

# Orchid: Research, Medicinal Uses, Threats and Conservation

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## ABSTRACT

Orchids are the largest and most diverse family of flowering plants, with over 25,000 species. They are found in a wide range of habitats, from tropical rainforests to alpine tundra. In India, orchids are found in all climatic zones, from the Himalayas to the deserts. Orchids are economically important plants, both as ornamentals and for their medicinal properties. They are also threatened by habitat loss and over-harvesting. In India, over 250 species of orchids are threatened. This review provides an overview of the diversity, conservation, and medicinal uses of orchids in India. It discusses the different types of orchids found in India, the threats they face, and the efforts being made to conserve them. It also discusses the traditional medicinal uses of orchids in India, and the scientific evidence for their efficacy. The review concludes by calling for increased research on the medicinal properties of orchids, and for more effective conservation measures to be put in place. This article also talks about how orchids were used in traditional medicine, how endangered they are, and how species can be protected where they grow.

*Key words* : Emphasising, Endemic, Extinct, Habitats, Medicinal Orchids.

## Introduction

Orchids are well known worldwide for their distinctive flowers and constitute the largest flowering plant family. Plants are a great gift that nature has bestowed onto mankind. Plant communities on this planet are essential to the survival of both man and animals (Sood SK., 2006). Orchids, which belong to the Orchidaceae family, are the monocotyledons with the most varied and advanced floral specialisation. The word orchid is derived from the term *orchis*, meaning testis. Theophrastus coined the word because plant anatomy resembles testicles. According to botanists, the Orchidaceae family has more species than any other flowering plant family, nearly 25,000 (Chase, 2005; Chase *et al.*, 2003; Pillon and Chase, 2006). In floriculture and herbal medicine, orchids are symbols of royalty and nobility. Orchid blossoms are prized for their distinct shape,

vibrant colours, and lengthy shelf life, which outlasts many other floriculture crops. Orchid cultivation has become a hugely profitable industry around the world as a result of these characteristics. A great variety of species have attractive flowers and are capable of interspecific and intergeneric hybridization, which has resulted in a plethora of hybrids with various floral features. Orchids are the largest and most sophisticated botanical family of higher plants in India, accounting for 9% of our flora. It is estimated that there are approximately 25,000-35,000 species in the world, divided into 800-1,000 genera (Chugh *et al.*, 2009). In India, there are roughly 17,500 flowering plant species (Rout, 2010). Herbs make up over 10,000 of them. Orchids are native to India, according to taxonomic research by numerous notable botanists (Misra, 2004). The temperate Himalayas (India) are home of orchids 1331 species which are belonging to 184 genera (Yonzone

and Kamran, 2008). North-East India is an orchid hotspot, accounting for roughly 70% of all Indian orchids. There are approximately 193 Orchid species in 71 genera, with 27 of them being endemics. In the Himalayas, most research on orchids has been about documenting them, but there haven't been many studies on the chemical and medical properties of medicinal orchids. There is a scarcity of knowledge on the medicinal worth of orchids in terms of their therapeutic capabilities in various locations, most of which are peculiar to certain regions and communities. The collection of such data is critical for providing a reference for disease cures through drug research that aids in health-related difficulties. Day by day biodiversity of orchids is decreasing rapidly, as a result, species conservation is a critical step in preventing vulnerable species from becoming extinct (Ceballos *et al.*, 2010). Due to anthropogenic activities, threats of their extinction are globally widespread and orchid faces habitat loss condition which is a result of pollution, changes in climate, land clearing, over utilisation (Stork, 2010; Hanski, 2011; Urban, 2015; Valiente-Banuet *et al.*, 2015). Conservation of orchid species is crucial because they have considerable value in ornamental and medicinal markets. De and Medhi (2014) have emphasized the rare species protection and endangered orchids in north-eastern India by introducing approaches to remote sensing and GIS surveys to conserve genetic resources and by using biotechnological tools to promote disease resistance and high yield. Some endangered species of orchid have already experienced a considerable population decrease (Cribb *et al.*, 2003), and policy recovery strategies are being established based on data from the IUCN red list (IUCN, 2020) and data from the IUCN red list (IUCN, 2020). Work on orchid conservation must concentrate on population monitoring, species distribution, and ecology, rather than the current trend in genetic diversity, propagation techniques, and taxonomy (Wraith *et al.*, 2019). A study conducted in Indonesia stressed that conservation efforts are very much needed at the local orchids are endangered by illegal harvest and not the local populace (Broto *et al.*, 2020).

Orchids are mostly epiphytic and thrive in tropical and subtropical environments. Edible orchids in Malawi are classified as *Habenaria*, *Satyrium* and *Disa* genera. In the beginning, an orchid study in Southern Africa was primarily concerned with taxonomy concerns (Williamson, 1977). Recently, a number of researchers (Hamisy, 2016; Davenport

and Ndangalasi, 2003; Bingham and Smith, 2002; Bingham and Kokwe, 2001; Golding, 2001; Ng'uni *et al.*, 2001) have focused on the sharp rise in demand for edible orchids. This has led to more cross-border trade, which has raised concerns about the orchid's long-term survival because of the high demand for it. The North Eastern mountainous parts of India, where epiphytic orchids can be found growing up to 2000 meters above sea level, are a paradise for epiphytic orchids (Chowdhery, 2009). *Arachnis*, *Cymbidium*, *Dendrobium*, *Paphiopedilum* and *Vanda* are some of the most widely cultivated native Indian genera. Arunachal Pradesh, Assam, Darjeeling, and Sikkim are all known for their Cymbidium cultivation. Tropical orchids, on the other hand, are found in regions of Kerala and Tamil Nadu. Epiphytic orchids develop slowly, owing to their technique of carbon acquisition. Epiphytic orchids are, by the way, the most economically significant orchid species (Hew and Young, 2004). The first documentary was presented by Chinese on the medicinal uses of orchids. Orchids like the *Dendrobium nobile*, *Gastrodia elata* and *Bletilla striata* were commonly utilised in traditional medicine (Bulpitt *et al.*, 2007). India is the richest habitat of orchids. Their ability to grow in the soil, on trees and on rocks allows them to flourish in a wide area of settings, from Tropical rainforests to high alpine tundra (epiphytic form, lithophytic form). Orchids are one of the most endangered groups of plants in the world. About 600 orchid species are listed as threatened on the IUCN Red List. The IUCN Red List is a global database of endangered species (Wraith and Pickering 2018; IUCN 2019). With orchid populations in most parts of the world continuing to decline (May 2018; Wraith and Pickering 2018, 2019), it's critical to examine existing studies, their conservation targets and set research priorities. Because of their specialized life cycle (mode of living, reliance on pollinators for pollination, lack of nutrition in seed and dependency on mycorrhizal fungi for seed germination and human intervention, orchids are highly vulnerable to loss or erosion even in their natural habitat. Appendix-I of CITES (Convention of International Trade in Endangered Species) list the globally protected species whereas nationally protected species listed under Schedule-VI of Wild Life (Protection) Act 1972. The Red Data Book of Indian Plants was issued by the Botanical Survey of India, lists the plant species facing threats of various categories and requires immediate attention. Accord-

ing to recent estimates, almost 250 species of native orchids are threatened in various ways. Out of 352 indigenous orchids in the nation, 40 are considered “endangered” and 72 are considered “threatened” (Ram *et al.*, 2011). Since biodiversity is a sovereign right of the nation according to the Convention on Biodiversity, once these species are lost or go extinct, it will be an irreparable loss for the nation. Furthermore, Reiter *et al.* (2016) revealed that just 25% of studies saw any fruit set and only 2.8 percent of studies identified recruitment in a global evaluation of fragile orchids, based on a review of 74 published conservation translocations. Given this lack of success, it is evident that a critical examination of present orchid conservation efforts is required.

### Use of Orchids in Traditional Medicines

Many countries have used orchids as medicines for a long time (Bulpit *et al.*, 2007). Unquestionably, the Chinese were the first to cultivate and catalogue orchids, and they were likely the first to use them medicinally. Additionally, the first literature about orchids were published by the Chinese (Jalal *et al.*, 2009). For ages, orchid species (*Dendrobium*) have been utilized as medical herbs in various countries. There are still roughly 40 *Dendrobium* species utilised in traditional Chinese medicine. *Acampe*, *Aerides*, *Coelogyne*, *Crepidium*, *Dactylorhiza*, *Gastrodia*, *Eulophia*, *Flickingeria*, *Otochilus*, *Pholidota*, *Satyrium*, and *Vanda* are other genera of medicinal orchids that are intensively exploited (Subedi *et al.*, 2013). Orchids have also been used for a long time in traditional Indian medicine. Ayurvedic remedies like Chavyanprasa include a considerable amount of Ashtavarga, also referred to as the “herb of immortality”. It includes medications made from orchids including *Platanthera edgeworthii*, *Habenaria intermedia*, and *Crepidium acuminatum* (Singh and Duggal, 2009). Additionally, the plant *Dendrobium macraei* is the source of the crucial Ayurvedic medication Jivanti (Kasera and Shukla, 2001). *Cymbidium giganteum*, *C. aloifolium*, *C. williomsoni*, *Dendrobium fimbriatum*, *Papilionanthe teres*, *Eulophia campestris*, *Satyrium nepalense*, *Laparis odorata*, *Orchis latifolia*, *Vanda cristata*, *V. tessalata*, *V. coerulea*, *V. spathulata*, *Dendrobium nobile*, *D. moschatum*, *Phaius tancarvilleae*, and *Cymbidium giganteum*, *C. aloifolium*, *C. williom* (Suresh *et al.*, 2000; Kong *et al.*, 2003; Hossain *et al.*, 2011; Medhi and Chakrabarti, 2009).

## Medicinal orchids of India

### Methodology

Reviewing relevant literature and doing reconnaissance, ethnobotanical, and social economic surveys all over India to find out the status of edible orchids and how they are used in different places. The purpose of the reconnaissance survey was to determine the distribution, occurrence and use of consumable and medicinal orchids by social communities in order to better understand how they are used in the community. The ethnobotanical survey was conducted as a quick assessment to determine edible orchid richness, geographical distribution, and renewable potential. In a social economic study, the impact of edible orchids on household income and food security in relation to gender was examined. All macromorphological characteristics, such as habit, flower color, scent, and so on, were meticulously studied. In the instance of epiphytes (Fig. 1), the species scarcity, habitat, ecology, and allied species were all recorded in the field book. Specimens were identified using available floras and by comparing them to PBL and CAL herbarium collections (central national herbarium). PBL was used to store the herbarium specimens that were collected and identified.

### Edible Orchids Status

The conservation and management methods for orchids are examined in terms of species diversity, ecodistribution, capacity for regeneration, and native conservation and management methods. Ecodistribution and Species diversity: In the native tongue, edible orchids are known as chinaka. Male and female chinaka are divided into two categories. Mzimba District has six key names for edible orchids, whereas Kasungu has nine. *Disa sp. are Disa zombica*, *Disa engleriana*, *Satyrium ambylosaccos*, *Satyrium buchananii*, *Satyrium cursonii* were identified among the edible orchid species based on the names recorded. The diversity differed from one location to the next. All six edible orchid species were registered only one village (Mazwana) in Mzimba District. There were no edible orchid species reported to have gone extinct in this study. However, it was observed that a number of species, including *S. cursonii*, *S. buchananii*, *S. ambylosaccos*, and *D. engleriana*, are becoming rare due to rising demand. Numerous hazards to the presence of ed-

**Table 1.** Ethnomedicinal uses of orchids



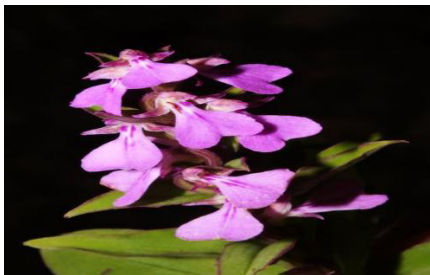

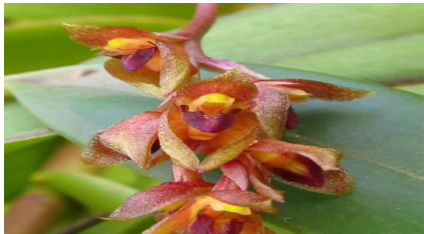
Botanical Name	Part Used	Medicinal Uses
 <p><i>Acampe carinata</i> (Griff.) Panigrahi</p>	Root, Leaf	Acute rheumatism, sciatica, neuralgia, secondary syphilis, and uterine disorders are all treated with this root. External application of a paste to cure scorpion and snake bites. Chest pain, gastrointestinal issues, and acidity can all be relieved with a leaf decoction taken orally.
 <p><i>Acampe rigida</i> (Buch. - Ham. ex Sm.) P.F. Hunt</p>	Root, Leaf	Muscle and joint pain are relieved, and blood circulation is improved.
 <p><i>Brachycorythis obcordata</i> (Lindl.) Summerh.</p>	Tuber	Tuber is astringent, expectorant, and nutritive. As a tonic and to treat dysentery, mix powder with milk.
 <p><i>Bulbophyllum odoratissimum</i> (Sm.) Lindl. ex Wall.</p>	Whole Plant	Tuberculosis, chronic inflammation, and fractures are all treated with an infusion or decoction.
 <p><i>Bulbophyllum sterile</i> (Lam.) Suresh</p>	Pseudobulb	Rheumatism and swellings are treated with pseudobulb.

Table 1. Continued ...

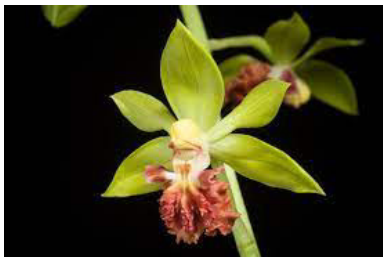




Botanical Name	Part Used	Medicinal Uses
 <i>Calanthe tricarinata</i> Lindl	Leaf, Pseudobulb	Sores and eczema are treated with a leaf paste. Aphrodisiac properties of the leaf and pseudobulb
 <i>Dendrobium chrysanthum</i> Wall. ex Lindl <i>Dendrobium nobile</i> Lindl.	Stem, Leaf	Stem is used as a tonic to nourish the stomach, boost the immune system, increase body fluid production, and lower fever. Leaf is used to treat mild skin problems and as an antipyretic.
 <i>Eulophia spectabilis</i> (Dennst.) Suresh	Whole plant	Tonic, energy, aphrodisiac, stomachic, analgesic, and anti-ageing properties are all associated with stem. A decoction of the stem can be used to lessen nightfall, menstrual pain, night sweats, salivation, thirst, and tongue dryness. Dyspepsia, dry and thirsty mouth, fever, anorexia, pulmonary tuberculosis, and lumbago are all symptoms of powdered stem. The entire plant is used to treat neurological diseases. Seeds are put to freshly cut wounds to speed up the healing process.
 <i>Habenaria dentata</i> (Sw.) Schltr.	Tuber, Leaf	Tuber is an appetiser, aphrodisiac, blood purifier, and tonic. In TB glands on the neck, tumours, and bronchitis, it's also helpful. Pinworm and roundworm infestations are treated using a tuber decoction. Leaf paste is used to treat skin problems.
 <i>Habenaria dentata</i> (Sw.) Schltr.	Wholeplant	Analgesic, aphrodisiac, disinfectant, and anti-rheumatic properties are all attributed to the whole plant. It's used to treat urological and orthopaedic issues.

Table 1. Continued ...

Botanical Name	Part Used	Medicinal Uses
<i>Monomeria barbata</i> Lindl. 	Tuber	Coughs, pulmonary tuberculosis, and injuries can all be treated with this drug.
<i>Oberonia falconeri</i> Hook.f. 	Wholeplant	Used in bone fractures
<i>Papilionanthe teres</i> (Roxb.) Schltr. 	Wholeplant	Externally applied paste for high fevers and dislocated bones. Juice is used to relieve a burning sensation as well as to treat fevers, coughs, and colds.
<i>Rhynchosstylis retusa</i> (L.) Blume 	Root, Flower, Leaf	In rheumatism, a paste of leaves and roots is employed. Constipation, gastritis, acidity, and an emollient are all treated with leaf juice. Root juice is used to heal wounds and cuts. Menstrual pain, arthritis, cuts, and wounds are treated with root decoction. As an emetic, a dry flower is utilised.
<i>Satyrium nepalense</i> D. Don 	Tuber	Diarrhoea, dysentery, and malaria are all symptoms of this drug. Tubers are used as an aphrodisiac and a child's growth booster. Externally applied juice for cuts and wounds. Powder is a tonic that can help with colds, coughs, and fevers.
<i>Vanda coerulea</i> Griff. ex Lindl. 	Leaf	Leaf juice is an expectorant that can help with eye problems, diarrhoea, loose stools, dysentery, and external skin problems.

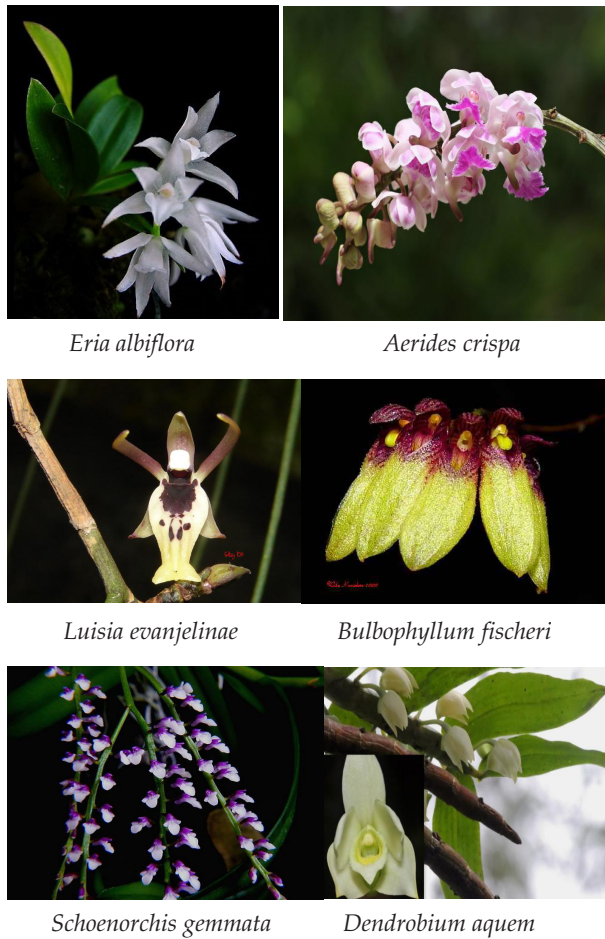


Fig. 1. Few epiphytic orchids

ible orchids were discovered through monitoring and interactions with people. Numerous hazards to the presence of edible orchids were discovered through observations and interactions with people. The amount of edible orchids is negatively impacted by the development of dimba (vegetable) gardens in the dambos and overexploitation brought on by excessive demand. Furthermore, the limited distribution of edible orchids puts them at risk of extinction. Potential for propagation, conservation of indigenous species, and management practises: Currently, edible orchids are not propagated artificially. People have protected the production of edible orchids from the dawn of time by selecting only tasselled plants and plucking only a plump tuber from the soil, leaving a shrived tuber to regenerate the following season. The traditional knowledge of edible orchid illness and pests has not been clarified. If it's grown artificially, rodents, mice, grasshoppers,

and monkeys have been known to eat it, making it a pest.

### Threat Status

The most threatened flowering plant species on the earth are orchids. Overexploitation, habitat damage by urbanisation and shifting farming, loss of pollinators, deadly diseases, climate change, and unlawful trading all contribute to the decline of orchids (Fig. 2). Due to over-collection orchids that are used for medicine and as ornament are under considerable threat (Pant *et al.*, 2002). The majority of the rare and endangered orchid species are listed in CITES' appendix II (Anonymous, 2017). *Aerangis ellisii*, *Laelia jongheana*, *Dendrobium cruentum*, *Laelia lobata*, *Peristeria elata*, *Paphiopedilum spp.*, *Phragmipedium spp.*, and *Renanthera imschootiana* are only a few of the species that have been included to CITES' appendix I to combat illegal trafficking.

IUCN has assessed the threat status of 880 species of orchid, of which 162 (18.41%) are classified as Critically Endangered (CE), 242 (27.61%) as Endangered (EN), 113 (12.84%) as Vulnerable (VU), 49 (5.57%) as Near Threatened (NT), 01 species (*Oeceoclades seychellarum*) as Extinct, and the remaining under Least Concern (Anonymous, 2016). Numerous other orchid species, including *Calanthe plantaginea*, *Cephalanthera longifolia*, *Crepidium acuminatum*, *Dactylorhiza hatagirea*, *Gymnadenia orchidis*, etc., are native to the Indo-Burma hotspot region and are highly threatened in terms of their



Fig. 2. Threat factors which are responsible for decline in orchid's number.

habitats as a result of overharvesting and their slow growth rates. Such orchids must also be assessed and listed on "The Red List of Threatened Species," both locally and globally.

### Conservation

It's crucial to figure out what we're trying to save or protect, as well as its location and state, before we can develop any conservation initiatives. The country's extensive orchid distribution has already been studied; these places should be prioritized. Over the last decades, there has been an increasing awareness about the conservation of depleting plant resources in India (Hegde, 1984, 1986, 1992 and Kataki *et al.*, 1984). The causes of depletion and remedial measures have also been discussed by various workers. However serious attempts to conserve the orchid wealth in gene bank have been made in few centres viz., National Orchidaria at Yercaud, Shillong and Howrah; under botanical survey of India; orchid sanctuary at Sikkim and Arunachal Pradesh etc. It is worthy to mention here that orchid centres in Arunachal Pradesh have contributed substantially to *ex situ* and *in situ* conservation and have been able to maintain more than 400 species as germplasm under cultivation. By seed and tissue culture laboratory this effort is backup for propagation of rare, endangered and ornamental orchids of the region. For the conservation of orchids in our country, it is imperative that chains of orchidaria and orchid sanctuaries have to be set in all major orchids habitats of our country to serve as gene banks. *In vitro* culture is an important job for large-scale orchid production. Thus, use of conventional and tissue culture techniques for mass multiplication is an essential approach for preserving wild populations from commercial harvesting pressure (Murashige and Skoog, 1962; Vij, 1993). Government of India under provisions of CITES has restricted the trade of endangered orchids viz. *Paphiopedilum* (all species) by bringing them under Appendix-1 of wild life protection act. now it becomes obligatory on the part of traders to propagate orchids *in vitro* and them inspected by authorities of Wild Life Preservation before trading them. This measure has helped in checking illegal collection thereby assisting conservation efforts of our wild species. To make the laws effective traders, official concerned and people in general are to be educated and made aware of the importance of conservation

with due respect for the law of country.

### Conclusion

Given the importance of edible orchids to people livelihood and evidence that their supply is dwindling as their use is rising, a variety of conservation-focused initiatives are required. Identifying edible orchids, domesticating edible orchids by trade and artificial regeneration, control are examples of such actions. Although these orchids are still often utilised in traditional medicine, it is disappointing that vital scientific research into their therapeutic potential is still not a priority. As a result, extensive research is required before the orchid species may be fully recommended for medicinal purposes. Additionally, the orchid's diverse native gene pool is disappearing alarmingly quickly as a result of overuse for both medical and aesthetic objectives. *Liparis olivacea* is one of the numerous species that have already become extinct in the wild, and many more are in danger of doing the same. The biodiversity of plants has been preserved, thanks to recent advances in conservation biology and biotechnological techniques, but the commercialization of therapeutic orchids has received very little attention, further stressing the species. Therefore, in addition to encouraging artificial replication, it is important to raise knowledge about effective conservation and outlaw the harvesting of any orchids from the wild at all levels.

**Conflict of Interest:** There is no conflict of interest among the authors.

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