



ROLE OF BOTANICAL GARDEN IN EX-SITU CONSERVATION OF RARE, ENDANGERED AND MEDICINAL PLANTS IN KHANDESH, MAHARASHTRA, INDIA

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Abstract: Present paper communicates ex-situ conservation of rare, endangered, endemic and medicinal plants from Khandesh region of Maharashtra state, India. In botanical garden I have conserved and multiplied plants by collection of saplings, seeds, rhizomes in proper season from forest areas.

Keywords: Conservatory; rare, endangered and medicinal plants; Khandesh, Maharashtra State, India.

INTRODUCTION

Khandesh is the northern part of Maharashtra State of India. Forest areas of Khandesh include Satpura Mountain and offshoots of Western Ghat (Sahyadris) which is one of the major hotspots of biodiversity in world.

India is one of the 12 mega biodiversity centers in the world with two hotspots of biodiversity Western Ghats and Eastern Himalayas. From the ages plants are used as source of medicines and are closely associated with cultural traditions.

Through the conservation of biodiversity the survival of many species and habitats which are threatened due to human activities can be ensured. Other reasons for conserving biodiversity include securing valuable natural resources for future generations and protecting the wellbeing of ecosystem functions.

Preserving the diversity of flora and fauna is essential for maintaining the natural equilibrium in the ecosystem. It is said that, disappearance of one plant species can result in the loss of 10 to 30 dependent species such as insects, higher animals and even other plants species.

Over the last 200 years, many species have become extinct and the extinction rate is on the increase due to the influence of human activity. The status of species has been assessed on a global scale by the world conservation union. Taxa that are facing a high risk of global extinction are catalogued and highlighted in the IUCN Red list of Threatened species.

Conservation efforts are often focused on a single species. This is usually for the reasons that: some species are key to the functioning of a habitat and their loss would lead to greater than average change in

other species populations or ecosystem processes. These are known as keystone species.

Conservation of medicinal, endemic and endangered plants can be accomplished by the ex-situ i.e. outside natural habitat by cultivating and maintaining plants in botanic gardens, parks, other suitable sites.

Some of the plants that have become extinct in the wild can still be found in botanic gardens. There is no doubt that *ex situ* conservation of wild plants in botanic gardens and *in situ* conservation in nature reserves are of complimentary importance.

A plant species extinct in the wild (*Clarkia franciscana*) has been preserved in a botanic garden and reintroduced to its native habitat in California.

About 4,900 or even more species of flowering plants are endemic to India and these are distributed among 141 genera belonging to 47 families. These species are conserved in the floristically rich areas of North-East India, the Western Ghats, north-west Himalayas and the Andaman and Nicobar Islands. These areas constitute two of the 18 hot spots identified in the world.

Botanical survey of India has published a list of 1500 species as rare and threatened and actively engaged in survey, study, utilization and conservation of this plant wealth of the country.

The world's roughly 1500 botanic gardens today contain at least 35000 plant species. The Royal Botanic Gardens of England (Kew England) along contains an estimated 25000 species of plants (10 percent of the world's flora) and International Union for Conservation of Nature and Natural Resources (IUCN) considers

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some 2700 of these species are rare, threatened or endangered.

India has a network of about 140 botanical gardens which includes 33 botanical gardens attached to 33 universities at Botany Departments. But hardly 30 botanical gardens have any active programme on conservation

Botanical gardens play a very important role in education, research, even recreation and ex-situ conservation especially those facing imminent threat of extinction. Several gardens in the world are specialized in cultivation and study of medicinal plants, while some contain a special medicinal plant garden or harbor special collection of medicinal plants.

I have given emphasis to rare or endangered plants, wild flowers and important economic plants of the regions of Khandesh. Each year more than 5-7 field tours were arranged to investigate and collect wild plants.

I have botanical garden in our college and my main objectives are 1) To prepare saplings of rare, endangered, endemic and medicinal plants 2) To distribute saplings to different botanical gardens, research institutes and biodiversity parks in India 3) To distribute saplings of medicinal plants to societies locally as social programme.

METHODOLOGY

Frequent field tours are arranged for collection of saplings, seeds and rhizomes. Seeds and saplings are cared in nursery for germination and post care. Collected specimens are identified with the help of floras and literature cited in references at the end. Herbarium specimens are prepared for authentication of collected material and housed in the Herbarium of the Department.

Following plant species I could conserve in my botanical garden during last three years in the programme by saplings and seeds collected from the forests. I also brought saplings of medicinal plants from nurseries for conservation and education to students.

In the following systematic enumeration plant species are arranged alphabetically with their botanical names, followed by family in parentheses. Vernacular names are appended at the ends of botanical names in inverted commas.

Then it is followed by taxonomic characters, flowering and fruiting period. Uses, present status in botanical garden and category i.e. rare or endangered are given at the end.

Acorus calamus L. (Araceae) “Vekhand”, “Sweet flag root”, “Vacha”

Taxonomy: A small herb with sweet scented roots. Leaves linear, thick and glabrous. Flowers white.

Fls. & Frts.: July- October.

Uses: Roots are useful to enhance memory. Its famous medicinal use is that, roots juice mixed with mother milk and is effective remedy in cough and cold for child under one year old. It is also believed by tribal people that rhizome pastes apply on forehead of child to protect from snake bite while working in field.

Status: Planted in pots in botanical garden.

Category: Rare in areas of its occurrence.

Amorphophallus bulbifer (Roxb.) Bl. (Araceae) “Suran”.

Taxonomy: Tall herbs with big, solid, rounded corms. Flowers white. Fruits globose in terminal. Seeds red on maturity.

Fls. & Frts.: July – October.

Uses: Corms are used as vegetables. Also medicinal in piles.

Status: Well in botanical garden

Category: Rare

Asparagus racemosus Willd. (Liliaceae) “Shatavari”

Taxonomy: Scandent, spinous, undershrub with fasciculated tuberous roots. Leaves reduced. Cladodes in whorls. Flowers small, white.

Fls. & Frts.: July-October.

Uses: Famous ‘shatavari churna’ is prepared out of roots and is useful to increase breast milk. Also medicinal in kidney troubles. Young roots also eaten raw to increase sperm count.

Status: Well grown around garden wall

Category: Rare

Bauhinia tomentosa L. (Caesalpinaceae) “Piwala Kanchan”.

Taxonomy: A tall tree with dark yellow, large flowers with brown blotch at the centre.

Fls. & Frts: September-October

Status: Endangered in Khandesh. By seed germination I have prepared many saplings. Well growing in botanical garden.

Uses: Dye obtained from flowers.

Ecology: This species is ecologically very important because the flowers from this tree, rich in pollen and nectar, attract various insects such as butterflies and bees. In turn, these insects will attract insect eating birds. Certain birds and the larvae of certain moth species feed on the flowers. This is also a host plant for many butterflies’ species, with the larvae feeding on the leaves.

Category: Endangered.

Caralluma adscendens (Roxb.) R. Br. var. ***fimbriata*** (Wall.) Grav. & Mayur (**Asclepiadaceae**) “**Makadsingi**”.

Taxonomy: A succulent herb with beautiful, dark-red, chocolate colored flowers.

Fls. & Frts.: More or less throughout the year.

Status: Well flourished in garden in bed.

Distribution: This species was occasional in rocky boulders in association with *Euphorbia antiquorum* but because of very rapid exploitation by tribals, this is going to be endangered from the area of Khandesh.

Uses: This is very good medicine for mental balance, eaten raw also, good vegetable too.

Category: Endangered.

Cissus quadrangularis L. (Vitaceae) “**Hadsankal**”.

Taxonomy: A creeping and trailing herbs. Stem quadrangular. Leaves orbicular, glabrous. Flowers green.

Fls. & Frts.: September-December.

Uses: Stem juice is medicinal and applied externally in spondylosis, arthritis, rheumatism and joint pains. Juice can be taken internally in spondylosis.

Status: Well growing along garden wall compound.

Category: Rare

Clitoria ternatea L. (Papilionaceae) “**Gokarna**”

Taxonomy: A trailing herbs. Leaves compound. Flowers blue-white. Pods somewhat falcate with 8-10 seeds.

Fls. & Frts.: More or less throughout the year.

Uses: **Dose:** 8-10 drops of fruit juice or root juice is given before sunrise through nose to cure chronic headache. 4 drops of seed juice put into nose to cure migraine.

Status: Well spreads in botanical garden.

Category: Occasional

Coccoloba uvifera (L.) L. (Polygonaceae) “**Sea Grape**”.

Taxonomy: A spreading branched shrub. Leaves very broad, thick. Stipules broad, brown, encircles the stem at nodes. Flowers red in spikes. Fruits not developed.

Fls. & Frts.: February-May.

Status: Native of America. Planted for evergreen and beautiful foliage.

Commiphora wightii (Arn.) Bhandari (Burseraceae) “**Gugal**”.

Taxonomy: A small shrubby plant with corky bark. Stem growth is very slow. From old stem a yellow sticky juice is obtained. Flowers creamy yellow.

Fls. & Frts. : February-June

Uses: Gum obtained from the mature stem and is reputed medicine in arthritis. Gum is also useful in religious ceremonies.

Status: Good and well in botanical garden, now in pots and will transfer to beds.

Category: Endangered.

Costus speciosus (Koen.) J. M. Sm. (Zingiberaceae) “**Bisht**”, “**Pushkara**”, “**Keukand**”, “**Kashmeera**”, “**Kust**”.

Taxonomy: A large undershrub. Stem glabrous. Leaves spiral, oblong-lanceolate. Flowers white, in terminal, compact spike. Capsules obtusely trigonous, deep-red.

Fls. & Frts.: August-November.

Uses: Rhizomes used in skin diseases, asthma, bronchitis, fever and constipation. Traditionally rhizome of the plant is used as anti-inflammatory and antipyretic properties.

Status: Well in botanical garden

Category: Endangered

Curcuma inodora Blatt. (Zingiberaceae) “**Jangali Haldi**”.

Taxonomy: A small herb. Leaves broadly lanceolate. Flowers in spikes, white-yellow with pinkish shade.

Fls. & Frts.: August-October.

Uses: Scentless turmeric is cultivated as an ornamental and also used in traditional medicine.

Status: Well in garden in pots.

Category: Endangered.

Dioscorea bellophylla (Prain) Haines (Dioscoreaceae)

Taxonomy: A climbing herbs. Leaves glabrous, ovate, prominently nerved. Flowers creamy in spikes. Fruits winged. Seeds minute.

Fls. & Frts.: August-October.

Uses: Tubers are eaten.

Status: Well flourished along with poles of polyhouse in garden.

Category: Endangered

Enicostemma axillare (Lam.) Raynal (Gentianaceae) “**Nai cha pala**”.

Taxonomy: A small herbs forming pure stand in forest areas. Stem quadrangular. Leaves 3-nerved, linear-lanceolate. Flowers white.

Fls. & Frts.: June-September.

Uses: Juice of the whole herb is useful in chronic fever.

Status: Flourished in garden at corners seasonally.

Category: Rare

Eulophia herbacea Lindl. (Orchidaceae) “**Dukkar kand**”, “**Kokad kand**”.

Taxonomy: A small terrestrial orchid with tubers. Leaves broadly linear-lanceolate. Flowers dark pink-purple-violet. Fruits dehiscent capsules. Seeds minute, many, blown away by winds.

Fls. & Frts.: More or less throughout the year.

Uses: Paste of the rhizome is useful in pimples.

Status: Very well flourished in pots since three years in botanical garden.

Category: Endangered

Gloriosa superba L. (Liliaceae) “Bachnag”, “Khadyanag”.

Taxonomy: Climbing herbs. Rhizome white. Leaves with coiled apex. Flowers scarlet-red. Capsules ellipsoid.

Fls. & Frts.: June-October.

Uses: Rhizome is used in extraction of an alkaloids i.e. colchicines. Plant is also largely exploited for beautiful flowers.

Status: Growing in garden seasonally.

Category: Endangered.

Gmelina arborea Roxb. (Verbenaceae) “Shivan”.

Taxonomy: A medium sized tree. Stem quadrangular. Leaves cordate to lobed. Flowers yellow. Fruits obovoid, glabrous, smooth, yellow when ripe.

Fls. & Frts.: February-June.

Uses: Fruits used in “Dashmul” of Ayurveda. Cure vata, pitta and cough. Leaf juice applied on severe headache.

Status: Well in botanical garden.

Category: Rare.

Gymnema sylvestre (Retz.) Schult. (Asclepiadaceae) “Gurmar”, “Madhunashini”

Taxonomy: A climbing herb. Leaves obovate, acute at apex. Flowers are small bell-shaped, yellow.

Fls. & Frts.: August-October.

Uses: Leaves are medicinal in curing diabetes.

Status: Planted along wall of botanical garden.

Category: Endangered.

Kleinia grandiflora (Wall. ex DC.) Rani (Compositae) “Wanderroti”

Taxonomy: A small undershrub. Leaves thick, broadly lanceolate, glabrous. Flowers in terminal heads.

Fls. & Frts.: September-November.

Uses: Leaves eaten by monkeys and is good food for wild life.

Status: Well in garden along fencing.

Category: Endangered.

Michelia champaca (Magnoliaceae) “Sonchapha”.

Taxonomy: A tall evergreen tree. Leaves broadly ovate-lanceolate. Flowers large, strongly scented, deep orange-yellow. Fruits an etaerio of achenes, green when young, black when mature, spotted with white.

Fls. & Frts.: Throughout year.

Uses: Leaves are fed to silkworms. *Michelia* wood is nicely figured and is used for furniture, cabinetwork, carvings, turnery and pattern making. Flowers yield an essential oil used in perfumery. A decoction of the bark and leaves is given after childbirth; the bark is used as a febrifuge. In Myanmar, the flowers are used to treat leprosy.

Status: Well in garden.

Category: Endangered.

Mimosa pudica L. (Mimosaceae) “Lajalu”.

Taxonomy: Prostrate to erect herbs. Leaves pinnately compound. Flowers pink in globose heads.

Fls. & Frts.: More or less throughout the year.

Uses: Leaf powder with milk is useful in curing piles. Leaf juice is also medicinal in fever and acidity.

Status: Successfully grown in wet places in garden.

Category: Rare.

Plumbago zeylanica L. (Plumbaginaceae) “Chitrak”

Taxonomy: A small herb with blue or white flowers in elongate spikes. Fruits stalked with green glands.

Fls. & Frts.: More or less throughout the year.

Uses: Roots and root powder is useful in rheumatism and constipation.

Status: Well in garden.

Category: Rare.

Rauwolfia tetraphylla (Apocynaceae) “Sarpagandha”.

Taxonomy: A tall shrub with four leaves at each nodes. Flowers small, creamy. Fruits dark red at maturity.

Fls. & Frts.: Throughout the year.

Uses: Roots are highly medicinal in treating cancer as substitute of *Rauwolfia serpentina*

Status: Well flourished in bed since seven years in botanical gardens.

Category: Endangered.

Saraca asoka (Roxb.) Willd. (Caesalpiniaceae) “Sita Ashok”.

Taxonomy: Small tree or shrubs, bark dark brown. Flowers with strong odor, red.

Fls. & Frts.: June-December.

Uses: Bark decoction is famous remedy (asokarista) in leucorrhoea. It is also recommended that bark powder with *Bacopa monieri* powder is given for to enhance memory.

Status: Well in botanical garden.

Category: Rare.

Sterculia urens Roxb.(Sterculiaceae) “Karaya gum”.

Taxonomy: This is medium sized tree with rusty-tomentose flowers. Stem pure white. Fruits tomentose, dehiscent.

Fls. & Frts. : February-June.

Status: Rare in forests. Planted in garden.

Uses: Gum pure white, transparent and highly medicinal in arthritis.

Category: Rare.

Terminalia arjuna (Roxb. ex DC.) Wight & Arn. (Combretaceae) “Arjun”.

Taxonomy: Tall tree with pure white bark. Flowers white, creamy. Fruits 5-angled.

Fls. & Frts.: February – June.

Uses: Bark powder with cow milk is taken orally for heart troubles.

Status: Growing well.

Category: Occasional.

Terminalia bellirica Roxb.(Combretaceae) “Behda”.

Taxonomy: Tall tree. Leaves crowded at the ends of branches and is good taxonomic character. Fruits in small size with inconspicuous ribs.

Fls. & Frts.: February-June.

Uses: Fruits are medicinal in ‘triphala churna’ as laxative. Bark is useful in anemia, leucorrhoea.

Status: We brought seeds from forest and prepared many saplings and all plants are growing well in our garden. Some saplings are distributed to other botanical gardens of other colleges.

Category: Rare.

Tinospora cordifolia (Willd.) Miers (Menispermaceae) “Giloy, ‘Amruta’, ‘Gulvel’.

Taxonomy: Climbing perennial herbs. Stem grey on maturity. Leaves cordate, glabrous. Flowers yellowish-green. Fruits dark red on maturity.

Fls. & Frts.: September-April.

Uses: Stem decoction is used as general tonic in weakness. Also useful in chronic fever, diabetes. Recently it is chemically proved that, stem juice is also highly effective in dengue, malaria and also improving memory and intelligence. It is said and proved that, this plant if grow in association with *Azadirachta indica* (Neem) it is highly medicinal than any other host.

Status: Densely flourished over garden fencing.

Category: Occasional.

Ventilago denticulata Willd. (Rhamnaceae)

Taxonomy: A woody perennial lianas. Leaves broadly ovate to elliptic. Flowers creamy-white or yellow. Fruits samaras, winged.

Fls. & Frts.: December-April.

Uses: Powdered bark is useful in sprains and sap is medicinal in deafness.

Status: Seeds brought from forest and germinated in nursery and now saplings are well.

Category: Rare.

RESULTS AND DISCUSSION

Our botanical garden is now well flourished with rare, endangered and medicinal plants. Ex -situ conservation of rare, endangered, endemic and medicinal plants (REEMP) is going on in one of five year (2010-2015) programme of University Grants Commission (UGC), New Delhi, India, under innovative programme–Teaching and Research in Multidisciplinary and emerging areas entitled Post Graduate Diploma in “Conservation of Medicinal, Endemic and Endangered Plants.

Main objectives of the course are as follows:

1. To study the trends of biodiversity conservation at national and international levels

2. To study the causes for biodiversity loss and measures for its conservation.
3. To study the methods of *ex-situ* and *in-situ* conservation feasible to Indian and local context with special emphasis to important medicinal, endemic and rare plants.
4. To acquire skill of nursery management and to train the students about methods of propagation.
5. To visit and study important institutes/ organizations/ national parks / wild life sanctuaries to orient/ supplement our efforts in conservation.
6. To disseminate knowledge through students-help to the society by the way of distribution of saplings to be conserved.
7. This course will help the students with recent techniques and methods and they will able to put their experience / training in practice.

In proper season with our PG Diploma students we are frequently going to field tours for collection of seeds, saplings, rhizomes etc. to multiply plants.

For some plants we are also going for tissue culture. We have seed germinator, but mostly plants are germinated in our nursery by seeds. We have successfully germinated the seeds of *Terminalia bellirica* (Behda) and about more than hundred saplings prepared and distributed to other botanical gardens of other colleges.

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