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STATUS OF EXOTIC ORCHID HYBRIDS AND SPECIES IN INDIA: ITS IMPACT ON INDIAN ORCHID INDUSTRY

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Abstract

Orchids have been known in India right from *Vedic* period as plants of medicinal value and also of ornamentation. A retrospect of orchid trade in India reveals that it began with the supply of wild orchids to western countries during British era in 19th century in a small way that too from the Himalayan region to cater to the needs of hobbyists and nursery men abroad. There has been consistent efforts in India for evolving indigenous hybrids. Attempts have also been made to cross exotic species and hybrids with indigenous species and exotic hybrids and species have added to our germplasm collection and to our agro biodiversity. Critical observation of the origin of some of these hybrids reveals that they are primary hybrids of yester years. The exotic hybrids and species have a positive effect in creating awareness on the potentials of orchids on orchid based floriculture in India.

Introduction

ORCHID TRADE in India has been essentially that of supply of wild orchid species to cater to the demands of Nursery men in London and other western countries for about a century up to about 1980s. However, in the post independence era, there has been a gradual shift in the trade of orchids in the world from species to that of hybrid plants and cut flowers giving rise to a vibrant floriculture industry today. This change is essentially due to the production of newer hybrids of commerce and the discovery of aseptic seed and tissue culture technique of propagation of orchids. Meanwhile, there has been a wide spread realization that wild orchids are no more abundant in the wild and require measures of conservation. This prompted several countries to become signatories of CITES including India. Orchids are now protected under Wild Life Conservation Laws of the respective countries and their export and import trade is regulated under the same. Realizing the potentials of orchids in export oriented floriculture, Government of India, initiated promotional programs under National Horticulture/ Floriculture Mission encouraging entrepreneurs and farmers to grow orchids in controlled conditions under poly houses granting subsidies. This resulted in the importation of commercial orchid hybrid plants along with green house technology. As a result of trade liberalization, Indian markets today have been flooded with both seedlings/plants and cut flowers from various countries like Thailand, Malaysia, Singapore, Indonesia, Australia, New Zealand, Taiwan, Europe *etc.*

In this paper, attempt has been made to enlist some of the important exotic orchid hybrids and species introduced into India for cultivation over the last fifty years adding to our germplasm and biodiversity. Further, status of these exotic orchids has been presented with respect to their performance under cultivation, systematic record of their nomenclature, their role in boosting production of quality hybrids and cut flowers for export market, supplementing the urban and rural economy and also in our research & development efforts. It has been observed, while the rest of the world has registered more than 125,000 Orchid hybrids; but India has hardly 100 indigenous hybrids registered so far. These hybrids are yet to prove their worth competing in the world market. In the present scenario, India has become more dependent on advanced countries for quality planting materials for the production of hybrids and cut flowers in sufficient quantity to feed the market. In this paper, an attempt has also been made to assess the positive and negative impacts of imported exotic orchid hybrids and species on Indian Orchid Industry. Some remedial measures have also been suggested.

Orchids have been known in India right from *Vedic* period as plants of medicinal value and also of ornamentation (Hegde 1984, 2001; Vij 1986, 2001). Even in Europe, China and other countries, traditionally orchids have been used for their medicinal and rejuvenation properties for treating virility and other ailments. During 19th and 20th century, with more and more explorations world over, the beauty and longevity of orchid blooms lead to a craze for possessing these plants for growing in private gardens and nurseries. This resulted in hobbyist oriented orchid trade and hunt

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for rare exotic orchids lead to the destructions of some of the important orchid habitats in the world. Eventually also, explorations have unravelled the orchid diversity with about 25,000 species occurring in the world in diverse habits and habitats. India is one of the orchid rich countries with about 1,300 species and many of the orchid species have become rare and endangered in the wild requiring conservation measures (Hegde 1997, 2000, 2001, 2009; Manilal and Sathish Kumar, 2004).

On the other hand, when one looks back at the history of Orchid development, a hobby orchid growing of royals and affluent people in Western countries has become today an industry of cut flowers and pot plants of multimillion dollar business world over. Production of the first orchid hybrid, *Calanthe* Dominyi in the 1856, is an important milestone in this direction that opened up tremendous possibilities of orchid breeding (Khoshoo, 1986). By 1890, some of these hybrids became available for the growers. In the year 1922, Knudson developed a technique of producing plants from seeds through aseptic culture in the laboratory without mycorrhiza. This is another important milestone in orchid growing. Subsequent discovery of meristem culture by G. M. Morel in 1956 revolutionized orchid industry both in terms of quality and quantity production of commercial hybrids. Today, the world has over 1,25,000 man-made registered orchid hybrids, leading to a vibrant Orchid Industry. Recent discoveries and modern biotechnological approaches of micro propagation, mutation breeding, transgenic varieties (Masahiri 2011; Murthy *et al*, 2009; Wong 2011) have added dimension to the orchid Industry introducing an array of newer hybrids and clones released to the market making it more competitive in the world floriculture market (Hegde 2011; Murthy *et al.* 2009). Today, Orchids command top position in floriculture and are grown both for cut flowers and pot flowers for their exquisite colour combinations, shapes and long vase life/plant life.

Orchid Trade – An Overview

World Scenario

It has been observed that production and trade of floricultural crops has ever increasing trend. Out of about US $21 billion floriculture trade, 8 % is that of orchids and has an increasing trend of 15 % annually (Singh 2011). Thailand, Singapore, Malaysia and Netherlands are the major producers of Orchids accounting for almost 90 % production. Thailand has almost 7000 ha of Orchid cultivation as compared to less than 100 acres in India. Orchid imports in India are in the tune of 25-30 crores with negligible export earnings.

It is significant to note that Netherlands is the world's leading flower producer and exporter supplying more than 170,000 tonnes of flowers to Germany. The Dutch control the world export and auctioning of floricultural produces. Major consumers of floriculture products are Japan, European countries, South Korea, Thailand, Indonesia and Pacific countries with ever increasing demand. Major exporters of floriculture products are Holland, Columbia, Israel, Italy, Spain, Thailand, France, the USA, South America, New Zealand, Ecuador, *etc.* Important flower crops in the world trade are *Alstroemeria, Anthurium, Carnation, Chrysanthemum, Gerbera, Gladiolus, Gypsophila Statice, Roses, Orchids* (Arandas, Cymbidiums, Dendrobiums, Paphiopedilums) *etc.* Orchids command high value and great in demand in the World Flower Trade.

Indian Scenario

A retrospect of orchid trade in India reveals that it began with the supply of wild orchids to western countries during British era in 19th century in a small way that too from the Himalayan region to cater to the needs of hobbyists and nursery men abroad. In the post independence period during 1970s and 1980s, the importance of orchids was realized both in terms of their conservation and export potential in floriculture both as cut flowers and pot plants. Accordingly, Government of India took initiative to promote orchids through various agencies like National Horticulture Board (NHB), Agricultural Produce Export Development authority (APEDA), NABARD, *etc.* besides promoting conservation, research and development through, MOEF, ICAR, DBT, Department of Science and Technology, *etc.* For the last fifty years emphasis has been given for research and sustainable development of orchids ensuring conservation of native species and developing this resource for commercial purpose through breeding, culture and farming of commercial varieties (Hegde, 2001). Efforts have been made to involve local communities in growing orchids supplementing their economy (Hegde, 1999). Sikkim, Darjeeling - Kalimpong in West Bengal, N.E. States, Kerala, Karnataka, parts of Maharashtra (Pune), Tamil Nadu (Nilgiris) and some States of W. Himalayas of North India have been found ideal places for growing of Orchids suiting to the agro climatic situations. Government of India considers floriculture as "Sunrise Industry" and has accorded 100% export oriented status and it has emerged as hi-tech activity taking place under controlled green house conditions. Liberalisation of Industrial and Trade Policies have paved a way for export oriented production of cut

flowers. New Seed Policy has enabled importation of planting materials easier to promote floriculture in India. Important floriculture crops identified are roses, gladiolus, gerbera, petunias, carnation, chrysanthemum, amaryllis, jasmine, anthurium, lilium and marigold, besides tropical and temperate Orchids like *Dendrobium, Mokara, Oncidium, Phalaenopsis, Vanda, Cattleya, Cymbidium*, and *Paphiopedilum*. Total acreage of these crops is about 73,619 ha with 34,349 tonnes of loose flowers and 49,366 tonnes of cut flowers. Late of course, orchids have gained importance in export oriented floriculture crop. However, they have the least production area and minimum contribution in the overall turnover of floriculture products.

Orchid Farming / Growing

Noting the importance of orchids in floriculture as a foreign exchange source, some initiatives have been taken by Government of India during 1970s under ICAR by establishing Orchid Research Centres at Shillong, Meghalaya and Hesarghatta, Bangalore to undertake breeding, propagation and improvement of cultivation packages. A devoted Orchid Research Centre has also been established subsequently in the year 1996 at Pakyong, Gangtok, Sikkim and applied aspects of Orchid farming have been carried out on temperate orchids besides conserving germplasm of orchids at this Centre (Bag, 2006; Naik *et al.* 2010; Ram Pal and Medhi, 2011; Upadhyaya and Rampal, 2001).

Noteworthy initiatives have been taken by some State Governments *i.e.,* Arunachal Pradesh (Hegde, 2001), Sikkim, Kalimpong (W.B.) and TBGRI (Sathish Kumar, 2008) and Kerala Agriculture University (Sobhana *et al.,* 2008) in promoting Orchid Research and Development. Sikkim, having a traditional background in floriculture, has gone a step ahead in growing orchids through effective implementation of floriculture technology Mission involving the communities. Some attempt has also been made by the author in Arunachal Pradesh for involving the tribal communities by establishing Self Help Groups (SHGs), Farmer's Societies and promoting local entrepreneurs by imparting training in orchid growing, distribution of planting materials and linking with market (Hegde, 1999), besides creating awareness on orchid conservation and cultivation adopting biotechnological approaches, through the Orchid Society Arunachal (OSA). In Karnataka also, initiatives have been taken in developing orchid farms for cut flower production by Kanflora, Sirsi (Hegde, 2005; Hegde and Hegde, 2006).

Substantial assistance for carrying out research and development programs on orchids have also been accorded by various Ministries and Departments of Government of India and other agencies like DBT, DST, MoEF, NHB, APEDA, NABARD, ICAR, etc.(Hegde, 2001; Singh 2011). Private players like Indo American Hybrid Seeds, Bangalore, A. V. Thomas and Co, Kerala, Natural Synergies, Chennai, Himalayan Orchids and Mainam Garden, Sikkim, India Carbon Ltd. (ICL Flora Exotica), Guwahati, Zopar Exports, Mizoram, Florence Flora, Bangalore, Kanflora Sirsi, Karnataka, K F Bioplants, Pune, Rhyncho Orchids, Trivandrum, De Orchids, Mumbai *etc.*, have contributed significantly in promoting Orchid Industry in India. Contribution of Pradhans – especially, Mr. Keshav Pradhan, Mr. U. C. Pradhan (1976, 1979), Mr. Bhim Pradhan, and others from Sikkim and Kalimpong/Darjeeling area in developing orchid based floriculture industry are indeed praiseworthy.

Role of The Orchid Society of India, Chandigarh; The Orchid Society of Karnataka, Bangalore; Kerala Cut Flower Producer's Society, Trivandrum and other floriculture Societies in various States of India in promoting and creating awareness on orchids in our country is significant and laudable. Out of about Rs. 500 crores businesses in floriculture industry in India, orchids have the least contribution in our country. In fact, India has lagged behind other countries in Orchid trade despite its rich natural resources, ideal agro climate and technical knowhow. In order to establish orchid trade industry in floriculture, Government of India under Agriculture Ministry encouraged importation of planting materials along with the technical knowhow of orchid farming, over the last 40 years. Today, we have good germplasm collection of exotic hybrids and species in India.

Exotic Hybrids and Species

There has been consistent efforts in India for evolving indigenous hybrids in various centres (NRCO, Sikkim; SFRI, Arunachal Pradesh; TBGRI Trivandrum; Centre for Orchid Gene Conservation of Eastern Himalayan Region, Manipur; U. C. Pradhan Orchid Lab, Kalimpong *etc.*) for the last fifty years (Hegde, 2001; Sathish Kumar, 2008; Kishor, 2011). Attempts have also been made to cross exotic species and hybrids with indigenous species. However, it is seen that further improvement of these hybrids is required for commercial production and competing in world floriculture market. In order to pick up with the modern trends in orchid breeding and production of quality cut flowers and plants, it is essential to import germplasm and planting materials from abroad, especially from

advanced countries like Holland, Thailand, Malaysia, Singapore, Australia, New Zealand, USA and Taiwan. Exotic hybrids and species have added to our germplasm collection and to our agro biodiversity. However, the list is only representative not exhaustive.

In the major commercial hybrid genera like *Aranda, Aranthera, Cattleya, Cymbidium, Dendrobium, Mokara, Oncidium, Phalaenopsis,* and *Vanda,* several cultivars have been imported and introduced for growing in India (Hegde, 1999; Hegde and Hegde

Table 1. Some of the exotic orchid hybrids and species.

Sr. no	Name of exotic hybrid/species	Agroclimate.	Remarks
1.	*Arachnis* Maggie Oei (*A. hookeriana* x *A. flos-aeris*)	Tropical	Interspecfic hybrid(1941)
2.	Aranda (*Arachnis hookeriana x Vanda lamellata*) - Debora (1945), Nancy, Hilda Galistan etc.	Tropical	Early Bigeneric hybrid
3.	Aranthera (*Arachnis hookeriana x Renanthera cocinia*) - Mohamed Haniff (1937), James Storie	Tropical	Bigeneric hybrid
4.	Ascocenda (*Ascocentrum x Vanda*) *e.g.* Peggy Foo, *Brassovola nodosa*	Tropical-Subtropical Tropical	Bigeneric hybrid Species
5.	Brassocattleya (*Brassovola x Cattleya*)	Tropical-Subtropical	Bigeneric hybrid
6.	Brassolaeliocattleya (*Brassovola x Laelia x Cattleya*)		Trigeneric hybrid
7.	*Cattleya* Species: *bourengiana, intermedia, loddigesii, skinneri* Hybrids: Rhyncho-Cattleya Yellow	Tropical	Species and hybrids
8.	*Cymbidium* hybrids: Alexanderi 'Westonbirt', Borrough Green 'Opal', Jungfrou 'Dos Peublos', Camales, Show girl 'Cooksbidge', Okney Pink Heather, Rievaul x Cooksbridge, Rotoura 'Rose', Angelica December Gold, Hautescens, Amesbury 'Frank slattery', Ceres S. J. Hanbury, *etc.*	Temperate	Complex hybrid clones
9.	*Dendrobium* hybrids: White - Pure white 4N, Jack Dorean, Aliga, Blushing, *etc.*, Light Pink_ Anna, Sakura, Dark Pink - Sonia, Deang siam, Nia rose, Pompadour, *etc,* Yellow - Jade, Fatima, Mary Mark, Blueberry, Bicoloured, Candy Strike, Mary Trouse(Green), *etc.*	Tropical	Inter-specific hybrid cultivars
10.	*Eunanthe sanderiana* (*V. sanderiana*)	Tropical	Species/varieties
11.	*Gangora quinquenervis*	Tropical	Species
12.	*Grammatophyllum speciosum*	Tropical	Species
13.	*Laeliocattleya (Laelia x Cattleya)*	Tropical-Subtropical	Bigeneric hybrid
14.	*Mokara(Arachnis x Ascocentrum x Vanda)*- Kelvin, Zaleha Alsagof *etc.*	Tropical	Trigeneric hybrid
15.	*Laelia anceps, goldiana, harpophylla*	Tropical-Subtropical	Species
16.	*Oncidium* species: *splendidum, ampliatum, stipitatum, papillio (Psychopsis picta)*	Tropical-Subtropical	Species
17.	*Paphiopedilum* species: *belatulum, callosum, charlesworthii, ciliolare, concolor, sukhakulii, superbiens, etc.* And their Hybrids: Wisnston Churchil, Hodefroye, *etc.*	Tropical-Subtropical-temperate	Inter-specific hybrids

18.	*Phalaenopsis* species: *amabilis, amboinensis, Intermedia,* lindenii, luddemaniana, sanderiana etc. Hybrids: Barbera Bush, Redfan 'Grazia', Antonio, Rma, *etc.*	Tropical-Subtropical	Species and hybrids clones/variants
19.	Potinara (*Brassovola x Laelia x Cattleya x* Sophrinitis)	Tropical-Subtropical	Quadrigeneric hybrid
20.	*Renanthera storiei, R. coccinia*	Tropical	Species
21.	*Rhynchostylis gigantea*	Tropical	Species
22.	Spathoglottis Premier (pink), Tamasek Park (yellow), Vanoverberghii (yellow)	Tropical	Hybrid varieties
23.	Vanda species: *coerulea* (Thai var), *rothschildiana, lamellata* Hybrids: Rothschildiana 'Sally Roth', Gordon Dillon 'Lea', *etc.*	Tropical	Species and Hybrids
24.	*Zygopetalum*	Tropical	Species and Hybrids

2006; Rajeevan, 2010; Upadhyaya and Rampal, 2001). Some initiatives have been taken to assess and enlist the performance of *Cymbidium* hybrids in Sikkim (NRC Orchids, 2000) and in Arunachal Pradesh (Hegde, 1999). APEDA has brought out a Production Manual of Cymbidiums suitable to this country (2006). In fact, a systematic cataloguing would yield more numbers of exotic hybrids and species that have been introduced under cultivation in India.

Critical observation of the origin of some of these hybrids reveals that they are primary hybrids of yester years. For example, Arachnis Maggie Oei (*A. hookeriana x A. Flos-aeris*) is an old hybrid produced in Singapore in 1941 cultivated now in India. However, this particular hybrid has been responsible to give rise to large number of modern complex hybrids of commerce. Similarly, Aranda (*Arachnis hookeriana* x *Vanda lamellata*) – Debora (1945) and Aranthera (*Arachnis hookeriana x Renanthera cocinia*) – Mohamed Haniff (1937) are the other examples which have been grown in India and could be utilized for the production of newer hybrids utilizing our own native species like *Arachnis cathcartii, A. clarkei, Vanda whitii, V. thwaitesii, etc.* In this regard, intensive breeding of tropical Vandas should be undertaken following the examples of Dr. Martin Motes (2011).

In case of dendrobiums and cymbidiums, there are innumerable hybrid clones introduced in India for cut flower production. However, most of them lack scientific names and mostly have been categorised from the colour of flowers like whites, greens, yellow, pink, bicolour, *etc.* In case of Dendrobium Sonia itself, there are more than two thousand cultivars distinguished from their shape, colour pattern, size and number of flowers, *etc.* We do not have proper information as to their breeding behaviour and viability of seeds *etc.* Other species like *Brassovola nodosa, Cattleya bourengiana, C. intermedia, C. loddigesii, C. skinneri, Eunanthe sanderiana* (*V. sanderiana*), *Gangora quinquenervis Grammatophyllum speciosum,* Oncidium *splendidum, O. ampliatum, O. stipitatum, O. papillio (Psychopsis picta), Paphiopedilum belatulum, P. callosum, P. charlesworthii, P. ciliolare, P. concolor, P. sukhakulii, P. superbiens, Phalaenopsis amabilis, P. amboinensis, P. intermedia, P. lindenii, P. luddemaniana, P. sanderiana, Renanthera storiei, R. coccinia, Rhynchostylis gigantea, Vanda coerulea* (Thai var), *V.rothschildiana, V. lamellate* and *Zygopetalam* sp. have been found in hobbyists collection and also in some nurseries. They have enriched our germplasm and can be utilized in our breeding program.

It has been observed in the farms and nurseries, besides in the collection of hobbyists that many of these hybrids imported from Thailand and other countries have the symptoms of diseases. In other words, we also import diseases along with the orchids; hence, strict quarantine measures are needed before and after importing the plants from abroad. There is a need for having a data base of exotic hybrids and species with scientific names, name of the breeder, name of the country imported from, quarantine information *etc.* There is also a need to have an Indian authority to register Orchid hybrids and a data base to encourage and systematize orchid breeding in India. While most of the tropical hybrids (Aranda, Aranthera, Mokara, Vanda, Dendrobium) are grown in coastal and Western Ghats regions of South India and some parts of Brahmaputra valley of Assam, the temperate orchid hybrids like *Cymbidium* and *Paphiopedilum* are grown

successfully in the Hill regions of NE India. Even in Bangalore City, Paphiopedilums are found to grow happily. Commercial cultivation of tropical hybrids has been successfully demonstrated involving the farmers and communities in Kerala, Karnataka and Assam (Hegde and Hegde, 2006; Rajeevan, 2010; Sathish Kumar, 2010). Similarly, Sikkim, Darjeeling and Arunachal Pradesh have also been successful in growing temperate orchids *i.e.*, Cymbidiums in a successful manner (Hegde, 1999). However, the flowers produced lack quality as compared to the flowers of the latest hybrid cultivars and therefore cannot compete with the flowers that have flooded our market. This seems to have adverse effect on our orchid industry.

Impact Assessment

Introspection reveals that we have all the technical knowhow of Orchid growing, propagation technique, biotechnological backing, green house technology, besides, wide ranging ideal agro climate from tropical to temperate regions and natural genetic resources. But, hat we lack is availability of market driven approach, lack of quality planting material of our own evolved from the native genetic resources that can compete with world market and consistent R & D back up with new hybrid varieties. Secondly, there is a lack of production of planting material, as well as quality and quantity of cut flowers to feed the market. Further, a close observation of data of import and export of orchids reveals, we have been importing more orchid planting materials than what we export as cut flowers or planting materials developed in India. In fact, we are more dependent on other countries for quality and quantity planting materials for supplying to the farmers and growers which affects the cost of production of cut flowers in India. Hence, the cost of our cut flowers is higher than the ones that we import. In other words, we are not able to compete with other countries even in our domestic flower market. In Cities like Bangalore, Delhi, Kolkata and Mumbai exotic orchid hybrids/species and cut flowers have flooded the market with comparatively cheaper rates than our own orchid hybrid varieties and their cut flowers. In a city like Bangalore, the cost per plant of various exotic commercial Orchids are:

- *Phalaenopsis*: Rs.70/- (seedlings); Rs. 185/- (pot plant); Rs. 400 – 750 – 1200/- (Fls).
- *Dendrobium*: Rs. 55/-(seedling); Rs. 200 - 350/- (Fls).
- *Vanda*: Rs. 350 – 500/- depending upon variety.
- *Cattleya*: Rs. 350 – 500/- depending upon variety
- *Oncidium, etc.* Tissue cultured and developed in India-Rs. 300 – 700/-.

Hobbyists don't mind buying them at this cost. However, the farmers, young entrepreneurs and other growers are affected by this cost and have negative impact in setting up a farm of their own. This is a discouraging factor in developing orchid industry. It has also been observed, while the rest of the world has registered more than 125,000 Orchid hybrids; India has hardly 100 indigenous hybrids registered so far. These hybrids are yet to prove their worth competing in the world market. In the present scenario, India has become more dependent on advanced countries for quality planting materials for the production of hybrids and cut flowers in sufficient quantity to feed the market. This obviously calls for reviewing the trade Liberalization and Seed Policies of India to promote and strengthen Indian Orchid Industry.

Conclusion

It is evident from the above discussion that the exotic hybrids and species have a positive effect in creating awareness on the potentials of orchids on orchid based floriculture in India. At the same time, it points out that we are far behind other countries in Orchid cut flower industry and unable to compete in the floriculture market both in domestic and foreign market. This warrants strengthening of our R & D base and reviewing our trade policies.

Further, it is necessary to invigorate breeding, improvement of quality, field trials and propagation adopting modern biotechnological approaches (Masahiri, 2011) for the quality production of hybrid varieties at a reasonable cost and make it available to the communities both at rural and urban levels in suitable agro climatic zones. This would help develop hub of activities right from farm gate to the market places in cities. Corporate sector should also be involved in taking up orchid based floriculture business to give a boost to the orchid industry in India.

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