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AGRO TECHNOLOGY STATUS AND CONSERVATION OF FEW THREATENED MEDICINAL PLANTS FROM DEOGARH DISTRICT, ODISHA, INDIA

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Abstract

For the overall development of an area, it is necessary to utilize its natural resources judiciously and this is possible only when the resources are identified and evaluated scientifically. Keeping this concept in mind, Deogarh district has been selected out of thirty districts of Odisha, which suffer from non-utilization of forest resources though it has vast potentialities. Therefore, the present work was started in the year 2006 onwards with a view to provide systematic enumeration of medicinal plants, analysis of threatened species, economic link between the tribal and plants, sustainable utilization and conservation of threatened medicinal plants. While exploring the forest areas scientifically for years together, the author came across some medicinal plants which of late identified as threatened for Deogarh district and have globally important for herbal drug industry. The present paper highlights 8 species of threatened medicinal plants along with their local names, botanical names, parts used, medicinal uses, average market price/kg, IUCN, agro technology status and conservation, which can be commercialized for improving the revenue generation in particular to Deogarh and in general to the state of Odisha.

INTRODUCTION

Natural products from plants have been playing a major role in human healthcare and food sources for decades (Tan et al. 2004). A common

conviction is that plant remedies are naturally better to synthetic drugs and that they are not harmful to human beings. Nearly 80 % of the world population depends upon traditional system of health care (Anonymous, 1998). Allopathic drugs have brought a revolution throughout the world but the plant-based medicines have its own unique status. The world trade figures suggest that India is second only to China with exports of about 32,600 tons of medicinal raw materials worth US 46 million Dollars annually (Lange, 1997). The recent trend toward commercialization of medicinal plants has resulted in overharvesting of some important medicinal plants and become threatened.The agro-climatic conditions of Odisha and more particularly Deogarh district harbor a vast number of medicinal plants due to the availability of wide variations of climate, soil and topography. As per estimate, more than 90% of medicinal plants are collected from wild. Apart from over-collection from the wild, the increasing population shrinking forest and other related factors have brought several medicinal plants to the brink of extinction. According to the International Union for Conservation of Nature and the World Wildlife Fund, there are between 50,000 and 80,000 flowering plant species used for medicinal purposes worldwide. Among these, about 15,000 species are threatened with extinction from overharvesting and habitat destruction (Bentley, 2010). Nayar et al. (1984) and Saxena and Brahmam (1983) have done an assessment of the rare, endemic and endangered plants of Eastern Ghats and Orissa respectively. Recently, the assessment of threatened medicinal plants of Odisha was carried through Conservation Assessment and Management Prioritization (Ved et al., 2007). They have considered 39 medicinal plants as threatened category. For Deogarh district, only eight threatened medicinal plants were selected for their agro technology status and conservation.

METHODS AND MATERIALS

Deogarh district is located between longitude 84º 28′ - 85º 15′ N and latitude 21º 11′ - 21º 43′ E with a total area of 6702 Sq. Km. towards the North-West part of Odisha. The topographical variation ranges from 250 m to 700 m from the MSL and thus harbouring a vast range of flora and fauna and providing an ample scope for medicinal flora diversification. The study involves intensive explorations and critical study of specimens for 6 years. Periodic field trips were conducted in such a way so as to cover all the areas of the district from 2006 to 2012. Threatened medicinal plant specimens were collected both in flowering and fruiting stages. Field observations on phenology, habit, habitat, local names, local uses (method adopted by Jain, 1995) etc. was recorded in the field at the time of collection. Plant specimens of folklore claims were collected, processed, critically studied, identified consulting the flora of Haines (1921-25), Mooney (1950), Gamble (1915-36), Saxena and Brahmam (1994-96) and preserved in the herbarium of CSIR-IMMT. The agro technology status of these threatened medicinal plants was collected from the farmers and Horticulture Dept. of Deogarh district.

RESULTS AND DISCUSSION

The details of 8 threatened medicinal plants have been provided in Table-1 with correct botanical name followed by name of the family, local names, locality, parts used and medicinal uses along with IUCN status. The agro technology status of these

species has been mentioned for organized farming of medicinal plants in the district as well as in the state.

1. *Celastrus paniculatus* Willd. (Plate 1.1)

Mode of propagation: Seeds and Vegetative

Seed Propagation:

Seed Collection: Fruit ripens after December and seeds can be collected in January. For propagation, seeds must be removed from the berries and then planted. Ripe fruits collected are placed in polythene covers and then dried in sun for 3 to 4 days. Fruits on drying dehisce and liberate the seeds into the cover.

Sowing Method: Seeds thus collected are sown on raised beds with seeds being dibbled into the beds to a shallow depth.

Germination Duration: Time for germination is 45 days.

Germination Percent: 30 to 40 percent of the seeds germinate. The seedlings are maintained in the nursery for one month.

Vegetative Propagation: Through cuttings (To propagate clones of known sex):

Planting Material: Eight to 15 cm long cuttings with at least 3 to 4 nodes are used. Softwood cuttings in midsummer or hardwood cuttings in winter from plants belonging to both sexes are taken.

Root Initiation: Semi-hard wood cuttings, root well when treated with 8000 ppm IBA quick dip. Rooted cuttings are planted in small pits, covered with soil leaving one node above the ground.

Market price: Seeds Rs 23-26 / kg

2. *Gardenia gummifera* L.f.

Mode of propagation: Vegetative Propagation: Stem cuttings

Planting Material: Semi hard wood stem cutting / air layering.

Size: 6 – 8 inch long cutting; Media: clay loam soil + FYM

Planting Method: Cuttings are planted in the nursery beds and maintained until they root and later transplanted to the field during November – December.

Rooting time: 20 – 30 days

3. *Gloriosa superba* L. (Plate 1.2)

Propagation: Through tubers

Seed rate: Tubers weighing 50-60g are used. On an average 3 tons or 41,500 tubers are required for planting one hectare of land.

Land preparation: Land is prepared by deep ploughing the soil in summer season and opening ridges and furrows spacing 60x60cm.

Planting: Seedlings raised from the seeds are able to produce only tubers and fail to set flowers and seeds in the first year. In case of plants raised from tubers, fruits and seeds can be obtained in the same year of planting. Therefore seeds should be sown at a spacing of 10-15 cm after the onset of rains. In the second year tubers can be uprooted and treated with 0.1% fungicide and planted at a spacing of 60 x 45 cm at a depth of 7.5-15 cm.

Market price: Seeds Rs. 500/kg, Tubers Rs. 25/ Kg.

4. *Mesua ferrea* L. (Plate 1.3)

Seed propagation:

Seed Collection: The brownish coloured fruits that fall in the month of April are collected either from the ground or from the tree or the seeds are collected in the third week from the beginning of seed fall. The fruits are spread out in the sun until they dehisce and then dried in shade. The seed should be sown soon after collection.

Sowing Method: A direct sowing in lines 1.8 m apart, with two rows of seeds in each line and with a cover crop of Tephrosia candida. Seeds are sown 7.5 x7.5 cm apart and at a depth 1 to 2 cm and

covered with a thin layer of earth. Seed rate: - 3.2 kg of seeds per bed of size 3.7 x 1.8 m.

Germination: Seeds take 25-30 days to germinate.

Germination Percent: 70 –95 percent.

Nursery Duration: 1-2 year

Market price: Seeds Rs 40-60/kg

5. *Piper longum* L.

Land preparation: The field is ploughed 2-3 times, brought to a fine tilth by harrowing and leveled so that water doesn't stagnate in the field for long time. Then the field is divided into convenient sized plots and pits are opened at a distance of 60 x 60 cm.

Planting: Pepper is propagated through rooted stem cuttings or suckers in the month of February-March. 8-10 cm long stem cuttings bearing 3-6 nodes and 2-3 leaves treated with root hormones are planted in 8x15 cm polythene bags.

6. *Pterocarpus marsupium* Roxb.

Mode of propagation: Seeds

Seed Propagation

Seed Collection: Pods ripen from December to March and become dark reddish brown in colour and remain on the tree up to the end of May. Pods are collected from February to May from the trees or from the ground.

Sowing Method: Seeds can be directly sown in June, or sown in polybags, or the entire pods are dibbled adopting a spacing of 10 x 10 cm.

Germination Duration: Germination commences in 7 days and completes in 56 days in the nursery.

Germination Percent: Germination percent varies from 40 to 90 percent.

7. *Rauvolfia serpentina* (L.) Benth.Ex. Kurz. (Plate 1.4)

Propagation: Seeds & Cuttings

Land preparation: The land is ploughed deep in May and left for weathering. After pre-monsoon showers FYM is added followed by second ploughing and two cross harrowing to break the clods. The land is finally dressed by planking and beds are laid out. Nursery should be raised in a partially shaded area with adequate irrigation facility. Each bed should be about 1.5m wide, 15-20 cm high and of convenient length. Beds with shallow furrows 8-10 cm apart are prepared in April and irrigated.

Sowing: About 5-7 Kg seeds are required for sowing one hectare area. Fresh seeds are preferred for sowing as their viability lasts for only for 6 months. Seeds are treated with Thiram (2-3 g / Kg seed) after soaking it in water for 24 hours and sown from the end of April to the first week of May at a distance of 8-10 cm and 1-2 cm deep.

Planting: It can also be propagated by vegetative means using stem and root cuttings and root stumps. Root cuttings 3-5 cm long and not exceeding 12.5 cm diameter are planted in June July and are covered completely with the soil leaving only 1 cm above the surface. The cuttings sprout within 3 weeks if there is adequate moisture. Rooting percent is about 50-80 and around 100 Kg of root cuttings are required to plant one hectare area.

Market price: Root Rs 125-150/kg

8. *Strychnos potatorum* L.

Mode of propagation: Seeds and Cuttings

Seed Propagation:

Seed Collection: Seeds are collected between February to March. The pulp is washed off to obtain the seeds. Seeds need to be dried in shade before use.

Seed Viability: The seed viability is very low which is also found in other species of this genus.

Pretreatment: Hot water treatment and soaking in cold water for 48 hours.

Sowing Method: Seeds are put in polybags in April and continuously watered. After 45 days the shoot comes up with the cotyledons just like a round cap. Root growth is faster than shoot growth. So longer polythene bag is required for raising seedlings.

Germination Duration: Germination takes 30 to 40 days after sowing.

Nursery Duration: 60 days

Germination Percent: About 40 percent.

Vegetative Propagation

Through Cuttings:

Planting Material: Hardwood cuttings of size 1.0 x 15-20 cm with 2-6 nodes.

Pretreatment: Cuttings treated with 500 ppm IBA produced good sprouts but failed to root for over 180 days.

Market price: Fruit Rs 40-60/kg

Conservation strategies: The following conservation strategies were adopted for conservation of threatened medicinal plants of in Deogarh district of Odisha.

IN-SITU CONSERVATION

In situ conservation of whole communities allows us to protect indigenous plants and maintain natural communities, along with their intricate network of relationships. In- situ conservation focused on the ecosystem approach rather than species oriented. Emphasized has been made to conserve the threatened medicinal plants of Deogarh district inside their natural habitat (Protected Areas and Conservation Reserves).

EX-SITU CONSERVATION

It is an effective conservation strategy especially for those overexploited and endangered medicinal plants with slow growth, low abundance, and high susceptibility to diseases. Ex-situ conservation aims to cultivate and naturalize threatened species to ensure their continued survival and sometimes to produce large quantities of planting material. Medicinal plants nurseries, gardens have been established in different regions of the district to conserve these threatened medicinal plants.

CULTIVATION PRACTICES

Cultivation of threatened medicinal plants reduces the pressure on harvesting from their wild resources and decreases their prices to a more reasonable range. Implementation of proper agro technology for cultivation of medicinal plants increases the yield. People of Deogarh district are following the above mentioned agro technology and cultivated these threatened medicinal plants in their gardens instead of going for wild collection. Cultivation also provides the opportunity to use new techniques to solve problems faced in the production of medicinal plants, such as toxic components, pesticide contamination and low contents of active ingredients. Cultivation of medicinal plants is a specialized task and the local communities who have for generations nurtured the resources in their natural habitat are best equipped for this task.

CONCLUSIONS

The present study highlights the agro technology status of few threatened medicinal plants and their sustainable conservation. These agro technologies are well established and can be easily implemented by the farmer community. Author emphasized the in-situ, ex-situ conservation along with good cultivation practices for conservation these threatened medicinal plants in Deogarh district of

Odisha. The Government should establish linkages with markets, so that the cultivation of medicinal plants become market-driven, with assured income security for tribal families. Moreover, application of modern techniques such as tissue culture, conservation of seeds and conservation of DNA etc. have opened new avenues for conservation of threatened medicinal plants.

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Table 1: Threatened Status and uses of Medicinal plants

Botanical Name and Family	**Local Name and Locality**	**Parts Used**	**Medicinal Uses**	**IUCN Status**
Celastrus paniculatus Willd. Fam: Celastraceae	Pengu, Kudapara	Bark, Leaves and Seeds	Paralysis, asthma, leucoderma, inflammation	VU
Gardenia gumífera L.f. Fam: Rubiaceae	Gurudu, Pradhanpat	Gum	Antispasmodic, antiseptic, anthelmintic	VU
Gloriosa superba L. Fam: Liliaceae	Na Nangalia, Purumunda	Seed, tuber	Skin Disease, Labor pain, Abortion	EN
Strychnos potatorum L. Fam: Strychnaceae	Nirmali, Kerjeng	Seed	Eye diseases,	VU
Mesua ferrea L. Fam: Clusiaceae	Nageswar, Khuluri	Flower, Oil	asthma, cough, leprosy, vomiting,	EN
Piper longum L. Fam: Piperaceae	Pipali, Koradkot	Root, Spike	Constipation, gonorrhea, bronchitis	EN
Pterocarpus marsupium Roxb. Fam: Fabaceae	Bija, Kerjeng	Bark, Leaves And Flowers	Leucoderma, urinary disorders, dysentery	EN
Rauvolfia serpentina (L.) Benth.Ex. Kurz. Fam: Apocynaceae	Patala garud, Pallahara	Root	Hyper tension, insomnia.	EN

(Fam: Family; EN- Endangered; VU –Vulnerable)

Plate 1: Enumerated threatened plant species from study area, 1: *Celastrus paniculatus* Willd, 2: *Gloriosa superba* L., 3: *Mesua ferrea* L., 4: *Rauvolfia serpentina* (L.) Benth.Ex. Kurz.