Indian Journal of Plant Sciences ISSN: 2319–3824(Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jps.htm
2016 Vol.5 (1) January-March, pp 126-133/Patil and Yadav
Research Article

CRITICALLY ENDANGERED FLOWERING PLANTS IN THE FOREST OF JALGAON DISTRICT (M.S) INDIA

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ABSTRACT
The present research paper deals with threat status of flowering plants assessed in forest of Jalgaon district (M.S) India, according to IUCN guidelines. During the course of investigation during 2011-2015 in the forest of Jalgaon district extensive and intensive field survey was conducted. Some plants not only showed restricted distribution but also appeared endangered, Vulnerable, and near threatened. The causes of threatened species are studied. Conservation strategies are also suggested. The area explored during study is restricted to Jalgaon district especially to Pal, Wadoda, Yawal region. The forest is dry deciduous type. Total 81 species of flowering plants are evaluated and placed in the threat categories. Out of the 81 plant species, 5 are critically endangered are enlisted. The species are *Ceropegia hirsuta* Wight, *Commiphora wighitii* (Arn.) Bhandari. *Curcuma aromatica* Salisb., *Olea dioca* Roxb., *Rauwoifia serpentina* (L.).

***Keywords*:** *Threat, Threat Categories, Endangered, Vulnerable, Near Threatened, IUCN, Pal, Vadoda, Yawal*

INTRODUCTION
Biodiversity is a basic property of life. It is considered essential for the proper functioning of living systems since, it provides populations, species and ecosystems. India is one of the top three countries in number of threatened endemics for at least one taxonomic group. Threat to biodiversity due to invasive alien species is considered only to that of habitat destruction. An exotic species of tropical America has naturalized in most parts of India. This is noxious weed because of its prolific seed production, fast spreading ability, allopathic effects on other plants and health hazard to human and other animals *Lantana camera*, one of ten worst weeds of world and native of subtropical America, is now found all over the Indian subcontinent.

There are some species whose number has been reduced to a critical level or whose habitats have been adversely affected so that they may become extinct if not given special protection. The reduced population of rare species causes concern and their distribution is limited, a single cause whether environmental or human activities may change and wipe out the species. The restricted species have neither colonizing ability nor regenerative ability such as vegetative expansion and persistent seed capability to regenerate.

These species are subjected to large fluctuations. The stress prone species have flowers which are produced late in their life history, low flowering and less viability of seeds. Such species are prone to become rare and finally lead to extinction. The extinction of species therefore, is due to environmental factors, ecological changes, biological factors, and pathological causes and anthropogenic interference in the form of destructions, or exploitations.

Conservation of natural resources and the capability to utilize them in sustainable manner are essential for the well being and continued survival of man. Under the duress of over exploration and habitat degradation a number of wild plants are essentially facing a constant threat of extinction. Out of the 60,000 plant species that are listed as threatened or extinction, over 20,000 (or more) are from India alone.

The botanical survey of India has prepared a provisional list of threatened plants which includes large number wild or wild relatives of food, horticulture, medicinal and aromatic plants. India is endowed with

a unique wealth of biota which includes a large number of medicinal and aromatic plant. Many of these plants are rare and endemic and found only in wild sources. The population explosion coupled with the improved standard of living led toothless exploitation, resulting in the imminent danger of extinction of these plants. Most of these wild medicinal and aromatic plants are highly habitual specific, found only in forests and occupying highly specialized ecological niche with restricted distribution (Kirtikar and Basu, 1918).

There is neither biological information nor adequate knowledge of casual factors that led to their rarity in the habitat. There is however, now an urgent need to evolve a sound strategy for the management and conservation of these plants on a long term basis. To evolve suitable strategies for conservation the domestication cultivation of medicinal plants, it is very essential to study the complete biological and ecological back ground of these species.

Biodiversity is destroyed rapidly throughout world Biodiversity loss originates from social, economic, political cultural and historical features of society. Habitat destruction is the largest single cause of biodiversity loss, introduction of exotic species, over harvesting, over exploitation loss of specific pollinators, loss of reproduction, low seed germination capacity, climate change and environmental factors due to change of environment beyond the tolerance limit of species, international trade pathological causes like out breaks of diseases and epidemics etc. are the major threats to the biodiversity.

Study Area

Jalgaon district of Maharashtra state includes varied topographical features and landscape, consisting of hills and forests. Stretches of barren plain, low rolling rocky hills and densely gullied topography near major river banks.

Regionally, from east to west, parallel with the Tapi, are the well marked belts of the country in the centre, rich Tapi valley, in the north, the high and Satpura, and in the south southwest, bare ridges and rich, well watered valleys flanked by the Ajanta range the Tapi banks are high and bare. North of Tapi, the whole length of the rich alluvial plain is bounded by the steep southern face of the Satpura- a belt of the mountain land from 32-35 km breadth. These two longitudinal valleys separate the southern ranges of Satpura from their northern terrain. Within the limits of Jalgaon district there are three chief hill ranges, The Satpura in the north, the Hatti in the south –east and Ajanta or Satmala in the south. Yalwal, Raver, Mukatainagar are the administrative tahasil. Jalgaon district lies between 20^0 and 21^0 north latitude and 74^0 $55^I$and 76^0 28^I east longitudes on its location in the upper Tapi basin forms a district topographical unit separated from neighboring Madhya Pradesh state by Satpuda and from the south hilly ranges. The total forest area in the district is 72685.27 hectares. Present work is restricted to Pal, Vadoda and Yawal forest area only.

MATERIALS AND METHODS

1. The main methods used to collect data were, Direct field observation, Plant specimen collection and identification, Plant authentication (Cooke, 1958; Patil, 2003; Kshairsagar and Patil, 2008).
2. Species specific information of plants in use was collected for preparation of Taxon Data Sheet according to the guidelines of IUCN (1993, 2000).
3. 81 plant species are critically assessed into different categories according to IUCN guidelines. Five plants are identified photographs are taken, their morphology, distribution, phenology, world distribution, medicinal uses (Kirtikar and Basu (1918) and threat recorded with the help of floras, manuals and other relevant literature (Deshpande, 1993; Nayar, 1993).
4. Herbarium are made and preserved in the Department of Botany, Nahata College Bhusawal.

Observations

Extensive survey was carried out during 2011-2015 in Yawal, Pal and Vadoda forests of Jalgaon district. 81 flowering plants collected, relevant information gathered related to threat status. Information of following species is collected, photographs are taken for preparation of taxon data sheets. Plant species are identified with the help of flora manuals, literature. Taxon Data Sheets are prepared according Conservation Assessment and Management Planning (Mace *et.al.* 1992; Mace and Stuart, 1994). Threat status of collected species is assessed, based on data collected.

Table 1: Showing assessed 81 plant species with families

Sr. No.	Botanical Name	Family
1	*Aegle marmelos* (L.) Corr.	Rutaceae
2	*Arisaema tortuosum* Schott.	Araceae
3	*Albizia amara* (Roxb.)Boiv.	Mimosaceae
4	*Amorphophallus bulbifer*,(Roxb) Bl.	Araceae
5	*Andrographis paniculata* (Burm.f.)Wall. exNees.	Acanthaceae
6	*Barleria gibsoni* Dalz.	Acanthaceae
7	*Buchanania cochinchinesis* (Lour)	Anacardaceae
8	*Cadaba fruticosa* (L.) Druce.	Cappariadaceae
9	*Caesalpinia bonduc* (L.) Roxb.	Caesalpiniaceae
10	*Capparis monni*,Wight	Cappariadaceae
11	*Careyaar borea* Roxb.	Lecythidaceae
12	*Cassine glauca* (Rottb) O. Ktze..	Celastraceae
13	*Centella asiatica* (L) Urban	Apiaceae
14	*Ceropegia hirsute* Wight & Arn.	Asclepiadaceae
15	*Ceropegia vincaefolia*, Hook .Bot	Asclepiadaceae
16	*Chlorophytum borivillianum* Sant.& Fern.	Liliaceae
17	*Chlorophytum tuberosum* (Roxb.) Baker.	Liliceae
18	*Clematis smilacifolia* Wall	Rununculaceae
19	*Commiphora wightii* (Arn.) Bhandari.	Burseraceae
20	*Corallocarpus epigaeus* (Rottl.) C.B.Cl.	Cucurbitaceae
21	*Creteva adansoni* ssp. Odora (Buch. Ham.) Jacobs.	Capparaceae
22	*Crotalaria Spectabilis* Roth.	Fabaceae
23	*Curculigo orchioides* Gaertn.	Hypoxidaceae
24	*Curcuma aromatica*, Salish.	Zingiberaceae
25	*Dalechampia indica* Wight	Euphorbiaceae
26	*Dioscorea belophlya* (Prain) Haines.	Dioscoreaceae
27	*Dioscoria pentaphylla*, Lin.	Dioscoreaceae
28	*Drimia indica* (Roxb) Jessop.	Liliaceae
29	*Embelia ribes* Burm.f.	Myrsinaceae
30	*Ensete superbum* (Roxb.) Cheesm.	Musaceae
31	*Eulophia nuda* Lindl.	Orchidaceae
32	*Eulophia ramentacea* Lindl.ex. Wight	Orchidaceae
33	*Ficus nervosa*Heyneex Roth.	Moraceae
34	*Ficus virens* Ait.	Moraceae

35	*Firmania colorata (*Roxb.**)**R. Br.	Fumaraceae
36	*Fumaria indica* (Haussk.) Pugsley	Papavaraceae
37	*Gardenia gummifera* L. f.	Rubiaceae
38	*Gloriosa superba* L.	Liliaceae
39	*Guizotia abyssinica* (L.f) Cass.	Asteraceae
40	*Gymnema sylvestre* (Retz.) R . Br. Ex.R. andS.	Asclepiadaceae
41	*Haldina cordifolia* (Roxb)Ridst.	Rubiaceae
42	*Hardwickia binata* Roxb.	Leguminosae
43	*Hellicteris isora* L.	Sterculiaceae
44	*Hiptage benghalensis* (L)Kurz..	Malphighiaceae
45	*Holarrhena pubescences* (Buch. Ham.)Wall.	Apocynaceae
46	*Iphigenia stellata* Blatt.	Liliaceae
47	*Juncellus pygmaeus Rottb*	Cyperaceae
48	*Melia dubia* Cav.	Meliaceae
49	*Millettia extensa* (Benth) Baker.	Fabaceae
50	*Moringa concanensis* Nimmo.	Moringaceae
51	*Mucuna monosperma* Dc ex Wight	Fabaceae
52	*Najas indica* (Willd.) Cham.	Najadaceae
53	*Nevilia plicata* Andr..	Orchidaceae
54	*Olea dioca* , Roxb.	Oleaceae
55	*Operculina turpethum*(L)Silva Manso.	Convolvulaceae
56	*Ophiuros exaltatus* (L) O. Ktze.	Poaceae
57	*Oroxylum indicum* (L.) Vent.	Bignoniaceae
58	*Pavetta concanica* Bremek.	Rubiaceae
59	*Plumbago zeylanica* L.	Plumbaginaceae
60	*Pterocarpus marsupium* Roxb.	*Fabaceae*
61	*Rauvolfia serpentina* (L) Benth.ex Kurz.	Apocynaceae
62	*Remusatia vivipera* (Roxb.)Schott.	Araceae
63	*Rhynchostylis retusa* (L) Bl.	Orchidaceae
64	*Rubia cordifolia*L.	Rubiaceae
65	*Santalum album* L	Santalaceae
66	*Saraca asoca* (Roxb) W.J. De Wilde.	Caesalpiniaceae
67	*Scilla hyacinthina* (Roth) Mc Bride	Liliaceae
68	*Senecio dalzelli* C.B Cl.	Asteraceae
69	*Sterculia villosa* Roxb. ex DC.	Sterculaceae
70	*Terminalia cuneata* Roth.	Combretaceae
71	*Thespsia lampas* (Cav) Dalz and Gibs.	Malvaceae
72	*Tinosporasinensis* (Lour.) Merr.	Menispermaceae
73	*Trachyspermum roxburghianum* (DC) Craib.	Apiaceae
74	*Tribulus rajasthanensis*, Bhandari and Sharma	Zygophylaceae
75	*Tylophora* fasciculate Buch-Ham .	Asclepiadaceae
76	*Typhonium bulbiferum* Dalz.	Araceae

77	*Vetiveria zizaniodes* (L) Nash.	Poaceae
78	*Vicia hirsuta* (L.) Gray.	Fabaceae
79	*Wrightia arborea* (Dennst). Mabb.	Apocynaceae
80	*Xenostegia tridentata* (L) A. andS.	Convolvulaceae
81	*Zingiber neesanum* (Grah.) Dalz.	Zinziberaceae

Enumeration of Plants

1. *Ceropegia Hirsuta Wight and Arn. Hamana,* Bignoniaceae

Suffruticose, twining, hirsute or pubescent, roots tuberous, Leaves membranous 2-4 inch long varying from ovate- cordate, obtusely acuminate to narrowly lanceolate acute; petiole ½ -1 inch long. Flowers in few flowered. Umbellate cymes; peduncles ½ -2 inch long, arising from between the petioles, hispid; pedicels ¼ - ½ inch long hispid; bracts subulate. Calyx divided to the base; sepals 1/3 inch long linear subulate, very acute hirsute with rigid hairs. Corolla greenish blotched with purple, 1 ½ - 1 ¾ inch long, with a very large club shaped head, tube inflated at the base, enlarged at the mouth; lobes about ½ as long as the tube, oblong – lanceolate, about ½ inch broad at the widest part, connate at the tip' outer corona lobes subquadrate, narrowed a little towards the more or less deeply bifid apex, the teeth deltoid, ciliate; inner corona lobes 1/8 inch long linear curved or hooked at the slightly clavate apex. Follicles 4 X 1/8 inch finely pointed, glabrous. Seeds 1/3 inch long, narrowly oblong: Coma 1 -1 ¼ inch long.

*Fls and Frts***:** August

Distribution: Very rare in dense forest of Satpuda Region, VAP-112

World distribution: W. Peninsula.

Medicinal uses:

Whole plant is used as an analgesic.

2. *Commiphora Mukul (Hooh.ex Stocks) Engl Guggul,* Burseraceae

A small armed tree with spinescent branches and ash coloured rough bark peeling off in flakes, young parts glandular, pubescent; leaves alternate, 1-3foliate, obovate, serrate –toothed in upper parts, lateral leaflets when present only half size of the terminal one; flowers small brownish red, polygamous is fascicles. Stamens 8-10, alternately long and short; fruits ovoid drupes, red when ripe.

Fls and Frts: March- April

World distribution: Africa

Distribution: Rare in dense forest of Waghzira VAP163.

Medicinal uses:

The gum is bitter, acrid astringent aromatic, thermogenic, expectorant, Digestive, tonic, demulcent aphrodisiac, stimulant, liver tonic, antispasmodiac, diuretic, emmenagogue rejuvenating, cough and ulcers asthama bronchitis, cardiac disorders anaemia, wounds and ulcers.

Threats: Habitat Loss.

3. *Curcuma Aromatica Salisb Ran- Haldi/Amba Halad,* Zingiberaceae

Stem less herb with tuberous root stocks, root stock large, of palmately branched, sessile annulate biennial tubers yellow and aromatic inside. Leaves 15-24 by 4-8 inch, oblong elliptic or oblong – lanceolate, caudate- acuminate, green often variegated above. Pubescent beneath, base deltoid; petioles as long as or longer than the blade. Flowering stem appearing with or before the leafing stem, as thick as the forefinger sheathed flowers fragrant shorter than the bracts in spikes 6-12 inch long; flowering bracts 1 ½ - 2 inch long , ovate recurved cymbiform, rounded at the tip, pale green, connate below forming pouches for the flowers ; bracts of the coma 2-3 inch long more or less tinged with red or pink Calyx 1/3 inch long, irregularly 3 lobed. Corolla tube 1 inch long. The upper half funnel-shaped; lobes pale rose – coloured the lateral lobes oblong the dorsal longer ovate, concave arching over the anthers. Lip yellow obovate, deflexed, sub entire or obscurely 3 lobed. Lateral staminates oblong, obtuse as long as the corolla lobes.

Fls and Frts: May

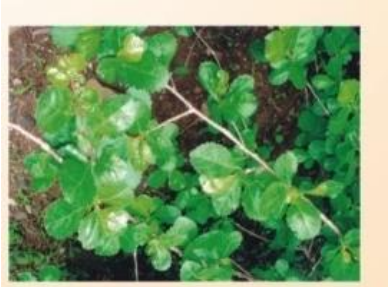
Distribution: Moist shady places at Manudevi, VAP 138.

World distribution: India. West Bengal
Medicinal uses:
I. The tubers are used medicinally.
II. Rhizomes are bitter, carminative, appetizer & tonic & are used in combination with astringent and aromatics for sprains, bronchitis, cough, and leucoderma and skin eruptions.
Threats: Exploited by traders for medicinal purpose.
4. *Olea dioca Roxb. Parjamb/Karmba Oleaceae*
A small or moderate sized glabrous tree; bark grey smooth. Leaves coriaceous, 3-5 by 11/4 – 2 inch elliptic- lanceolate, acute or acuminate entire, or distantly and sharply serrate, waved, glabrous, base acute, running down into petiole; main nerves 8-10, slender, conspicuous beneath; petioles ¼ - ½ inch long. Flowers polygamo-dioecious in compound panicles 1-3 inch long, which are axillary or leaf opposed or from below the leaves, the male panicles rather larges and more dense than the hermaphrodite ones male flowers calyx 1/25 inch long, glabrous lobes triangular, accute 1/50 inch long Corollas ½ inch long lobes 1/30 inch long. Triangular – ovate subacute; filaments short, hermaphrodite. Flowers: Calyx and Corolla as in the male; stamen usually 2 sometimes 3; filament inserted on the corolla or sometimes on the ovary, epigynous drupe ½ -2/3 inch long, ellipsoid often slightly pointed purple and covered with a whitish powdery bloom when ripe. Seed ellipsoid shortly pointed, rugose, glabrous intensely bitter to the taste: testa tuin; cotyledon oblong – elliptic flat.
Fls and Frts: January to April
Distribution: Frequent in moist deciduous forests of Machindranath, VAP152.
World distribution: India, (Lower hills of Assam and Bengal), Western peninsula
Medicinal uses:
The roots are used for cancer in Siddha treatment.
Threats: Habitat loss and thinning of forests.
5. Rauwolfia Serpentina (L) Benth. Ex Kurz Sarpangandha Apocynaceae
Herb to under shrubs, 0.5-2 m tall. Stem woody at base. Rootstock thick and woody. Bark ashy white, thin, Latex watery. Brabchlets hairless. Leaves 3-4 in a whorl or sometimes opposite, elliptic or oblanceolate, 8-16×3-5 cm. base gradually tapering, apex acuminate, margin entire, papery, hairless, with distinct stalk; lateral nerves 8-15 pairs, purple shade, about 2×1 cm. Drupes united in their lower half, stalkless, fleshy, ovoid, about 7 cm long, hairless, shiny, purplish black when ripe. Seeds 1, ovoid.
Fls and Frts: March- May
World distribution: India, Andaman, Java, Srilanka
Distribution: Rare in Manudevi, VAP103.
Medicinal uses:
i. The chief use of the drug is sedative and hypnotic and reducing blood pressure.
ii. The juice of leaves is used for cure of corneal opacity of eyes.
iii. The alkaloids stimulate central nervous system suitable for cases of mild anxiety or patients of chronic mental illness. The drug has tranquillising effect.
iv. Root is considered as anthelmintic and an antidote to snake venom.
v. Root decoction is given during labour pains to increase uterine contraction.
Threats: Overexploitation for medicine.

Table 1: List of Species Assessed as Critical Endangered in the Forest of Jalgaon District M.S. (India)

Sr.No.	Name of the Species	Threat Categories	Family
1	*Ceropegia hirsuta Wight*	CR	Asclepidaceae
2	*Commiphora wighitii* (Arn.)Bhandari.	CR	Burseraceae
3	*Curcuma aromatica Salisb*	CR	Zingiberaceae
4	*Olea dioca* Roxb.	CR	Oleaceae
5	*Rauwoifia serpentina* (L.)	CR	Apocynaceae

CR-Critically endangered



***Commiphora wighitii* (Arn.) Bhandari**

***Curcurma aromatica* Salisb**

***Rauvolfia serpentina* (L) Benth Ex. Kurz**

RESULTS AND DISCUSSION

Results

Data obtained from the field survey is represented in this chapter during consistent and well planned intensive and extensive field work information on the flowering plants have been recorded to analyse the threat status. In all information on 81 species found to be appropriate to include in the study. These are represented in Pie Diagram (Figure 1).

Specific information on the species, families, habit, habitat, IUCN Categories and Figure shows the various categories of 81 plants under Vulnerable-25, Endangered-23, Not Threatened-15, and Lower Risk-06, Data Deficient-05, Not Evaluated-02 and Critically Endangered-05.

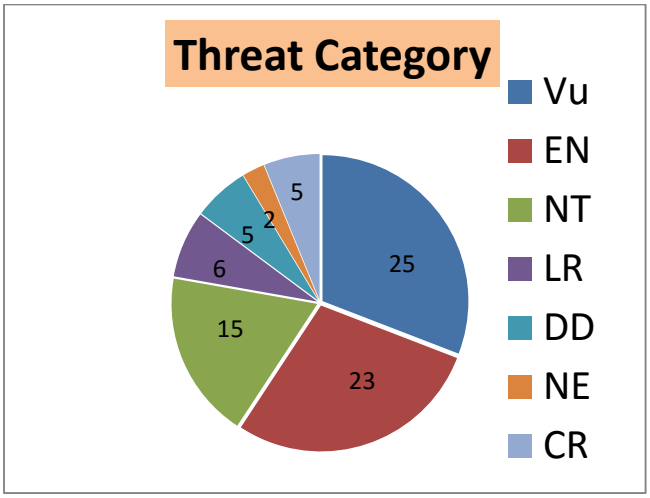


Figure 1: Showing the Pie Diagram of IUCN Categories of Assessed Plants from the Forest of Jalgaon Forests

VU- Vulnerable, EN- Endangered, NT-Near Threatened, LR- Lower Risk, DD-Data Deficient, NÉ-Not Evaluated, CR-Critically Endangered.

Conclusion

Present study has revealed that in the area there are 81 threatened flowering plant species under the threat categories. They have been critically analyzed following the IUCN (1993, 2000) guidelines. Out of the 81 plant species, 5 are critically endangered. The species are *Ceropegia hirsuta* Wight, *Commiphora wighitii* (Arn.) Bhandari, *Curcuma aromatica* Salisb., *Olea dioca*, Roxb, *Rauwoifia serpentina* (L.). The causes of getting endangered are trade, overexploitation, habitat loss, habitat fragmentation, over grazing, soil erosion, climate changes, loss of reproduction, low seed germination capacity and shifting cultivation

practices of the tribal people along with heavy encroachment. These species can be protected in reserve forests and in particular reserved areas. There is however, now an urgent need to evolve a sound strategy for the management and conservation of these plants on a long term basis. To evolve suitable strategies for conservation the domestic cultivation of medicinal plants must be adopted. It is very essential to study the complete biological and ecological background of these species.

AKNOWLEDGEMENT
Authors are extremely grateful to Principal, Bhusawal Arts, Science and P.O.Nahata Commerce College Bhusawal and Z.B Patil college, Deopur, Dhule for providing Laboratory facilities for the present study.

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