri	*Lyonia ovalifolia*	*Bulbophyllum viridiflorum, Chiloschista usneoides, Coelogyne corymbosa, C. cristata, C. ovalis, Cymbidium elegans, C. iridioides, Dendrobium aphyllum, D. chryseum, D. denudans, D. eriiflorum, D. heterocarpum, D. longicornu, Gastrochilus calceolaris, Kingidium taenialis, Oberonia acaulis, Pleione hookeriana, Vanda cristata*
Ban Litchi	*Benthamidia capitata*	*Dendrobium aphyllum, D. longicornu*
Banjh	*Quercus leucotricha*	*Bulbophyllum viridiflorum, Cleisostema* spp. *Coelogyne*

Table 4. Host-tree and orchid species specificity (contd.).

Host tree		Orchid species
Common name	Botanical name	
		corymbosa, C. cristata, Cymbidium elegans, C. iridioides, Dendrobium aphyllum, D. chryseum, D. denudans, D. eriiflorum, D. heterocarpum, D. longicornu, Gastrochilus calceolaris, Kingidium taenialis, Oberonia acaulis, Pleione hookeriana, Vanda cristata,
Chiuri	*Diploknema butyracea*	*Aerides multiflora, A. odorata, Coelogyne flaccida, C. ovalis, Dendrobium aphyllum, D. heterocarpum, D. longicornu, Gastrochilus calceolaris, Oberonia acaulis, Oberonia* spp., *Rhynchostylis retusa, Vanda cristata,*
Chutro	*Berberis asiatica*	*Chiloschista usneoides, Dendrobium denudans, D. eriiflorum, Gastrochilus calceolaris, Kingidium taenialis*
Kaphal	*Myrica esculenta*	*Coelogyne corymbosa, C. flaccida, C. ovalis, Cymbidium iridioides, Dendrobium aphyllum, D. denudans, D. eriiflorum, D. longicornu, Gastrochilus calceolaris, Oberonia acaulis, Vanda cristata*
Katush	*Castanopsis indica*	*Bulbophyllum viridiflorum, Chiloschista usneoides, Coelogyne corymbosa, C. cristata, C. ovalis, Cymbidium iridioides, Dendrobium aphyllum, D. chryseum, D. denudans, D. eriiflorum, D. heterocarpum, D. longicornu, Gastrochilus calceolaris, Kingidium taenialis, Oberonia acaulis, Pleione hookeriana, Vanda cristata*
Kaulo	*Persea odoratissima*	*Aerides odorata, Chiloschista usneoides, Coelogyne corymbosa, C. cristata, C. flaccida, C. ovalis, Dendrobium aphyllum, D. denudans, D. eriiflorum, D. heterocarpum, D. longicornu, Oberonia acaulis, Pholidota* spp., *Vanda cristata*
Khote Salla	*Pinus roxburghii*	*Dendrobium aphyllum, D. denudans, D. longicornu, Rhyncostylis retusa*
Lali Gurans	*Rhododendron arboreum*	*Bulbophyllum viridiflorum, Chiloschista usneoides, Coelogyne cristata, C. flaccida, C. ovalis, Cymbidium elegans, C. iridioides, Dendrobium aphyllum, D. chryseum, D. denudans, D. eriiflorum, D. heterocarpum, D. longicornu, Gastrochilus calceolaris, Kingidium taenialis, Oberonia acaulis, Pleione hookeriana, Vanda cristata*
Lek Chutro	*Berberis cristata*	*Chiloschista usneoides, Dendrobium aphyllum, D. denudans, D. eriiflorum, D. longicornu, Kingidium taenialis, Vanda cristata*
Mauwa	*Engelhardtia spicata*	*Aerides multiflora, A. odorata, Coelogyne flaccida, C. ovalis, Dendrobium aphyllum, D. eriiflorum, D. heterocarpum, D. longicornu, D. nobile, Epidendrum radicans, Gastrochilus calceolaris, Oberonia acaulis, Rhynchostylis retusa, Vanda teres, Pholidota* spp.
Mayal	*Pyrus pashia*	*Chiloschista usneoides, Dendrobium aphyllum, D. longicornu, Kingidium taenialis, Vanda cristata*
Sal	*Shorea robusta*	*Aerides multiflora, A. odorata, Coelogyne flaccida, Dendrobium aphyllum, D. eriiflorum, D. heterocarpum, Gastrochilus calceolaris, Oberonia acaulis, Rhynchostylis retusa*
Pashi	*Miorometes rhamnoides*	*Dendrobium heterocarpum, Epidendrum radicans, Rhynchostylis retusa*
Utis	*Alnus nepalensis* .	*Dendrobium nobile, Coelogyne flaccida, Epidendrum,, Vanda cristata, Thunia alba,*
Wild Cherry	*Prunus cerasus*	*Aerides multiflora, Coelogyne flaccida, Epidendrum radicans, Rhynchostylis retusa, Vanda cristata, V. tessellata*

surface of other plants (Table 4). Their thick, white roots are specially adapted to absorb moisture and dissolved nutrients. Because these tropical orchids usually grow high in the trees, rather than on the forest floor, they are accustomed to good air circulation and plenty of light.

References

Bhattacharjee, S.K. and L.C. De. 2005. *Post-harvest Technology of Flowers and Ornamental Plants.* Pointer Publishers, Jaipur, Rajasthan, India.

Friend, G.M.R. 2004. *Growing Orchids in Your Garden.* Timber Press, USA.

Lopez, R.G. and E.S. Runkle. 2005. Environmental physiology of growth and flowering of orchids. *Hort. Science,* 40(7):1969-73.

Nagrare, V.S. and Ram Pal. 2008. Cultivating potted orchids fetches more. *Indian Horticulture* 24-26.

Rao, A.N. 2004. Medicinal orchid wealth of Arunachal Pradesh. *Newsletter of Envis Node on Indian Medicinal Plants* 1(2):1-5.

Shimura, H., M. Matsuura, N. Takada and, Y. Koda. 2007. An antifungal compound involved in symbiotic germination of *Cypripedium macranthos* var. *Rebunense* (Orchidaceae). *Phytochemistry,* 68:1442-47.

Singh, Foza. 1990. Indian orchids. *Indian Horticulture,* 35(1):14-15.

Taylor, S. 2009. How to make an orchid tree. *http://www.Bellaonline.com/articles.*

Teoh, Eng-Soon. 2005. *Orchids of Asia.* Times Editions, Singapore.