

**CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
WORKSHOP**

for

NON-TIMER FOREST PRODUCTS OF MADHYA PRADESH

REPORT

SEPTEMBER 1998

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In collaboration with

DEVELOPMENT ALTERNATIVES, NEW DELHI

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Selected Non-timber forest products of Madhya Pradesh

Report

CAMP workshop for selected NTFPs of Madhya Pradesh

Conservation Assessment and Management Plan workshop for Non-Timber Forest Products of Madhya Pradesh

A Conservation Assessment and Management Plan workshop for selected species of Non-Timber Forest Products (NTFP) plants was conducted at the Indian Institute of Forest Management campus in Bhopal. The 3-day workshop held from the 16th to 18th June 1998 was organized by the Centre for Excellence on NTFP, Indian Institute of Forest Management (IIFM) in collaboration with Development Alternatives, New Delhi. The workshop was facilitated by Zoo Outreach Organisation (ZOO) / Conservation Breeding Specialist Group, India (CBSG India) and was made possible with the kind support of the sponsors Ford Foundation, New Delhi and Madhya Pradesh State Minor Forest Produce (Training and Development) Cooperative Federation Limited (MPMFP), Bhopal. Botanists from different specialized fields such as ecology, taxonomy, forest studies, managers and herbal pharmaceutical industries attended the workshop. In total there were 31 participants, which included 5 from IIFM and 2 from ZOO/CBSG India. The list of participants are listed as Authors to the Report.

This exercise was the first of its kind anywhere to assess this economically important, highly utilized component of biodiversity, the NTFPs. NTFPs include any plant or plant part or product thereof that is harvested from the forest either for local, domestic or commercial consumption or for exports. Medicinal plants also form a component of NTFP but not exclusively.

NTFPs are an important source of sustenance for rural communities in most parts of India, especially in Madhya Pradesh, which has nearly 20% of total forest cover in India. NTFPs contribute to the needs of rural people usually by providing the only source of income for women and children. It provides food, medicine, fodder or as a income source through trade of parts or products.

Local people, traders and the forest department regularly harvest NTFPs from the forests of Madhya Pradesh. The dependence on these forest resources is so heavy it is increasingly felt that these resources are dwindling as they are utilized unsustainably. With the advent of commercial utilization of NTFPs, windows of opportunity for wider trade and bigger harvests have taken precedent over sustained harvests by locals dependent on forest resources for their livelihood. Factors that have led to declines in forest resources are frequent, untimely and unmanaged harvests regardless of age class of plants and rotation of harvest areas. This has led to unsustainable usage causing a decline in recruitment rate, decrease in quality of habitat due to frequent treading, opportunistic fires and soil erosion. This therefore seems to be affecting some NTFPs in the state, which warranted a status assessment of the species in the wild. The organizing agencies therefore thought it best to conduct a status assessment workshop using methodology of the Conservation Assessment and Management Plan workshop.

Conservation Assessment and Management Plan

One of the great difficulties of carrying out basic tasks such as identification and monitoring, creation of management and action plans and recovery programmes for species, is coordinating the great mass and variety of specialist knowledge and agency authority. Much time and energy is wasted in duplication of effort, territorial and ownership disputes, and inability to find and adhere to a common ground. The business community, realising the importance of effective communication and teamwork, has developed a broad spectrum of management strategies and tools which are used daily to manage time and human interaction. More and more, the conservation community is recognising the importance of using some of these tools to achieve their goals, rapidly and effectively. The Conservation Breeding Specialist Group (CBSG) of the Species Survival Commission of IUCN has pioneered the use of some these tools in well-planned strategic problem-solving and task-performance exercises. CBSG calls these exercises

"processes" because - in the contemporary conservation scenario - nothing is static except the fact of change itself.

The Conservation Action and Management Plan Workshop was developed by CBSG for the purpose of prioritising species for conservation action including *ex situ* component. Over the last decade, CBSG has conducted dozens of CAMP workshops for literally hundreds of species, using (and thereby testing) the then current iteration of the IUCN Red List Categories as their basic methodology to glean a status ranking. The IUCN Red List guidelines and criteria are used in all CAMP workshops to assess and assign a category to each species.

For the CAMP Workshop CBSG has developed a Taxon Data Sheet and a Spreadsheet format which includes parameters necessary to assess the IUCN status as well as provide other useful information necessary for creating management and action plans. The spreadsheet organises the information in a concise manner so that it is accessible at a glance. The information in this Report is organised on spreadsheets in the Report section, followed by the individual Taxon Data Sheets. A CAMP Workshop also utilises principles of management psychology to guide human interaction. A set of Guidelines for Group Interaction is presented to the workshop participants who agree as a group to work accordingly in order to complete the task. Objective Facilitators (persons trained in management skills and the workshop process) are used to lead and guide the workshop so that individual and professional bias does not affect group decisions and to assist in maintaining the integrity and focus of the workshop.

CAMP Workshops bring together a variety of specialists and enthusiasts from academic, government, managerial, and even the commercial sector to evaluate taxa for setting priorities for conservation action. The fear of loss and hope of recovery of species drives CAMP Workshops. Individuals part with unpublished information in order to contribute to a body of information which will provide strategic guidance for application of intensive management and information gathering. CAMP Workshops results, are, or should be, dynamic, leading to specific conservation activities in forest, market, classroom, courtroom - locally and nationally as well as on the international stage.

In India, CAMP workshops have been conducted for medicinal plants in southern India, northeastern, northern and central India, northwestern Himalaya, Indian mangroves and associated flora and fauna, Indian mammals, amphibians and reptiles and selected soil invertebrates and freshwater fishes.

IUCN Red List

Earlier efforts to monitor the earth's resources and activate conservation measures include the Red Data Books of IUCN, now called the World Conservation Union. The IUCN Red Data Books have provided a guide for species conservation status for the last three decades. A few years ago, it was felt that both the categories and methodology used by individuals compiling the Red Data Books needed review. Over a seven-year period, the IUCN Criteria for Endangerment used in compiling Red Data Books, were examined, revised, reviewed and improved over six different iterations. The present system, the IUCN Red List Categories, 1994, is more objective, numerate, and consistent for all groups. The revised IUCN Red List Categories provide a methodology for assessment and categorisation, which can be applied, to any group of organisms (except microorganisms). The revised IUCN Red List criteria is being used now by conservation actioners and scientists all over the world and is not considered the best possible method available today for assessing the conservation status of species.

The categories are both numerical and quantitative. Information such as distribution of the species, extent of occurrence of a species, its area of occupancy, threats to the species, its habitat status, habitat quality, threats to the habitat, environmental factors and catastrophes are considered while assessing the status. A species is assessed as "threatened" based on 5 criteria, viz.:

- A. Population reduction
- B. Restricted distribution
- C. Low population numbers and extreme fluctuation
- D. Restricted population
- E. Probability of extinction

There are three "threatened" categories

Critically Endangered - when a species is facing a very high risk of extinction in the immediate future

Endangered - when a species is facing a high risk of extinction in the medium-term future

Vulnerable - when a species is facing risk of extinction in the long-term future.

And three "non threatened" categories

When a species does not qualify for the threatened category it is classified under the non-threatened category as either

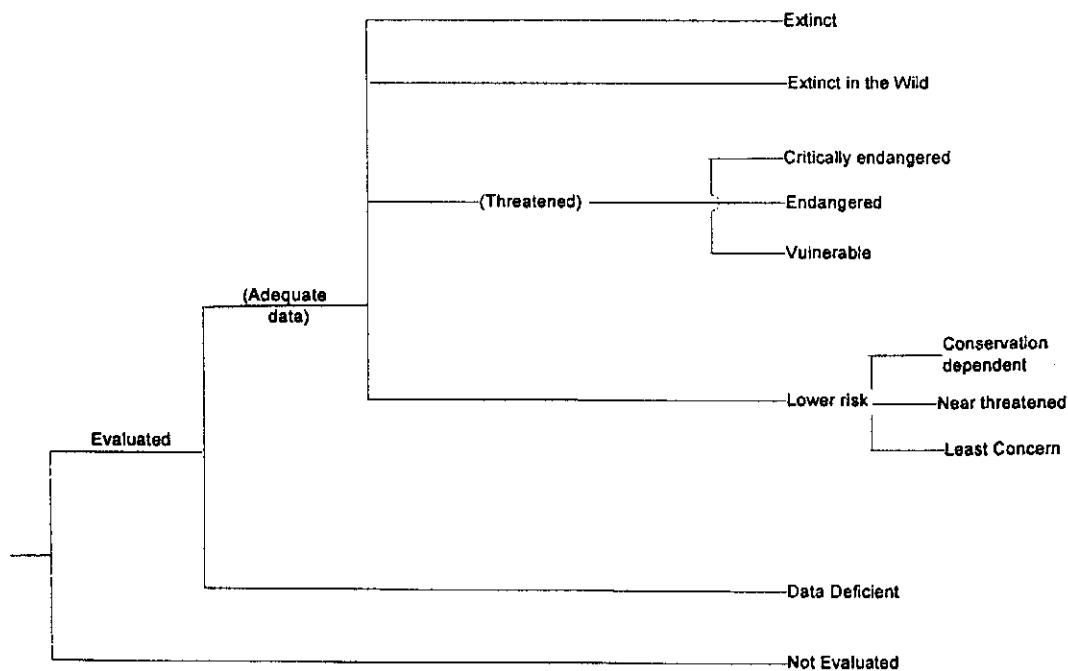
Lower Risk conservation dependent

Lower Risk near threatened or

Lower Risk least concern

There are other categories to cover extinction, survival in captivity or cultivation only, lack of data and no assessment (see figure)

Structure of the Categories



Result:

The organizers had pre-prioritized 40 species of NTFPs of Madhya Pradesh for assessment at the workshop (Table 1). Of these species, 39 were assessed and one was Not Evaluated since the species was not native to India.

The basis for pre-prioritization was the extent of usage, commercial importance and demand. The number of pre-prioritized species is not indicative of their importance in the list of 1000 NTFPs in the state. The number of species for assessment was restricted to 40 because of time and the fact that this was first such exercise and that it would require ample time for introductory training in application of Red List Criteria.

Thirty-nine taxa (species, subspecies and varieties) evaluated belonged to 29 families of which 13 were herbs, 10 were shrubs and 16 were trees. Nearly 60% (24 taxa) of the assessed taxa are threatened in Madhya Pradesh. The table below indicates the number of threatened taxa.

Table 1. Status of evaluated NTFPs in Madhya Pradesh

IUCN Status	No. of NTFPs
Extinct	0
Extinct in the Wild	0
Critically Endangered	2
Endangered	8
Vulnerable	14
Lower Risk conservation dependent	0
Lower Risk near threatened	6
Lower Risk least concern	9
Data Deficient	0
Not Evaluated	950+

The IUCN categories are most appropriately applicable at the global level. However, it is justifiable in applying the categories (since there are no specific guidelines to apply them at regional, national or state levels at this time) at a lower level, like in the case of the current workshop. At this workshop, the assessment was restricted to only the state of Madhya Pradesh and so the degree of threat to the taxa may not reflect a true picture for the status in the rest of the country. It is therefore imperative the designation "in the state of Madhya Pradesh" be used while quoting the status, and the above table must also be taken in the same sense.

Distribution of taxa and the criteria for deriving threat status

All the 39 taxa have a wide distribution, mostly found throughout India or widespread within India. Within Madhya Pradesh the extent of occurrence and the area of occupancy of these taxa are mostly more than 20,000 sq.km. and 2,000 sq.km., threshold values less than which can make a taxon qualify for one of the subcriteria of the Restricted Distribution criterion. Madhya Pradesh, being the biggest state in India with a forest cover of more than 1,50,000 sq.km. does not have restricted distribution for any of the taxa assessed. Therefore, the criterion for Restricted Distribution was not employed while deriving the status.

However, the reason for concern that led to the conduct of the workshop is the decline perceived of the populations of these taxa within the state. The workshop participants were unanimous in recording declines perceived over years which is reflected in the recruitment rate, the harvest loads, the pressures from the commercial sector, biotic pressures, loss of habitat and other threats. Therefore all of the threatened taxa were assessed based on the Population Reduction criterion. The threshold values of reduction, viz. 20%, 50% and 80% are dependent on another factor, the rate of reduction, that is whether the reduction is within the last 10 years or 3 generations, whichever is longer. It was agreed at the workshop that since the term 3 generations means that reduction rates have to be calculated for more than 100 years before, the rate of population decline would be assessed only in terms of years and not generations.

Lack of knowledge of population fluctuations and the impossibility of assessing the number of mature individuals in the state made it impossible to assess the status based on criteria Population Estimation and Restricted Population. Similarly, the last criterion Probability of Extinction was not used because of lack of biological information about the taxa and lack of time.

Table 2. Status of NTFP taxa assessed according to 1994 IUCN Red List Categories in the state of Madhya Pradesh, India.

Species	IUCN	Criteria *
<i>Abutilon indicum</i>	LOWER RISK least concern	--
<i>Achyranthes aspera</i>	LOWER RISK least concern	--
<i>Acorus calamus</i>	ENDANGERED	A1acd
<i>Aegle marmelos</i>	VULNERABLE	A1acd+2cd
<i>Andrographis paniculata</i>	LOWER RISK least concern	--
<i>Anogeissus latifolia</i>	LOWER RISK near threatened	--
<i>Asparagus racemosus</i> var. <i>javanicus</i>	VULNERABLE	A1acd+2cd
<i>Bauhinia vahlii</i>	ENDANGERED	A2cd
<i>Boswellia serrata</i>	ENDANGERED	A1ad+2d
<i>Buchanania lanzan</i>	VULNERABLE	A1acde
<i>Butea monosperma</i>	LOWER RISK least concern	--
<i>Celastrus paniculatus</i>	ENDANGERED	A1cde+2cde
<i>Centella asiatica</i>	VULNERABLE	A1cd+2cd
<i>Chlorophytum borivillianum</i>	ENDANGERED	A1acd+2cd
<i>Costus speciosus</i>	VULNERABLE	A2cde
<i>Curculigo orchioides</i>	LOWER RISK near threatened	--
<i>Curcuma angustifolia</i>	VULNERABLE	A1acd+2cd
<i>Curcuma aromatica</i>	LOWER RISK least concern	--
<i>Curcuma caesia</i>	CRITICALLY ENDANGERED	A2cd
<i>Cyperus rotundus</i>	LOWER RISK least concern	--
<i>Dioscorea hispida</i>	VULNERABLE	A1cde+2cde
<i>Emblica officinalis</i>	VULNERABLE	A1cde+2cde
<i>Embelia tsjeriam-cottam</i>	VULNERABLE	A2de
<i>Helicteres isora</i>	VULNERABLE	A2cde
<i>Hemidesmus indicus</i>	LOWER RISK near threatened	--
<i>Holarrhena antidysenterica</i>	LOWER RISK near threatened	--
<i>Madhuca indica</i>	LOWER RISK near threatened	--
<i>Rauvolfia serpentina</i>	CRITICALLY ENDANGERED	A1acd+2cd
<i>Schleichera oleosa</i>	VULNERABLE	A2cde
<i>Semecarpus anacardium</i>	VULNERABLE	A2cde
<i>Sterculia urens</i>	LOWER RISK near threatened	--
<i>Strychnos nux-vomica</i>	ENDANGERED	A2cd
<i>Syzygium cuminii</i>	LOWER RISK least concern	--
<i>Tephrosia purpurea</i>	LOWER RISK least concern	--
<i>Terminalia arjuna</i>	VULNERABLE	A1acd+2cd
<i>Terminalia chebula</i>	VULNERABLE	A1acde
<i>Tribulus terrestris</i>	ENDANGERED	A2d.
<i>Withania somnifera</i>	ENDANGERED	A1cde+2cde
<i>Woodfordia fruticosa</i>	LOWER RISK least concern	--

* All assessments are based on the Population Reduction criterion

Threats to NTFPs in Madhya Pradesh

The above list of NTFP taxa assessed as threatened reflects the threats these taxa are facing in the wild in Madhya Pradesh. Keeping in mind that the assessments are only for Madhya Pradesh and the criterion for assessment being Population Reduction, the accuracy of this criterion and the assessment is enhanced for a smaller area. Threats vary from forest to forest, district to district and so on depending on the extent of area that is being considered for assessment. An assessment for Madhya Pradesh, therefore, gives a better picture of the status of a taxon as compared with that of the entire country or the entire distribution of the taxon. Threats to taxa are also localized to some forest within Madhya Pradesh and may not be true in the entire state. However, at the workshop, threats in all the areas were not looked upon exclusively and all the threats affecting a taxon were listed. The list of threats affecting NTFPs in Madhya Pradesh is listed in the table below.

Table 3. Threats affecting selected NTFPs of Madhya Pradesh

Species	Threats to habitat	Threats to population
<i>Abutilon indicum</i>	None	Overexploitation, weedicides, trade, disease, inter-specific competition from exotics
<i>Achyranthes aspera</i>	None	None
<i>Acorus calamus</i>	Loss of marshy habitat, change in rainfall pattern, habitat fragmentation, climate, edaphic changes, drought, siltation	Human interference, harvest, harvest for medicine, over-exploitation, trade, reduction in regeneration
<i>Aegle marmelos</i>	Biotic pressure, loss of habitat, habitat fragmentation, fire	Harvest for medicine and food, over-exploitation, trade of parts, inter-specific competition from exotics
<i>Andrographis paniculata</i>	Decrease in quality of habitat	Biotic pressures, soil erosion, climatic changes, grazing, habitat fragmentation, habitat loss due to exotic plants, trampling, edaphic changes
<i>Anogeissus latifolia</i>	Damming, grazing, trampling, habitat loss (encroachment); loss of habitat due to exotic plants	Harvest, harvest for timber, over-exploitation, trade, trade of parts,
<i>Asparagus racemosus</i> var. <i>javanicus</i>	Damming, grazing, loss of habitat, trampling, edaphic changes, drought, fire	Harvest for medicine, overexploitation, trade for market or medicine, trade of parts, destructive extraction techniques
<i>Bauhinia vahlii</i>	Damming, grazing, loss of habitat, habitat loss due to exotic plants, drought, fire	Harvest, over-exploitation, trade for market, trade of parts for making plates (leaves), lack of regeneration
<i>Boswellia serrata</i>	Biotic pressures, damming.	Harvest for medicine and timber, overexploitation for gum and resin, trade of parts, trade, lack of regeneration
<i>Buchanania lanzan</i>	Biotic pressures, edaphic changes, loss of habitat, habitat loss due to exotic plants, pollution, power-lines, trampling, fire, landslide	Harvest, harvest for food, over-exploitation, browsing, trade of parts, interspecific competition, interspecific competition from exotics, pests, lack of regeneration, unscientific methods of collection.
<i>Butea monosperma</i>	Fire	Harvest, Overexploitation, Trade for market or medicine
<i>Celastrus paniculatus</i>	Loss of habitat, habitat loss due to exotic plants, trampling, edaphic changes, clear-felling of forests for plantation	Harvest for medicine, over-exploitation, interspecific competition from exotics
<i>Centella asiatica</i>		
<i>Chlorophytum borivillianum</i>	Grazing, trampling, fire, habitat loss due to exotic plants	Harvest, harvest for medicine, harvest for food, over-exploitation, trade for market or medicine
<i>Costus speciosus</i>	Biological/natural factors, Degradation of forests, Grazing, Habitat loss, Habitat loss due to exotic	Harvest, Harvest for medicine, Over-exploitation, Trade of parts, Inter-specific competition from exotics, Inter-specific

Species	Threats to habitat	Threats to population
	plants, power lines, trampling, climate, edaphic change	competition from livestock,
<i>Curculigo orchioides</i>	Biotic pressure, loss of habitat, grazing, habitat loss due to exotic plants, trampling	Harvest for medicine, over-exploitation, trade, predation by wild boar and bear.
<i>Curcuma angustifolia</i>		
<i>Curcuma aromatica</i>	Biotic pressures, climatic factors, habitat fragmentation, habitat loss due to exotic plants, trampling, fire	Harvest, harvest for medicine, over-exploitation, trade, inter-specific competition from exotics, inter-specific competition from livestock, predation by wild boar
<i>Curcuma caesia</i>	Unknown	Harvest for medicine, over-exploitation, trade in the past
<i>Cyperus rotundus</i>		Harvest for medicine, trade for market or medicine
<i>Dioscorea hispida</i>	Loss of habitat, reduction in soil humidity, grazing, trampling, edaphic changes	Harvest for medicine and food, overexploitation, trade, inter-specific competition from exotics.
<i>Embllica officinalis</i>	Fire, grazing, biotic pressure, introduced taxa (<i>Lantana camera</i>), soil erosion, hardening of soil	Harvest for medicine, food and timber, loss of habitat, habitat fragmentation, over-exploitation, trade, inter-specific competition from exotics, inter-specific competition from livestock, lack of regeneration.
<i>Embelia tsjeriam-cottam</i>	Habitat loss.	Harvest for medicine, over-exploitation, trade, inter-specific competition from exotics, lack of regeneration.
<i>Helicteres isora</i>	Biotic and natural pressures, grazing, habitat loss, habitat loss due to exotic plants, trampling, climate, edaphic changes	Harvest for medicine, browsing, trade of parts, interspecific competition from exotics, inter-specific competition from livestock, harvest
<i>Hemidesmus indicus</i>	Damming, loss of habitat, climate may result in predicted decline	
<i>Holarrhena antidysenterica</i>	Natural succession of sal forest leading to teak forest ; grazing, loss of habitat, edaphic changes, fire	Harvest for medicine, trade of parts, trade, lack of regeneration
<i>Madhuca indica</i>	Grazing, trampling, powerlines, fire.	Lack of regeneration, destructive method of cultivation, harvest, harvest for medicine, harvest for food, trade, over-exploitation, poor regeneration due to seed collection
<i>Rauvolfia serpentina</i>	Loss of habitat, habitat fragmentation, fire	Harvest, harvest for medicine, over-exploitation, trade for market or medicine
<i>Schleichera oleosa</i>	Biotic pressures, natural factors, habitat loss, habitat fragmentation, habitat loss due to exotic plants, power lines, pollution, trampling,	Harvest for timber, trade of parts, disease, inter-specific competition from exotics

Species	Threats to habitat	Threats to population
	climate, edaphic changes, fire	
<i>Semecarpus anacardium</i>	Soil erosion, biotic pressures, habitat loss due to exotic plants, pollution, power lines, edaphic changes, fire, landslide.	Harvest, harvest for medicine, overexploitation, trade of parts, trade, inter-specific competition from exotics, lack of regeneration.
<i>Sterculia urens</i>	Limestone mining, habitat fragmentation	Harvest for gum, overexploitation, trade, lack of regeneration
<i>Strychnos nux-vomica</i>	Loss of habitat, drought, fire (lesser threat as fires are rare in Bastar area)	Harvest for medicine, trade for market or medicine, seed collection affects regeneration
<i>Syzygium cuminii</i>	Change in moisture and status, lowering of water table, damming, habitat loss due to exotic plants. Edaphic changes.	Harvest for medicine, food and timber, trade
<i>Tephrosia purpurea</i>	Loss of habitat, habitat fragmentation,	Harvest for medicine, overexploitation, trade for market or medicine
<i>Terminalia arjuna</i>	Damming, grazing, loss of habitat, pesticides, pollution, climate, edaphic changes, siltation, drought, <i>El Nino</i> , fire	Human interference, Harvest for medicine, overexploitation, Trade for market or medicine, trade of parts, trampling, girdling
<i>Terminalia chebula</i>	Habitat loss due to encroachments, grazing, edaphic changes.	Girdling, harvest, harvest for medicine, trade, decline in animal vectors, inter-specific competition from exotics.
<i>Tribulus terrestris</i>	Grazing, habitat loss due to exotic plants, edaphic changes	Harvest for medicine, overexploitation, pesticides/weedicides, trade of parts, trade, disease, genetic problems, inter-specific competition, inter-specific competition from exotics and from livestock
<i>Withania somnifera</i>	Biotic pressures, loss of habitat, habitat loss due to exotic plants, political unrest, edaphic changes	Harvest, harvest for medicine, overexploitation, trade, trade of parts, disease, inter-specific competition from exotics, pests, predation by exotics,
<i>Woodfordia fruticosa</i>	Soil erosion, habitat loss due to exotic plants	Trade

It can be seen in the above table that two kinds of threats affect NTFPs, threats to habitat and direct threats to the population. Threats to habitat have been identified as habitat loss, edaphic changes, fire and other changes that affect the quality of habitat for the taxon. Threats to the population include harvest, overexploitation and trade, which are main threats, though other threats such as restricted regeneration, indiscriminate harvest, loss of numbers, etc. will have an effect on the population demography in the future.

Trade is an important factor to be considered since most of the population declines can be associated with direct or indirect impacts of trade.

Trade

All NTFPs are in trade, either local, domestic, commercial or international. As explained in the introduction, NTFPs form a source of sustenance to families in rural Madhya Pradesh, but the recent trends in national and world markets have attracted other users in the field and the trade has become unsustainable, at least from the point of view of populations in the wild. NTFPs yield fruits, roots, bark, leaves, twigs, flowers, rhizome, gums, resins, fibres, dyes, alkaloids as raw material in various industries such as furniture, paint, leather, pharmaceutical, food, animal feed, rope, dye, paper, cloth and other related industries. There is a very heavy dependence by modern industries on these taxa, which is seen in the amount of NTFP parts harvested and traded annually. The demand for parts or raw materials is on the increase continually while the resource base, the forests, are on the decline. The entire cycle is in a state of imbalance. Trade and commerce has therefore made a self-sustaining local harvests into an unsustainable issue. Table 4 shows the kinds of trade and the parts in trade of the NTFPs assessed in the workshop.

Table 4. Parts in trade and the level of trade of NTFPs assessed.

Species	Trade	Parts in Trade
<i>Abutilon indicum</i>	Commercial, International	Fruits
<i>Achyranthes aspera</i>	Local, Domestic, Commercial	Whole plant
<i>Acorus calamus</i>	Domestic, Commercial, International	Rhizome
<i>Aegle marmelos</i>	Domestic, Commercial	Bark, fruits, leaves
<i>Andrographis paniculata</i>	Local, Domestic, Commercial	Whole plant
<i>Anogeissus latifolia</i>	Local, Domestic, Commercial, International	Branch/twigs, gum/resin
<i>Asparagus racemosus</i> var. <i>javanicus</i>	Local, Domestic, Commercial, International	Root
<i>Bauhinia vahlii</i>	Local, Domestic, Commercial	Bark, leaves, branch/twigs, seeds
<i>Boswellia serrata</i>	Commercial	Branch/twigs, sap, gum/resin
<i>Buchanania lanzan</i>	Local, Commercial	Fruits (kernels), roots, leaves
<i>Butea monosperma</i>	Local, Commercial	Bark, flowers (colouring matter), Root (Dye), leaves, branch/twigs (Rangini crop of Lac), Gum/resin
<i>Celastrus paniculatus</i>	Domestic, Commercial, International	Fruits, seeds
<i>Centella asiatica</i>	Domestic, Commercial	Leaves, Branch/twigs, whole plant
<i>Chlorophytum borivillianum</i>	Local, Domestic, commercial	Rhizome/ tuber
<i>Costus speciosus</i>	Local, Domestic, Commercial	Rhizomes
<i>Curculigo orchoides</i>	Local, Domestic, Commercial	Fruit, root
<i>Curcuma angustifolia</i>	Local, Domestic, Commercial, International	Rhizome, tuber
<i>Curcuma aromatica</i>	Local, Domestic, Commercial	Rhizome
<i>Curcuma caesia</i>	Presently not traded	Rhizome
<i>Cyperus rotundus</i>	Commercial, International	Dry tubers
<i>Dioscorea hispida</i>	Local, Domestic, Commercial	Rhizome
<i>Embllica officinalis</i>	Local, Domestic, Commercial, International	Fruits, leaves
<i>Embelia tsjeriam-cottam</i>	Local, Domestic, Commercial	Fruits
<i>Helicteres isora</i>	Commercial	Bark (dry), Fruits, Leaves

Species	Trade	Parts in Trade
<i>Hemidesmus indicus</i>	Commercial, International.	Root
<i>Holarrhena antidysenterica</i>	Local, Domestic, Commercial, International	Root, leaves, branch/twigs, stems, seeds, bark
<i>Madhuca indica</i>	Local, Commercial	Flowers, fruits,
<i>Rauvolfia serpentina</i>	Commercial	Root, leaves
<i>Schleichera oleosa</i>	Commercial	Fruits, branch/ twigs, gum/ resin, timber, seed
<i>Semecarpus anacardium</i>	Local, Domestic, Commercial, (unsure of International)	Fruit, nut
<i>Sterculia urens</i>	Domestic, Commercial, International	Gum/resin
<i>Strychnos nux-vomica</i>	Commercial, International	Seeds
<i>Syzygium cuminii</i>	Local, Domestic, Commercial	Leaves, fruits, stem
<i>Tephrosia purpurea</i>	Commercial	Whole plant
<i>Terminalia arjuna</i>	Local, Domestic, Commercial, International	Fruits, root, bark
<i>Terminalia chebula</i>	Commercial	Fruits
<i>Tribulus terrestris</i>	Domestic, Commercial, International	Fruits, Root, Leaves, Whole plant
<i>Withania somnifera</i>	Local, Domestic, Commercial, International	Bark, root, leaves, branch/twigs
<i>Woodfordia fruticosa</i>	Domestic, Commercial	Flowers

Note: Local trade is within a village, community or between nearby villages
Domestic trade is between villages or towns within a region
Commercial trade could be domestic trade on a large scale or within the country
International trade is exports.

Recommendations for research, management and cultivation

Trade is a "necessary evil" that is needed for any village, town, city, region or country to prosper and given the vast changes taking place in the Indian economic situations and opening up of commerce with the outside world, India is in a situation where the trade sector is on a boom. This also includes natural resources. One cannot condemn trade nor can one condemn India's vital but limited biological resources. A balance has to be struck. The CAMP has provided a glimpse into this situation based on which a series of recommendations have been suggested by the participants at the workshop.

First and foremost, our knowledge of biodiversity is extremely limited. A series of recommendations is proposed to study in detail aspects of biology, distribution, taxonomy, genetics, alkaloid contents, propagation techniques, tissue culture, husbandry research and limiting factor research among many other taxon specific research. All the above research will help in making sound management recommendations and draw up action plans for conservation and sustainable utilization. The recommendations also include a specific exercise such as the population and habitat viability assessment to understand the probability of extinction of the taxon under threat. Table 5 lists research recommendations as suggested by the participants.

Table 5. Research recommendations suggested for the assessed NTFPs

Species	Supporting research recommendation
<i>Abutilon indicum</i>	Survey, genetic research, life-history studies, limiting factor research, epidemiology
<i>Achyranthes aspera</i>	Genetic research, life history studies
<i>Acorus calamus</i>	Survey, Limiting factor research, Oil content in Rhizome
<i>Aegle marmelos</i>	Survey, Genetic research, Taxonomic research
<i>Andrographis paniculata</i>	Survey, genetic research, life history studies, limiting factor research, PHVA

Species	Supporting research recommendation
<i>Anogeissus latifolia</i>	Survey, Life history studies
<i>Asparagus racemosus</i> var. <i>javanicus</i>	Survey, genetic research, taxonomic research, biochemical research
<i>Bauhinia vahlii</i>	Survey, PHVA
<i>Boswellia serrata</i>	Industry based research and development
<i>Buchanania lanzan</i>	Survey, genetic research, life history studies, epidemiology
<i>Butea monosperma</i>	Genetic research, biochemical research (for white and yellow varieties)
<i>Celastrus paniculatus</i>	Survey, Genetic research, Life history studies
<i>Centella asiatica</i>	Survey, Life history, Limiting factor
<i>Chlorophytum borivillianum</i>	Survey, seed germination
<i>Costus speciosus</i>	Survey, genetic research, life history studies, limiting factor research, epidemiology, PHVA
<i>Curculigo orchiodes</i>	Survey, life history studies, limiting factor research
<i>Curcuma angustifolia</i>	Survey, Biochemical research
<i>Curcuma aromatica</i>	Survey, genetic research, life history studies, limiting factor research, epidemiology
<i>Curcuma caesia</i>	Survey, genetic research, taxonomic research, life history studies, limiting factor research, PHVA
<i>Cyperus rotundus</i>	Genetic research, Biochemical studies
<i>Dioscorea hispida</i>	Survey, life history studies, limiting factor research, agrotechnology
<i>Emblica officinalis</i>	Survey, genetic research, taxonomic research, biochemical studies
<i>Embelia tsjeriam-cottam</i>	Survey, life history studies, limiting factor research
<i>Helicteres isora</i>	Survey, genetic research, life history studies, limiting factor research, epidemiology, PHVA
<i>Hemidesmus indicus</i>	Survey, genetic, biochemical studies
<i>Holarrhena antidysenterica</i>	Survey, limiting factor research, biochemical analysis/ research
<i>Madhuca indica</i>	Survey, genetic research, life history studies, correlation between temperature and fruit/flower drop; PHVA.
<i>Rauwolfia serpentina</i>	Survey, Limiting factor research (seed viability).
<i>Schleichera oleosa</i>	Survey, genetic research, life history studies, limiting factor research, PHVA
<i>Semecarpus anacardium</i>	Survey, genetic research, Life history studies, to identify high tannin content zones/circle in-MP, hybridization
<i>Sterculia urens</i>	Survey, genetic research, life history studies, limiting factor research
<i>Strychnos nux-vomica</i>	Genetic research, biochemical analysis
<i>Syzygium cuminii</i>	Genetic research, limiting factor research, research for polyembryony
<i>Tephrosia purpurea</i>	Survey, Life history studies, Limiting factor research, Biochemical studies
<i>Terminalia arjuna</i>	Survey, genetic research, taxonomic research, Biochemical analysis owing to its medicinal properties
<i>Terminalia chebula</i>	Survey, genetic research, limiting factor research
<i>Tribulus terrestris</i>	Survey (ongoing), Taxonomic research (ongoing), Life history studies
<i>Withania somnifera</i>	Survey, genetic research, life history studies, PHVA
<i>Woodfordia fruticosa</i>	Survey

Management is the second step only in the order of this report presentation, but not in implementation with respect to research or cultivation recommendations. NTFPs require management in the wild before it is too late. As seen from this exercise, 24 taxa are under the threat of extinction in Madhya Pradesh, be it in long-term future, near future or immediate future. All these taxa require special attention if their populations have to remain stable in the wild and if they have to be economically viable. The various threats that affect the taxa cannot be considered in isolation and a series of management action is needed. Some immediate management recommendations made for the assessed NTFPs are given in table 6.

Table 6. Management recommendations suggested for the assessed NTFP taxa.

Species	Management
<i>Abutilon indicum</i>	Habitat management, wild population management, Sustainable utilisation, public awareness, genome resource banking, limiting factor management, cultivation
<i>Achyranthes aspera</i>	None
<i>Acorus calamus</i>	Habitat management, monitoring, sustainable utilization, limiting factor management, cultivation
<i>Aegle marmelos</i>	Habitat management, monitoring, sustainable utilization, public awareness, cultivation/plantation
<i>Andrographis paniculata</i>	Habitat management, public awareness, genome resource banking, limiting factor management, cultivation
<i>Anogeissus latifolia</i>	Monitoring, sustainable utilization, public awareness
<i>Asparagus racemosus</i> var. <i>javanicus</i>	Habitat management, monitoring, sustainable utilisation, public awareness, genome resource banking, cultivation
<i>Bauhinia vahlii</i>	Habitat management, sustainable utilisation, public awareness, monitoring, trade
<i>Boswellia serrata</i>	Monitoring, sustainable utilisation, public awareness, genome resource banking, cultivation
<i>Buchanania lanzan</i>	Habitat management, wild population management, monitoring, sustainable utilisation, public awareness, cultivation
<i>Butea monosperma</i>	Monitoring, genome resource banking (white & yellow variety), cultivation (white & yellow variety)
<i>Celastrus paniculatus</i>	Habitat management, monitoring, sustainable utilization, public awareness, limiting factor management, cultivation
<i>Centella asiatica</i>	Habitat management, Monitoring, sustainable utilization, Genome Resource Banking, Limiting factor management, Cultivation
<i>Chlorophytum borivillianum</i>	Habitat management, sustainable utilisation, public awareness, cultivation
<i>Costus speciosus</i>	Habitat management, wild population management, public awareness, genome resource banking, cultivation.
<i>Curculigo orchiodes</i>	Habitat management, sustainable utilization, public awareness, genome resource banking, limiting factor management, cultivation
<i>Curcuma angustifolia</i>	Monitoring, habitat management, sustainable utilization, cultivation, public awareness, limiting factor management for fire, extraction techniques
<i>Curcuma aromatica</i>	Habitat management, wild population management, sustainable utilization, genome resource banking, limiting factor management, public awareness, cultivation.

Species	Management
<i>Curcuma caesia</i>	Habitat management, wild population management, monitoring, public awareness, genome resource banking, limiting factor management, cultivation
<i>Cyperus rotundus</i>	Monitoring, sustainable utilisation, public awareness, genome resource banking
<i>Dioscorea hispida</i>	Habitat management, monitoring, sustainable utilization, public awareness, limiting factor management, cultivation
<i>Emblica officinalis</i>	Habitat management, sustainable utilisation, public awareness, cultivation, improved harvesting techniques.
<i>Embellia tsjeriam-cottam</i>	Habitat management, wild population management, sustainable utilization, cultivation
<i>Helicteres isora</i>	Habitat management, sustainable utilization, public awareness, genome resource banking, cultivation
<i>Hemidesmus indicus</i>	Habitat management, monitoring, sustainable utilization, public awareness
<i>Holarrhena antidiysenterica</i>	Habitat management, monitoring, sustainable utilization, public awareness, genome resource banking, limiting factor management, cultivation
<i>Madhuca indica</i>	Wild population management, monitoring, sustainable utilization, public awareness.
<i>Rauvolfia serpentina</i>	Habitat management, monitoring, sustainable utilization, Cultivation
<i>Schleichera oleosa</i>	Habitat management, sustainable utilization, public awareness, genome resource banking, limiting factor management, cultivation/plantation
<i>Semecarpus anacardium</i>	Habitat management, Sustainable utilization, Public awareness, Genome Resource Banking
<i>Sterculia urens</i>	Habitat management, monitoring, sustainable utilization, public awareness, genome resource banking, limiting factor management, cultivation.
<i>Strychnos nux-vomica</i>	Habitat management, monitoring, translocation, sustainable utilisation, public awareness, cultivation/plantation
<i>Syzygium cuminii</i>	Wild population management, sustainable utilization, limiting factor management, cultivation
<i>Tephrosia purpurea</i>	Habitat management, monitoring, sustainable utilization, cultivation
<i>Terminalia arjuna</i>	Habitat management, wild population management, monitoring, sustainable utilization, public awareness, genome resource banking, cultivation, Large scale ex situ conservation for medicinal and sericultural use.
<i>Terminalia chebula</i>	Habitat management, sustainable utilization, public awareness, genome resource banking, limiting factor management, cultivation
<i>Tribulus terrestris</i>	Sustainable utilization, public awareness, genome resource banking
<i>Withania somnifera</i>	Wild population management, sustainable utilization, public awareness, genome resource banking, cultivation
<i>Woodfordia fruticosa</i>	Sustainable utilization

There is an overwhelming recommendation for sustainable utilization as seen in the management recommendation table, so is cultivation. Cultivation is a must for any sustainable use effort. Currently, there is a move towards cultivation by some of the bigger pharmaceutical industries, but there seems to be a wide gap between what is cultivated and the requirement, making the trade unsustainable. Cultivation has a drawback since some contend that the secondary metabolites derived from a cultivated medicinal plant may not be the same as that found in

the wild. But that is not reason enough to avoid cultivation because secondary metabolites can vary within wild populations depending on the habitat, vegetation, edaphic, climatic and growth conditions. Cultivation can also provide a more stable future for rural communities dependent on NTFPs for sustenance and there can be an assured supply of raw materials in the future without adversely affecting the genetic makeup or demography of the wild population.

Table 7. NTFPs recommended for cultivation along with reason for cultivation and the level or urgency of cultivation.

Species	Cultivation	Level of Cultivation
<i>Abutilon indicum</i>	for research, trade	--
<i>Achyranthes aspera</i>	No	Not recommended
<i>Acorus calamus</i>	for species recovery of pink variety. Research	Initiate programme within 3 years.
<i>Aegle marmelos</i>	for species recovery, preservation of live genome	Initiate programme within 3 years.
<i>Andrographis paniculata</i>	for education, research, preservation of live genome	--
<i>Anogeissus latifolia</i>		--
<i>Asparagus racemosus javanicus</i>	for species recovery, research, preservation of live genome	Initiate programme within 3 years
<i>Bauhinia vahlii</i>	for species recovery, education, trade	Initiate programme within 3 years
<i>Boswellia serrata</i>	for preservation of live genome	Initiate programme after 3 years
<i>Buchanania lanzan</i>	for species recovery, research, husbandry, trade	Ongoing plantation programme to be intensified
<i>Butea monosperma</i>	for preservation of live genome	--
<i>Celastrus paniculatus</i>	for education, reintroduction, research, preservation of live genome	Initiate programme within 3 years
<i>Centella asiatica</i>	for education, reintroduction, research, preservation of live genome	Initiate programme within 3 years.
<i>Chlorophytum borivillianum</i>	for research and preservation of live genome	Ongoing programme be intensified
<i>Costus speciosus</i>	for species recovery, reintroduction, research, preservation of live genome	Ongoing programme be intensified
<i>Curculigo orchioides</i>	for education, research, preservation of live genome	Initiate programme after 3 years.
<i>Curcuma angustifolia</i>	recommended for species recovery, education, research	Initiate programme within 3 years
<i>Curcuma aromatica</i>	for species recovery, reintroduction, research, preservation of live genome	Initiate programme after 3 years.
<i>Curcuma caesia</i>	for species recovery, education, reintroduction, research, preservation of live genome	Ongoing programme be intensified
<i>Cyperus rotundus</i>	for education, research	Initiate programme after 3 years.
<i>Dioscorea hispida</i>	for education, reintroduction, research	Initiate programme within 3 years
<i>Emblica officinalis</i>		Ongoing programme be intensified
<i>Embelia tsjeriam-cottam</i>	for species recovery, education, preservation of live genome	Initiate programme within 3 years

<i>Helicteres isora</i>	for species recovery, reintroduction, research	Ongoing programme be intensified
<i>Hemidesmus indicus</i>		Initiate programme within 3 years
<i>Holarrhena antidysenterica</i>	for education, reintroduction, research, preservation of live genome	Initiate programme after 3 years.
<i>Madhuca indica</i>		--
<i>Rauvolfia serpentina</i>	for species recovery and trade	Initiate programme within 3 years
<i>Schleichera oleosa</i>	for species recovery, reintroduction, research	Ongoing programme be intensified
<i>Semecarpus anacardium</i>	for species recovery, research	Ongoing programme be intensified
<i>Sterculia urens</i>		--
<i>Strychnos nux-vomica</i>	for research, preservation of live genome, trade	Initiate programme within 3 years
<i>Syzygium cuminii</i>	for research	--
<i>Tephrosia purpurea</i>	for research, preservation of live genome, trade	Initiate programme within 3 years
<i>Terminalia arjuna</i>	for species recovery, research, sericulture	Initiate programme within 3 years
<i>Terminalia chebula</i>	for species recovery, education, research, preservation of live genome	Initiate programme within 3 years
<i>Tribulus terrestris</i>	for species recovery, research, preservation of live genome	Ongoing programme be intensified
<i>Withania somnifera</i>	for species recovery, research	Ongoing programme be intensified
<i>Woodfordia fruticosa</i>	Not recommended	--

The results of the CAMP indicate that the NTFPs in Madhya Pradesh are in danger of being overexploited and unsustainable. It requires immediate intervention from the different agencies concerned to

1. initiate and encourage cultivation,
2. regulate harvests of wild populations,
3. initiate awareness programmes,
4. manage wild populations for genetic and demographic stability,
5. resolve not to harvest some taxa that are in severe danger of extinction until such time the populations recover and establish in the wild and simultaneously cultivate them,
6. encourage the private sector to develop the market only from cultivations and not harvests from the wild,
7. identify synthetic ecologically-friendly alternatives (not alternate wild species) for some raw material,
8. encourage intensive research and development for the recommendations suggested by the workshop participants,
9. conduct more assessment workshops to document the status of other NTFPs.

Selected Non-timber forest products of Madhya Pradesh

Summary Data Table

Summary Data Table for selected taxa of Non-timber forest products of Madhya Pradesh

SPECIES	HABIT	RANGE (SQ. KM)	AREA (SQ. KM)	NO. OF LOC.	HABITAT TRENDS - PAST/PRESENT	THREATS	POP. TRENDS PAST/PRESENT	POP. TRENDS FUTURE	DATA QUAL.	IUCN	CRIT.	RES. RECOM.	RESEARCH MGT.
<i>Abutilon indicum</i> Malvaceae	Shrub	D	D	F	Increase	Ov, Ps, T, D, Ice	< 20%	< 20%	2, 3, 5	LR-lc	--	S, T, Lh, Lr, E	Hm, Wm, Su, Pa, Grb, Lm, C
<i>Achyranthes aspera</i> Amaranthaceae	Annual herb or Under shrub	D	D	Contig.	Increase	None	Increase	Stable	2, 3, 5	LR-lc	--	T, Lh	None
<i>Acorus calamus</i> Araceae	Herb, Aromatic	C	B	F	Decrease	L, Lf, C, E, Sd, Sn, O, I, H, Hm, Ov, T, Rr	> 50%	> 20%	2, 3, 5, 4	EN	Alacd	S, Lr, O	Hm, M, Su, Lm, C
<i>Aegle marmelos</i> Rutaceae	Medium sized tree	D	C	F	Decrease	Bp, L, Lf, Sf, O, Hm, Hf, Ov, Tp, Ice	> 20%	> 20%	2, 3, 5, 4	VU	Alacd, 2acd	S, T	Hm, M, Su, Pa, C
<i>Andrographis paniculata</i> Gentianaceae	Erect Annual herb	D	D	F	Stable	Bp, C, Gr, Lf, La, T, E, S, H, Hm, Ov, T	Increase	--	2, 3, 5	LR-lc	--	S, T, Lh, Lr, P	Hm, Pa, Grb, Lm, C
<i>Anogeissus latifolia</i> Combretaceae	Tree	D	D	Contig.	Decrease	Dm, Gr, T, L, La, H, Ht, Ov, T, Tp	< 20%	Uk	2, 3, 5	LR-nt	--	S, Lh	M, Su, Pa
<i>Asparagus racemosus javanicus</i> Liliaceae	Creepers	D	D	one Contig.	Decrease	Dm, Gr, L, T, E, D, Sf, Hm, Ov, T, Tp, H	> 20%	> 20%	2, 3, 5, 4	VU	Alacd, 2cd	S, T, Br	Hm, M, Su, Pa, Grb, C
<i>Bahinia vahlii</i> Caesalpiniaceae	Gigantic woody climber	D	C	Contig.	Decrease	Dm, Gr, L, La, D, Sf, H, Ov, T, Tp, Rr	> 20%	> 50%	2, 5, 4	EN	A2cd	S, P	Hm, Su, Pa, M, O
<i>Boswellia serrata</i> Bursaceae	Large sized tree	D	D	Contig.	Decrease	Dm, Bp, Hm, Ht, Ov, Tp, T, Rr	> 50%	> 50%	2, 3, 5, 4	EN	Alad, 2d	O	M, Su, Pa, Grb, C
<i>Buchanania lanzan</i> Anacardiaceae	Medium sized tree	D	B	Unknown Fragmen ted	Decrease	Bp, E, L, La, Pu, Pl, T, Sf, Sl, O, H, Hf, Ov, H, Tp, Ic, Ice, Ps, Rr, O	> 20%	< 20%	2, 3, 5, 4	VU	Alacde	S, T, Lh, E	Hm, Wm, M, Su, Pa, C
<i>Butea monosperma</i> Fabaceae (Papilionaceae)	Small deciduous tree	D	D	F	Stable	Sf, H, Ov, T	Stable	< 20%	2, 3, 4	LR-lc	--	T, Br	M, Grb C
<i>Celastrus paniculatus</i> Celastraceae	Large climbing shrub	D	D	F	Decrease	L, La, T, E, O, Hm, Ov, Ice	> 50%	> 50%	1, 2, 3, 5, 4	EN	Alcde, 2cde	S, T, Lh	Hm, M, Su, Pa, Lm, C

SPECIES	HABIT	RANGE (SQ. KM)	AREA (SQ. KM)	NO. OF LOC.	HABITAT TRENDS - PAST/PRESENT	THREATS	POP. TRENDS PAST/PRESENT	POP. TRENDS - FUTURE	DATA QUAL.	IUCN	CRIT.	RES. RECOM.	RESEARCH MGT.
<i>Centella asiatica</i> Apiaceae	Runner Herb	D	D	F	Decrease	None	> 20%	> 20%	1, 2, 5, 4	VU	A1cd, A2cd	S, Lh, Lr	Hm, M, Su, Grb, Lm, C
<i>Chlorophytum borivilianum</i> Liliaceae	Herb	C	B	F	Decrease	Gr, T, Sf, La, H, Hm, Hf, Ov, T	> 50%	> 50%	2, 3	EN	Alacd, 2cd	S, O	Hm, Su, Pa, C
<i>Costus speciosus</i> Zingiberaceae	Shrub	B	B	F	Decrease	Gr, L, La, Pl, T, C, E, O, H, Hm, Ov, Tp, Ice, Il	< 20%	> 20%	2, 3, 5	VU	A2cde	S, T, Lh, Lr, P, E	Hm, Wm, Pa, Grb, C.
<i>Curculigo orchioides</i> Hypoxidaceae	Annual herb	D	D	F	Stable	Bp, L, Gr, La, T, O, Hm, Ov, T, P	< 20%	< 20%	2, 3, 5, 4	LR-nt	--	S, Lh, Lr	Hm, Su, Pa, Grb, Lm, C
<i>Curcuma angustifolia</i> Zingiberaceae	Herb	C	C	F	Decrease	--	> 20%	> 20%	2, 3, 5, 4	VU	Alacd, 2cd	S, Br	M, Hm, Su, C, Pa, Lm, O
<i>Curcuma aromatica</i> Zingiberaceae	Annual herb	D	D	F	Decrease	Bp, Lf, La, T, Sf, H, Hm, Ov, T, Ice, Il, P	< 20%	< 20%	2, 3, 5	LR-lc	--	S, T, Lh, Lr, E	Hm, Wm, Su, Grb, Lm, Pa, C.
<i>Curcuma caesia</i> Zingiberaceae	Annual shrub	B	B	F	UK	Hm, Ov, T	> 80%	> 80%	1, 2, 3, 5	CR	A2cd	S, T, Lh, Lr, P	Hm, Wm, M, Pa, Grb, Lm, C
<i>Cyperus rotundus</i> Cyperaceae	Perennial sedge	D	D	Contig.	Decrease	Hm, T	No	< 20%	2, 3, 5, 4	LR-lc	--	T, Br	M, Su, Pa, Grb
<i>Dioscorea hispida</i> Dioscoreaceae	Climber	D	D	F	Decrease	L, Gr, T, E, O, Hm, Hf, Ov, T, Ice.	> 20%	> 20%	1, 2, 5	VU	A1cde, 2cde	S, Lh, Lr, O	Hm, M, Su, Pa, Lm, C
<i>Embelia officinalis</i> Euphorbiaceae	Tree	D	C	F	Decrease	S, Sf, Bp, Gr, O, Hm, Hf, Ht, L, Lf, Ov, T, Ice, Il, Rr	> 20%	> 20%	2, 3, 5, 4	VU	A1cde, 2cde	S, T, Br	Hm, Su, Pa, C, O
<i>Embelia tsjeriam-cottam</i> Myrsinaceae	Large shrub or small tree	D	D	Contig.	Decrease	L, Hm, Ov, T, Ice, Rr	< 20%	> 20%	2, 5, 4	VU	A2de	S, Lh, Lr	Hm, Wm, Su, C
<i>Helicteres isora</i> Sterculiaceae	Small tree	C	B	F	Decrease	Bp, Gr, L, La, T, C, E, O, Hm, Gr, Tp, Ice, Il, H	< 20%	> 20%	2, 3, 5	VU	A2cde	S, T, Lh, Lr, E, P	Hm, Su, Pa, Grb, C
<i>Hemidesmus indicus</i> Asclepiadaceae	Slender, twining, semi-erect climber/shrub	D	C	1, F	Stable	Dm, L, C	< 20%	< 20%	3, 5, 4	LR-nt	--	S, T, Br	Hm, M, Su, Pa
<i>Holarhena antidysenterica</i>	Small tree or large	D	C	1	Decrease	Gr, L, E, Sf, O, Hm,	< 20%	< 20%	2, 3, 5, 4	LR-nt	--	S, Lr, Br	Hm, M, Su, Pa, Grb,

SPECIES	HABIT	RANGE (SQ. KM)	AREA (SQ. KM)	NO. OF LOC.	HABITAT TRENDS - PAST/PRESENT	THREATS	POP. TRENDS PAST/PRESENT	POP. TRENDS - FUTURE	DATA QUAL.	IUCN	CRIT.	RES. RECOM.	RESEARCH MGT.
Apocynaceae	shrub												
<i>Madhuca indica</i> Sapotaceae	Tree	D	B	F	Decrease	TP, T, Rl, Gr, T, Pl, Sf., Rl, H, Hm, Hf, T, Ov, O	< 20%	< 20%	2, 3, 5	LR-nt	--	S, T, Lh, O, P	Lm, C Wm, M, Su, Pa
<i>Rauwolfia serpentina</i> Apocynaceae	Evergreen under shrub	C	B	F	Decrease	L, Lf, Sf, H, Hm, Ov, T	> 80%	> 80%	2, 3, 5, 4	CR	Alacd, 2cd	S, Lr	Hm, M, Su, C
<i>Schleichera oleosa</i> Sapindaceae	Tree	D	D	F	Decrease	Bp, L, Lf, La, Pl, Pu, T, C, E, Sf, O, Ht, Tp, D, Ice	< 20%	> 20%	2, 3, 5	VU	A2cde	S, T, Lh, Lr, P	Hm, Su, Pa, Grb, Lm, C
<i>Semecarpus anacardium</i> Anacardiaceae	Tree	D	B	F	Decrease	S, Bp, La, Pu, Pl, E, Sf, Sl, H, Hm, Ov, Tp, T, Ice, Rl	< 20%	> 20%	2, 3, 5	VU	A2cde	S, T, Lh, O	Hm, Su, Pa, Grb
<i>Sterculia urens</i> Sterculiaceae	Tree	D	D	F	Stable	Lf, O, H, Ov, T, Rl	> 20%	> 20%	1, 2, 3, 5, 4	LR-nt	--	S, T, Lh, Lr	Hm, M, Su, Pa, Grb, Lm, C.
<i>Strychnos nux-vomica</i> Loganiaceae	Evergreen tree	A	A	1	Decrease	L, D, Sf, Hm, T, Rl	< 20%	> 50%	2, 3, 5, 4	EN	A2cd	T, Br	Hm, M, T, Su, Pa, C
<i>Syzygium cumini</i> Myrtaceae	Tree	D	D	F	Stable	Dm, La, E, S, Hm, Hf, H, T	< 20%	< 20%	2, 3, 5, 4	LR-lc	--	T, Lr, O	Wm, Su, Lm, C
<i>Tephrosia purpurea</i> Fabaceae	Perennial herb	D	D	F	Stable	L, Lf, Hm, Ov, T	Increase	No	2, 3, 5, 4	LR-lc	--	S, Lh, Lr, Br	Hm, M, Su, C
<i>Terminalia arjuna</i> Combretaceae	Large, evergreen tree, buttressed stem	D	C	F	Decrease	Dm, Gr, L, Ps, Pu, C, E, Sn, D, M, Sf, L, Hm, Ov, T, Tp, T, H	> 20%	> 20%	1, 2, 5, 4	VU	Alacd, 2cd	S, T, Br	Hm, Wm, M, Su, Pa, Grb, C
<i>Terminalia chebula</i> Combretaceae	Tree	D	D	Contig.	Decrease	L, Gr, E, H, Hm, T, Rr, Ice.	> 20%	> 20%	2, 3, 5, 4	VU	Alacd	S, T, Lr	Hm, Su, Pa, Grb, Lm, C
<i>Tribulus terrestris</i> Zygophyllaceae	Annual Herb	C	B	F	Increase	Gr, La, E, Hm, Ov, Ps, Tp, T, D, G, Ic, Ice, Il	> 20%	> 50%	2, 3, 5	EN	A2d	S, T, Lh	Su, Pa, Grb
<i>Withania somnifera</i> Solanaceae	Annual shrub/Under shrub	B	A	F	Decrease	Bp, L, La, E, O, H, Hm, Ov, T, Tp.	> 50%	> 50%	2, 3, 5	EN	Alcde, 2cde	S, T, Lh, P	Wm, Su, Pa, Grb, C

SPECIES	HABIT	RANGE (SQ. KM)	AREA (SQ. KM)	NO. OF LOC.	HABITAT TRENDS - PAST/PRESENT	THREATS	POP. TRENDS PAST/PRESENT	POP. TRENDS - FUTURE	DATA QUAL.	IUCN	CRIT.	RES. RECOM.	RESEARCH MET.
<i>Woodfordia fruticosa</i> Lythraceae	Shrub	D	C	F	Stable	D, Ice, Ps, Pe S, La, T	Increase	Increase	1, 2, 3, 5, 4	LR-lc	--	S	Su

IUCN Red List Categories and Criteria explained in brief below

* IUCN Red List Categories :
 CR - Critically endangered -- a taxon is Critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future as defined by the criteria.
 EN - Endangered -- a taxon is Endangered when it is not Critically endangered but is facing a very high risk of extinction in the wild in the near future as defined by the criteria.
 VU - Vulnerable -- a taxon is Vulnerable when it is not Critically endangered or Endangered but is facing a high risk of extinction in the wild in the medium term future as defined by the criteria.
 LR - Lower risk - a taxon is Low Risk when it has been evaluated and does not qualify for any of the threatened categories, Critically endangered, Endangered, Vulnerable, or Data Deficient. (LR-nt - near threatened, LR-lc - least concern, LR-cd - conservation dependent.
 DD - Data deficient - A taxon is Data Deficient when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.
 NE - Not evaluated - A taxon is Not Evaluated when it has not yet been assessed against the criteria.

** IUCN Red List Criteria

A - Population reduction - (1) observed, inferred, suspected or estimated reduction, or (2) projected or predicted reduction of at least 20% (VU), or 50% (EN), or 80% (CR) in 10 years or 3 generations whichever is longer based on (a) Direct observation; (b) index of abundance appropriate for the taxon; (c) decline in areas of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) effects of introduced taxa, hybridisation, pathogens, pollutants, competitors, or parasites.

Summary Data Tables for Selected Species of Northern, Northeastern and Central Indian Medicinal Plants are on the following pages. Below is a Key to the symbols used in the tables:

- No. of Location : F = Fragmented
- Range: A = < 100 sq.km.; B = < 5,000 sq.km.; C = < 20,000 sq.km.; D = > 20,000 sq.km.;
- Area: A = < 10 sq.km.; B = < 500 sq.km.; C = < 2,000 sq.km.; D = > 2,000 sq.km.;
- Data Quality: 1= Reliable census or population monitoring; 2 = General field studies; 3 = Informal field sightings; 4 = Indirect information; 5 = Museum/ herbarium/ collection/ records; 6 = Hearsay/ popular belief
- Threat: Bp = Biotic pressure; L = Loss of habitat; Lf = Loss of habitat due to fragmentation; D = Diseases; H = Harvest; Hf= Harvest for food; Hm= Harvest for medicine; Ht= Harvest for timber; I = Human interference; Ip= Loss of habit due to exotic plants; Ls= Landslide; Ov= Over-exploitation; P = Predation; Pr = Population reduction; Sf=Fire as catastrophic event; T=Trade; Tp = Trade of parts; O = Others
- Supporting research & Management recommendation:
 E = Epidemiology; G= Genetic management; Grb = Genome resource banking; H=Husbandry research; Hm = Habitat management; Lh= Life history studies; Lm = Limiting factor management; Lr = Limiting factor research; M = Monitoring; O = Other (specific to the species); Pa = Public awareness; P = PHVA; Pp = PHVA pending further work; S= Survey search and find; T = Taxonomic and morphological genetic studies; Tl= Translocations; Su = Sustainable utilisation; Wm = Wild population management

Selected Non-timber forest products of Madhya Pradesh

Taxon Data Sheets

Species (and synonyms): *Abutilon indicum* G.Don
Abutilon indicum (L.) Sw.
Sida indica

Family: Malvaceae

Common name(s): Kanghi, Mudra (Hindi), Atibala (Sanskrit),
Kankati (Ayurvedic), Potari (Bengali), Dabali
(Gujarati), Country mallow (English)

Taxonomic status: Species

Habit or life form: Shrub (Robust hairy shrub/Under shrub)

Habitat of taxon: Dry open areas, wastelands, stream sights and
Hill slopes

Habitat specificity/niche: Plains, open canopy forest

TAXON DISTRIBUTION:

India Distribution: All over India except temperate regions

Current Distribution in MP: Throughout MP

Elevation: 500 - 2,000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: < 20% increase in the last 10 years. < 20 %
increase predicted in the next 10 years

Change in habitat quality: Stable

THREATS:

Threats to habitat: None

Threats to population: Overexploitation, weedicides, trade, disease,
interspecific competition from exotics

TRADE:

Trade: Commercial, international

Parts in trade: Fruits

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: Annual herb

Population trends past/present: < 20% decline in the last 10 years

Population trends - future: < 20% decline in the next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting,
literature

Recent field studies: Unknown

STATUS:

IUCN: LOWER RISK - LEAST CONCERN in State of Madhya
Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: None

Known presence in P.A.s: In all P.A.'s in MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life-history studies,
limiting factor research, epidemiology

Management: Habitat management, wild population management,
sustainable utilisation, public awareness,

Reason for Cultivation: genome resource banking, limiting factor
Cultivation facilities: management, cultivation
Species management program: For research, trade
Level of cultivation: None
Cultivation techniques: Recommended
Initiate cultivation after 3 years
Known

GENERAL COMMENTS:

A lot of work on the species is recommended, especially on distribution, lifespan, conservation, agrotechnique for this species is to be developed in this five year plan. Species highly adaptable to changing habitat. Ministry of Health and Family Welfare and Ministry of Agriculture recommended this species for cultivation. Seed powder is used for treating impotency. Decoction of plants is used in urinary diseases and leaves used for eyewash.

Sources:

Hort. Brit. (1827) 1: 54
Nath, B, H.O. Saxena, S.S. Shukla (1968).
Important ayurvedic plants of Madhya Pradesh.
Rewa Govt., regional press, MP, 40 pp.
Other References: 1, 2, 3, 4 (See end of report)

Compilers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V.
K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C.
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Pandey, S.K. Dubey, F.B. Homji, S.N. Khotale, V.
Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad,
K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Achyranthes aspera* L.
Achyranthes porphyristachya Wall.
Family: Amaranthaceae
Common name(s): Apamarga (Sanskrit), Chirchitta, Adzachazae, Latjira, Puthkunda (Hindi), Prickly chaff flower (English)
Taxonomic status: Species
Habit or life form: Annual herb or Under shrub
Habitat of taxon: Degraded land
Habitat specificity/niche: Widely adaptable species

TAXON DISTRIBUTION:

India Distribution: Throughout India
Current Distribution in MP: Throughout MP
Elevation: Upto 3000 ft. in India
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Contiguous

HABITAT INFORMATION:

Habitat Trends: Increase in area
Change in habitat quality: No change

THREATS:

Threats to habitat: None
Threats to population: None

TRADE:

Trade: Local, domestic, commercial
Parts in trade: Whole plant

POPULATION INFORMATION:

Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: Annual
Population trends past/present: Increasing
Population trends - future: Stable

INFORMATION SOURCE:

Data quality: General field studies, informal field sighting, literature
Recent field studies: Unknown

STATUS:

IUCN: LOWER RISK - LEAST CONCERN in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: None

Known presence in P.A.s: All PAs in MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Genetic research, life history studies

Management: None

Reason for Cultivation: No

Cultivation facilities: None

Species management program: Not required

Level of cultivation: Not recommended

Cultivation techniques: Some techniques known

GENERAL COMMENTS:

High medicinal value. Whole plant is used for urinary disorders, gynecological problems, eye-drops, stomach ailment. Used extensively by tribals for cure for scorpion, snake, dog bites and delivery problems. Seeds are eaten for reducing appetite without energy loss. Used during festivals.

Sources:

Sp. Pl. (1753) 204
Flora of British India 4:730
Cook 2:580
CSIR. Wealth of India
Gill, L.S. , M. Idu and D.N. Ogbor (1997). Folk medicinal plants: Practices and believes of the bini people. Ethnobotany, Journal of Society of ethnobotanist 9: 182 (1-5), Deep Publications
Other References: 3 (See end of report)

Compilers:

F.B. Homji, S.S. Bisen, S.N. Khotele, P. Bhattacharya, V. Paul, C. Bedi

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, S.N. Khotele, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): **Acorus calamus L.**
Family: Araceae
Common name(s): Sweet flag (English), Baceha, Bach, Igir, Safed bach, Ghora bach, Shod bach (Hindi), Vacha (Sanskrit)

Taxonomic status: Species
Habit or life form: Herb, Aromatic
Habitat of taxon: Swampy and marshy open places
Habitat specificity/niche: Valleys - Prefers waterlogged conditions

TAXON DISTRIBUTION:
India Distribution: Sikkim, Darjeeling, Karnataka, UP, MP, Meghalaya and Manipur
Current Distribution in MP: Jagdalpur, Japalbur, Bilaspur, Calaghat, Rewa, Shahdol and Sarguja circles
Elevation: 400 - 800 metres (800 - 1200)
Range (Sq. km.): < 20,000
Area Occupied (Sq. km.): < 500
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: Decrease in area of > 20% in 10 years and decrease of > 20% predicted in the next 20 years
Change in habitat quality: Decrease

THREATS:
Threats to habitat: Reduction in marshy areas, change in rainfall pattern, habitat loss, habitat fragmentation, climate, edaphic changes, drought, siltation
Threats to population: Human interference, harvest, harvest for medicine, over-exploitation, trade, reduction in regeneration

TRADE:
Trade: Domestic, commercial, international
Parts in trade: Rhizome

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: Unknown
Generation time: one year
Population trends past/present: > 50% decline in the last 10 years
Population trends - future: > 20 % decline predicted in the next 10 years

INFORMATION SOURCE:
Data quality: General field studies, informal field sighting, literature, indirect information
Recent field studies: Bisen, S. S., TFRI, Jabalpur, 1996, Standardizing the conservation strategies of agro-technology for its cultivation - Bach; CIMAP, Lucknow, Devp. of improved varieties of Bach; Dr. Sathe, MPCSP, Obaidullaganj, MP, Tissue culture studies

STATUS:
IUCN: **ENDANGERED in State of Madhya Pradesh, India**
Criteria based on: Alacd (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: MP Transit Rules 1961 applicable

Known presence in P.A.s: Occurs in some National parks - Kanha, Bandhavgarh, Indravati, Kanger Valley, Achanakmor, Sanjay National Park

Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Survey, Limiting factor research, Oil content in Rhizome

Management: Habitat management, Monitoring, Sustainable utilisation, Limiting factor management, cultivation

Reason for Cultivation: For species recovery of pink variety. Research

Cultivation facilities: None

Species management program: Not at present; Recommended

Level of cultivation: Initiate cultivation within 3 years

Cultivation techniques: Techniques are known

GENERAL COMMENTS:

This species was assessed in Lucknow CAMP Workshop as Vulnerable and also at Southern Indian Medicinal Plants CAMP as Vulnerable for southern India. Bach is found in two varieties, pink rhizome which is almost extinct and white rhizome which is commonly found. Species is in commercial use, thereby development of agrotech- nique, analytical methods are standardised, the-refore there is need for gene bank and protec-tion of species in wild. Oil content in rhizome. The rhizome is used for fever, as nerve tonic, in dysentery, skin diseases, snake bite, numbness and general debility and epilepsy. This plant growing near by areas of Jabalpur contains high active ingredients. High transpiration rate in sub-tropic with swampy edaphic factors do produce raw materials of International quality standards.

Sources:

Sp. Pl. (1753). 324.
 Arora, R.K. (1997). Ethnobotany and its role in the conservation and use of Plant genetic resources in India. Ethnobotany, 9: 1 and 2 (6-15), Deep Publication, Delhi.
 Farooqu, A.A. and M.M. Khan (1993). Production technology of medicinal and aromatic plants. (83-85). First edition. Indian herb research and supply company, Bangalore,
 Molur, S. and S. Walker (1996). Report of Conser- vation Assessment and Mgt. Plan workshop for Selected Southern Indian Medicinal Plants (Seco- nd Workshop). ZOO/CBSG, India, FRLHT, 147 pp.
 Molur, S. and S. Walker (1998). Report of Conservation Assessment and Mgt. Plant workshop for Selected species of Northern, Northeaster and Central Indian Medicinal Plants. BCPP End- angled Species Project, ZOO/CBSG, India, 62 pp.
 Other References: 1 (See end of report)

Compilers:

P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A. Boaz, V. L. Pandey, S. K. Dubey

Reviewers:

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Species (and synonyms): *Aegle marmelos* L. ex. Roxb.
Crataeva marmelos L.

Family: Rutaceae

Common name(s): Bel, Baelpatra (Hindi), Bilva (Sanskrit), Bael (English)

Taxonomic status: Species

Habit or life form: Medium sized tree

Habitat of taxon: Tropical dry deciduous and mixed forests

Habitat specificity/niche: 900 - 2500 ft - Plains- open and closed canopy forest ; Hill slopes/sides, valleys

TAXON DISTRIBUTION:

India Distribution: Found all over India except Kashmir, Sikkim and higher altitudes of Himalaya

Current Distribution in MP: All forests circles of MP

Elevation: Up to 2500 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2000

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: Decrease in area < 20% in last 10 years; < 20% decline predicted in next 10 years

Change in habitat quality: Decrease

THREATS:

Threats to habitat: Biotic pressure, loss of habitat, habitat fragmentation, fire

Threats to population: Harvest for medicine and food, over-exploitation, trade of parts, interspecific competition from exotics

TRADE:

Trade: Domestic, commercial

Parts in trade: Bark, fruits, leaves

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: 100 years

Population trends past/present: > 20% decline in last 10 years.

Population trends - future: > 20% decline predicted in next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal sighting, literature, Indirect information

Recent field studies: SFRI, Jabalpur Station, MP State, 1997, Status of NTFPs in MP State

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: **Alacd** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation), **2cd** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES:

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: FMP Transit Rules, 1961 applicable to Bael fruit

Known presence in P.A.s: Occurs in all National Parks, in Sacred Groves, 4 bird sanctuaries - Sailam, Sardapur, Karera, Ghatigem

Endorsed protection plans: No - protected around temple because of religious sentiments

RECOMMENDATIONS:

Supporting research: Survey, Genetic research (fruit), Taxonomic research

Management: Habitat management, monitoring, sustainable utilisation, public awareness, cultivation/plantation

Reason for Cultivation: Recommended for species recovery, preservation of live genome

Cultivation facilities: None

Species management program: Not at present; Recommended

Level of cultivation: Initiate programme within three years.

Cultivation techniques: Techniques known

GENERAL COMMENTS:

Held sacred by Hindu community - extensively planted near Hindu temples for leaves. found in Sacred groves. Overexploited due to religious sentiments and myths. Occurs in all National Parks and Sanctuaries. The roots are sweet astringent, bitter and febrifuge and useful in diarrhoea. Pulp of ripe fruit aromatic cooling, laxative. Unripe fruit astringent, in diarrhoea. Decoction of the bark is used in intermittent fever.

Sources: Other References: 4 (See end of report)

Compilers: P. C. Kotwal, P.C. Sutar, M. Mullick, K. D. Mehra, S.R. Azad, S. K. Agarwal, B. Joshi, M. Gopalakrishnan

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotetele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Andrographis paniculata* (Burm.f.) Wall. ex. Nees
Justicia paniculata Burm.f.

Family: Gentianaceae

Common name(s): Kadu, Chirrata, Larmul, Bhuineem, Kaalmeg, Kirayat (Hindi), Bhunimba (Ayurvedic), Kirata (Sanskrit), Creat, King of bitters (English)

Taxonomic status: Species

Habit or life form: Erect annual herb (Much branched)

Habitat of taxon: Tropical dry and moist deciduous forest

Habitat specificity/niche: Plains - open canopy forest, Valleys, Riparian

TAXON DISTRIBUTION:

India Distribution: UP, MP, Bihar, Orissa, Maharashtra, Gujarat, AP, Rajasthan except the top hills of Himalaya

Current Distribution in MP: Throughout MP

Elevation: 750 - 4000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Stable in area

Change in habitat quality: Decrease in quality

THREATS:

Threats to habitat: Biotic pressures, soil erosion, climatic changes, grazing, habitat fragmentation, habitat loss due to exotic plants, trampling, edaphic changes

Threats to population: Harvest, harvest for medicine, over-exploitation, trade

TRADE:

Trade: Local, domestic, commercial

Parts in trade: Whole plant.

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: >2,500

Generation time: Annual

Population trends past/present: Increasing

Population trends - future: Unknown

INFORMATION SOURCE:

Data quality: General field study, informal field sighting, literature

Recent field studies: None

STATUS:

IUCN: LOWER RISK - LEAST CONCERN in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: Not listed

Known presence in P.A.s: In all P.A.'s of MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, limiting factor research, PHVA

Management: Habitat management, public awareness, genome resource banking, limiting factor management, cultivation

Reason for Cultivation: Education, research, preservation of live genome

Cultivation facilities: None

Species management program: Not at present ; Recommended

Level of cultivation: Initiate programme after 3 years

Cultivation techniques: Some techniques known

GENERAL COMMENTS: TFRI, Jabalpur, Standardisation of cultivation techniques, 1994-1996 CDRI Assessment of bitter principle for liver tonic, ongoing Substitute of *Swertia chirayita* therefore the pressure on the species is fast increasing which may eventually be a threat. Species is prized for its bitter principle kalmeghin, an alkaloid known as liver tonic and for the preparation of anti-malarial drug, blood purifier, and control of diabetes. Harvested thrice a year, pre-seed setting, fruiting stage and mature stage, a practise that is responsible for some decline in population. The plant is used for Malaria, liver diseases, chronic fever, leprosy, skin diseases, worms, pruritus and as a cooling agent and laxative. NBPGR, New Delhi is developing agro-technique for this species. This species was assessed as LR-1c in Southern India .

Sources: Pl. As. RAR. (1832). 3: 116
Other References: 1, 2, 3, 6 (See end of report)

Compilers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers: P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Anogeissus latifolia* (DC) Wall. ex. Bedd.
Family: Combretaceae
Common name(s): Dhawda, Dhawa, Bakla (Hindi), Gum-gatti (Trade name), Axel wood (English)

Taxonomic status: Species
Habit or life form: Tree
Habitat of taxon: Predominantly dry deciduous and in association with Sal
Habitat specificity/niche: Plains, open canopy forest

TAXON DISTRIBUTION:
India Distribution: All over the country except NE Indian states and J & K
Current Distribution in MP: All circles except Gwalior
Elevation: 750 - 2000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Contiguous

HABITAT INFORMATION:
Habitat Trends: < 20% decline in the last 10 years
Change in habitat quality: Stable

THREATS:
Threats to habitat: Damming, grazing, trampling, habitat loss (encroachment); loss of habitat due to exotic plants
Threats to population: Harvest, harvest for timber, over-exploitation, trade, trade of parts,

TRADE:
Trade: Local, domestic, commercial, international
Parts in trade: Branch/twigs, gum/resin

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 80 - 90 years
Population trends past/present: < 20% decline in the last 30 years
Population trends - future: Unknown

INFORMATION SOURCE:
Data quality: General field study, informal field sighting, literature
Recent field studies: Saxena, 1993-98 in Sarguja, Betul and Chindwara; G. N. Khatal, TFRI, 1970 - 75; Bisen, TFRI, 1993-94 in Central Madhya Pradesh

STATUS:
IUCN: LOWER RISK - NEAR THREATENED in State of Madhya Pradesh, India
Criteria based on: Not applicable
Other legislation: Manufacture of charcoal banned inside forest area
Known presence in P.A.s: Yes
Endorsed protection plans: None

RECOMMENDATIONS:
Supporting research: Survey, life history studies
Management: Monitoring, sustainable utilisation, public awareness
Reason for Cultivation: None
Cultivation facilities: None
Species management program: No; not required

Level of cultivation: Not applicable
Cultivation techniques: Techniques are known

GENERAL COMMENTS: Species related to culture (of indigenous community). Excellent for making agricultural implements. Wild animals expose injured parts to bark of tree. (This needs investigation.) Primary cause of habitat change is due to diversion to non-forest uses. Fuel wood is used as charcoal. The roots are astringent, acrid, thermogenic and stomachic. The bark is astringent, anti-inflammatory, used for urinary disorders, skin diseases and leprosy. The tree yields gum which is a good substitute for gum arabic which is chiefly built up of pentose and galactose.

Sources: Chopra, R.N., S.L. Nair and E.C. Chopra (1956). Glossary of Indian Medicinal plants. Council of Scientific and Industrial Research, New Delhi, 20 pp.
Indian Medicinal Plants. Orient Longman publishers, 163 pp.
Cat (1828). 4015

Other References: 2 (See end of report)

Compilers: F.B. Homji, S.S. Bisen, A. Pai, P. Bhattacharya, Saxena, P. Srivastava, S.N. Khotale, V. Paul, C. Bedi

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari

Species (and synonyms): **Asparagus racemosus** Willd. var. **javanicus** Baker
Family: Liliaceae
Common name(s): Shatawar, Shatawari, Shatmooli, Satmuli, Dhusar, Halyum (Hindi), Satavari (Sanskrit), Asparagus (English)

Taxonomic status: Variety
Habit or life form: Creeper (Herbaceous, Dioecious, 1-3 m. tall, Perennial straggler)
Habitat of taxon: Found in all habitats; grows well in fertile, well drained soil, moist temperate region with plenty of sun shine
Habitat specificity/niche: Plains-open and closed canopy forest; Hill slopes/sides; valleys

TAXON DISTRIBUTION:
India Distribution: Found throughout the country in tropical and sub-tropical region
Current Distribution in MP: Throughout MP
Elevation: Up to 3000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: One

HABITAT INFORMATION:
Habitat Trends: Decrease of > 20% in last 10 years; decrease of > 20% in next 10 years
Change in habitat quality: destructive exploitation
Decrease in quality due to grazing, fire,

THREATS:
Threats to habitat: Damming, grazing, loss of habitat, trampling, edaphic changes, drought, fire
Threats to population: Harvest for medicine, overexploitation, trade for market or medicine, trade of parts, destructive extraction techniques

TRADE:
Trade: Local, domestic, commercial, international
Parts in trade: Root

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: Annual
Population trends past/present: > 20% decline in last 10 years
Population trends - future: > 20% decline in next 10 years

INFORMATION SOURCE:
Data quality: General field study, informal field sighting, literature, indirect information
Recent field studies: SFRI Bulletin, Jabalpur, 1997, Status of NTFPs in MP; IGKVV, Raipur - Mr. Sind (Asst. Prop), Jabalpur, 1996, cultivation practices of *A. racemosus*

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **Alacd** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation), **2cd** (Population reduction predicted due to future decline in area of occupancy, extent of

occurrence and/or quality of habitat and due to actual or potential level of exploitation)
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: MP transit rules apply to Shatawar
Known presence in P.A.s: In all P.A.'s in MP
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, taxonomic research, biochemical research
Management: Habitat management, monitoring, sustainable utilisation, public awareness, genome resource banking, cultivation
Reason for Cultivation: For species recovery, research, preservation of live genome
Cultivation facilities: Yes; tissue culture
Species management program: Not at present
Level of cultivation: Initiate programme within 3 years
Cultivation techniques: Techniques known

GENERAL COMMENTS:

An easily cultivable species for propagation, suitable habitat very important for seed based propagation. Illegal international trade abounds; need for legislation. Extraction techniques are very exploitative. Wild form has inferior value. There is a need for genetic improvement of quality ex situ. Population is highly fragmented because of its habit - climber. Found on forest floor in miscellaneous parts. Roots are bitter sweet, have cooling effect used as an aphrodisiac and also for tuberculosis, bronchitis, gonorrhoea, leucorrhoea, epilepsy and cardiac debility

Sources:

SOC (1875) 14: 624
Flora of British India. 6: 316
Cooke 3: 270
Other References: 1, 2, 3, 4 (See end of report)

Compilers:

A.A. Boaz, P.C. Kotwal, P. Bhattacharya, S.K. Agarwal, M. Gopalakrishnan, B. Joshi, S. K. Dubey, K. D. Mehra, M. Victor, V.L. Pandey, P.C. Sutar

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Mullick, S.R. Azad, B. Joshi, F.B. Homji, S.N. Khotele, V. Paul, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Bauhinia vahlii* Wight and Arn.
Family: Caesalpinaceae
Common name(s): Mahul, Maljhan, Jallur (Hindi), Chambul (Marathi), Camel's foot climber (English)
Taxonomic status: Species
Habit or life form: Gigantic woody climber (Liana)
Habitat of taxon: Common in teak, sal, mixed and miscellaneous forests, particularly up to 3000 ft.
Habitat specificity/niche: Along valleys and wetter parts

TAXON DISTRIBUTION:
India Distribution: Found throughout the country, up to 3000 ft; principally in mixed and sal forest
Current Distribution in MP: Throughout MP within 3000 ft. in dense forests
Elevation: Upto 3000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2000
Number of locations: Contiguous in the sal and teak zone

HABITAT INFORMATION:
Habitat Trends: > 20 % decrease in habitat over 10 years; > 20% decline in habitat predicted in next 10 years due to grazing, management plans that prescribe removal of climbers, etc. clearing, cleaning operations.
Change in habitat quality: Decrease in quality due to management prescriptions, overgrazing, resulting in degradation of habitat.

THREATS:
Threats to habitat: Damming, grazing, loss of habitat, habitat loss due to exotic plants, drought, fire
Threats to population: Harvest, over-exploitation, trade for market, trade of parts for making plates (leaves), lack of regeneration

TRADE:
Trade: Local, domestic, commercial
Parts in trade: Bark, leaves, branch/ twigs, seeds

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 50 years
Population trends past/present: > 20 % in last 10 years
Population trends - future: > 50% in next 10 years due to trade related threats

INFORMATION SOURCE:
Data quality: General field studies, literature, indirect information
Recent field studies: SFRI, Jabalpur, Raipur, 1997, Status of NTFPs in MP; MPMFP data, MP, current, Data on MFP's of MP; All working plans and resource surveys, MP, Surveys and dates from Resource survey of working plan areas

STATUS:
IUCN: **ENDANGERED** in State of Madhya Pradesh, India
Criteria based on: A2cd (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)
CITES: Not listed

National wildlife legislation:	Not listed
National Red Data Book:	Not listed
International Red data book:	Not listed
Other legislation:	MP transit rules apply to mahul leaves
Known presence in P.A.s:	Present. More common in Pachmarhi NP
Endorsed protection plans:	None

RECOMMENDATIONS:

Supporting research:	Survey, PHVA
Management:	Habitat management, sustainable utilisation, public awareness, monitoring, trade
Reason for Cultivation:	Recommended for species recovery, education, trade
Cultivation facilities:	None
Species management program:	Not at present; Recommended
Level of cultivation:	Initiate programme within three years
Cultivation techniques:	Known

GENERAL COMMENTS:

A change in approach with respect to cutting down of all climbers as a blanket working plan prescription. This harms mahul. Large scale propagation through seeds in forest areas. It can be managed as a short rotation crop so that trees are not harmed. Short species being cut as being obnoxious. Species being cut as being obnoxious. Policy of removing climbers is causing decline and should be examined. Seeds are used as aphrodisiac. Bark fibre is used for rope making known as mohul rope. Leaves are demulcent, mucilaginous and are used as dona and pattal.

Sources:

Prodr. (1834) 297

Compilers:

A.A. Boaz, P.C. Kotwal, P. Bhattacharya, S.K. Agarwal, M. Gopalakrishnan, B. Joshi, S.K. Dubey, K.D. Mehra, M. Victor, P.C. Sutar

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Mullick, S.R. Azad, V.L. Pandey, F.B. Homji, S.N. Khotetele, V. Paul, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Boswellia serrata* Roxb. ex. Colebr.
Family: Burseraceae
Common name(s): Salai, Salar, Luban (Hindi), Kunduru (Sanskrit), Indian Olibanum tree, Indian Frankincense (English)

Taxonomic status: Species
Habit or life form: Large sized tree
Habitat of taxon: Dry deciduous forests
Habitat specificity/niche: Plains - open canopy forest, Hill slopes/ sides, valleys

TAXON DISTRIBUTION:
India Distribution: Drier parts of Indian peninsula
Current Distribution in MP: Jhabua, Bhopal, Durg, Rajgarh, Indore, Rewa, Khandwa, Seoni, Shahdol, Surguja circles.
Elevation: Up to 1,000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Contiguous

HABITAT INFORMATION:
Habitat Trends: Decrease of > 20% in the last 10 years; decrease of > 20% predicted in next 10 years
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Biotic pressures, damming.
Threats to population: Harvest for medicine and timber, overexploitation for gum and resin, trade of parts, trade, lack of regeneration

TRADE:
Trade: Commercial
Parts in trade: Branch/ twigs, sap, gum/ resin

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 20 -25 years
Population trends past/present: > 50% decline in the last 10 years
Population trends - future: > 50% decline predicted in the next 10 years

INFORMATION SOURCE:
Data quality: General field studies, informal field sighting, literature, indirect information
Recent field studies: SFRI, 1984 -92, in MP

STATUS:
IUCN: **ENDANGERED** in State of Madhya Pradesh, India
Criteria based on: **Alad**(Observed population reduction due to actual or potential level of exploitation); **2d** (Population reduction predicted due to future decline in actual or potential level of exploitation)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: MP transit legislation rules apply; also gum extraction is banned
Known presence in P.A.s: In all PAs in MP
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research:	Industry based research and development
Management:	Monitoring, sustainable utilisation, public awareness, genome resource banking, cultivation
Reason for Cultivation:	Preservation of live genome
Cultivation facilities:	None
Species management program:	Not at present; Recommended
Level of cultivation:	Initiate programme after 3 years
Cultivation techniques:	Unknown
 GENERAL COMMENTS:	 Very crude methods of gum extraction practised (inspite of it being banned) is responsible for a decreased population numbers. Harvesting for packaging material is well controlled and does not pose a threat to salai species. Gum is sweet, bitter astrigent, antipyretic, antidysenteric, jaundice and arthritis. The bark is sweet and used in dysentery, ulcer and skin diseases
 Sources:	 As. Res. (1807) 9: 379
Other References:	3 (See end of report)
 Compilers:	 A.A. Boaz, P.C. Kotwal, P. Bhattacharya, S.K. Agarwal, M. Gopalakrishnan, B. Joshi, S.K. Dubey, K.D. Mehra, M. Victor, P.C. Sutar
 Reviewers:	 K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Eise, M. Mullick, S.R. Azad, V.L. Pandey, F.B. Homji, S.N. Khotale, V. Paul, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Buchanania lanzan Spreng.*
Buchanania latifolia Roxb.

Family: Anacardiaceae

Common name(s): Achar, Chirounji (Trade name) Charoli, Char (Hindi), Cuddapah almond, Almondette tree (English), Tapasya-priya (Sanskrit)

Taxonomic status: Species

Habit or life form: Medium sized tree

Habitat of taxon: Tropical dry deciduous forest

Habitat specificity/niche: Plains-open canopy forest, sal associate

TAXON DISTRIBUTION:

India Distribution: Southern, Central, and NE India but not found in Alpine regions

Current Distribution in MP: Present in all circles, abundant in Jagdalpur, Kanker, Raipur, Durg, Bilaspur, Sagar, Sarguja, Hoshangabad and lowest in Gwalior

Elevation: 500 - 3000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): < 500

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: < 20% decline in last 10 years and < 20% decline predicted in next 10 years

Change in habitat quality: Decrease

THREATS:

Threats to habitat: Biotic pressures, edaphic changes, loss of habitat, habitat loss due to exotic plants, pollution, powerlines, trampling, fire, landslide

Threats to population: Harvest, harvest for food, over-exploitation, browsing, trade of parts, interspecific competition, interspecific competition from exotics, pests, lack of regeneration, unscientific methods of collection.

TRADE:

Trade: Local, commercial

Parts in trade: Fruits (kernels), roots, leaves

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: about 50 years

Population trends past/present: > 20% decline in last 10 years

Population trends - future: < 20% decline predicted in next 10 years

INFORMATION SOURCE:

Data quality: General field study; informal field sighting, literature, indirect information

Recent field studies: Anupama Koliyar, November 1996 - May 1997 in Betul Forest division and Satpura National Park. S. Patnaik, 1997-98 in Chindwara

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: **Alacde** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and

the effects of introduced taxa, pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Ban on felling according to working plan and LRC, MP

Known presence in P.A.s: All P.A.s but sparse in Northern MP
Endorsed protection plans: None

RECOMMENDATIONS:
Supporting research: Survey, genetic research, life history studies, epidemiology
Management: Habitat management, wild population management, monitoring, sustainable utilisation, public awareness, cultivation
Reason for Cultivation: For species recovery, research, husbandry, trade
Cultivation facilities: Government nurseries
Species management program: Not at present; Recommended
Level of cultivation: Ongoing plantation programme to be intensified
Cultivation techniques: Known

GENERAL COMMENTS:
Loranthus (locally called Banda) is a major pest. Value addition vis a vis economically viable, socially acceptable, drying technology for the dry fruit so as to avoid deterioration by fungal attack. Chirouji oil is substitute to olive oil. Used in cosmetics and also used in leprosy treatment in unani and ayurvedic systems of medicine. Seed kernel is used as dry fruits in sweet preparation. Left over residue after oil extraction is used as cattle feed. The roots are acrid, astringent, cooling constipating, used for leprosy, skin diseases and diarrhoea. Leaves are cooling digestive expectorant, purgative, for leprosy and skin diseases. Fruits are sweet, sour cooling emollient, nervine tonic, cardiologic, aphrodisiac used for cardiac debility and abdominal disorders.

Sources: Other References: 6 (See end of report)

Compilers: K.M. Parikh, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

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Species (and synonyms): *Butea monosperma* (Lam.) Taubert
Butea frondosa Koenig ex. Roxb.
Erythrina monosperma Lam.
Plasa monosperma Kuntze

Family: Fabaceae (Papilionaceae)

Common name(s): Palas, Dhak, Cheola, Tesu (Hindi), Flame of the Forest (English), Bengal kino (Trade name)

Taxonomic status: species

Habit or life form: Small deciduous tree, 15 m ht.

Habitat of taxon: Sal and mixed forests and also on wastelands.

Habitat specificity/niche: Plains-open canopy forest; hill slopes/sides; valleys; occurs also in wastelands

TAXON DISTRIBUTION:

India Distribution: All over India except above 3000 ft. altitude

Current Distribution in MP: All circles of MP

Elevation: 900 - 2000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: Stable

Change in habitat quality: No

THREATS:

Threats to habitat: Fire

Threats to population: Harvest, Overexploitation, Trade for market or medicine

TRADE:

Trade: Local, commercial

Parts in trade: Bark, flowers (colouring matter), Root (Dye), leaves, branch/twigs (Rangini crop of Lac), Gum/resin

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: 20-25 years

Population trends past/present: Stable

Population trends - future: < 20% decline as a result of trade - no time limit given

INFORMATION SOURCE:

Data quality: General field study, informal field sighting, indirect information

Recent field studies: SFRI, Eastern MP (Chattigarh) 1996, Status of NTFP in MP (with ref. Lac) + Palas leaves and flowers. Development alternatives, 1995 in Bundel Khand

STATUS:

IUCN: LOWER RISK - LEAST CONCERN in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: None

Known presence in P.A.s: All national parks and sanctuaries of Madhya Pradesh

Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Genetic research, biochemical research (for different varieties - white and yellow (saffron) varieties)

Management: Monitoring, Genome Resource Banking (white and yellow variety), cultivation (only white and yellow variety)

Reason for Cultivation: For preservation of live genome

Cultivation facilities: None

Species management program: No and not recommended

Level of cultivation: Not applicable

Cultivation techniques: Some techniques known

GENERAL COMMENTS:

The tree is exploited for all its parts, i.e. leaves, fruits, gum-resin and flowers (dyes) and also roots. The tree is not allowed to grow in form of a tree as it is hacked / cut down by the local population for leaves and fruits. It grows/survives in form of bushes in the wasteland, cultivated agricultural activities. No of trees of white variety and yellow variety is very low (<100). The bark is acrid, bitter astringent, thermogenic, emollient, aphrodisiac, appetiser, digestive. The leaves are astringent, antiinflammatory, aphrodisiac, used to cure pimples, boils and colic. The flowers are astringent, sweet cooling, constipating, aphrodisiac and used for birth control. The seeds are purgative ophthalmic, anthelmintic and used in curing herpes skin diseases and ringworm. The Gum is known Bengal kino.

Sources: Development Alternatives (1995). Report on Biomass enterprises - leaf plate making Upadhye, A.S., M.G. Kumbhojkar and D.K. Kulkarni (1997). Ethno-medico botany of some sacred plants of western Maharashtra. Ethno-botany 9 (65-68), Deep Publications, New Delhi
Other References: 3 (See end of report)

Compilers: A.A. Boaz, P.C. Kotwal, P. Bhattacharya, S.K. Agarwal, M. Gopalakrishnan, B. Joshi, S.K. Dubey, K.D. Mehra, M. Victor, P.C. Sutar

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Mullick, S.R. Azad, V.L. Pandey, F.B. Homji, S.N. Khotete, V. Paul, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Celastrus paniculatus* Willd.
Celastrus montana Wt. and Arn.

Family: Celastraceae

Common name(s): Jyothishmati (Sanskrit), Malkangani (Hindi)

Taxonomic status: Species

Habit or life form: Large climbing shrub

Habitat of taxon: Dry, moist deciduous forest

Habitat specificity/niche: Along streams and slopes. Plains - open and closed canopy; hill slopes and valleys

TAXON DISTRIBUTION:

India Distribution: Found throughout the greater part of India

Current Distribution in MP: Throughout MP. More frequent in moist areas.

Less common in dry areas

Elevation: Up to 4000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: > 20% decrease in last 10 years due to clearfelling of forest and cutting of climbers for silviculture

Change in habitat quality: Decrease due to decrease in rainfall, reduction in forest cover and biotic pressure

THREATS:

Threats to habitat: Loss of habitat, habitat loss due to exotic plants, trampling, edaphic changes, clearfelling of forests for plantation

Threats to population: Harvest for medicine, over-exploitation, interspecific competition from exotics

TRADE:

Trade: Domestic, commercial, international

Parts in trade: fruits, seeds

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: Perennial

Population trends past/present: > 50% decline in last 10 years

Population trends - future: > 50% decline predicted for next 10 years

INFORMATION SOURCE:

Data quality: Census or monitoring, general field study, informal field sighting, literature, indirect information

Recent field studies: SFRI, 1988 in Jabalpur, Bilaspur, Chindwara, Mandla, Jabalpur, Bastar (Integrated project MPCST)

STATUS:

IUCN: **ENDANGERED** in State of Madhya Pradesh, India

Criteria based on: **1cde** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites), **2cde** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of

exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES: Not listed

National wildlife legislation: Banned by Government of India in the form of raw material or medicine National Red National Red

Data Book: Not listed

International Red data book: Not listed

Other legislation: None

Known presence in P.A.s: All Pas in MP

Endorsed protection plans: Banned for trade by GOI

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies

Management: Habitat management, monitoring, sustainable utilisation, public awareness, limiting factor management, cultivation

Reason for Cultivation: For education, reintroduction, research, preservation of live genome

Cultivation facilities: No

Species management program: Not at present; Recommended

Level of cultivation: Initiate programme within three years

Cultivation techniques: Some techniques known

GENERAL COMMENTS:

In MP there is a debate on changing the policy that "climbers should not be cut" because of the importance of such species. The debate calls for change in the policy. Species valued for oil from seeds. Oil used as a Nervine tonic (paralysis remedy), rheumatism. This species assessed as LR-nt in Lucknow CAMP and as Vulnerable in Southern India. NBPGR regional station, Ranchi is developing agro-technique for this species. The bark is used for abortions and as brain tonic. The leaf sap is a good antidote for opium poisoning. The seeds are acrid, bitter, thermogenic, emollient, stimulant, intellect promoting, digestive, laxative, emetic, expectorant, appetiser, aphrodisiac and cardio tonic.

Sources: Sp. Pl. (1797). 1: 1125
Other References: 1, 2, 3, 7, 8 (See end of report)

Compilers: S.S. Bisen, S. N. Khotale, S. Patnaik, V. Paul, P. Bhattacharya, F.B. Homji, A. Pai, C. Bedi

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Centella asiatica* (L.) Urban
Hydrocotyle asiatica L.

Family: Apiaceae

Common name(s): Brahmi (Sanskrit, Hindi), Indian pennywort, Asiatic pennywort (English), Manduki, Brahma (Hindi), Manduka parni (Sanskrit)

Taxonomic status: Species

Habit or life form: Runner (prostrate) Herb

Habitat of taxon: Moist areas (Marshy places especially along irrigation cannoys

Habitat specificity/niche: Riparian

TAXON DISTRIBUTION:

India Distribution: UP, HP, WB, Orissa, Bihar, Karnataka

Current Distribution in MP: Bilaspur, Shandol and Sarguja circles (frequently) but found all over the state

Elevation: Up to 5000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): >2,000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Decrease of > 20% in the last 10 years
Decrease of > 20% in the next 10 years in riparian area

Change in habitat quality: Decrease in quality due to change in water regimes

THREATS:

Threats to habitat: Unknown

Threats to population: Trade

TRADE:

Trade: Domestic, commerical

Parts in trade: Leaves, Branch/twigs, whole plant

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: Perennial

Population trends past/present: > 20% decline in the last 10 years

Population trends - future: > 20% decline in the next 10 years

INFORMATION SOURCE:

Data quality: Census or monitoring, General field study, Literature, Indirect Information

Recent field studies: CDRI, 1991 onwards, Evaluation of Phytochemical Properties; Indian Council of Ayurveda and Siddha. TFRI, since 1994, Germplasm collection.

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: Alcd (Observed popopulation reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation); 2cd (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red Data Book: Not listed

Other legislation: Not listed
Known presence in P.A.s: Yes in the circles Bilaspur, Shahdol and Sarguja and others
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, life history, limiting factor
Management: Habitat management, monitoring, sustainable utilisation, genome resource banking, limiting factor management, cultivation
Reason for Cultivation: Recommended for education, reintroduction, research, preservation of live genome
Cultivation facilities: No
Species management program: Not present; recommended
Level of cultivation: Initiate programme within 3 years
Cultivation techniques: Techniques for similar taxa known

GENERAL COMMENTS:

There are three plants known by the name Brahmi. The original Brahmi is *C. rotundifolia*. There is another Brahmi known as *Bacopa moneri*. The original Brahmi is in short supply; the other two are used as substitutes in North India. All three are used to manufacture medicines for mental disorders, hysteria, and as a tonic and hair oil. The plant is used for treating skin diseases, leprosy and blood disorders. Leaves taken as tonic for improving memory and treating syphilitic and skin diseases. NBPGR regional station, Cuttack is developing agro-technique for this species.

Sources:

Anon. Indian Medicinal Plants.
Katewa, S.S. and A. Arora (1997). Some plants in folk medicine of Udaipur dist., (Rajasthan), 9 (48-51), Deep Publications, New Delhi.
Other References: 1, 2, 3 (See end of report)

Compilers:

S.S. Bisen, S. N. Khotele, S. Patnaik, V. Paul, P. Bhattacharya, F.B. Homji, A. Pai, C. Bedi

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Chlorophytum borivillianum* Santapau and Fernandez

Family: Liliaceae

Common name(s): Safed musli, Dhauli musli (Hindi), Sweta musli (Sanskrit)

Taxonomic status: Species

Habit or life form: Herb

Habitat of taxon: Open mixed teak forest

Habitat specificity/niche: Plains - open canopy forest, Hill slopes/sides

TAXON DISTRIBUTION:

India Distribution: Gujarat, Rajasthan, MP

Current Distribution in MP: Hoshangabad, Khandawa, Indore, Sagar, Bhopal. Rewa

Elevation: 500 - 2500 ft.

Range (Sq. km.): < 20,000

Area Occupied (Sq. km.): < 500

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: > 20 % decrease over the last 10 years; > 50 % decline in next 10 years due to biotic pressure and decrease in forest cover

Change in habitat quality: Decrease in quality due to biotic pressure and fire

THREATS:

Threats to habitat: Grazing, trampling, fire, habitat loss due to exotic plants

Threats to population: Harvest, harvest for medicine, harvest for food, overexploitation, trade for market or medicine

TRADE:

Trade: Local, domestic, commercial

Parts in trade: Rhizome/ tuber

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: 1 year

Population trends past/present: > 50 % decline in last 10 years

Population trends - future: > 50 % decline predicted in next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting

Recent field studies: Trivedi, Indore, 1994/95, Identification of different species, chemical analysis, seed germination for seed dormancy; Mittal, J. D., Jalgaon, Maharashtra, 1995, Mittal Musli Farm-cultivation

STATUS:

IUCN: **ENDANGERED** in State of Madhya Pradesh, India

Criteria based on: **Alcd** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation); **2cd** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Rare (1988)

International Red data book:	Not listed
Other legislation:	MP Transit Rules 1961 applicable
Known presence in P.A.s:	All protected areas except Gwalior circle
Endorsed protection plans:	No
RECOMMENDATIONS:	
Supporting research:	Survey, seed germination
Management:	Habitat management, sustainable utilisation, public awareness, cultivation
	Reason for Cultivation: For research and preservation of live genome
Cultivation facilities:	Unknown
Species management program:	Yes
Level of cultivation:	Ongoing programme intensified or increased
Cultivation techniques:	Techniques known
GENERAL COMMENTS:	
	Flowers occur in August to September. Unsustainable exploitation of the tubers which doesn't allow seed-dispersal when the plant is still flowering, leaves and flowers are used as vegetables affecting regeneration. Four species are found in MP - <i>C. arundinaceum</i> , <i>C. borivillianum</i> , <i>C. tuberosum</i> , <i>C. laxum</i> . Tuberous root is used as tonic.
Sources:	Nair, MP and A.R.K. Sastry (1988). Red Data book of Indian Plants, Vol. II. Botanical Survey of India, Calcutta
Compilers:	P. C. Kotwal, P.C. Sutar, M. Mullick, K. D. Mehra, S.R. Azad, S. K. Agarwal, B. Joshi, M. Gopalakrishnan
Reviewers:	K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotetele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Costus speciosus* (Koen. ex. Retz.) Sm.
Family: Zingiberaceae
Common name(s): Keokend, Kenka, Keu (Hindi), Kyi (Bangla), K
emuka (Sanskrit), Spiral ginger (English)
Taxonomic status: Species
Habit or life form: Shrub (four to ten ft. tall)
Habitat of taxon: Tropical deciduous forests
Habitat specificity/niche: Plains - open canopy forest, valleys, riparian,
thrives in moist soil.

TAXON DISTRIBUTION:
India Distribution: Bihar, UP, HP, MP, WB, Assam, Meghalaya, Orissa
Current Distribution in MP: Circles Jagdalpur, Kanker, Raipur, Durg,
Bilaspur, Calaghat, Chindwara, Betul, Sarguja,
Hoshangabad
Elevation: up to 4000 ft.
Range (Sq. km.): < 5000
Area Occupied (Sq. km.): < 500
Number of locations: Unknown; Fragmented

HABITAT INFORMATION:
Habitat Trends: > 20% decline in the last 10 years. < 20%
decline predicted in the next 8-10 years.
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Biological/natural factors; degradation of
forests; grazing, habitat loss, habitat loss due
to exotic plants, power lines, trampling,
climate, edaphic changes
Threats to population: Harvest, harvest for medicine, over-
exploitation, trade of parts, inter-specific
competition from exotics, inter-specific
competition from livestock,

TRADE:
Trade: Local, domestic, commercial
Parts in trade: Rhizomes

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2500
Generation time: Annual
Population trends past/present: < 20% decline in the last 10 years
Population trends - future: > 20% decline predicted in the next 10 years

INFORMATION SOURCE:
Data quality: General field studies, information field
sighting, literature
Recent field studies: Unknown

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **A2cde** (Population reduction predicted due to
future decline in area of occupancy, extent of
occurrence and/or quality of habitat and due to
actual or potential level of exploitation and
the effects of introduced taxa, hybridisation,
pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed

Known presence in P.A.s: All P.A.s in MP
 Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, limiting factor research, epidemiology, PHVA
 Management: Habitat management, wild population management, public awareness, genome resource banking, cultivation.
 Reason for Cultivation: For species recovery, reintroduction, research, preservation of live genome
 Cultivation facilities: Amarkanta, Jabalpur, Bilaspur, Jagdalpur
 Species management program: Yes
 Level of cultivation: Ongoing programme should be intensified
 Cultivation techniques: Known

GENERAL COMMENTS:

There is an urgent need for compilation of information in different centres in India and in MP (need of data base). Information is very scanty. RRL, Jammu has worked on this species. TFRI has germ plasm collection and agrotechnology for the state. Root is bitter, astringent, purgative, depurative, stimulant and used to treat snake bite.

Sources:

Task Force, MP Forest Development Corporation - Exhibition held on 30th September 1997 at IAA in Bhopal, organised by SFRI, Jabalpur
 Other References: 2, 3 (See end of report)

Compilers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers:

P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Curculigo orchioides* Gaertn.
Family: Hypoxidaceae
Common name(s): Kali musli, Musalikand, Tallura (Hindi),
Mushali, Talamuli (Sanskrit), Black muscale
(English)
Taxonomic status: Species
Habit or life form: Annual herb
Habitat of taxon: Dry deciduous and moist deciduous forest
Habitat specificity/niche: Plains, open canopy and closed canopy forest

TAXON DISTRIBUTION:
India Distribution: Throughout the country except temperate zone
(JandK)
Current Distribution in MP: Throughout MP
Elevation: 750 - 3000 ft.
Range(Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2000
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: Stable in the past but less than 20% decline
predicted in the next 10 years
Change in habitat quality: No change

THREATS:
Threats to habitat: Biotic pressure, loss of habitat, grazing,
habitat loss due to exotic plants, trampling
Threats to population: Harvest for medicine, over-exploitation, trade,
predation by wild boar, bear.

TRADE:
Trade: Local, domestic, commercial
Parts in trade: Fruit, root

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2500
Generation time: Annual
Population trends past/present: < 20% decline in the last 10 years
Population trends - future: < 20% decline predicted in the next 10 years.

INFORMATION SOURCE:
Data quality: General field study, informal field sighting,
literature, indirect information
Recent field studies: TFRI, 1994 ongoing, germ plasm collection from
all over MP

STATUS:
IUCN: LOWER RISK - NEAR THREATENED in State of Madhya
Pradesh, India
Criteria based on: Not applicable
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed
Known presence in P.A.s: All P.A.s in MP
Endorsed protection plans: None

RECOMMENDATIONS:
Supporting research: Survey, life history studies, limiting factor
research

Management: Habitat management, sustainable utilisation, public awareness, genome resource banking, limiting factor management, cultivation
Reason for Cultivation: For education, research, preservation of live genome
Cultivation facilities: None
Species management program: No species management programme but recommended
Level of cultivation: Initiate programme after 3 years
Cultivation techniques: Some techniques known

GENERAL COMMENTS: Medicinal use, Ayurvedic preparations, tonics and leucorrhoea TFRI, Jabalpur is conducting an ongoing programme on germ plasm studies. Rhizome is used for piles, jaundice, asthma, diarrhoea and as aphrodisiac and paultice for itch and skin diseases. NBPGR regional station, Trichur is developing agro-technique for this species.

Sources: Fruct (1788): 1: 63, t16, FBI 6: 279
 Cooke. 3: 225
 Other References: 2, 3 (See end of report)

Compilers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Feer, A. Kolyial, S.S. Bisen

Reviewers: P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Curcuma angustifolia* Roxb.
Family: Zingiberaceae
Common name(s): Tikhur (Hindi), East Indian arrowroot (English)
Taxonomic status: Species
Habit or life form: Herb
Habitat of taxon: Found in moist, cool areas, (sal forest), Moist deciduous forests
Habitat specificity/niche: 1500 - 2000 ft.

TAXON DISTRIBUTION:
India Distribution: Western peninsular
Current Distribution in MP: Throughout MP except in Western MP. Specially found in Bastar, Mandla, Sarguja, Jabalpur, Kanker and Bilaspur circles

Elevation:
Range (Sq. km.): < 20,000
Area Occupied (Sq. km.): < 2000
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: > 20% decline in last 10 years; > 20% decline anticipated in next 10 years
Change in habitat quality: Decrease in habitat quality due to grazing, trampling, extraction in excess of sustainability

THREATS:
Threats to habitat: Unknown
Threats to population: Trade for parts

TRADE:
Trade: Local, domestic, commercial, International
Parts in trade: Rhizome, Tuber (underpart modification of stem)

POPULATION INFORMATION:
Indian population: Unknown
MP population: none
Number of mature individuals: > 2500
Generation time: Annual
Population trends past/present: > 20% decline over last 10 years
Population trends - future: > 20% decline projected in next 10 years due to habitat loss, threats and trade

INFORMATION SOURCE:
Data quality: General field study, Informal field sighting, literature, indirect information
Recent field studies: SFRI, Entire MP, 1976, Status of NTFPs in MP; Central tuber Cooperative Research Institute, Coimbatore, 1980s, Biochemical studies on Tikhur

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: Alacd (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation); 2cd (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed

Other legislation: Transit rules apply to Tilephur tubers in MP
Known presence in P.A.s: in all P.A.s in Eastern MP
Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Survey, Biochemical research
Management: Monitoring, Habitat management, Sustainable
utilisation, Cultivation, Public awareness,
Limiting factor management for fire, extraction
techniques
Reason for Cultivation: Recommended for species recovery, education,
research
Cultivation facilities: None
Species management program: No at present; Recommended
Level of cultivation: Should initiate programme within three years
Cultivation techniques: Techniques known

GENERAL COMMENTS:

It is a major nutrient supplement for tribals especially during summer; hence recommend cultivation in these areas - contributes to food security of tribals in lean season. Scientific extraction techniques need to be developed especially for retaining its medicinal properties. Used in pharmaceutical industries and in the preparation of sherbet. It has been assessed as LR-nt at Lucknow CAMP. Rhizome is demulcent, nutritious and contains starch which is used as substitute for true arrowroot from *Maranta arundinacea*

Sources: Other References: 2, 8 (See end of report)

Compilers: A.A. Boaz, P.C. Kotwal, K.D. Mehra, M. Mullick,
P.C. Sutar, S.R. Azad, B. Joshi, M.
Gopalakrishnan S. K. Dubey, V. L. Pandey, M.
Victor, S. K. Agarwal.

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V.
K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C.
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Dubey, F.B. Homji, S.N. Khotetele, V. Paul, P.
Bhattacharya, C. Bedi, N. Ram Prasad, K.M.
Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Curcuma aromatica* Salisb
Curcuma zedoaria Roxb. non Rose.

Family: Zingiberaceae

Common name(s): Jungli hanldi, Kachura, Kasturi haldi (Hindi),
Wild turmeric, Yellow zedoary (English), Vana-
haridra, Sati (Sanskrit)

Taxonomic status: Species

Habit or life form: Annual herb

Habitat of taxon: Moist deciduous forest, understory

Habitat specificity/niche: Plains - closed canopy forest

TAXON DISTRIBUTION:

India Distribution: Throughout the country except in temperate zone
and dry deserts

Current Distribution in MP: Throughout MP

Elevation: 800 - 4000 ft

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Unknown; Fragmented

HABITAT INFORMATION:

Habitat Trends: < 20% decline in last 10 years. < 20% predicted
in next 10 years.

Change in habitat quality: Decrease in quality

THREATS:

Threats to habitat: Biotic pressures, climatic factors, habitat
fragmentation, habitat loss due to exotic
plants, trampling, fire

Threats to population: Harvest, harvest for medicine, over-
exploitation, trade, inter-specific competition
from exotics, inter-specific competition from
livestock, predation by wild boar

TRADE:

Trade: Local, domestic, commercial

Parts in trade: Rhizomes

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: Annual

Population trends past/present: < 20% decline in last 10 years

Population trends - future: < 20 % decline predicted in next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting,
literature

Recent field studies: Unknown

STATUS:

IUCN: **LOWER RISK - LEAST CONCERN** in state of Madhya
Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: None

Known presence in P.A.s: In all P.A.'s in MP but lowest in Gwalior circle

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, limiting factor research, epidemiology

Management: Habitat management, wild population management, sustainable utilisation, genome resource banking, limiting factor management, public awareness, cultivation.

Reason for Cultivation: For species recovery, reintroduction, research, preservation of live genome

Cultivation facilities: SFRI, Jabalpur, Amarkantak, Bilsapor, Jagdalpur

Species management program: Not at present

Level of cultivation: Not recommended

Cultivation techniques: Known

GENERAL COMMENTS: Rhizomes used as flavouring agent and condiment. Dry rhizomes are exported. Cultivation especially in Andhra Pradesh (Rajamundry). Tonic made from rhizome is carminative, externally applied in combination with astringent, bitter and aromatic to bruises and sprains and to promote eruptions in snake bite.

Sources:

Compilers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers: P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotete, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Curcuma caesia* Roxb.
Family: Zingiberaceae
Common name(s): Kali haldi, Nar-kachura (Hindi), Black zedoary (English)
Taxonomic status: Species
Habit or life form: Annual shrub
Habitat of taxon: Moist deciduous forest (undergrowth)
Habitat specificity/niche: Riparian

TAXON DISTRIBUTION:
India Distribution: MP, WB, Orissa
Current Distribution in MP: Rare in MP, WB, Orissa
Elevation: Up to 2000 ft.
Range (Sq. km.): < 5000
Area Occupied (Sq. km.): < 500
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: Unknown
Change in habitat quality: Unknown

THREATS:
Threats to habitat: Unknown
Threats to population: Harvest for medicine, overexploitation, trade in the part
Trade: Presently not traded
Parts in trade: Rhizome

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: < 2500
Generation time: Annual
Population trends past/present: > 80% decline in last 30 years
Population trends - future: > 80% decline predicted in next 10 years

INFORMATION SOURCE:
Data quality: Monitoring, general field study, informal field sighting, literature
Recent field studies: TFRI, 1994 ongoing, survey and collection of germ plasm in Madhya Pradesh

STATUS:
IUCN: **CRITICALLY ENDANGERED** in State of Madhya Pradesh, India
Criteria based on: A2cd (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Negative list of exports
Known presence in P.A.s: Achanakmar WLS, Bastar-Kanger Valley WLS
Endorsed protection plans: No

RECOMMENDATIONS:
Supporting research: Survey, genetic research, taxonomic research, life history studies, limiting factor research, PHVA
Management: Habitat management, wild population management, monitoring, public awareness, genome resource banking, limiting factor management, cultivation

Reason for Cultivation: for species recovery, education, reintroduction, research, preservation of live genome

Cultivation facilities: TFRI, Jabalpur; SFRI, Jabalpur; Shiv-Tarai Forest Sanctuary Nursery

Species management program: No existing programme but very strongly recommended

Level of cultivation: Ongoing cultivation programme should be intensified

Cultivation techniques: Some techniques known

GENERAL COMMENTS: Once widely used as remedy for asthma; due to over-exploitation and reasons Unknown, species population has declined in the wild. It is presently threatened with extinction in the next five to six years. May be of importance in Tantric medicine. The plant is so rare that trade is no longer possible. This species was assessed as CR at Lucknow CAMP. Rhizome is an aromatic stimulant carminative used externally for sprain and bruises.

Sources: Singh, U. et al., (1990). Dictionary of economic plants of India. ICAR, 62 pp.
Other References: 2, 8 (See end of report)

Compilers: S.S. Bisen, S.N. Khotele, F.B. Homji, V. Paul, C. Bedi, A. Pai

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, P. Bhattacharya, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Cyperus rotundus* L.
Cyperus hexastachyos Rottb.
Family: Cyperaceae
Common name(s): Motha (Hindi), Nut grass (English), Masta (Sanskrit)
Taxonomic status: Species
Habit or life form: Perennial sedge
Habitat of taxon: Found in a wide variety of climatic conditions
Habitat specificity/niche: Plains - open and closed canopy; hill slopes/sides and valleys

TAXON DISTRIBUTION:
India Distribution: Found throughout the country in 500 - 2000 altitude range
Current Distribution in MP: Throughout MP growing as a weed.
Elevation: 500 - 2000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2000
Number of locations: Contiguous

HABITAT INFORMATION:
Habitat Trends: < 20% decrease in the last 10 years ; < 20 % predicted over next 10 years
Change in habitat quality: Decrease caused by preponderance of this weed itself and other like it

THREATS:
Threats to habitat: Unknown
Threats to population: Harvest for medicine, trade for market or medicine

TRADE:
Trade: Commercial, international
Parts in trade: Dry tubers

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: Annual, proliferates through tubers
Population trends past/present: Not declining
Population trends - future: < 20% decline predicted in next 10 years due to trade related exploitation

INFORMATION SOURCE:
Data quality: General field study, informal field sighting, literature, indirect information
Recent field studies: SFRI, Jabalpur, Entire MP, Bulletin on Status of NTFPs in MP

STATUS:
IUCN: LOWER RISK - LEAST CONCERN in State of Madhya Pradesh, India
Criteria based on: Not applicable
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: MP Forest Department transit rules apply; export is also restricted
Known presence in P.A.s: Present in all P.A.'s in MP
Endorsed protection plans: none

RECOMMENDATIONS:

Supporting research:	Genetic research, Biochemical studies
Management:	Monitoring, Sustainable utilisation, Public awareness, Geonme resource banking
Reason for Cultivation:	Education, Research
Cultivation facilities:	None; Not recommended
Species management program:	No; Not recommended
Level of cultivation:	Initiate programme after three years.
Cultivation techniques:	Techniques not known
GENERAL COMMENTS:	It is the spread of weeds species such as this which causes forest degradation. This is a weed that is found growing profusely to the extent that it can cause erosion of habitat quality for other, more useful forest species and agricultural crops. More controlled propagation will become necessary once awareness increases regarding its useful qualities, leading to over-exploitation for commercial purposes. Tuber is diuretic, emmenagogue anthelmentic, diaphroetic astringent stimulant, used for stomach disorder and irritation of the bowels.
Sources:	Sp. Pl. (1753). 45, FBI, 6: 614, Cooke 3: 385 Other References: 1 (See end of report)
Compilers:	P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V. L. Pandey, S. K. Dubey
Reviewers:	K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, F.B. Homji, S.N. Khotete, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Dioscorea hispida* Dennst.
Family: Dioscoreaceae
Common name(s): Baichandi (Hindi)
Taxonomic status: Species
Habit or life form: Climber (deeply rooted perennial vine)
Habitat of taxon: Moist deciduous forest
Habitat specificity/niche: Plains - closed canopy forest, riparian, predominantly in sal forest

TAXON DISTRIBUTION:
India Distribution: UP, WB, AP, Bihar, Orissa, Maharashtra, NE Indian states, MP
Current Distribution in MP: Throughout MP
Elevation: Up to 4000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: < 20% decline in last 10 years; > 20% decline predicted in next 10 years
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Loss of habitat, reduction in soil humidity, grazing, trampling, edaphic changes
Threats to population: Harvest for medicine and food, overexploitation, trade, interspecific competition from exotics.
Trade: Local; domestic, commercial
Parts in trade: Rhizome

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: Perennial
Population trends past/present: > 20% decline in last 10 years
Population trends - future: > 20% decline predicted in next 10 years

INFORMATION SOURCE:
Data quality: Monitoring, general field studies, literature
Recent field studies: SFRI, 1988 - 97, status survey in MP

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **Alcde** (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites), **2cde** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation:
Known presence in P.A.s: All PAs in MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, life history studies, limiting factor research, agrotechnology

Management: Habitat management, monitoring, sustainable utilisation, public awareness, limiting factor management, cultivation

Reason for Cultivation: Education, reintroduction, research

Cultivation facilities: None

Species management program: Recommended

Level of cultivation: Initiate cultivation within 3 years

Cultivation techniques: Some techniques known

GENERAL COMMENTS:

Used extensively by people for food along with thikhur since it is an excellent source of carbohydrates and can be preserved in the form of chips. Potential for commercial exploration as white starch. Production technology is known.

Sources:

Farooqu, A.A. and M.M. Khan (1993). Production technology of medicinal and aromatic crops. (31-34). First edition. Indian Herbs Research and Supply Company, Bangalore.

Compilers:

F.B. Homji, S.S. Bisen, S.N. Khotela, A. Pai, P. Bhattacharya, V. Paul, C. Bedi, S. Patnaik, P.C. Kotwal.

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Embllica officinalis* Gaertn.
Phyllanthus emblica L.

Family: Euphorbiaceae

Common name(s): Amla, Aonla (Hindi), Amlaka (Sanskrit), Indian gooseberry, Emblic (English)

Taxonomic status: Species

Habit: Tree (medium-sized)

Habitat: Associate tropical dry deciduous and tropical moist deciduous forest, plains, open and closed canopy forest, hill slopes and valleys.

TAXON DISTRIBUTION:

India Distribution: UP, WB, AP, TN, Bihar, Orissa, Maharastra, Gujarat, Rajasthan, Kerala, Karnataka, Goa, Pondicherry throughout tropical and sub-tropical India.

Current Distribution in MP: Throughout Madhya Pradesh

Elevation: 1000 -3000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: < 20% decline in the last 20 years

Change in habitat quality: Decrease

THREATS:

Threats to habitat: Fire, grazing, biotic pressure, introduced taxa (*Lantana camera*), soil erosion, hardening of soil

Threats to population: Harvest - for medicine, food and timber, loss of habitat, habitat fragmentation, over-exploitation, trade, inter-specific competition from exotics, inter-specific competition from livestock, lack of regeneration.

TRADE:

Trade: Local, domestic, commercial, international

Parts in trade: Fruits, leaves

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: 10 - 12 years

Population trends: > 20% decline in the last 10 years
> 20% decline in the next 10 years

INFORMATION SOURCE:

Data quality: General field study; informal field sighting; literature; indirect information.

Recent field studies: M. F. P. Federation, 1996-97, in MP; State Forest Research Institute, 1997, in Madhya Pradesh; Anupama Koliyal, 1996 -97 in Betul Forest Division and Satpura NP.

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: **1cde** (Observed popopulation reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites), **2cde** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat

and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed
Known presence in P.A.s: In all 34 sanctuaries & 11 national parks in MP
Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Survey, genetic research, taxonomic research, biochemical studies
Management: Habitat management, sustainable utilisation, public awareness, cultivation, improved harvesting techniques.
Reason for Cultivation: Unknown
Cultivation facilities: Clonal orchards, seed orchards, and plantations
Species management program: Required
Level of cultivation: Ongoing programme should be intensified or increased
Cultivation techniques: Known

GENERAL COMMENTS:

Emblica officinalis, Panna var., is much sought after due to its high quality. There is a special unit at Katni to extract / harvest Panna variety. This is by Dabar (used for Chyavan Prash tonic). Many myths are connected to Amla collection such as green amla is more beneficial for making tonic. The problem is that green amla is harvested by cutting the tree. If allowed to ripen the fruits can be harvested by simply shaking the tree. Ripening allows for enhanced alkaloid content in the fruit so the myth is untrue. Biochemical research is needed for Panna variety of fruit. Since most of the fruits are harvested, regeneration is limited and therefore a major threat to the recruitment and demography of the species in the future. Dry fruits used in treatment haemorrhage, diarrhoea and dysentery and to treat anaemia, jaundice and dyspepsia. Sherbet of Amla with lemon juice arrests acute bacillary dysentery. Fermented liquor used in treating jaundice, dyspepsia and cough. Seeds are used for asthma, bronchitis, biliousness.

Sources: Koliyal, A. 1997, (M.Sc. Dissertation)
Extraction of NTFP in Betul Forest Division and its impact on population structure of these species.
Sp. Pl. (1753). 982
Other References: 4 (See end of report).

Compilers: P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S.R. Asad, S. K. Agarwal, B. Joshi, M. Gopalakrishna, M. Victor, A.A. Boaz.

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotete, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Embelia tsjeriam-cottam* A. DC
Embelia ribes Burm.
Embelia robusta C.B, Clarke non Roxb.

Family: Myrsinaceae
Common name(s): Baibairang (Hindi), Vidanga (Sanskrit)
Taxonomic status: Species
Habit or life form: Large shrub or small tree
Habitat of taxon: Moist deciduous forest
Habitat specificity/niche: Plains - closed canopy forest, associated with sal

TAXON DISTRIBUTION:
India Distribution: Throughout greater part of India
Current Distribution in MP: Jagdalpur, Kanker, Raipur, Durg, Bilaspur, Calaghat, Chindwara, Betus, Jabalpur, Shahdol and Sarguja circles
Elevation: Up to 5000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Contiguous

HABITAT INFORMATION:
Habitat Trends: < 20% decline in last 10 years; < 20% decline in next 10 years.
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Habitat loss.
Threats to population: Harvest for medicine, overexploitation, trade, interspecific competition from exotics, lack of regeneration.

TRADE:
Trade: Local, domestic, commercial
Parts in trade: Fruits

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 10 years
Population trends past/present: < 20% decline in last 10 years
Population trends - future: > 20% decline predicted in next 10 years

INFORMATION SOURCE:
Data quality: General field studies, literature, indirect information
Recent field studies: Unknown

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **A2de** (Population reduction predicted due to future decline in actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed
Known presence in P.A.s: In PAs of sal zones
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, life history studies, limiting factor reearch

Management: Habitat management, wild population management, sustainable utilisation, cultivation

Reason for Cultivation: Species recovery, education, preservation of live genome

Cultivation facilities: None

Species management program: Not present currently, but recommended

Level of cultivation: Initiate programme in 3 years

Cultivation techniques: Some techniques known

GENERAL COMMENTS: Species is valued for medicinal uses (cough, dropsy, birth control pills), seeds used as adulterant with pepper. Exploitation is increasing and there is lack of regeneration. Production of seeds/ collection gone down due to reduction in sal forest. This species was assessed as EN in southern India.

Sources: Trans. Linn. Soc. (1837). XVII
Other References: 3, 7 (See end of report)

Compilers: F.B. Homji, S.S. Bisen, S.N. Khotele, A. Pai, P. Bhattacharya, V. Paul, C. Bedi

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Helicteres isora* L.
Family: Sterculiaceae
Common name(s): Maradphalli, Bhendu, Jhonkaphal (Hindi), East India Screw Tree (English); Marodphalli (Trade name)

Taxonomic status: Species
Habit or life form: Small tree (maximum 10 ft.)
Habitat of taxon: Tropical deciduous forest (Dry forests and open areas)
Habitat specificity/niche: Plains - open canopy forest; closed canopy forest

TAXON DISTRIBUTION:
India Distribution: Southern, Central, Northeastern India and northern India except temperate zones
Current Distribution in MP: All circles but abundantly found in Jagdalpur, Kanker, Raipur, Calaghat, Jabalpur, Rewa
Elevation: 700 - 2500 ft.
Range (Sq. km.): < 20,000
Area Occupied (Sq. km.): < 500
Number of locations: Unknown but Fragmented

HABITAT INFORMATION:
Habitat Trends: < 20% decline in the last 10 years and < 20 % decline predicted in the next 10 years
Change in habitat quality: Decrease

THREATS:
Threats to habitat: Biotic and natural pressures, grazing, habitat loss, habitat loss due to exotic plants, trampling, climate, edaphic changes
Threats to population: Harvest for medicine, browsing, trade of parts, interspecific competition from exotics, interspecific competition from livestock, harvest

TRADE:
Trade: Commercial
Parts in trade: Bark (dry), Fruits, Leaves

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: Unknown
Population trends past/present: < 20% decline in the last 20 years
Population trends - future: > 20% decline in the next 10 years

INFORMATION SOURCE:
Data quality: General field study; informal field sighting; literature
Recent field studies: Unknown

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **A2cde** (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed

Other legislation: Not listed
Known presence in P.A.s: Not listed
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, Genetic research, Life history studies, Limiting factor research, Epidemiology, PHVA
Management: Habitat management, sustainable utilisation, public awareness, genome resource banking, cultivation
Reason for Cultivation: for species recovery, reintroduction, research
Cultivation facilities: Government nurseries
Species management program: Unknown
Level of cultivation: Ongoing programme intensified or increased
Cultivation techniques: Techniques known

GENERAL COMMENTS:

Fruits are used in marriage ceremonies in Vaishya community. It is a fodder species. Demulcent, astringent used for controlling griping of bowels and flatulence in children. The bark is used for dysentery and diarrhoea, Roots and bark used for scabies applied topically.

Sources: Wall, G. A. Dictionary of the Economic products of India, Vol. 4
Anon. Wealth of India
Sp. Pl. (1753). 963
Other References: 3 (See end of report)

Compilers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers: P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Hemidesmus indicus* (L.) Schult.
Periploca indica L.

Family: Asclepiadaceae

Common name(s): Anantmul, Salsa (Hindi), Indian sarasaparilla (English), Khaparbela (Local-Bastar area)

Taxonomic status: Species

Habit or life form: Slender, twining, semi-erect climber/shrub

Habitat of taxon: Dry and moist deciduous forests

Habitat specificity/niche: Plains - open and closed canopy forests, hill slopes/sides and valleys

TAXON DISTRIBUTION:

India Distribution: Central and South India but not found above 3000 ft.

Current Distribution in MP: Found throughout

Elevation: up to 3000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2000

Number of locations: One

HABITAT INFORMATION:

Habitat Trends: Stable

Change in habitat quality: < 20% decline due to forest destruction. Forest destruction (mainly due to fire), otherwise can propagate by root stock that is deeply embedded in soil and escapes fire

THREATS:

Threats to habitat: Damming, loss of habitat, climate may result in predicted decline

Threats to population: Unknown

TRADE:

Trade: Commercial; international.

Parts in trade: Root

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: It is a perennial that propagates through root stock.

Population trends past/present: < 20% decline over last 10 years

Population trends - future: < 20 % decline predicted in next 10 years

INFORMATION SOURCE:

Data quality: Informal field sightings, literature, indirect information

Recent field studies: SFRI, Jabalpur and other areas of MP, 1997, Status of NTFP in MP, MPMFP Federation, MP, current - ongoing, Data on NTFPs in MP

STATUS:

IUCN: LOWER RISK - NEAR THREATENED in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: M P. transit rules apply to Anantmul roots

Known presence in P.A.s: Present in all P.A.'s of MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, Genetic, Biochemical studies
 Management: Habitat management, monitoring, sustainable utilisation, public awareness
 Reason for Cultivation: Recommended
 Cultivation facilities: None
 Species management program: Not at present; Recommended
 Level of cultivation: Initiate programme within three years
 Cultivation techniques: Unknown

GENERAL COMMENTS: Commercial trade may result in decline in population in the future. Though habitat is being destroyed, the very high cost of digging and extremely volatile nature of its essential oils, exploitation is to a limited extent. This medicinal plant is used as an appetizer and for blood cleansing and not for a chronic disease. This also limits its exploitation. In 8th 5year plan GOI (health) enlisted this among the 45 species to be conserved in arboretum in every state, provided the flora is represented in the state in the wild. Root used as substitute for *Sarsa piralla*, demulcent, alternative diaphoretic, diuretic, appetite loss, blood purifier in leucorrhoea, syphilis, rheumatism and snake or scorpion bite.

Sources: Roem and Schult. (1819). Syst. Veg. 6:126
 Other References: 1, 2, 3, 4 (See end of report)

Compilers: P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalkrishnan, M. Victor, A. Boaz, V. L. Pandey, S. K. Dubey

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Holarrhena antidysenterica* (L.) Wall. ex. DC
Nerium antidysentericum L.

Family: Apocynaceae

Common name(s): Kurchi, Karva, Karvaindarjau, Korei, Kora, Kanju (Hindi), Kutaja, Chirabilva (Sanskrit), Easter tree, Ivory tree, Conessi bark (English)

Taxonomic status: Species

Habit or life form: Small tree or large shrub

Habitat of taxon: Tropical deciduous forest

Habitat specificity/niche: Plains - open and closed canopy forest; hill slopes/sides, valleys, wasteland

TAXON DISTRIBUTION:

India Distribution: Throughout India ; abundantly found in MP, Maharastra, Orissa

Current Distribution in MP: Predominantly sal zones of the state

Elevation: 1500 - 2500 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2000

Number of locations: One location

HABITAT INFORMATION:

Habitat Trends: Less than 20% decrease in last 10 years and less than 20% decrease predicted in the next 10 years

Change in habitat quality: Decrease in quality

THREATS:

Threats to habitat: Natural succession of sal forest leading to teak forest ; grazing, loss of habitat, edaphic changes, fire

Threats to population: Harvest for medicine, trade of parts, trade, lack of regeneration

TRADE:

Trade: Local, domestic, commerical, international

Parts in trade: Root, leaves, branch/twigs, stems, seeds, bark

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: 20 - 25 years

Population trends past/present: < 20 % decline in the last 10 years

Population trends - future: < 20% predicted decline in the next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field study, literature, indirect information

Recent field studies: Unknown

STATUS:

IUCN: LOWER RISK - NEAR THREATENED in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: Not listed

Known presence in P.A.s: Not listed

Endorsed protection plans: Not listed

RECOMMENDATIONS:

Supporting research: Survey, limiting factor research, biochemical analysis/ research
Management: Habitat management, monitoring, sustainable utilisation, public awareness, genome resource banking, limiting factor management, cultivation
Reason for Cultivation: For education, reintroduction, research, preservation of live genome
Cultivation facilities: None
Species management program: No program; Programme not required
Level of cultivation: Not required
Cultivation techniques: Some techniques known

GENERAL COMMENTS: Bark and seed of this species used for making ayurvedic medicines. Collection of seeds affects natural regeneration in the forest besides site degradation. Bark is used for the manufacture of anti-dysenterics and seeds in the preparation of liver tonic. The bark used for dysentery, dried and ground as paste for use over body in dropsy. Seeds astringent used in fever, dysentery, diarrhoea and intestinal worms.

Sources: Other References: 1, 2, 3, 4 (See end of report)

Compilers: S.S. Bisen, P. C. Kotwal, P.C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, M. Gopalakrishnan

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotetele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Madhuca indica* GFGmel
Bassia latifolia Roxb.
Madhuca latifolia Roxb.
Bassia indica Roxb.

Family: Sapotaceae
Common name(s): Mahua, Moha, Madhuca [Hindi]
Taxonomic status: Species
Habit: Tree
Habitat: Tropical dry deciduous

TAXON DISTRIBUTION:
India Distribution: MP, Orissa, AP, UP, N.E. States, Bihar, Maharashtra, Karnataka, TN [sparse], Gujarat
Current Distribution in MP: Present in all circles but lowest in Gwalior circle
Elevation: 1500 - 2000 ft.
Range (Sq. km.): > 20,000 sq. km
Area Occupied (Sq. km.): < 500
Number of locations: Not known, but Fragmented

HABITAT INFORMATION:
Habitat Trends: < 20% decline predicted in the next 20 - 30 years
Change in habitat quality: No change

THREATS:
Threats to habitat: Grazing, trampling, powerlines, fire.
Threats to population: Lack of regeneration, destructive method of cultivation, harvest, harvest for medicine, harvest for food, trade, over-exploitation, poor regeneration due to seed collection

TRADE:
Trade: Local, commercial
Parts in trade: Flowers, fruits,

POPULATION INFORMATION:
Indian population: Not known
MP population: Not known
Number of mature individuals: > 2,500
Generation time: > 200 years
Population trends: <20% decline in the last 20-30 years. < 20% decline predicted in the next 50 years

INFORMATION SOURCE:
Data quality: General field studies; informal field sighting; literature
Recent field studies: Anupama Koliyal in Betul Forest Division and Satpura National Park, November 1996 - May 1997

STATUS:
IUCN: LOWER RISK - NEAR THREATENED in State of Madhya Pradesh, India
Criteria based on: Not applicable
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Ban on felling according to MP Land Revenue Code Section 240 - 242.
Known presence in P.A.s: In all 34 sanctuaries and 11 national parks
Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, correlation between temperature and fruit / flower drop; PHVA.

Management: Wild population management, monitoring, sustainable utilisation, public awareness.

Reason for Cultivation: No.

Cultivation facilities: SFRI, Jabalpur; TFRI, Jabalpur

Species management program: Ongoing programme should be intensified

Level of cultivation: Not applicable

Cultivation techniques: Some techniques known.

GENERAL COMMENTS: Fruit/flower drop indicates drop in the atmospheric temperature. Moisture in flower [while storing] burns the flower [advisable to keep it dry]. Open silo storage advisable. Seedlings are being raised in government nurserys. The species is worshipped and is under little biotic pressure. In tribal sect of M.P it is considered a sacred tree. It is used in vinegar, alcohol, sugar candy industry and in wax industries. Oil taken out of the fruit is used in soap, lubricants, manufacture and the left over residue is used as fish poison locally. Oil is used in bakery, confectionart items in place of cocoa butter and also used in cosmetics. TFRI is doing germ-plasm collection from all over the country for developing a clonal bank. Country liquous dependent on mahua. It is an excellent lubricant. Research on processing technology of mahua fruit at Food Technology Institute, Allahabad.

Sources: Koliyal, A. , 1997, [M.Sc. Dissertation], Extraction of MTFP in Betul Forest Division and its Impact on the Population Structure of these Species.
Other References: 3, 4 (See end of report)

Compilers: K. K. Bhardwaj, S. K. Sharma, D.D. Sharma, V.K. Sonakia, B. Mendke, C.H.V. Ramakrishna, C. Veer, A. Koliyal.

Reviewers: S.S. Bisen, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Rauvolfia serpentina* Benth
Rauvolfia canisens
Ophioxylan serpentina L.

Family: Apocyanaceae
Common name(s): Chandrabhaga, Pagalbooti, Sarpagandha, Chotachand (Hindi)

Taxonomic status: Species
Habit or life form: Evergreen undershrub
Habitat of taxon: Moist deciduous forests
Habitat specificity/niche: Plains - open canopy forest; hill slopes/sides

TAXON DISTRIBUTION:
India Distribution: Foothills of Himalayas, Kerala - W and S. portions, Uttar Pradesh Tamil Nadu, Orissa, W. Bengal, Assam, Maharastra, Bihar, Madhya Pradesh
Current Distribution in MP: Jagdalpur, Kanker, Raipur, Durg, Bilaspur, Betul, Bhopal, Shahdol and Sarguja circles
Elevation: 400 - 1500 ft.
Range (Sq. km.): < 20,000 sq.km.
Area Occupied (Sq. km.): < 500 sq. km.
Number of locations: Unknown; Fragmented

HABITAT INFORMATION:
Habitat Trends: > 20% decrease in the last 10 years
Change in habitat quality: > 20% decrease predicted in the next 10 years due to biotic pressure and forest fires

THREATS:
Threats to habitat: Loss of habitat, habitat fragmentation, fire
Threats to population: Harvest, harvest for medicine, over-exploitation, trade for market or medicine

TRADE:
Trade: Commercial
Parts in trade: Root, leaves

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 1 year (annual)
Population trends past/present: > 80% decline in the last 10 years
Population trends - future: > 80% in the next 10 years

INFORMATION SOURCE:
Data quality: General field study, informal field sighting, literature, indirect information
Recent field studies: SFRI, Jabalpur, MP, 1997, Status of NTFPs in MP

STATUS:
IUCN: **CRITICALLY ENDANGERED** in State of Madhya Pradesh, India
Criteria based on: **1**cd (Population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation); **2**cd (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Listed under the negative list of exports

Known presence in P.A.s: Occurs in Indravati N.P., Kangeri N.P, Pamed, N.P.; Achanakmar Sanctuary, Semersol Sanctuary
Endorsed protection plans: No

RECOMMENDATIONS:

Supporting research: Survey, Limiting factor research (seed viability).
Management: Habitat management, Monitoring, sustainable utilisation, cultivation
Reason for Cultivation: For species recovery and trade
Cultivation facilities: None
Species management program: Not at present; Recommended
Level of cultivation: Initiate programme within three years
Cultivation techniques: Some techniques known

GENERAL COMMENTS:

R. canisens - Seed viability is not known- about 30% germination. Regeneration problem. Medicinally highly valued and commercially highly exploited. The species is shifted to commercial cultivation. The quality of active ingredients is below the international standard in wild forms. Gene banks and conservation of natural habitat is strongly recommended. This species was assessed as EN in northeastern and southern India. A selection in *R. serpentina* RS-1 has been brought out for the purpose of high speed germination and high root yield containing stable profile of alkaloids reserpine, serpentine and ajmalline. Wild growing species don't have high yield as well as alkaloids contains. Now totally in-situ conserve plants improved varieties and production technology is leading to good quantity and quality material. Cropping systems and rotation based on *rauvolfia* are well planned and established. However adult adulteration of raw material with bark of *R. subharyana* drop the International market. Western pharmaceuticals have found 3% reserpine in *R. vomtoria* in Africa compare to less than 2 % in *R. serpentina* of Asian region. Root is used as a sedative, for curing insanity, reducing blood pressure, remedy for painful bowels, during labour to increase uterine contractions. Juice of leaves used for removal of opacity in cornea of eye.

Sources:

CIMAP (Lucknow) Publications
Ferguson, A.A. (1995). Indian Herbs
Chaddha, K. L. Advances in Horticulture
Farooqu, A.A. and M.M. Khan (1993). Production technology of medicinal and aromatic crops (74-76). First edition. Indian Herbs Research and Supply Company, Bangalore
Gupta, R. (1995). Medicinal and aromatic plants in India, In: Medicinal and aromatic plants in Asia - breeding and improvement (117-130), Rapa publications.
Paroda, R.S. (1995). Medicinal and aromatic plants based cropping systems in south Asia. , (31-61). Rapa publications.
Chomchalow, N (1995). Germ plasm conservation and utilization in Asia (1-5). Rapa publications.
Other References: 2, 5, 8 (See end of report)

Compilers:

P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalkrishnan, M. Victor, A. Boaz, V. L. Pandey, S. K. Dubey

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Schleichera oleosa* (Lour.) Oken
Schleichera trijuga Willd. and Klein
Pistacia oleosa Lour.

Family: Sapindaceae

Common name(s): Kusum, Kosum (Hindi), Lac tree, Ceylon oak, Honey tree (English)

Taxonomic status: Species

Habit or life form: Tree (medium sized)

Habitat of taxon: Mixed deciduous forest

Habitat specificity/niche: Plains- open and closed canopy forest, valleys, hill slopes/ sides

TAXON DISTRIBUTION:

India Distribution: Almost all states of India except J and K and Himachal Pradesh (high altitude)

Current Distribution in MP: All over MP Sparsely distributed in northern and western MP

Elevation: 1000 - 2000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Decrease of > 20% in the last 20 years. >20% decline in next 10 years. Change in habitat quality: Decrease

THREATS:

Threats to habitat: Biotic pressures, natural factors, habitat loss, habitat fragmentation, habitat loss due to exotic plants, power lines, pollution, trampling, climate, edaphic changes, fire

Threats to population: Harvest for timber, trade of parts, disease, interspecific competition from exotics

TRADE:

Trade: Commercial

Parts in trade: Fruits, branch/ twigs, gum/ resin, timber, seed

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: 100 years

Population trends past/present: < 20% decline in the last 20 years

Population trends - future: > 20% decline predicted in the next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting, literature

Recent field studies: SFRI in MP

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: A2cde (Population reduction predicted due to future decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: As per working plan LRC, MP, there is a ban on felling
Known presence in P.A.s: All P.A.'s in MP excepting Northern part
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, limiting factor research, PHVA
Management: Habitat management, sustainable utilisation, public awareness, genome resource banking, limiting factor management, cultivation/ plantation
Reason for Cultivation: for species recovery, reintroduction, research
Cultivation facilities: government nurseries, plantations, experimental plots
Species management program: Sp. mgmt pgm. present undertaken by Lak Research Institute, Ranchi, Bihar
Level of cultivation: Ongoing programme should be intensified
Cultivation techniques: Known

GENERAL COMMENTS:

Commercial plantation is required. Production to be improved as domestic requirement is increasing. Basically, non-edible oil; after processing it can be used as edible oil and also as illuminant. NOVOD Board is providing subsidy at Rs. 150 per kilo. Young and tender shoots are eaten by tribals. Bark as astringent and for cure of itch. Powder seeds applied on skin ulcers of animals and removal maggots. Oil of seeds used to cure itch and acne, stimulating agent for scalp both for cleaning and promoting growth of hair.

Sources: Anon. Wealth of India
Other References: 3 (See end of report)

Compilers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, C. H. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers: P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Semecarpus anacardium* L.F.
Anacardium orientale L.
Family: Anacardiaceae
Common name(s): Bhilwa, Bhela, Bhilama, Dhobinut (Hindi),
Cleaning nut (English/Trade name)
Taxonomic status: Species
Habit or life form: Tree (small sized)
Habitat of taxon: Tropical moist and dry deciduous forest (mixed
forest and Sal associate)
Habitat specificity/niche: 500 to 4000 ft (wider range); Plains-closed
canopy forest

TAXON DISTRIBUTION:
India Distribution: All southern states, central India, NE States
Current Distribution in MP: Lowest in circle Gwalior (sparsely) and
abundantly in circles Bilaspur, Sarguja,
Jagdalpur, Kanker, Raipur and Durg. Otherwise
present in all circles.
Elevation: 500 to 4000 ft (wider range)
Range (Sq. km.): >20,000
Area Occupied (Sq. km.): 10 - 500
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: Decrease in habitat of < 20% over 10 - 20 years
due to biotic pressure and soil erosion
Change in habitat quality: Decrease in quality due to human and cattle
population pressure.

THREATS:
Threats to habitat: Soil erosion, biotic pressures, habitat loss due
to exotic plants, pollution, power lines,
edaphic changes, fire, landslide.
Threats to population: Harvest, harvest for medicine, overexploitation,
trade of parts, trade, interspecific competition
from exotics, lack of regeneration.

TRADE:
Trade: Local, Domestic, Commercial, (unsure of
International)
Parts in trade: Fruit, nut

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: less than 50 years
Population trends past/present: < 20% decline over 10 years
Population trends - future: > 20 % decline in the next 10 years

INFORMATION SOURCE:
Data quality: General field study, Informal field sightings,
Literature
Recent field studies:

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: **A2cde** (Population reduction predicted due to
future decline in area of occupancy, extent of
occurrence and/or quality of habitat and due to
actual or potential level of exploitation and
the effects of introduced taxa, hybridisation,
pathogens, pollutants, competitors or parasites)
CITES: Not listed
National wildlife legislation: Not listed

National Red Data Book:	Not listed
International Red data book:	Not listed
Other legislation:	Felling of trees prohibited in working plans and SLRC MP
Known presence in P.A.s:	in all PAs in MP
Endorsed protection plans:	None

RECOMMENDATIONS:

Supporting research:	Survey, genetic research, Life history studies; To identify high tannin content zones/circle in MP; hybridisation
Management:	Habitat management, Sustainable utilisation, Public awareness, Genome Resource Banking
Reason for Cultivation:	Recommended for species recovery, research
Cultivation facilities:	Yes; Government nurseries ; number not known
Species management program:	Does not exist currently; recommended
Level of cultivation:	Ongoing programme intensified
Cultivation techniques:	Techniques known

GENERAL COMMENTS:

Worshipped by tribals. Commercial utility as skin disease, anticancer, marking nut. Dr. Wad worked on anticancer alkaloid quality of this nut. Contents of fruits are used in Ayurvedic medicines as kayakalp. Tannin - dyes industries. As insecticides; oil used as lubricant and in paint industry. Seed kernel has an almond like taste and is roasted and eaten. Nut used abortion agent and given as vermifuge. Oil from nuts used for rheumatism and leprosy. Gum from bark is used for venereal diseases, leprosy and nervous debility.

Sources:

Information leaflet by MFP Federation; National symposia on medicinal plant in central India, 1986-7, Ministry of Health and Family Welfare
Other References: 3 (See end of report)

Compilers:

S. K. Sharma, D. D. Sharma, V. K. Sonakia, Ch. V. Ramakrishna, A. Koliyal, C. Veer, K. M. Parikh.

Reviewers:

K. K. Bharadwaj, B. Mendke, S.S. Bisen, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotetele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Sterculia urens* Roxb.
 Family: Sterculiaceae
 Common name(s): Kullu (Hindi), Indian tragakanth, Gun karaya
 (Trade names), Kateera gum (English)
 Taxonomic status: Species
 Habit or life form: Tree
 Habitat of taxon: Dry and moist deciduous forests
 Habitat specificity/niche: Open canopy forests, exposed hill slopes/sites.
 Grows along with salai (*Boswellia serrata*)

TAXON DISTRIBUTION:

India Distribution: Madhya Pradesh, Rajasthan, Gujarat, Maharashtra,
 A. P., Orissa, Karnataka, U. P., Bihar, Assam,
 Northwestern India and Eastern India

Current Distribution in MP: Throughout MP

Elevation: Unknown
 Range (Sq. km.): > 20,000
 Area Occupied (Sq. km.): > 2000
 Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Stable
 Change in habitat quality: Decrease

THREATS:

Threats to habitat: Limestone mining, habitat fragmentation
 Threats to population: Harvest for gum, overexploitation, trade, lack
 of regeneration

TRADE:

Trade: Domestic, commercial, international
 Parts in trade: Gum/resin

POPULATION INFORMATION:

Indian population: Unknown
 MP population: Unknown
 Number of mature individuals: > 2,500
 Generation time: > 100 years
 Population trends past/present: > 20% decline in last 20 years
 Population trends - future: > 20% decline predicted in next 20 years

INFORMATION SOURCE:

Data quality: Monitoring, general field study, informal field
 sighting, literature, indirect information
 Recent field studies: G. N. Khardwal, 1988-89 ; RSRI, Kanpur, 1992;
 KFRI, Peechi, 1987

STATUS:

IUCN: LOWER RISK - NEAR THREATENED in State of Madhya
 Pradesh

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: MP Forest Department ban on gum tapping from
 1990 - 1997

Known presence in P.A.s: In all P.A.'s

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies,
 limiting factor research

Management: Habitat management, monitoring, sustainable
 utilisation, public awareness, genome resource

	banking, limiting factor management, cultivation.
Reason for Cultivation:	For research, trade
Cultivation facilities:	None
Species management program:	No programme as yet but recommended by MP Forest Department through working plants
Level of cultivation:	Initiate programme after 3 years
Cultivation techniques:	Some techniques known
GENERAL COMMENTS:	Seed germination is low, creating problems for regeneration Natural habitat where plan grows is the most limiting factor for plant growth Overtapping for gum has resulted in large scale mortality of plant in spite of management ban on tappat. Pl. ing, illicit tapping continues. Gum used as substitute for tragacanth.
Sources:	Cor. Pl. (1795). 1: 25, t 24 Graham, (1839). Cat. Pl. 18, Bombay Other Refences: 2, 3 (See end of report)
Compilers:	S.S. Bisen, S.N. Khotele, C. Bedi, V. Paul, A. Pai
Reviewers:	K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, P. Bhattacharya, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Strychnos nux-vomica* L.
Family: Loganiaceae
Common name(s): Nux-vomica, kuchala (Hindi), snakewood/
Poisonnut (English), Vishamushti (Sanskrit)
Taxonomic status: Species
Habit or life form: Evergreen tree
Habitat of taxon: Moist deciduous forest, dry deciduous forests
Habitat specificity/niche: Plains- closed and open canopy forest; hill
slopes

TAXON DISTRIBUTION:
India Distribution: Up to 2000 ft. in tropical regions especially in
S. India, Also in Orissa, West Bengan,
Maharashtra, Bihar (Chhotanagpur), Uttar Pradesh
(Gorakhpur)Current
Distribution in MP: Bastar and Mandla District of Madhya Pradesh
Elevation: 2000 ft.
Range (Sq. km.): < 10
Area Occupied (Sq. km.): < 10
Number of locations: 1

HABITAT INFORMATION:
Habitat Trends: < 20% decrease in last 10 years
Change in habitat quality: < 20% decline predicted in next 10 years due to
biotic pressure

THREATS:
Threats to habitat: Loss of habitat, drought, fire (lesser threat as
fires rare in Bastar area)
Threats to population: Harvest for medicine, trade for market or
medicine, seed collection affects regeneration

TRADE:
Trade: Commercial, international
Parts in trade: Seeds

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500
Generation time: 80 years
Population trends past/present: < 20% decline in last 10 years
Population trends - future: > 50% decline predicted in next 10 years

INFORMATION SOURCE:
Data quality: General field study, informal field sighting,
literature, indirect information
Recent field studies: MPPMFP Federation, MP, Current Data on Medicinal
plants in MP, AP, Orissa. Current Field cultivation
studies being conducted

STATUS:
IUCN: **ENDANGERED** in State of Madhya Pradesh, India
Criteria based on: **A2cd** (Population reduction predicted due to
future decline in area of occupancy, extent of
occurrence and/or quality of habitat and due to
actual or potential level of exploitation)
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: MP transit rules apply
Known presence in P.A.s: Found in P.A.s in Bastar and Mandla
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Genetic research, biochemical analysis
Management: Habitat management, monitoring, translocation, sustainable utilisation, public awareness, cultivation/plantation

Reason for Cultivation: Recommended for research, preservation of live genome, trade

Cultivation facilities: None; Recommended

Species management program: Not at present; Recommended

Level of cultivation: Initiate programme within 3 years

Cultivation techniques: None

GENERAL COMMENTS:

Plantation techniques and nursery techniques should be developed, mainly to meet trade needs. Since this extremely useful medicinal plant species is found only in Bastar and Mandla, field trials in the forest areas of MP are recommended to increase its distribution. This will increase the supply for trade, increase awareness, and also bring this medicinal plant in focus for research purpose. Twenty years back abundant in 4 - 5 circles, now very sparse. Bastar used to supply for commercial, now there is nothing. Only from Orissa and A. P. Root bark ground up into a fine paste with lime juice and made into pills which are set to be effective against cholera. Leaves applied as poultice to sloughing, wounds and ulcers especially for maggot treatment. Seeds with aromatics given for colic.

Sources:

MPMFP Federation data
Sp. Pl. (1753). 189.
Other References: 2 (See end of report)

Compilers:

P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalkrishnan, M. Victor, A.A. Boaz, V. L. Pandey, S. K. Dubey

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Syzygium cuminii* (L.) Skeels
Eugenia jambolina Lam
Myrtus cumini L.

Family: Myrtaceae

Common name(s): Jamun (Hindi), Jambu (Sanskrit), Java plum,
Jambolan (English)

Taxonomic status: Species

Habit or life form: Tree

Habitat of taxon: Dry and moist deciduous forests

Habitat specificity/niche: Plains, open and closed canopy forests, riparian

TAXON DISTRIBUTION:

India Distribution: All over the country except higher elevations of
the Himalays

Current Distribution in MP: Throughout Madhya Pradesh

Elevation: Up to 3500 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Stable

Change in habitat quality: Decrease in quality

THREATS:

Threats to habitat: Change in moisture and status, lowering of water
table, damming, habitat loss due to exotic
plants. Edaphic changes.

Threats to population: harvest for medicine, food and timber, trade

TRADE:

Trade: Local, domestic, commercial

Parts in trade: Leaves, fruits, stem

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2500

Generation time: > 100 years

Population trends past/present: < 20% decline in last 20 years

Population trends - future: < 20% decline predicted in the next 20 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting,
literature, indirect information

Recent field studies: Unknown

STATUS:

IUCN: LOWER RISK - LEAST CONCERN in State of Madhya
Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: Not listed

Known presence in P.A.s: In all P.A.s in MP

Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Genetic research, limiting factor research,
research for polyembryony

Management: Wild population management, sustainable
utilisation, limiting factor management,
cultivation

Reason for Cultivation: for research
Cultivation facilities: None
Species management program: No - presently none but recommended for future
Level of cultivation: Some techniques known
Cultivation techniques: Some techniques known

GENERAL COMMENTS:

Important for timber, food and medicine; seeds used in diabetic medicine. Seeds used in diabetic medicine. Leaves for fodder and tooth powder. Timber for shelter, agricultural implements. Canoes, boats. Bark astringent for gargling and washing. Fresh juice given with goat milk to children with diarrhoea. Juice of leaves used for dysentery. Juice of ripe fruit made in to vinegar for stomachic, carminative and as diuretic. Fruits useful astringent in bilious diarrhoea. Seeds used in diabetes.

Sources:

Other References: 3 (See end of report)

Compilers:

S.S. Bisen, S.N. Khotele, A. Pai, C. Bedi, V. Paul, F.B. Homji

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, P. Bhattacharya, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Species (and synonyms): *Tephrosia purpurea* (L.) Pers.
Galega perpurea L.

Family: Fabaceae (Papilionaceae)

Common name(s): Sarponkha (Sanskrit), Sharapunkha, Ban-nil, Bhamasia (Hindi), Purple tephrosia, Wild indigo (English)

Taxonomic status: Species

Habit or life form: Perennial herb

Habitat of taxon: Open forest areas and wastelands along railway line and bunds

Habitat specificity/niche: Plains- open canopy forest and hill slopes

TAXON DISTRIBUTION:

India Distribution: MP except temperate regions, Himalayas; found all over the country

Current Distribution in MP: All circles

Elevation: 800 - 3000 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): > 2,000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Stable, no change predicted

Change in habitat quality: No

THREATS:

Threats to habitat: Loss of habitat, habitat fragmentation,

Threats to population: Harvest for medicine, overexploitation, trade for market or medicine

Trade: Commercial

Parts in trade: Whole plant

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: 6 months - 1 year

Population trends past/present: Increasing

Population trends - future: No decline predicted

INFORMATION SOURCE:

Data quality: General field study, informal field sighting, literature, indirect information
Recent field studies: SFRI, Jabalpur, MP, 1997, Status of NTFP's in MP

STATUS:

IUCN: LOWER RISK- LEAST CONCERN in State of Madhya Pradesh, India

Criteria based on: Not applicable

CITES: Not listed

National wildlife legislation: Not listed

National Red Data Book: Not listed

International Red data book: Not listed

Other legislation: Unknown

Known presence in P.A.s: All National Parks and Sanctuaries in MP

Endorsed protection plans: Unknown

RECOMMENDATIONS:

Supporting research: Survey, Life history studies, Limiting factor research, Biochemical studies

Management: Habitat management, monitoring, sustainable utilisation, cultivation

Reason for Cultivation: For research, preservation of live genome, trade

Cultivation facilities: None; recommended

Species management program: No
Level of cultivation: Initiate programme within three years
Cultivation techniques: Some techniques known

GENERAL COMMENTS: Grows well on slopes and propagates well naturally. Whole plant is pulled up as soon as flowers begin to appear. NBPGR regional station, Jodhpur is developing agro-technique.

Sources: Other References: 1, 2, 4 (See end of report)

Compilers: P. C. Kotwal, P.C. Sutar, M. Mullick, K. D. Mehra, S.R. Azad, S. K. Agarwal, B. Joshi, M. Gopalakrishnan

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Terminalia arjuna* (Roxb.) Wt. and Arn.
Terminalia glabra Wt. and Arn.
Pentaptera arjuna Roxb.

Family: Combretaceae

Common name(s): Koha, Arjuna, Kahua, Kahu, Maruthu (Hindi)

Taxonomic status: Species

Habit or life form: Large, evergreen tree, buttressed stem

Habitat of taxon: Along rivers, streams

Habitat specificity/niche: Riparian

TAXON DISTRIBUTION:

India Distribution: Not found > 2000 ft. (Upper Himalayas); otherwise found all over the country

Current Distribution in MP: Throughout MP

Elevation: 1000 - 2500 ft.

Range (Sq. km.): > 20,000

Area Occupied (Sq. km.): < 2,000

Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: > 20% decrease in last 10 years; > 20% decrease predicted in next 10 years

Change in habitat quality: Decrease in quality due to faulty exploitative practice

THREATS:

Threats to habitat: Damming, grazing, loss of habitat, pesticides, pollution, climate, edaphic changes, siltation, drought, El Nino, fire

Threats to population: Human interference, Harvest for medicine, overexploitation, Trade for market or medicine, trade of parts, trampling, girdling (faulty exploitative practice)

TRADE:

Trade: Local, domestic, commercial, international

Parts in trade: Fruits, root, bark

POPULATION INFORMATION:

Indian population: Unknown

MP population: Unknown

Number of mature individuals: > 2,500

Generation time: 100 years

Population trends past/present: > 20% decline in the last 10 years

Population trends - future: > 20% decline predicted in the next 10 years

INFORMATION SOURCE:

Data quality: Monitoring, general field study, literature, indirect information, museum / records

Recent field studies: SFRI - in and around Katni, Jabalpur distt., 1997 (study) "Status of NTFPs in MP (a combined publication on the number of NTFP spp. SFRI - around Dhamtari, Tikamzach, Raipur, 1998 (Publication), Publication on a number of NTFP spp.

STATUS:

IUCN: **VULNERABLE** in State of Madhya Pradesh, India

Criteria based on: Alod (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation), 2cd (Population reduction predicted due to future decline in area of occupancy, extent of

occurrence and/or quality of habitat and due to actual or potential level of exploitation)

CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Ban on extraction of bark in MP, MP Transit rules, ban on felling. Land revenue Act and Forest Conservation Act, (Arjuna is not felled legally; it is protected).
Known presence in P.A.s: Found in all P.A.'s in MP
Endorsed protection plans: Working Plan prescriptions for management of species

RECOMMENDATIONS:
Supporting research: Survey, genetic research, taxonomic research, Biochemical analysis owing to its medicinal properties
Management: Habitat management, wild population management, monitoring, sustainable utilisation, public awareness, genome resource banking, cultivation, Large scale ex situ conservation for medicinal and sericultural use.
Reason for Cultivation: Species recovery, research, sericulture
Cultivation facilities: Yes, few. Tissue culture studies in several areas.
Species management program: Not at present; Recommended
Level of cultivation: Initiate programme within three years
Cultivation techniques: Techniques known

GENERAL COMMENTS: Coordinated research needed for sericultural and medicinal applications. Legislations exist but much illegal extraction and trade. Research needed for non-destructive / scientific bark extraction. Plant is used as medicine as laxative, anthelmintic for children, blood purifier. Root given for tympanitis, dyspepsia and cronic diarrhoea. Fresh root bark ground and made in to pills with little black pepper given in cases of obstinate colic. This species was assessed as LR-nt in southern India.

Sources: SFRI - bulletin on status of NTFP's in MP (1998 publication)
Wight and Arnold (1834). Prodr. 314
Other References: 1, 2, 3, 7 (See end of report).

Compilers: P. C. Kotwal, P. C. Sutar, M. Mullick, K. D. Mehra, S. R. Azad, S. K. Agrawal, B. Joshi, M. Gopalkrishnan, M. Victor, A. Boaz, V. L. Pandey, S. K. Dubey

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, F.B. Homji, S.N. Khotale, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Terminalia chebula* Retz
Family: Combretaceae
Common name(s): Harra, Hared, Myrobalan (Hindi), Haritali (Sanskrit), Hirda (Marathi), Chebulic (English)

Taxonomic status: Species
Habit or life form: Tree
Habitat of taxon: Dry and moist deciduous forest
Habitat specificity/niche: Plains - open and closed canopy forest; hill slopes/sides

TAXON DISTRIBUTION:
India Distribution: Orissa, Bihar, West Bengal - all states except temperate regions
Current Distribution in MP: All circles except Khandha, Indore, Ujjain, Bhopal, Shivpuri, Gwalior and Sagar
Elevation: Unknown
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2,000
Number of locations: Contiguous

HABITAT INFORMATION:
Habitat Trends: > 20% decline in last 10 years; > 20% decline predicted in next 10 years
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Habitat loss due to encroachments, grazing, edaphic changes.
Threats to population: Girdling, harvest, harvest for medicine, trade, decline in animal vectors, interspecific competition from exotics.

TRADE:
Trade: Commercial
Parts in trade: Fruits

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2,500 years
Generation time: > 100 years
Population trends past/present: > 20% decline in last 10 years
Population trends - future: > 20% decline in next 25 -30 years

INFORMATION SOURCE:
Data quality: General field studies, informal field sighting, literature, indirect information, herbarium
Recent field studies: Development Alternatives, 1998 in Chhindwara, Bastar, Raigarh, Bilaspur, Mandla; P.C. Sutar and A. Pai, 1988 in Chidwara, Bastar, Bilaspur and Mandla (Conservation Assessment of resources for tannin extraction).

STATUS:
IUCN: **VULNERABLE** in State of Madhya Pradesh, India
Criteria based on: Alacde (Observed population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES:
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed

Other legislation: Nationalised forest produce in MP, Maharashtra, Orissa
Known presence in P.A.s: In all PAs except in circles Khandala, Indore, Ujjain, Bhopal, Shivpuri, Gwalior, Sagar
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, limiting factor research
Management: Habitat management, sustainable utilisation, public awareness, genome resource banking, limiting factor management, cultivation
Reason for Cultivation: Species recovery, education, research, preservation of live genome
Cultivation facilities: None
Species management program: Recommended
Level of cultivation: Initiate programme within 3 years
Cultivation techniques: Some techniques known

GENERAL COMMENTS:

Four varieties of harra and suitable for different uses such as medicines and for tanning. Trees saved when forest lands were encroached. Villagers do not cut this tree. Sometime back synthetic tanning material had led to the decline, however, the trend is reversing again. Harra is collected at 2 stages - hal (immature) harra fruit and mature fruit. Component of triphala, a popular ayurvedic preparation. Fruit astringent laxative used externally as local application for chronic ulcers and wounds and as carbol in stomatitis. Fine powder used as dentifrice and considered useful for carious teeth, bleeding and ulcerations of the gums. NBPGR regional station, Ranchi is developing agro-technique of this species.

Sources: Retz (1789). Obs. Fasc. 5: 31
Sutar, P.C. and A. Pai (1998). Report on conservation assessment of resources for tanin extraction enterprise. Development Alternatives, New Delhi
Other References: 1, 2, 3 (See end of report)

Compilers: F.B. Homji, S.S. Bisen, S.N. Khotale, P.C. Sutar, A. Pai, V. Paul, C. Bedi, P. Srivastava, P. Bhattacharya

Reviewers: K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, N. Ram Prasad, K.M. Parikh, J. Tiwari

Species (and synonyms): *Tribulus terrestris* (L.)
 Family: Zygophyllaceae
 Common name(s): Gokhru, Gokshura (Hindi), Puncture vine, Land Caltrops (English)
 Taxonomic status: Species
 Habit or life form: Annual Herb (Prostrate)
 Habitat of taxon: Cultivated areas and wasteland, Riverbank.
 Habitat specificity/niche: Agricultural lands (species of disturbed area); Plain in open area

TAXON DISTRIBUTION:

India Distribution: In all dry, arid zones (wastelands, adjoining agricultural lands, on roadside) Current
 Distribution in MP: Circles Indore, Ujjain, Khandha, Bhopal, Shivpuri, Gwalior, Sagar, Betul and Hoshangabad. Partially available in moist areas like circle Hoshangabad
 Elevation: Unknown
 Range (Sq. km.): 20,000
 Area Occupied (Sq. km.): 500
 Number of locations: Fragmented

HABITAT INFORMATION:

Habitat Trends: Increase in area as dry, arid zone increases with disturbance; < 20% increase predicted over next 20 years due to cultivation and resulting wastelands
 Change in habitat quality: Increase in habitat "quality" required for this species, e.g. cultivated, barren lands

THREATS:

Threats to habitat: Grazing, habitat loss due to exotic plants, edaphic changes
 Threats to population: Harvest for medicine, overexploitation, pesticides/weedicides, trade of parts, trade, disease, genetic problems, interspecific competition, interspecific competition from exotics and from livestock

TRADE:

Trade: Domestic, Commercial, International
 Parts in trade: Fruits, Root, Leaves, Whole plant

POPULATION INFORMATION:

Indian population: Unknown
 MP population: Unknown
 Number of mature individuals: >2,500
 Generation time: Annual
 Population trends past/present: > 20% decline over last 5 years
 Population trends - future: > 50% decline over next 10 years

INFORMATION SOURCE:

Data quality: General field study, informal field sighting, Literature
 Recent field studies: General field study, Informal field sighting, Literature

STATUS:

IUCN: **ENDANGERED** in State of Madhya Pradesh, India
 Criteria based on: **A2d** (Population reduction predicted due to future decline in actual or potential level of exploitation)
 National Red Data Book: Not listed
 International Red Data Book: Not listed
 National legislation: None

Other legislation: None
 Known presence in P.A.s: Sparsely available in all PAs in MP
 Endorsed protection plans: Yes - see comments

RECOMMENDATIONS:
 Supporting research: Survey (ongoing), Taxonomic research (ongoing),
 Life history studies
 Management: Sustainable utilisation, Public awareness,
 Genome Resource banking
 Reason for Cultivation: Species recovery, research, preservation of live
 genome
 Cultivation facilities: Unknown
 Species management program: Yes. One of the species recommended in the 9th 5-
 year plan from Ministry of Health and Family
 Welfare
 Level of cultivation: Ongoing programme intensified or increased
 Cultivation techniques: Yet to develop

GENERAL COMMENTS:
 Ministry of Agriculture (Government of India) enlisted the species as economically viable as a regular trade raw material in international market. In the workplan of 8th Five year plan mandate, specific collection and conservation of the species in herbal gardens in 16 state agricultural universities has been mooted. Government of India Health Department of ISM ? enlisted 129 species for whom agrotechnique is to be developed in the 9th Five-year Plan. There is sufficient funding and human resource development for this purpose. CSIR is working on standardisation of active ingredients of this species. Entire plant is useful. Cooling diuretic aprodisiac, useful in painful micturition, calculus affections, urinary discharge, impotence, for gout, kidney diseases.

Sources:
 National Symposium of Medicinal and Aromatic Plants, Government of India Health, 1987-88 in Five Regions
 Proceeding of Review Meeting of Govt. of India Agriculture (Centrally Sponsored Scheme) Review Meeting, 8th Five Year Plan.
 Government of India Health Review Meeting held at TFRI on 14.3.98
 Sp. Pl. (1753). 387
 Santapau (1957). Fl. Purandhar. 29
 Other References: 2, 3 (See end of report)

Compilers:
 S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen, C. M. Parikh,

Rivewers:
 K. K. Bharadwaj, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotele, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Withania somnifera* L. (Dunal)
Family: Solanaceae
Common name(s): Ashwagandha; Ashgandh (Hindi); Indian ginseng (English)
Taxonomic status: Species
Habit or life form: Annual shrub (1-5 ft. tall), Under shrub
Habitat of taxon: Dry, arid zones (dry deciduous forest)
Habitat specificity/niche: Plains - open canopy forest; valleys, forest edges

TAXON DISTRIBUTION:
India Distribution: Gujarat, Rajasthan, U. P. , Punjab, Haryana, Maharastra, W. Bengal, MP, Southern India, Himalaya up to 5000 ft.
Current Distribution in MP: Circles Khandha, Indore, Hoshangabad, Betul, Chhindwara, Ujjain, Bhopal, Shivpuri, Gwalior, Sagar, Rewa. Sparse in other circles.
Elevation: Up to 5000 ft.
Range (Sq. km.): < 5000
Area Occupied (Sq. km.): < 10
Number of locations: Unknown; Fragmented

HABITAT INFORMATION:
Habitat Trends: > 50% decline in last 5 years; > more than 50% in next 10 years
Change in habitat quality: Decrease in quality

THREATS:
Threats to habitat: Biotic pressures, loss of habitat, habitat loss due to exotic plants, political unrest, edaphic changes
Threats to population: Harvest, harvest for medicine, overexploitation, trade, trade of parts, disease, inter-specific competition from exotics, pests, predation by exotics,

TRADE:
Trade: Local, domestic, commercial, international
Parts in trade: Bark, root, leaves, branch/twigs

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: > 2500
Generation time: Annual
Population trends past/present: > 50% decline in last 10 years
Population trends - future: > 50% decline predicted in next 10 years

INFORMATION SOURCE:
Data quality: General field study, informal field sighting, literature
Recent field studies: S.K. Dubey, 1997 in Vidisha, Chatarpur, Sagar (information from tribals). MFP Federation, 1995-98 in Sagar division

STATUS:
IUCN: **ENDANGERED** in State of Madhya Pradesh
Criteria based on: **1cde** (Population reduction due to decline in area of occupancy, extent of occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites), **2cde** (Population reduction predicted due to future decline in area of occupancy, extent of

occurrence and/or quality of habitat and due to actual or potential level of exploitation and the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites)

CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed
Known presence in P.A.s: All P.A.s of MP
Endorsed protection plans: None

RECOMMENDATIONS:

Supporting research: Survey, genetic research, life history studies, PHVA
Management: Wild population management, sustainable utilisation, public awareness, genome resource banking, cultivation
Reason for Cultivation: for species recovery, research
Cultivation facilities: facilities Malkuli (Hosangavad) nursery, Mandla nursery, Amarkantak (Shadole), ICAR, Indore
Species management program: Recommended
Level of cultivation: Ongoing programme should be intensified
Cultivation techniques: Known

GENERAL COMMENTS:

Orthodoxical concentration to a particular circle by the pharmacopia and trade agents due to likes and dislikes for specific regions. All government autonomous organisations and NGOs are highly concerned with the threat to the species. ICAR is coordinating a research project on this species in Indore. The species is a non-nationalised item. Alkaloid content not optimum in the wild state. Concentrated extract of the plant is exported out of the country. Root considered aphrodisiac, diuretic, narcotic, abortif used in rheumatism, debility from old age and emaciation in children.

Sources: Task Force, MFP Development, Forest Development corporation, MP
Dictionary of Indian folk medicine and ethnobotany
Farooqu, A.A. and M.M. Khan (1993). Production technology of medicinal and aromatic plants (3-4). First edition. Indian Herbs Research and Supply Company, Bangalore.
DC. Prodr. (1852). 13 (1): 458
Other References: 3, 4 (See end of report)

Compilers: S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, S.S. Bisen

Reviewers: K. K. Bharadwaj, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, F.B. Homji, S.N. Khotete, V. Paul, P. Bhattacharya, C. Bedi, N. Ram Prasad, K.M. Parikh, J. Tiwari, A. Pai, P. Srivastava

Species (and synonyms): *Woodfordia fruticosa* (L.) Kurz.
Woodfordia floribunda Salisb.
Lithrum fruticosum L.

Family: Lythraceae
Common name(s): Dhawai, Dhauta (Hindi), Fire flame bush
(English)

Taxonomic status: Species
Habit or life form: Shrub
Habitat of taxon: Dry and moist deciduous forest
Habitat specificity/niche: Plains - open canopy forest; hill slopes/sides,
valleys, riparian

TAXON DISTRIBUTION:
India Distribution: Orissa, Bihar, A. P., Maharashtra, MP, Gujarat,
Rajasthan, Tamil Nadu
Current Distribution in MP: Throughout MP
Elevation: Up to 3000 ft.
Range (Sq. km.): > 20,000
Area Occupied (Sq. km.): > 2000
Number of locations: Fragmented

HABITAT INFORMATION:
Habitat Trends: Stable till date but < 20% decline predicted in
the next 20 years
Change in habitat quality: Unknown

THREATS:
Threats to habitat: Soil erosion, habitat loss due to exotic plants
Threats to population: Trade

TRADE:
Trade: Domestic, commercial
Parts in trade: Flowers

POPULATION INFORMATION:
Indian population: Unknown
MP population: Unknown
Number of mature individuals: >,2500
Generation time: 10 years
Population trends past/present: Increasing
Population trends - future: Predict an increase

INFORMATION SOURCE:
Data quality: Monitoring, General field study, Informal field
sighting, literature, indirect information
Recent field studies: Y. S. Parmani, 1991 onwards, in Sokin

STATUS:
IUCN: LOWER RISK - LEAST CONCERN in State of Madhya
Pradesh
Criteria based on: Not applicable
CITES: Not listed
National wildlife legislation: Not listed
National Red Data Book: Not listed
International Red data book: Not listed
Other legislation: Not listed
Known presence in P.A.s: Known presence in all P.A.'s in India
Endorsed protection plans: None

RECOMMENDATIONS:
Supporting research: Survey
Management: Sustainable utilisation
Reason for Cultivation: Not recommended
Cultivation facilities: No
Species management program: Does not exist and not recommended

Level of cultivation:
Cultivation techniques:

Not required
Some techniques known

GENERAL COMMENTS:

The flowers of this species is used widely in the country for preparation of Arishta (Arjuna arishta) an ayurvedic drug. The flowers also yield a valuable dye which was used earlier for dying cloth. Dried flowers astringent used in dysentery, menorrhagia, liver problem, disorder of mucous membrane, haemorrhoids, stimulant in pregnancy.

Sources:

Other References: 2, 3, 4 (See end of report)

Compilers:

F.B. Homji, S.S. Bisen, S.N. Khotele, A. Pai, C. Bedi, V. Paul

Reviewers:

K. K. Bharadwaj, S. K. Sharma, D.D. Sharma, V. K. Sonakia, B. Mendke, Ch. V. Ramakrishna, C. Veer, A. Kolyial, P.C. Kotwal, P.C. Sutar, M. Mullick, K.D. Mehra, S.R. Azad, S.K. Agrawal, B. Joshi, M. Gopalakrishnan, M. Victor, A.A. Boaz, V.L. Pandey, S.K. Dubey, P. Bhattacharya, N. Ram Prasad, K.M. Parikh, J. Tiwari, P. Srivastava

Other References

1. GOI Ministry of Health & Family Welfare. Dept. of Indian Systems of Medicine & Homeopathy. Letter No. Z-190-17/8/90-MPCell, Dated 11/2/1997.
2. Under Secretary, Govt. of India, Ministry of Health, Letter No. Z-18017/23/97-MPCell, Dated 8/4/97.
3. Srivastava, R.C. (1989). Drug plants of Central India. Today and tomorrow publishers, 171 pp.
4. TFRI (1994). Survey Bulletin.
5. Molur, S. , V. Tandon, D.K. Ved, N. Namboodiri & S. Walker (1995). Report of Conservation Assessment & Mgt. Plan workshop for Selected Southern Indian Medicinal Plants (First Workshop). ZOO/CBSG, India, FRLHT, 108 pp.
6. Molur, S. & S. Walker (1996). Report of Conservation Assessment & Mgt. Plan workshop for Selected Southern Indian Medicinal Plants (Second Workshop). ZOO/CBSG, India, FRLHT, 147 pp.
7. Molur, S. & S. Walker (1997). Report of Conservation Assessment & Mgt. Plan workshop for Selected species of Medicinal Plants (Third Workshop). ZOO/CBSG, India, FRLHT, 138 pp.
8. Molur, S. & S. Walker (1998). Report of Conservation Assessment & Mgt. Plant workshop for Selected species of Northern, Northeast & Central Indian Medicinal Plants. BCPP Endangered Species Project, ZOO/CBSG, India, 62 pp.