TOWARDS CONSERVATION OF MEDICINAL PLANT LORE OF INDIAN ARID ZONE

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Introduction

Indian arid zone covers an area of about 32 million km^2 of which more than 60% lies in North-West Rajasthan. It also extends to some parts of Haryana, Punjab in North (9%), Gujarat in the South (20%) and two southern States viz., Andhra Pradesh and Karnataka (10%). Indian desert is characterized by sparse vegetation cover, low and erratic rainfall (180 mm), extremely hot temperature, (48°C) during summer months and extremely cold temperature (–2°C) during winter months, frequent and severe drought, high wind velocity, high rate of evapo-transpiration, low relative humidity and deep ground water table. Soils are generally coarse in texture and their water holding capacity is very low and with low nutrient status. Moisture deficiency is the chief limiting factor for the establishment of vegetation. Apart from these factors the density of human population in our desert areas is about 60 per km^2, whereas it is about 3 per km^2, in most of the world's deserts. The livestock population far exceeds human population in this desert area and their density is about 125 per km^2.

Inspite of adverse climatic conditions and high biotic pressure, the Indian Thar desert supports a number of plant species of which a few are endemic, threatened and rare in the Indian Thar desert (Singh, 1985; Bhandari and Shringhi, 1987; Mertia, 1990). Indiscriminate use of natural resources for various developmental activities in the desert ecosystem has led to the loss of many endemic plants like *Commiphora wightii, Carallumma edulis, Barleria acanthoides, Tephrosia falciformis, Dipcadi erythraeum, Glossonema varians, Neurada procumbens* etc. of this region. Given the changing pattern of our needs regarding food, fodder, fuel, fibre and medicine etc., we may not be able to foretell today as to which species may be needed and for what purpose. Past over exploitation and present neglect has led to the extinction of many of such important species.

Some work has been done on medicinal plant species of Indian arid desert (Atal *et al.*, 1975; Gupta *et al.*, 1966; Mertia and Nagarajan, 1997) particularly on medicinal uses of different plant species based on local inventories. However, there is less available information on natural population dynamics of these species in the Indian desert and techniques of propagation are not known. Therefore, it was of paramount importance to select such species on priority basis and conduct study on the biology and to standardize package of practices for their commercial

cultivation. An attempt has been made in this paper to report the findings of research work under progress on the status, distribution, economic uses, propagation techniques and field performance of a few medicinal plant species of Indian desert.

Material and Methods

The study is a part of a long term project on conservation of endangered and economic plant species of the Indian Thar Desert at Central Arid Zone Research Institute, Regional Research Station, Jaisalmer (Rajasthan); located between 26°-54' N latitude and 70°-55' E longitude. A list of plants has been prepared from the published literature, authors' own experience over the last 30 years and on the basis of their economic uses and severity of threat. Consequently, a series of exploration trips were undertaken in Jaisalmer District during the last 20 years. Besides the available literature on habit, habitat and phenology, the field observations were recorded for the first time by using standard procedure. Vegetation cover was recorded by line intercept method (Cainfield, 1941) in the month of September for three years (1999-2001). Plant population density of respective species was computed from the line transect data. The information on morphological growth attributes was recorded following Kent and Coker (1992). The various economic uses and ethno-medicinal value have also been collected from the local inhabitants and ethnic groups.

Results and Discussion

Commiphora wightii (Arn.) Bhandari (Burseraceae) : This plant is well known for its oleo-gum resin called 'gugal', which has high medicinal value. In local medicine, the gum is used as antiseptic on wounds. It is also useful in the treatment of rheumatic arthritis and heart diseases. It is a much branched small tree distributed in North-western Gujarat and Rajasthan. It occurs on open rocky and hilly areas. Due to over-exploitation for its oleo-gum, this plant has become threatened and is rarely visible in the natural habitat, therefore, it has been included in the Red Data Book of IUCN. In the natural habitat, the plant population density ranges from 12-30 plant ha^{-1} and the height from 2-5 m.

Efforts were made for its regeneration through seeds and it was found that germination through seeds was very difficult as they could not respond even to various chemical treatments (Singh *et al.*, 1998). Therefore, different kinds of vegetative cuttings were tried. It was found that the cuttings with smaller diameter (6.0 - 6.5 mm) gave significantly higher shoot (98.0%) and root (40.0%) initiation, number of roots (12) per cutting, shoot length (20.4 cm) and root length (15 cm) than the hardwood cuttings having more diameter (9.0 - 9.3 mm) (Mertia and Nagarajan, 2000).

For better rooting and establishment, it is advised to use tender wood cuttings for successful raising of plants and rehabilitation of this species in the desert ecosystem. The rooted cuttings were planted in the field on a rocky site at a spacing of 3 x 4 m which, established well (Fig. 1). There is hundred per cent survival in both the types which were collected from Western Rajasthan and Gujarat. The material from Gujarat is more succulent and has spreading habit whereas, the material from Western Rajasthan is

Fig. 1

Growth of *Commiphora wightii* after 18 months of planting seedlings raised through shoot cuttings

Table 1

Growth performance of Commiphora wightii (Guggal) raised through vegetative cuttings at monthly intervals in Jaisalmer

Growth attributes	Growth after months of planting									
	Material from Gujarat					Material from Rajasthan				
	Initial	6	7	8	9	Initial	6	7	8	9
Plant height (cm)	45.0	125.0	136.0	140.0	141.0	43.5	101.0	111.0	116.0	119.0
Crown (cm)	-	168.0	173.0	178.0	179.0	-	27.0	29.0	32.0	35.0
Collar dia. (mm)	13.5	24.0	25.0	27.0	27.0	14.5	24.0	25.0	26.0	26.0
No. of branches	3.5	3.5	3.5	3.5	3.5	5.6	5.6	5.6	5.6	5.6

comparatively woody and grew erect. Data on different attributes have been incorporated in Table. 1.

Tephrosia falciformis Ramas. (Fabaceae) : It is locally known as 'Rati Byani', which is endemic to Western Rajasthan. The pods are valued for falciformin content (Khan *et al.*, 1986). Besides this the whole plant as well as roots have many other uses viz., tonic, stimulant, laxative, treatment of worms, syphilis, chronic

bronchitis, bladder trouble and intestinal worms. The plant is a much branched perennial shrub. The plant species is found on sandy undulating habitat and the plant stand is pure with few annuals. In nature the plant population density ranges from 2,500-4,300 plants ha^{-1}, height ranges from 90-120 cm, spread 75-145 cm and the number of branches from 8-20 $plant^{-1}$. The flowering and fruiting season were observed between July to September.

This plant species can be propagated through seeds. Poor germination was observed when untreated seeds were sown. Therefore, various seed treatments were applied to break the seed dormancy and it was noticed that the seeds soaked in cold water after partial removal of seed coat gave cent percent germination even under field conditions (Table 2). Therefore, it is advised that the partial removal of seed coat with cold water treatment for 6 hours would result in maximum seed germination and subsequent establishment and survival of this species.

Glossonema varians (Stocks) Benth. (Asclepiadaceae) : This plant is locally known as 'Khiroli'. The fruits are eaten raw by the local people during rainy season. The chemical and nutritive analyses are yet to be done for the fruits as well as for the whole plant but traditionally patients of diabetes consume the fresh young fruits. A small herb occurs in sandy and gravel habitat along with desert grasses and annuals. The distribution of this species is highly localized. In nature, the species has varied range of plant population density (80-135 ha^{-1}), height (12-25 cm) and spread (25-32 cm). The flowering and fruiting

Table 2

Various seed treatments, mean germination and percentage germination of Teprosia falciformis

Treatment	Mean Germination	Percentage Germination	MDG	GV
T1 - Seeds soaked in cold water for 24 hrs.	3.33	13.32	1.4	4.2
T2 - Seeds soaked in cold water for 12 hrs.	1.67	6.68	0.2	0.2
T3 - Seeds treated with conc. H_2SO_4 for 10 min.	19.00	76.00	3.8	72.2
T4 - Seeds treated with conc. H_2SO_4 for 20 min.	22.67	90.68	4.8	115.2
T5 - Seeds treated with conc. H_2SO_4 for 30 min.	23.33	93.32	4.8	115.2
T6 - Mechanical scarified seeds (partial removal of seed coat)	23.67	94.68	4.9	117.6
T7 - Mechanical scarified Seed+ Treated with cold water for 6 hrs.	25.0	100.00	5.0	125.0
T8 - Control (untreated normal seeds)	3.67	14.68	0.2	0.2
SEm±	0.183	-	-	-
CD (p=0.05)	0.555	-	-	-

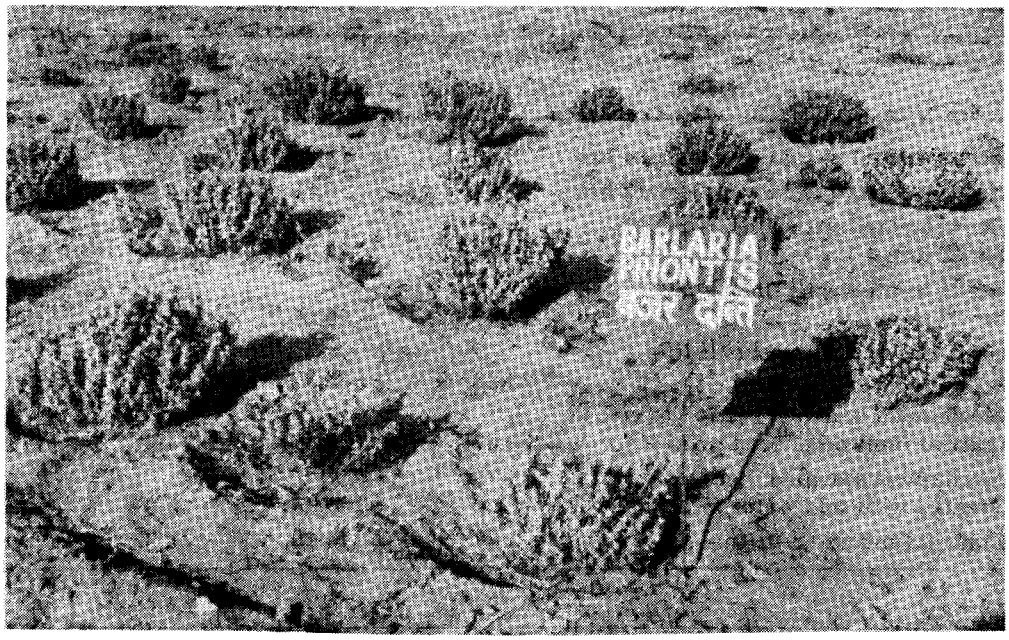
season were observed during July to September.

For establishment of this species in the field, the efforts were made through seed and it was noticed that the germination per cent was very poor (10-15%). However, vegetative propagation resulted in 95 per cent rooting in shoot cuttings. The vegetative cuttings of three types viz; 10, 15 and 20 cm length having diameter of 2.5, 3.5, and 4.5 mm, respectively were used in polybags filled with commonly used soil mixture in nursery conditions. Maximum rooting 95 per cent was observed in cuttings of 10 cm length with 4.5 mm diameter and minimum 40 per cent in cuttings of 20 cm length and 2.5 mm diameter. Therefore, for raising quick and large number of plants, the vegetative cuttings of 10 cm length with 4.5 mm diameter are more suitable.

Barleria prionitis Linn. (Acanthaceae) : It is commonly known as 'Vajradanti' in Hindi. This species is endemic to Western Rajasthan. The roots of the plants are used in Indian medicine as diuretic and against inflammation, boils, swellings and diabetes. It is much branched and small perennial thorny shrub. The species occurs in rocky and hilly slopes as pure colonies. The population density under natural condition ranges between 250-400 plant ha^{-1}, height varies from 12-18 cm and the spread ranges from 27-35 cm. The flowering and fruiting of this species were noticed during September to December.

This seeds of this species were tried for their propagation in field and the result

Fig. 2



Growth of *Barleria prionitis* plants raised through seeds after 12 months

was not encouraging because of their poor germination percentage (10-20). The cause of low germination is yet to be ascertained. Alternatively, to avoid poor establishment in field due to direct seeding, the self-seeded plants from the natural habitat were pricked out and transplanted in poly bags. These pricked out plant gave cent per cent survival under nursery as well as in the field conditions (Fig. 2). Therefore, it is possible to transplant the self-seeded natural plants in the fields. Though they are available in less number due to poor seed germination, however, it will help in conserving such endemic and rare plant species from disappearance.

Dipcadi erythraeum Webb. & Berth. (Liliaceae) : The bulbs of this plant have a typical aromatic odour and the local people apply the decoction of bulbs for rheumatic pain. This plant is a small annual herb. It occurs on low-laying rocky and gravelly substratum along with other annuals and perennials. In nature the plant population density varied from 10-16 plant ha^{-1} and grows up to the maximum height of 22 cm with 4 to 8 leaves. Normally it attains flowering within 20-25 days after first rain. The flowering and fruiting were observed during July and August. This is very rare and endemic plant of this region.

The multiplication of this species was studied through seed as well as bulb. The direct sowing of seeds gave poor results. However, raising of nursery with seeds and transplanting the seedlings gave cent per cent success in the field.

SUMMARY

The Indian desert flora has an important place in the field of desert floristics, as it support western as well as eastern elements along with higher percentage of endemic plants. There are numerous plant species which are confined to western bulge of our country and are less known at this point of time in other areas. However species viz; *Commiphora wightii* (Gugal) and *Tephrosia falciformis* (Rati Biyani) are now under application in the field of medicine. Besides mitigating the ethno-medicinal needs of the desert peasantry, these species offer potential for conservation and optimum use in the field of medicines. The results of the present study clearly infer the possibilities of conservation of the some of the species investigated. However, detailed study on their physio-chemical composition would provide more information on the economic values of individual plant species. Efforts are continuing on investigation of many more species, which would provide valuable information on different aspects of conservation, and propagation of endemic species for better eco-environment in the extreme arid regions along with their medicinal value.

भारतीय शुष्क क्षेत्र के औषध पादपों के संरक्षण की ओर

आर०एस० मेड़तिया व एम० नागराजन्

सारांश

मरूभूमि पादपमत्रिकी के क्षेत्र में भारतीय मरू पेड़ पौधों का महत्वपूर्ण स्थान है क्योंकि ये इसके पश्चिमी और पूर्वी दोनों के तत्वों को सहायता पहुँचाते हैं और वहीं मिलने वाले पेड़ पौधों का अधिक प्रतिशत हैं । पेड़ पौधों की बहुत सारी पादप जातियां ऐसी हैं जो हमारे देश के पश्चिम में बड़े भूभाग में ही मिलती है जिन्हें इस समय दूसरे भागों में लोग बहुत ही कम जानते हैं तथापि कुछ पादप जातियां जैसे *कोम्मिफोरा वाइटिआई* (गूगल) और *टेफ्रोसिया फाल्कीफौर्मिस* (रतिबियानी) ऐसी हैं जिन्हें चिकित्सा में उपयोग किया जाता है । मरू में रहने वाले किसानों की रसायनज औषधियों की जरूरतें कम करने

में इन जातियों का संरक्षण और चिकित्सा क्षेत्र में इष्टतम उपयोग किए जाने की बहुत संभावनाएं हैं । इस अध्ययन के परिणामों से अन्वेषित की गई कुछ जातियों के संरक्षण की संभावनाओं का स्पष्टत: निष्कर्ष प्राप्त होता है । तथापि, उनकी भौतरसायनिक संरचना का विस्तारपूर्वक अध्ययन किया जाने पर अलग-अलग पादपजाति के आर्थिक मूल्य के बारे में और अधिक जानकारी प्राप्त होगी । बहुतसारी अन्य पादपजातियों का अन्वेषण कार्य चल रहा है जिससे संरक्षण के विविध पक्षों तथा चिकित्सीय मूल्यों के साथ-साथ इन अत्याधिक शुष्क क्षेत्रों का परिस्थिकी-पर्यावरण श्रेष्ठतर बनाने के लिए वहीं की स्थानसीमित जातियों के प्रवर्धन कराने विषयक मूल्यवान जानकारी उपलब्ध होगी ।

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