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# *EX SITU* AND *IN SITU* CONSERVATION OF ORCHIDS IN INDIA

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**Abstract**

India is rich in orchid diversity with about 1200 species in 167 genera. They are found in almost all the phyto-geographical regions of the country. While entire stretch of the Indian Himalayas is home to nearly 900 species, the Eastern Himalayas alone harbours +/-839 species. Western Ghats region has about 283 species. Besides, the orchids are also distributed in the Western Himalayas with more than 250 species. The very fact that orchids are so large in number speaks of their diverse distribution pattern and habitat preference from sea level up to the snow peaks of the Himalayas in varied climatic conditions. Similarly, there is a great diversity in their habit too. They may be saprophytic, leafy terrestrial, lithophytic or epiphytic. Depending upon the ecological situations, orchids exhibit great adaptations and modifications in their morphological and floral characters which are diagnostic to a particular species. In this paper, diversity of orchids, their habit and habitat, in various phyto-geographical regions has been presented. In view of high endemism and RET status of several species, it is highly desirable to conserve the orchid resource of the country under both *in situ* and *ex situ* conditions. Need for adopting biotechnological approaches in conserving and propagating the endangered species has been emphasized. International rule and law in conserving the orchids around the world especially of IUCN and CITES has been dealt in brief and the role of Orchid Specialist Group (OSG) around the world and in India in promoting conservation of orchids has also been presented. Further, efforts made so far in India in conserving the orchids have been dealt along with future course of action to be taken for effective conservation of this unique group of plants.

## Introduction

INDIA IS considered as one of the Mega Biodiversity regions in the world with two major Biodiversity Hot-spots, The Eastern Himalayas and The Western Ghats. These Hot-spots with their lush green and diverse forest types are the real treasure-houses of multitudinal biotypes remarkably co-existing in diverse environmental conditions. One such precious resource in these treasure houses is perhaps the Orchids – the loveliest of all the flowering plants.

Orchids are considered to be highly evolved and specialized with adaptive excellence, displaying ingenuity in reproductive mechanisms and high degree of mimicry alluring and enticing the pollinators with attractive shape, colour, nectar, *etc* (Hegde, 1984). In view of the long lasting flower qualities - beauty, texture & designs beholding the onlookers, orchids are today, considered as "gems" or "Blooming Gold" in Floriculture with multi-million dollar business world over. Besides, orchids are also known for their medicinal properties and have been used in traditional system of medicines in various parts of the world. There are more than 50 species in India which have been used in various traditional systems of medicines. *Vanilla* is one of the important commercial orchids used in aromatic industry.

## Habitat

*Distribution*

Orchids are known for diversity of their habits and habitats. There are about 20,000 species in 760 genera distributed all over the world except in Polar Regions & Dry Deserts. Maximum concentration is seen in tropical and sub-tropical regions.

Nearly 1200 species in 167 genera representing 6 sub-families, 17 tribes and 30 sub-tribes grow in India. However, Misra (2007) estimates 1331 taxa under 185 orchid genera. The Hot Spot regions, Eastern Himalayas and Western Ghats are the richest orchid habitats in the country. NorthEast India with eight states alone contributes $\pm$ 839 species in 144 genera (Hegde, 1997, 2000, 2001, 2007; Kataki, *et al.*, 1984; Manilal and Sathish Kumar, 2004; Pradhan 1976, 1979). Table 1 provides the numerical strength of orchid species in different Indian states.

Arunachal Pradesh in the extreme North East tip of India is a paradise of the blooming beauties. It harbours maximum number of orchids with 614 species in 133 genera (Hegde, 1984, 2000, 2001, 2005). The state is rightly called "Orchid Paradise" of the country. In the Western Ghats, there are 283 species in 76 genera (Rao and Hegde, 2006; Rao and Sridhar, 2007).

The orchids are also found in the Eastern Ghats along the East Coast. Besides, they are also distributed in the Western Himalayas with about 250 species, in Gangetic Plains with about 60 species and in the Central parts of India with about 40 species.

*Ecology*

Orchids are found in diverse climatic situations of Warm humid tropical conditions of the West Coast, East Coast, Wetern Ghats and Eastern Ghats of Peninsular India to cooler subtropical, temperate and alpine

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conditions of the Himalayas. However, they can't thrive in Dry Deserts and Polar Regions. The most important factor for their healthy growth is high humidity (>60%) around the year. Most of the species do not like direct sun light and hence shady condition is required either on the ground or on the standing trees. However, some orchids like *Arundina graminifolia, Goodyera procera,* some Vandas, etc occur in the open areas indicating their liking for sun light. In India, various Forest types are a home to a variety of orchids. It is significant to note that one in every 15 species of flowering plants is that of orchids. There are about 20000 species in 760 orchid genera constituing 8% of flowering plants and nearly 40% of monocots. The orchids display high degree of compatibility between species and genera; more than one lakh man-made hybrids of commerce have been registered so far.

Table 1. Orchid species and genera in Indian states.

| State | Species | Genera |
|---|---|---|
| Andaman & Nicobar Islands | 80 | 15 |
| Andhra Pradesh | 67 | 33 |
| Arunachal Pradesh | 614 | 133 |
| Assam | 193 | 75 |
| Goa | 20 | 17 |
| Gujarat | 16 | 10 |
| Karnataka | 176 | 49 |
| Kerala | 252 | 79 |
| Maharashtra | 73 | 26 |
| Manipur | 207 | 66 |
| Meghalaya | 374 | 104 |
| Mizoram | 230 | 73 |
| Nagaland | 249 | 74 |
| Orissa | 127 | 47 |
| Sikkim | 520 | 122 |
| Tamil Nadu | 195 | 66 |
| Tripura | 52 | 34. |
| West Bengal | 322 | 82 |

## Diversity

Orchids are highly evolved group of plants with tremendous modification in their vegetative and flower structures; they also exhibit a great diversity in their habits and habitats. So diverse is their habit! So bizarre is their flower structure! At times one finds them leafless, colourless and even stem-less; but, often with variously modified stem, leaf and flowers. They are found on ground, on rocks and on trees; but always attracting one's attention with their curious shape and brilliant colour adding beauty to the land and landscape.

Based on the habit, orchids can be epiphytes, lithophytes, terrestrials or saprophytes (mycoheterotrophs !) and based on the vegetative characters, they can either be sympodials or monopodials. Thus, the orchids display tremendous variation and specialization in both vegetative and floral characters. Variations in the vegetative and floral characters are diagnostic in deciding the identity of a species and genera under various sub-tribes, tribes and sub-families in the classification of various taxa in the family Orchidaceae.

### *Native Ornamentals*

Although our country has about 1200 species of orchids occurring naturally, only about 150 species are ornamental and of commercial value. Others are mostly botanical curiosities contributing to bio-diversity of the region. Important among them are those belonging to the genera *Cymbidium, Dendrobium, Paphiopedilum* and *Vanda.* For the past one-century, large number of these native species has been traded with other countries – especially U.K. and Europe from Sikkim, Kalimpong and Shillong which has contributed to the erosion of our valuable germ-plasm and at the same time contributed to the development of several new hybrids of commerce else where in the world.

### *Present Status in Natural Habitats*

Today, orchids, our precious heritage, have become rare, vulnerable, endangered, threatened and on the verge of extinction due to man's various activities. It is significant to note that out of 1200 species in India, about 314 species are endemic to the country. In North East India, 187 species are endemic while in Western Ghats as many as 113 endemic species of orchids are found (Hegde, 1997, 2000). Further, it is interesting to note that there are as many as 215 species in India which are considered as endangered requiring immediate conservation measures *in situ* or *ex situ* in sanctuaries and orchidaria. Thus, our precious heritage is dwindling in nature day by day with the multifarious developmental activities and indiscriminate collection for trade, giving no heed for conservation. The blue and red Vandas that adored the forests of NE India in the past, and collected in head loads, by the earlier

Botanists like J. D. Hooker in the 18th century, are today hardly found in the wild and are listed under threatened category of Wildlife Conservation Act. So also, the curious lady slipper orchids like *Paphiopedilum wardii* and *P. druryii* are under threat and on the verge of extinction. According to Dr. Sanford, a renowned orchid ecologist: *"It is the height of folly to destroy orchids and their habitats without knowing exactly what their role may be – to say nothing of the psychological scar that destruction of natural beauty leaves permanently upon man".*

## Conservation

With the realisation of the depletion of orchid genetic resources, there have been consistent efforts to conserve them through

- Legislative measures of conservation
- *In situ* conservation in Sanctuaries/Reserves.
- *Ex situ* conservation in Orchidaria/Botanic gardens by cultivation.

*Legislative Measures*

As early as in 1936, Government of Assam prohibited unauthorized collection of *Vanda coerulea* (Blue vanda) and *Renanthera imschootiana* (Red Vanda), which are now included under, schedule VI of Wild life (Protection) Act 1972 of Government of India as amended in 1992. Accordingly, all orchids are protected plants under Wild life (Protection) Act.

The International Union for Conservation of Nature (IUCN) has a Species Survival Commission (SSC) with a well defined preservation programme for the Convention on International Trade in Endangered Species of Wild flora and Fauna (CITES). Under this provision, orchids are now being treated as protected species. In India, three genera and eleven species have been treated as protected under Schedule –VI of Wild Life Protection Act 1972 and simultaneously under CITES Appendix –I. All other species of India have been kept under Appendix II of CITES. The following are included under CITES Appendix –1 and Schedule – VI of Wild life (Protection) Act of G.O.I.

*Paphiopedilum charlesworthii*, *P. fairrieanum*, *P. hirsuitissimum*, *P. spicerianum*, *P. insigne*, *P. venustum*, *P. wardii*, *P. druryii*, *Renanthera imschootiana* (red Vanda), and *Vanda coerulea* (blue Vanda). Incidentally, excepting *P. druryii, which* is reported from Kerala, all other species of *Paphiopedilum* belong to N.E. India. This obviously speaks of the gravity of situation for conservation.

Under the provisions of the law, no wild orchids can be traded with and therefore plants listed above can not be allowed for export. However, under CITES rules and regulations, whenever CITES – Appendix –I species are cultivated then, these can be allowed for export subject to the condition that proper permit for possessing and growing these scheduled plants is obtained from the concerned State, provided the nursery is registered under Wild Life Preservation office, Government of India.

APPENDIX – I includes species threatened with extinction. In effect, no trade in Wild plants is allowed. Trade is allowed in cultivated and artificially propagated plants subject to licensing.

APPENDIX – II includes species, which may be threatened unless trade is strictly regulated. Orchidaceae is listed on Appendix – II. Trade in wild and propagated specimen is allowed subject to licensing. Further, all cultured orchid seedlings in flasks or aseptically cultured from seeds and tissues, are now exempt from CITES control w.e.f. 16th April 1993.

These legislations have helped in checking illegal collection of orchids from the wild as no importing countries also accept plants of wild origin. However, it is necessary to create awareness among customs Officials about these rules and train them on recognizing orchids of wild origin. In this regard, The Proceedings of the Seminar on CITES Implementation for Plants (1997), outlines and illustrates the method of recognizing the wild plants at the port and the procedure to deal with the same.

*In situ conservation in Sanctuaries/Reserves.*

Although 4.5% of the total geographical area of our country is covered under the Wild life Protected Area Network covering some important orchid habitats, there are number of endangered and threatened orchids that occur outside these network (Hegde, 1997). For instance, most of the endangered, threatened orchids including *Vanda coerulea*, *Renanthera imschootiana*, and *Paphiopedilum* species occur outside Wild Life sanctuaries and reserves. Hence, there is a need for identifying such habitat areas of endangered orchids and create orchid sanctuaries and reserves for conservation of this unique group of plants. Arunachal Pradesh has pioneered in this direction by creating "Sessa Orchid Sanctuary" with 100 Sq. km. area in West Kameng District under Wild Life Protection Act which is an abode of about 200 species that include some of the endangered and endemic species (Hegde, 1986). Similar Sanctuaries have also been created in Sikkim at Deorali and Singtam and such efforts are needed in

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all other states of our country.

*Ex situ Conservation in Orchidaria/Botanic Gardens*

With the depletion of natural forest day by day, numbers of orchids are lost forever. In order to conserve this bio-resource, it must be ensured that orchids from forest areas likely to be cleared for other developmental purposes are shifted to safer places like orchid Sanctuaries and Orchid Centers where they could be cultivated and maintained. It must be ensured that necessary provisions are made to ensure *ex situ* conservation for orchids. In India, Botanical Survey of India is maintaining three National Orchidaria and Experimental Gardens one each at Yercaud (Tamil Nadu), Howrah (West Bengal) and Shillong (Meghalaya) where representative species of the region are cultivated. Similarly, Arunachal Pradesh State Forest Research Institute is maintaining large number of orchid species at Orchid Research Centre Tipi, Itanagar, Sessa, Dirrang, Jenging and Roing as a measure of *ex situ* conservation of orchids and also for breeding and improvement. Similar attempts have also been made by Mizoram, Meghalaya, Manipur, Nagaland and Sikkim. Other states like Assam, Tripura, West Bengal, Orissa, Kerala and Tamil Nadu are also making efforts in this direction. In Karnataka, three *ex situ* conservation Centers have been established one in Kodagu at Nisargadhama, another in Kudremukh and the third in Dhandeli (Rao and Sridhar, 2007). A natural Orchidarium for the conservation of orchid germ-plasm has also been planned in Bangalore within Lal Bagh Botanical Garden. A DST (Govt. of India) sponsored Orchid Field Gene Bank for East Himalayan Region has been established at Hengbung (Manipur).

However, what is important is creating awareness by the general public for conserving these unique plants for posterity. In this regard, various Universities, Colleges and Schools should involve themselves in this cause for creating awareness by introducing orchids in school and college curriculum. Every Botanic Garden in our country must have an Orchidarium representing the locally available orchid species. Activities under Agri-Horticultural and Orchid Societies also would help in creating mass awareness and train the students and general public in the science and art of orchid cultivation. In this context, The Orchid Society of India is doing a great job. Further, it would be worthwhile considering propagation of orchids by adopting biotechnological means through aseptic culture of seeds collected from various species of orchids and rehabilitate them in their habitat / sanctuaries and encourage local people and the hobbyists to cultivate them in their home garden. This would ensure conservation of our germplasm ex *situ*.

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