



Floristic Diversity with Special Reference to Rare and Threatened Plants of Jawahar Sagar Sanctuary Area near Kota Rajasthan

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(Received 14 January, 2014, Accepted 24 March, 2014)

ABSTRACT: Jawahar Sagar Sanctuary is one of the richest floristic regions of Rajasthan. In floristic analysis of the study area 422 species of angiosperm plants were documented. In the present paper 37 plant species have been recorded as rare or endangered plants. All 37 plant species are enumerated with their botanical names, local names, red data categories and present status in the study area. Many of these plant species have immediate attention for their conservation. It is an alarming situation where endangered species requires more and more attentions. The present study also highlights that some rare or endangered plants abundantly found in Jawahar Sagar Sanctuary area. The sanctuary is observed as the best conservation model of the plant diversity and it harbors a large number of endangered and rare plants.

Keywords: Diversity, Endangered, Extinct, Floristic, Rare, Sanctuary.

INTRODUCTION

The term biodiversity is an amalgam of two words biological and diversity. In general biodiversity is a complex and balanced network of different species, which are mutually in dependent on each other. Floral and faunal diversities are two facts components of biodiversities which covers the variety and variability of species. The Government of India has already mandate up with a Biodiversity Acts, 2002 and national Environment policy, 2005. To achieve the effective implementation of the above acts we must have a comprehensive update list of plants and animals of the region with particular interest to rare and threatened taxa. Thus, present attempt has been made for documentation of floral components and threatened or rare plants of Jawahar Sagar study area. These rare and threatened plants species has to be highlighted for their conservation.

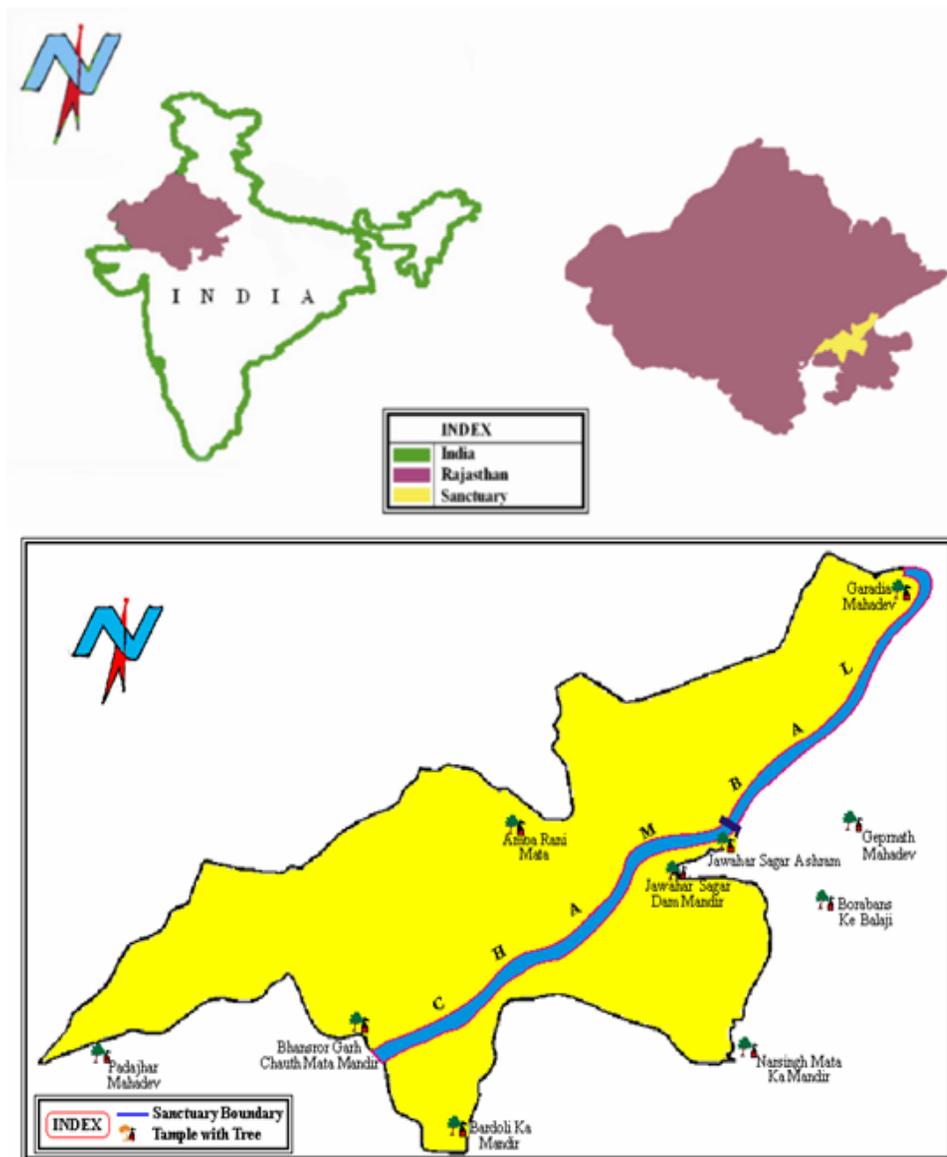
The floristic diversity of Rajasthan has documented by Singh and Pandey (1998) in details. Comprehensive flora of Rajasthan in three volumes (Shetty and Singh 1987, 91, 93) published by Botanical survey of India. According to IUCN an endangered species is a population of organisms which is at risk of becoming extinct because it is either few in numbers. "Threatened species" is a related term, referring to a species likely to become endangered within the foreseeable future. The Species Survival Commission of the International Union for Conservation of Nature and Natural Resources (IUCN) published information online about

approximately 41,500 endangered species worldwide as the Red List of Threatened Species.

In India the work on threatened plants was first published in 1980 by the Botanical survey of India (BSI). Jain and Sastry, 1980 published a small booklet entitled "Threatened plants of India". Later on comprehensive work on rare and threatened plants of India was also published by BSI in the form of a book in three volumes entitled "RED DATA BOOK OF INDIAN PLANTS" (Nayar and Sastry, 1987, 1988, 1990). Arid zone circle Jodhpur of BSI published a list of rare taxa of western region of Rajasthan (2008). Pandey et. al (2012) have also published depleting 65 taxa with their present status and conservation in Rajasthan. Earlier the criteria for categorizing threatened plants were mainly based on qualitative characters. In 1994, IUCN has revised their criteria by qualitative and quantitative characters were essential. CITES (Convention on Inter-national Trade Endangered Species of Wild Flora & Fauna) has kept threatened plants into Appendix I, II, and III depending upon gravity of threatened for ban in international trade. Forty species of plant are kept in CITES list of Indian plants. Jawahar Sagar Sanctuary is one of the richest floristic regions of Rajasthan and botanical paradise of the area. But, floristic diversity of the study area is affected due to pollution and population pressure. In this paper plant wealth with reference to threatened plant species of Jawahar Sagar Sanctuary area are presented.

Study area: Rajasthan is a largest state of India and represents 10.41% of the country total geographical area. It has a rich heritage of culture and diversified habitat. The state is characterized by diverse physiographic due to ranging from green land valleys to sand land desert. The presence of great Indian Thar Desert in its western portion makes Rajasthan a unique state of India. Rajasthan state is a broadly divided into three main parts viz., Western Rajasthan, Central Rajasthan and South-east-Rajasthan. South-east Rajasthan is also known as Hadoti region, it comprises Kota, Bundi, Baran and Jhalawar districts.

Jawahar Sagar Sanctuary area is part of south-east Rajasthan. Jawahar Sagar, Bhaisrodghad and few parts of Darah Sanctuary have been merged in Mukundra Hills National Park. It is situated in Rajasthan near Madhya Pradesh border. Jawahar Sagar was declared a wild life sanctuary on 9th Oct 1975 and it covers an area 194 sq.k.m. It lies between of 24°-56'-25°-44' east longitude and 75°-26'-75°-41' north Latitude. The major river Chambal passes trough the sanctuary area so; it is the life line of Jawahar Sagar Sanctuary. The vegetation of sanctuary is composed of tropical or mixed decuduos forest.



Map of the study area

MATERIAL AND METHOEDS

The present study deals with many plant species observed for floristic data. Rare or endangered plants were recorded from the study area. During the field survey various criteria of IUCN for categorizing threatened plants, viz extent of occurrence, area of occupancy, number of individuals, probability of extinction etc. were measured. Rarity of species was determined by field study, visual estimations and literature. In course of the collection revealed that few rare and endangered species were present in the study area, which have been also mentioned in the Red data book of Indian plants, IUCN list of threatened species and list of BSI arid zone circle. Extensive surveys of the study area were conducted to prepare a list of plant species occurring in different seasons. The photograph and specimen of all these plant species were collected for herbarium purposes. Herbarium sheets were prepared and documented. Identifications were done with the help of different floras and different herbaria of Rajasthan (Bhandari, 1990; Singh and Shetty, 1987-93; Sharma, 2002).

RESULT AND DISCUSSION

Taxonomical surveys were conducted in different tracks in the forest areas of Jawahar Sagar Sanctuary 422 angiosperm taxa were documented for floristic analysis. During the course of present investigations 422 plant species of which 350 were dicots and 72 monocots were collected and identified. The total number of

enumeration of plants with species, genera and families are summarized in Table 1. The phyto-diversity ratio of species level between monocots to dicots is 1: 4.9 of genera 1: 3.0 and of families 1:5.1. The result is very much similar to flora of Rajasthan (Singh and Shetty, 1987, 91, 93; Sharma, 2002). General pattern of vegetation in sanctuary varies from region to region because of great fluctuation of climate. Forest of sanctuary area can be classified under three heads:-

1. Tropical moist deciduous forest -These forests are found in sub humid and most hilly areas of the present study. The dominant trees in these forest area are *Anogeissus latifolia*, *Butea monosperma*, *Dendrocalamus strictus*, *Diospyros melanoxylon*, *Mitragyna parviflora* and *Terminalia alata*.

2. Mixed dry deciduous forest -The dry deciduous forest together cover more than 70% of the sanctuary is dominated by *Anogeissus pendula* and several species of *Terminalia* and *Wrightia tinctoria*. Most part of the country has these forests are dry teak forest, because Teak is dominating vegetation and also reported by Saxena et al. (1992) and Thakur and Khare (2009), but here teak was not observed in the forest of study area.

3. Scrub forest-The typical vegetation of the scrub forests is very sparse and constituents are *Acacia senegal*, *A. leucophloea*, *Capparis decidua*, *C. sepiaria*, *Dichrostachys cinerea*, *Euphorbia nerifolia*, *Mimosa hamata*, etc. Very popular tree of Rajasthan *Prosopis cineraria* was not observed in the study area.

Table 1: Diversity of Dicot and Monocot.

S.NO.	DICOTS NUMBER %		MONOCOTS NUMBER %		TOTAL	RATIO
1.SPECIES	350	83.2%	72	16.7%	422	1:4.9
2.GENERA	214	79.1%	57	20.8%	271	1:3.0
3.FAMILIES	83	83.6%	16	16.3%	99	1:5.1

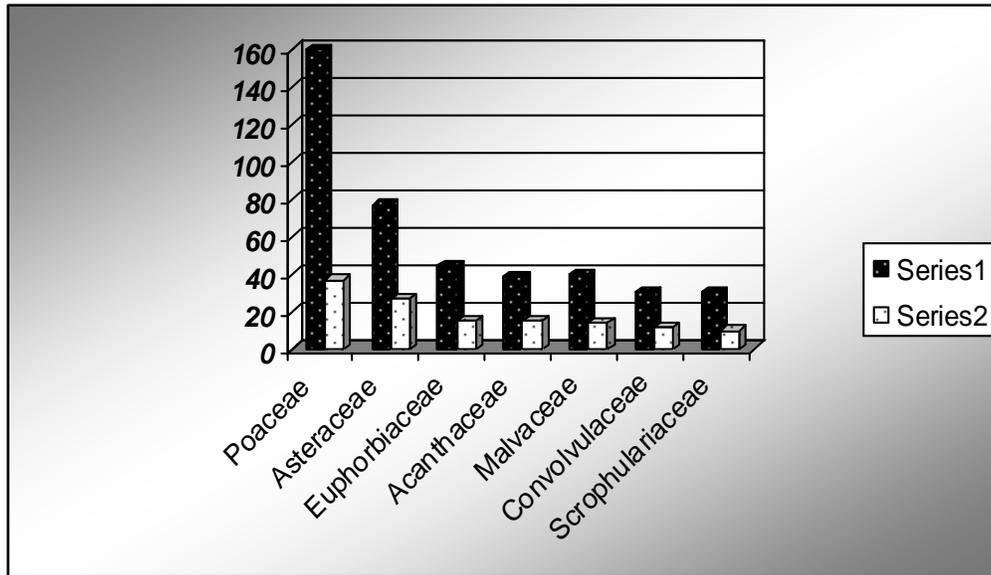


Fig. 1. Comparative Statement of Large Families “Flora of Rajasthan and Present work” Series 1- Flora of Rajasthan, Series 2- Present work.

In Rajasthan monocotyledons are very poorly represented but the family Poaceae maintains diversity in the study area comprising 37 plant species (Figure). In Flora of Rajasthan Poaceae, Asteraceae, Euphorbiaceae and Acanthaceae were the prominent families as recorded by Sharma (2002). The present study has shown floristic richness, which can be attributed to the mixed deciduous forests. Floristic composition shows presence of a few evergreen species and few dry species composed a mixed type of vegetation. The different type of vegetation and forests supports the rich phyto-diversity of the study area. Conservation of floristic diversity is one of the national and international needs to save our natural wealth.

In the present study, 37 plant species have been documented as threatened or rare. Reference to rare and endangered plant 37 plant species belong to 29 families enumerated in alphabetical order with local names, red data Book category and present status in study area (Table 2). Plants arranged in the table refer to the classification of threatened plants as given by IUCN. The categories include: Extinct (EX); Extinct in wild (EW) and threatened. Threatened which are divide in to Critically endangered (CR); Endangered (EN); vulnerable (VN); Near threatened (NT) and Least concern (LC). Based on these categories, assessment of plant species have been carried out our observations.

Table 2: List of Rare and Threatened Plants of the Study Area.

S. No.	Botanical name	Local name	Family	Habit	Red data Book category	Present status in study /Sp.N.
1.	<i>Abutilon bidentatum</i> Hoesh.	Kanghi	Malvaceae	Herb	Invulnerable	VU SUJ-156
2.	<i>Acacia catechu</i> * (L.f) Willd.	Khair	Mimosaceae	Tree	Invulnerable	LC SUJ-772
3.	<i>Adina cordifolia</i> (Willd) ex Roxb.	Haldu	Rubiaceae	Tree	Vulnerable	NT SUJ-1612
4.	<i>Ailanthes exceksa</i> Roxb.	Aruu	Simaroubaceae	Tree	Vulnerable	VU SUJ-744

5.	<i>Alangium salvifolium</i> L.f.Wang.	Ankol	Alangiaceae	Tree	Rare	EW SUJ-1480
6.	<i>Alysicarpus vaginalis</i> (L.)D.C.	----	Fabaceae	Herb	Invulnerable	EN SUJ-1384
7.	<i>Ampelocissus latifolia</i> Roxb.**	Pannibel	Vitaceae	Climber	Invulnerable	CR SUJ-628
8.	<i>Argyreia nervosa</i> Dalz.	Tamseri	Convolvulaceae	Climber	Invulnerable	EW SUJ-524
9.	<i>Bauhinia vahalli</i> Wt Arn.**	Kachnar bel	Cesalpiniaceae	Climber	Rare	CR SUJ-1448
10.	<i>Boswellia serrata</i> Roxb.*	Salar	Burseraceae	Tree	Rare	LC SUJ-288
11.	<i>Celastrus paniculata</i> Willd.**	Malkagini	Clastraceae	Climber	Rare	CR SUJ-784
12.	<i>Chlorophytum laxaum</i> R. Br.	Safed mausali	Liliaceae	Herb	Rare	EN SUJ-1680
13.	<i>Cissus rependa</i> Vahl.	Hadjod	Vitaceae	Herb	Rare	EX SUJ-924
14.	<i>Cordia dichotoma</i> Forst.	Lasora	Ehreteaceae	Tree	Vulnerable	EN SUJ-1608
15.	<i>Crateva nervosa</i> DC.	Varana	Capparaceae	Tree	Rare	EN SUJ-908
16.	<i>Curcuma pesudomontana</i> Grah.	Kali mausali	Zingiberaceae	Herb	Invulnerable	VU SUJ-1624
17.	<i>Cythocline purpurea</i> Roxb.	Bandaria	Asteraceae	Herb	Vulnerable	VU SUJ-736
18.	<i>Dalbergia latifolia</i> Roxb.	Safed shisham	Fabaceae	Tree	Invulnerable	EN SUJ-152
19.	<i>Didymocarpus pygmaea</i> Clarke.	Pathar phodi	Gesneriaceae	Herb	Vulnerable	NT SUJ-448
20.	<i>Dioscorea bulbifera</i> L.**	Jata- shankari	Dioscoreaceae	Climber	Endangered	CR SUJ-1752
21.	<i>Eranthemum roseum</i> Vahl R.Br.**	-----	Acanthaceae	Shrub	Rare	EW SUJ-1516
22.	<i>Feronia limonia</i> L.	Kaith	Rutaceae	Tree	Invulnerable	EN SUJ-432
23.	<i>Gloriosa superba</i> Linn.**	Kalihari	Liliaceae	Climber	Endangered	EW SUJ-696
24.	<i>Ipomoea cairica</i> (L.)Sweet.	----	Convolvulaceae	Climber	Vulnerable	EN SUJ-1144
25.	<i>Justicia neesii</i> Raman.	----	Acanthaceae	Herb	Vulnerable	VN SUJ-596
26.	<i>Mallotus philippensis</i> Lam.	Sindhuria	Euphorbiaceae	Tree	Rare	EN SUJ-2580
27.	<i>Manilkara hexandra</i> Roxb.Dub **	Khirani	Sapotaceae	Tree	Invulnerable	CR SUJ-1028

28.	<i>Melhaniania fultetyporensis</i> Munro	-----	Sterculaceae	Shrub	Rare	EN SUJ-472
29.	<i>Mimosa hamata</i> Willd.	Bander ki roti	Mimosaceae	Shrub	Invulnerable	NT SUJ-936
30.	<i>Morinda tomentosa</i> Heyne.	Aal	Rubiaceae	Tree	Vulnerable	NT SUJ-1020
31.	<i>Nyctanthes arbortristis</i> L.**	Harsingar	Nyctagenaceae	Tree	Vulnerable	CR SUJ-1200
32.	<i>Pterocarpus marsupium</i> Roxb.**	Bija sal	Fabaceae	Tree	Rare	CR SUJ-1496
33.	<i>Salvadora persica</i> L.	Jaal	Salvadoraceae	Tree	Invulnerable	EN SUJ-1152
34.	<i>Sarcostemma viminalis</i> L.**	Sambher bel	Asclepiadaceae	Climber	Endangered	CR SUJ-700
35.	<i>Terminalia alata</i> * Heyne. Ex Roth.	Sadada	Combretaceae	Tree	Invulnerable	LC SUJ-1060
36.	<i>Terminalia bellirica</i> Gaertn.	Baheda	Combretaceae	Tree	Invulnerable	EN SUJ-1196
37.	<i>Wrightia tinctoria</i> * R.Br.	Dhudhi	Apocynaceae	Tree	Invulnerable	LC SUJ-1452

*Abundantly found in the study area, ** Extremely high risk of extinction in the wild condition

EW - Extinct in wild, CR - Critically endangered – Extremely high risk of extinction in the wild, EN - Endangered – High risk of extinction in the wild, VU - Vulnerable – High risk of endangered in the wild, NT - Near threatened – Likely to become endangered in near future, LC - Least concern – Lowest risk to become near threatened.

According to the Encyclopedia of Earth, over 8,000 plant species worldwide are officially threatened or endangered. Barethlott *et. al.*, (2000) observed that in general more than 25% taxa are under various degrees of continuous threat globally. The present findings revealed that 37 plant species have been documented as rare and threatened. Hence, these taxa have been categorized in to high risk. Mishra and Agarwal (2006) recommended that 78 more plants from north Western Ghats to be included in the red data book. The present study revealed that climbers like *Ampelocissus latifolia*, *Bauhinia vahalli*, (Fig. I) *Celastrus paniculata*, *Dioscorea bulbifera*, *Glorisa supraerba* (Fig. VI) *Sarcostemma viminalis* (Fig. VII) were recorded critically endangered in the study area. Critically endangered species of the study area essentially needed protection by all concerned. According to Goel and Mitru (2000) wild life sanctuary plays a vital role in in-situ conservations. Pandey *et.al.* (1012) gave emphasis for the establishment of national parks and sanctuaries where threatened plant species can multiply freely. So, the state wise plan is required for identification of rare and threatened plant species and to be protected by the in-situ conservation.

Tecomella undulata (Bignoniaceae), *Soymida fabrifuga* (Meliaceae), were reported as rare in the project report of forest department in 2004 in Jawahar Sagar Sanctuary area. These species were also mentioned as

rare in Red data book of India. *Dicoma tomentosa* (Asteraceae), *Hymenodictyon excelsum* (Rubiaceae), *Sisymbrium irio* (Brassicaceae) were reported (Singh and Shetty 1991) from Jawahar Sagar dam in the flora of Rajasthan but these species were not found in the present study. During the field survey (2008-2010) many plant species were not observed in the study area but these species were reported by earlier workers (Sharma 2002; Singh and Shetty 1987, 1991, 1993). These species were not observed as any site of study area, so it can be concluded that they are getting extinct in the wild condition of the study area. So, it is an alarming situation where threatened taxon requires more and more attention for preserving their genetic diversity. A few rare and threatened plant species were abundantly observed in the study area. *Terminalia alata* was mentioned as rare in the Red data list of IUCN (1994-2007), but it was abundantly found in the present study. *Acacia catechu*, *Boswellia serrata* (Fig. II) and *Wrightia tinctoria* (Fig-VIII) these taxa were considered as threatened in Red data categories but the present study has shown their common distribution in the study area. Mishra and Agarwal (2006) have suggested that excluding 10 plant species of Western Ghats from Red data book because they have become common in their distribution. Common distribution of rare and endangered species in the study area articulated that Jawahar Sagar Sanctuary harbors a large number of endangered and rare plants.

It is an attempt to highlights the rare or threatened plants of this study area. The government bodies as well as various NGOs have to come forward to take up responsibility of this important task to save the plant wealth. Efforts should also be made in search of rare plants of every regions of the country for their

conservation. Hence, protective measures have to be taken for these precious plants wealth, because they will be danger in near future. It can be concluded that wild life sanctuary plays a vital role in conservations of plant wealth. The national parks and sanctuaries provide good habitats for in-situ conservation of plants.

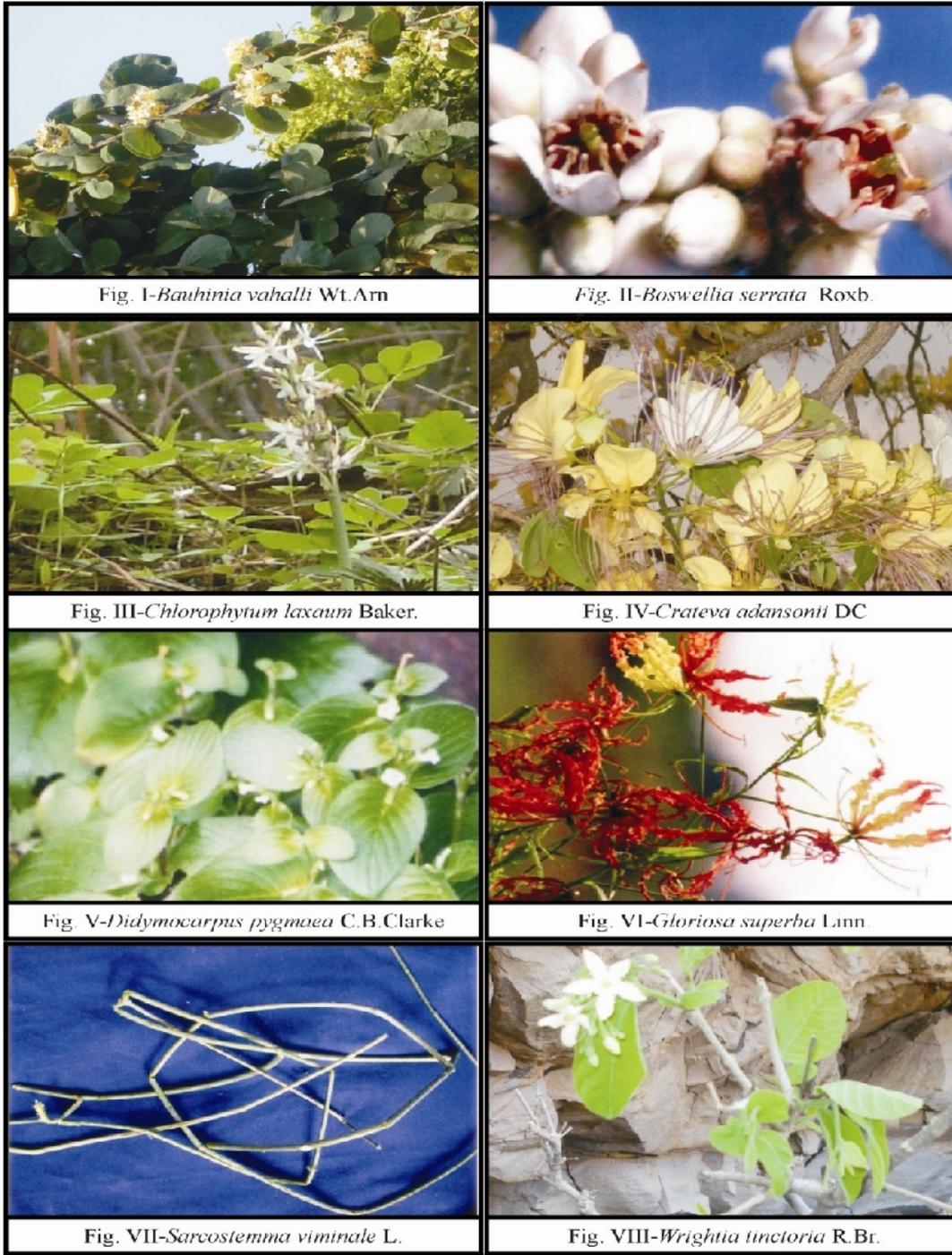


Fig. I-*Bauhinia vahalli* Wt.Arn

Fig. II-*Boswellia serrata* Roxb.

Fig. III-*Chlorophytum laxaum* Baker.

Fig. IV-*Crateva adansoni* DC

Fig. V-*Didymocarpus pygmaea* C.B.Clarke

Fig. VI-*Gloriosa superba* Linn.

Fig. VII-*Sarcostemma viminale* L.

Fig. VIII-*Wrightia tinctoria* R.Br.

Endangered and Rare Plants

ACKNOWLEDGEMENT

Authors are thankful to staff member of forest department for providing help during study. Authors are also grateful to R.P. Pandey and P.J. Parmar of botanical survey of India, Arid zone Regional centre, Jodhpur Rajasthan for identification of plants.

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