

HABITAT STUDIES FOR CONSERVATION OF MEDICINAL ORCHIDS OF MIZORAM

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Abstract

Orchids occupy a wide range of habitats and are characterised by distinct floral attributes, pollination mechanism, and association with unique fungal partners. Mizoram has more than 250 species of orchids, and some of these have medicinal importance as well. Mostly, the tubers of these orchids are used in medicine. Many of them face the extreme danger of extinction due to over-exploitation and habitat destruction. They require a special kind of environment, habitat and unique micro-climatic conditions to survive and perpetuate. Studies on quantitative information are highly important for conservation plan in a particular area and to understand the ecology of the species. The present study was aimed to identify the habitat types preferred by medicinally important orchids. An extensive sampling was conducted for medicinal orchids in the state of Mizoram where a few medicinal orchid species were recorded in different habitats *i.e.*, tropical evergreen and semi evergreen forests, tropical moist deciduous forests and montane sub-tropical pine forests. *Paphiopedilum hirsutissimum*, *P. villosum*, and *Renanthera imschootiana* are highly endangered in the state. Among the three habitats, montane sub-tropical pine forests were found to be most suitable habitat for medicinal orchids of Mizoram.

Introduction

THE ABUNDANCE of many orchid species is believed to have fallen to critical levels in recent years due to high levels of threats through both natural and anthropogenic causes (Kull *et al.*, 2006). Of the 259 species of endemic orchids in India, about 72 species are vulnerable and 26 species are endangered (Nayar, 1996). These orchids are important both botanically and commercially (Pathak *et al.*, 2010). Literature studies revealed that many known brands of herbal medicines use substitutes for some medicinal orchids due to their unavailability and one such example is that of *Eulophia dabia*; it has become rare and is being substituted by *Satyrium nepalense* (Jalal and Rawat, 2009). Orchids occupy a wide range of habitats and are characterised by distinct floral attributes, pollination mechanism, and association with unique fungal partners (Dressler, 1990). In India, these plants are represented by 1,129 species and 184 genera (Karthikeyan, 2000) and show maximum diversity in the Eastern Himalaya, including the NorthEastern region, Western Ghats, Eastern Himalaya and Eastern part of Western Himalaya (Kumaon Himalaya). Mizoram encompasses an area of 21,081 km², comprising 8 districts. Different forests types are known to occur in the state *i.e.*, tropical evergreen and semi-evergreen forests, tropical moist deciduous forests, and montane subtropical pine forests, located between 21°58" N to 24°35" N latitude and 91°15" E to 93°29" E with varying altitudes from 722 m to 2000 m asl (Thapa and Sahoo, 2003). The climate is influenced by the monsoon pattern of rainfall. Generally, the average annual rainfall ranges between

200 and 250 cm. Fischer (1938) reported about 151 species of orchids from Lushai Hills, presently Mizoram. However, Botanical Survey of India (BSI), NorthEast region listed 253 species of orchids in Mizoram, out of which some species have medicinal importance (Table 1). Mostly, the tubers of these orchids are used in medicine. Many of these orchids face the extreme danger of extinction due to over-exploitation and habitat destruction; infact, these plants require a special kind of environment, habitat and unique micro-climatic conditions to survive and perpetuate. Studies on their habitat are important to conserve species, protect and restore wild species and prevent their extinction, and fragmentation or reduction in population size range. Habitat preference of orchids should also be identified so that habitat-wise conservation strategies may be developed. The present study, thus, aims to identify the habitat types preferred by medicinally important orchids.

Habitat and Ecology

Orchids are herbaceous plants distributed from high mountains to tropical rain forests. Their habitats are directly influenced by temperature, rainfall, altitude, humidity and soil condition besides the microclimatic conditions and survival of individual species depends on the availability of suitable conditions (Chowdhery, 2001). Depending upon their occurrence, different vegetation types of orchid habitats can be recognized:

Tropical Evergreen and Semi-Evergreen Forests

These forests occur in regions with heavy rainfall and are highly rich in floral diversity and the forests are

Table 1. Medicinal uses of orchid species by the Mizo tribes of Mizoram.

Species	Medicinal use(s)
<i>Aerides multiflora</i>	Leaf Juice is applied externally to remove worms from the body; roots are used for curing rheumatism, neuralgia, uterine disease etc.
<i>Dendrobium ariaeflorum</i>	Extract is used as narcotic
<i>D. denudans</i>	Extract is used as narcotic
<i>D. nobile</i>	Fresh and dried stem is used to cure stomachache and as analgesic
<i>Eria tomentosa</i>	Leaf juice is used as medicinal bath
<i>Eulophia nuda</i>	Used for curing diabetes, bronchitis, deworming and tumors
<i>Habenaria</i>	Used for curing hemiplegia, paralytic infections, chronic diarrhoea, and diabetes
<i>Pholidota imbricata</i>	Pseudobulbs are finely macerated in mustard oil and applied on joints for rheumatic pains
<i>Vanda coerulea</i>	Leaf juice is used for treatment of diarrhoea, dysentery and as external application for skin diseases

Source: Thapa and Sahoo (2003); Rao (2004)

multi-storeyed (Chowdhery, 2001). The top canopy is composed of lofty trees like species of *Bauhinia variegata*, *Bischofia javanica*, *Bursera serrata*, *Dipterocarpus turbinatus*, *Duabanga sonneratioides*, *Dysoxylum procerum*, *Engelhardtia spicata*, and *Erythrina suberosa* (Thapa and Sahoo, 2003). Such tall trees with their dense, close canopy form a dense and dark humid environment, which is excellent for the luxuriant growth of epiphytic species. As a result, these forests are occupied by epiphytes. The following genera with medicinal potential are found in this region *i.e.*, *Aerides multiflora*, *Dendrobium ariaeflorum*, *Eria tomentosa*, *Eulophia nuda*, and *Rhynchostylis retusa* etc.

Tropical Moist Deciduous Forests

Apart from tropical evergreen and semi-evergreen forests, tropical deciduous forests are also found in areas where rainfall is less. The important trees of these forests include *Actinodaphne macroptera*, *Bischofia javanica*, *Castanopsis* sp., *Juglans regia*, *Lagerstroemia flos reginae*, *Michelia oblonga*, and *Quercus* sp. etc. (Thapa and Sahoo, 2003). In the absence of sufficient rainfall and humidity, the number of epiphytic medicinal orchids is low as compared to evergreen forests. The species such as *Aerides multiflora*, *Dendrobium denudans*, and *Eria* etc. with medicinal potential are found in this region.

Montane Sub-Tropical Pine Forests

The sub-tropical zone has cooler and humid climate and is characterised by trees which are bushy in appearance and shorter than those of tropical forests (Chowdhery, 2001). The common tree species are *Bischofia javanica*, *Canarium* sp. *Castanopsis indica*,

Kadsura roxburghiana, *Michelia oblonga*, *Pterospermum* sp., *Quercus* sp., and *Terminalia myriocarpa* (Thapa and Sahoo, 2003). The following genera with medicinal potential are found in this region *i.e.*, *Cymbidium aloifolium*, *Dendrobium denudans*, *Habenaria*, *Pholidota imbricata*, and *Vanda coerulea*. The humus rich forest floor which remains moist and shaded also provides very favourable substratum for terrestrial medicinal orchid *i.e.*, *Phaius*. The stones and boulders which are covered with thick layer of mosses can be seen densely covered with species of *Coelogyne* spp. and *Dendrobium nobile*. The occurrence of specific mycorrhizal fungus in the microclimate might also influence the habitat of the orchids (Hegde, 1982). Soil requirements, mycorrhiza, acidity, soil temperature, and solar exposure are the environmental factors that categorize orchid habitats (Case, 1962). Species with specific habitat requirements have greater tendencies of extinction than the species with a broad habitat range (Samant *et al.*, 1996).

Among the three habitat types, montane sub-tropical pine forests had the maximum diversity to help the growth of medicinal orchids. *Malaxis acuminata* and *Eulophia nuda* occur in shady places, moist ground and in the areas that are wet and mossy. *Habenaria* spp. too prefer moist localities, but these species generally grow in a scattered way.

Present Status and Conservation

The old age practice of shifting cultivation or *Jhuming* is the single major factor for large scale depletion of natural forest cover in Mizoram, thereby affecting many orchid species in their natural habitat (Singh *et al.*, 1990). As a result, nearly 55% of the orchids of

Mizoram, today fall under different categories of threat as envisaged in the Red Data Book published by International Union for Conservation of Nature and Natural Resources (IUCN). Based on herbarium records, literature and authors own field observations, the orchids of Mizoram have been classified as common, vulnerable, rare, threatened and extinct following Lucas and Synge (1980). Of the 253 taxa, only 112 species are fairly widely distributed in the State with larger populations, whereas 97 or 40% of the total species belong to rare category, while the remaining 15% of the orchids fall under vulnerable and threatened category. In the rare category, the taxa like *Cymbidium cochleare*, *C. macrorhizon*, *Dendrobium chrysotoxum*, *D. parishii*, *Galeola falconeri*, *G. lindleyana*, *Paphiopedilum hirsutissimum*, *P. spicerianum*, *P. villosum*, and *Vanda parishii* are under greater threat due to habitat destruction or continued over exploitation. *Paphiopedilum charlesworthii* has been recorded only from Mizoram and Burma (Pradhan, 1976), could not be collected again and appears to have vanished from its Indian haunts. *Arundina graminifolia* (D. Don) Hochr., *Dendrobium densiflorum* Lindl., *Paphiopedilum hirsutissimum* (Lindl. ex Hook.) Stein, *Paphiopedilum spicerianum* (Reichb. F.) Pfitz, *Renanthera imschootiana* Rolfe and *Vanda coerulea* Griff. ex Lindl. are in the list of endangered species in Mizoram.

In situ preservation, through the establishment of sanctuaries and reserve forests, is the most effective means of conservation for relatively large populations. The orchid sanctuaries at Sairep, near Lunglei, and Ngopa, near Champhai, set up by the State Forests Department, are positive steps in this direction. Similarly, the wildlife sanctuaries at Ngengpui, in Chhimtuipui district and Dampa, in Aizawl district are also help in conservation of rich orchid habitats. Nonetheless, the steps taken so far are not sufficient to offset the threat to the rich orchid diversity met within the State, and it is desirable to establish additional sanctuaries in the orchid rich habitats in different eco-climatic zones like Blue Mountains, Mamit, North Vanlaiphai, Saithah, Ngurtlang, Zote-tlang, and Dampa tlang for preserving the orchid flora for posterity (Singh *et al.*, 1990).

Another viable means for preservation of selected taxa is their *ex situ* conservation in botanical gardens, where they can be rehabilitated and cultivated not only for future research, but also for their multiplication and commercial exploitation. Botanical Survey of India (BSI) has effectively brought under cultivation more than 130 species of Mizoram orchids *i.e.*, *Aerides fieldingii*,

Anoectochilus griffithii, *A. sikkimensis*, *Arundina graminifolia*, *Coelogyne barbata*, *Dendrobium densiflorum*, *Renanthera imschootiana*, and *Vanda coerulea* *etc.*, at the National Orchidarium and Experimental Garden, Shillong (Singh *et al.*, 1990). The *in vitro* raised seedlings need to be made available for rehabilitation in the wild and commercial purposes so as to release pressure on the depleting natural populations of ornamental species.

Conclusion

The most striking feature of the orchids is that they need a specific microhabitat for their growth and proliferation which vary in different habitats. In order to prevent their extinction, it is necessary to grow and conserve the species as per their favourable habitat, which acts as a gene pool. The fragile habitats should also be conserved as nature reserves so as to ensure sustainability of the ecosystem and thereby conserving the fast dwindling germplasm.

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