

## **Status of lichens on *Shorea robusta* (Sal) and indication of lichen threat in Amarkantak**

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### **Introduction**

Lichens are vital component of the ecosystem serving as substrate for shelter, food, nutrient cyclers, succession etc. (Gradstein, 1992)<sup>1</sup> Lichens, in general, prefer a pollution free atmosphere and therefore flourish in areas where air pollution by toxic gases is nil or negligible. Lichens are extremely sensitive to man-made atmospheric pollutants and they are the first plants to disappear in cities. They are very susceptible to adverse environmental condition such as pollution. Hence, lichen have attracted much attention recently as indicator of air quality, biodiversity and climate change. Lichens are among the most widely distributed and dominant groups of organism at Amarkantak and is the most successful symbiotic organism in Achanakmar- Amarkantak Biosphere Reserve. They are found colonizing on rocks, soil, trunks, and branches of tree. Biodiversity of man-made habitat is often considered less valuable than that of natural site. Over centuries nearly all habitat in a civilized landscape have been altered by humane activity. However the rocks of ancient Rang Mahal temple have not been disturbed and as a result tend to be characterized by more stable condition than many other landform. In

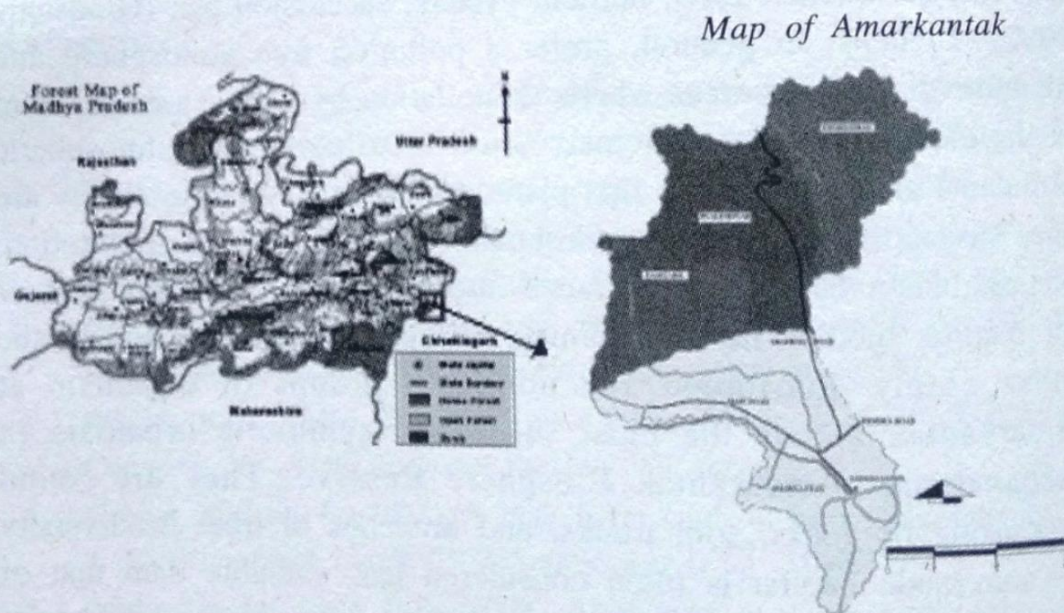
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heterogeneous forest land the diversity of lichens is variable, as the supporting host tree species provide space for different types of lichens. In this area some lichens show preference for *Shorea robusta* (Sal) Ficus species for vigorous growth of Graphidaceae lichen<sup>2</sup>. Hence the present study constitutes the enumeration of lichens on Sal forest and aims to keep the attention towards the valuable lichen species and its threats in Amarkantak region.

**Study Site-** Amarkantak is township of Anuppur district in Madhya Pradesh. It is situated in the Maikal mountain range at 22°40' north latitude and 81°47' east longitude. Amarkantak constitute a world wide network and infrastructure for scientific information of flora and fauna.



*Fig- 1 Map of Amarkantak study site.*

### **Geology and Soil:**

Amarkantak has hills capped with Bauxite and Laterite products with underlying basalt. Soils are typically shallow where the topography is steep but of fair depth on the flatter tops, Latérite is usual<sup>3</sup>. The soil is ferruginous and clay with more or less acidic and neutral.

## **Climate**

The temperature and rainfall data of the area are based on records of observatory forest department. The mean temperature ranges from 21°C to 31°C the January mean being about 21 and the May temperature rising to about 31°C to 34°C .May and June are the hottest months and December and January coldest months when the lowest temperature reaches to 1°C. Rainfall is large from Southwest monsoon and maximum rainfall occurred during July to September. Winter rains occur in December and January. Total annual rainfall is over 1000 mm. During the highest rainfall the lichens, especially *Parmelia* species shows good growth on bark of *Shorea robusta*.

## **Methodology**

The present study has been done by the randomly selected trees of Sal only (*Shorea robusta*) at Amarkantak region in different places. Lichens were collected by using simple bark remover. Non harvesting techniques were used during collection. These specimens were identified at National Botanical Research Institute and presently herbariums were kept at department of forestry Guru Ghasidas Vishwavidyalaya Bilaspur. Pressure on forest and study of threat to lichen were conducted by questionnaires from local people about their fuel wood, number of cattle, encroachment and population of Amarkantak with respect to forest.

## **Lichens on Sal forest of Amarkantak range**

Sal was found to be dominant species in all gradients with density of 533 trees/hac in plateau, 545 trees/hac in slopes and 538 trees/hac in plain area. In general middle aged trees were dominating in the area. It is best host species of lichen but deforestation forest fire and air pollution can damage the lichen growth<sup>4</sup>. However Amarkantak is 100 kilometer away from the industrial city. But recent research from other country the sulphur dioxide gases can affects up to area of more than

100 kilometer. Some of the lichen species were identified from Amarkantak forest area on *Shorea robusta* are as following-

S.N.	Name of species	Family	Attachment	Location	Altitude
1.	<i>Bulbothrix isidiza</i> (Nyl) Hale	Physciaceae	Bark -Sal	Jamunadadar Dhunipani Maiki bagiya	950 m 900 m 920m
2.	<i>Bulbothrix setschwanensis</i> (Zahlbr.) Hale	Parmeliaceae	Fallen twig	Dhunipani Sonmuda	900 m 1000 m
3.	<i>Caleoplaca flavorubescens</i> (Hudson) J.Laudon	Teloschistaceae	Bark -Sal	Jamunadadar	950 m
4.	<i>Canopermalia cinerascens</i> (Lyngé) Elix &Hale	Parmeliaceae	Bark -Sal	Panchdhara Sambhudhara Jamunadadar	950 m 1002 m 950 m
5.	<i>Canopermalia Texana</i> (Tuck) Elix &Hale	Parmeliaceae	Bark- Sal	Tikritola	1060 m
6.	<i>Dirinaria consimilis</i> (Stirton) D.D.Awasthi	Pysciaceae	Bark -Sal	Sonmuda Dhunipani Jamunadadar Sambhudhara	1000 m 900 m 950 m 1002 m
7.	<i>Hypotrachyna</i> Awasthi Hale & Patw	Parmeliaceae	Bark -Sal	Jamunadadar	950 m
8.	<i>Heterodermia diademata</i> (Taylor) D.D.Awasthi	Physciaceae	Bark -Sal	Jwaleswar, Sambhudhara	1002 m
9.	<i>Heterodermia obscurata</i> (Nyl) Trevisan	Physciaceae	Bark -Sal	Jamunadadar Mai ki bagiya	950 m
10.	<i>Lecanora argentata</i> (Ach.) Degel	Leconaraceae	Bark -Sal	Forest department	—
11.	<i>Parmotermia saccatilobum</i> (Taylor) Hale	Parmeliaceae	Bark- Sal	Sambhudhara Jamunadadar Mai ki bagiya	1002 m 950 m 920m
12.	<i>Permotrema praesoridiosum</i> (Nyl )Hale	Parmeliaceae	Bark -Sal	Sonmuda Tikritola	1000 m 1060 m
13.	<i>Pertusaria granulata</i> (Ach) mull.Arg	Pertusariaceae	Bark -Sal	Jamunadadar Dhunipani Panchdhara Mai ki bagiya	950m 900 m 950 m 920m
14.	<i>Pertusaria concina</i>	Pertusariaceae Erichsen	Bark -Sal	Jamunadadar, Sonmuda	950 m 1000 m
15.	<i>Pertusaria leucosorodes</i> (Nyl)	Pertusariaceae	Bark -Sal	Sambhudhara	1002 m
16.	<i>Pertusaria rimosa</i> D.D. Awasthi & Srivastava	Pertusariaceae	Bark -Sal	Maiki bagiya	920m
17.	<i>Physcia dimidiata</i> (Arn) Nyl	Physciaceae	Bark -Sal	Tikritola near Narmada temple	1060m

Table No-1 Lichen specimen identified on host species *Shorea robusta* (Sal) at Amarkantak

### Disappeared Lichens on monuments

Amarkantak has its own cultural uniqueness identity due to presence of old monuments between the dense forest of *shorea robusta* and presence of beautiful lichen on them which is situated at only hundred meter apart from origin of river Narmada. Lichen growths are observed abundantly on the temple and statue of Goddess contains the lichen species (*Lepraria lobifrance*)<sup>5</sup> since which was made 8<sup>th</sup> century ago. The history of the area goes back to 8<sup>th</sup> century A.D. when Sankaracharya built a Surya Kund to specify the origin of the Narmada. He also installed the idol of Shiva at Pataleshwar in Amarkantak. The Pataleshwar temple was built later by Kalchury king Karna Deva (1041-1073). However the rocks of ancient century Rang Mahal temple have often been disturbed little during the century and as a result tend to be characterized by abundance of lichen on them in which all of them are cleaned by chemicals. Some samples were collected from replaced rocks of monuments in which some species are *Arthothelium saxicolum* Makhiza & Patw of Arthoniaceae, *Caloplaca amarkantakana*<sup>6</sup> Joshi, Y. & Upreti sp. Saxicolus Lichen and *Pertusaria leucosora* Nyl. of Pertusariaceae family Fig-2 Showing species of *lapraria lobifrance*



Fig-2 Lichen on statue of goddess



Fig-3 Vigorous growth of lichen on temple



Fig-4 After cleaning with chemical

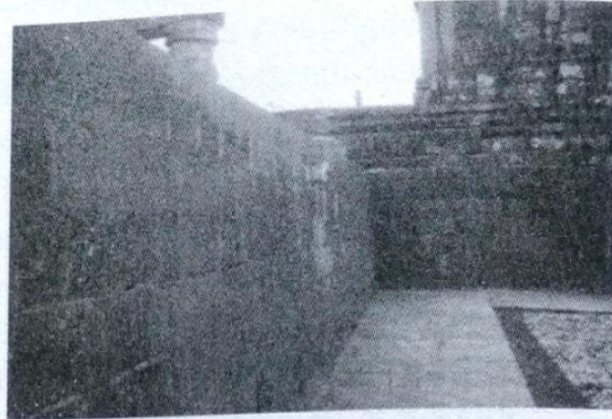


Fig-5 Replaced stone showing disappeared lichen

### Sal heartwood borer epidemic

Sal (*Shorea robusta* geartn.F) belongs to the family Dipterocarpaceae. It is a large, tropical and an important family containing 18 genera and 450 species. India contains 5 genera and 32 species and these are very important for forestry point of view especially for lichen. The attacks of Sal heartwood borer are reported in several forest area of Madhya Pradesh and Chhattisgarh serious epidemic attack are recorded during 1924-28, 1962-64, 1979-83, 1995-2000,. Though sporadic attack are common as the insect is endemic to these areas. Presently only one dead insect of *Hoplocerambyx spinicornis* was observed during the observation and study of lichen on February 2010. Earlier data represents the series of Sal heartwood borer in Achanakmar Amarkantak Biosphere Reserve in which millions of tree were affected resulting in a loss of several lichen species from host tree species Sal (the home of lichen). Sal is a large deciduous nearing semi evergreen tree with sighting foliage good for lichen growth. Sal is better timber than teak so it is used by the people in various constructional work Sal wood is consider as very high calorific value so it also cut by local people in large amount for fulewood destructing the lichen species which takes several year to grow in the bark.

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During the 1997-98 due to epidemic problem of Sal heartwood borer (*Hoploceramyx spinicornis*) The intensity of damage in different areas of Amarkantak region was as follows :

Division	Range	Compartment	Area	Affected tree
S.Shahdol	Amarkantak	31	7,864.7	70,925
	Rajendragram	35	7,567.4	17,475
	SADA	4	1,200.0	8,696
	Total	74	17,655.4	97,824

Table No- 2 Past Sal borer epidemic At Amarkantak (source forest department)

### Tourism

Tourism is sensitive case in which possibility of degradation can be occur. About more than 35 lichen species were identified in Amarkantak area since lichen are very sensitive to environment pollution unfortunately, just like the more high profile mammals and bird species the lowly lichen too appear to be under threat in Amarkantak from humane interference like tourism. Presently more than 100s of vehicles per day causes atmospheric pollution and the numbers of vehicles are increasing continuously.

Pressure on forest	Percentage
Human population	20%
Cattle population	05%
Fuelwood	70%
Grazing	40%
Timber	02%

Table -3 pressures on forest at Amarkantak

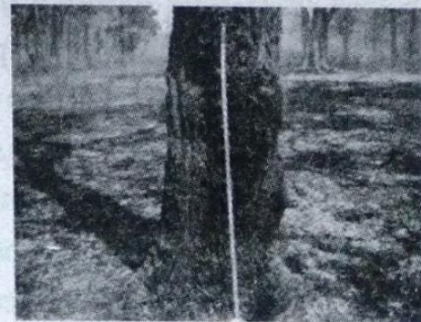


Fig- 6 Damaged lichen from forest fire

Due to human population, cattle population and wide spread rural poverty. The forest of the Amarkantak is subject to Enormous pressure. These pressures are resulting in deforestation and forest degradation

### **Forest fire**

Forest fire in Amarkantak region is generally ground fire. This is the most effective problem of forest department Forest fire can damage the valuable plant diversity within a minute that take many years to establish in the natural condition.

Sal tree occupying the lichen get damaged due to ground fire up to breast height (Fig-6) including ground rocks. Trricoulous lichens are also susceptible to damaged quickly by grazing livestock. Lichens of fallen trees, twigs and branches are also losing their life due to ground fire. Every year in the beginning of February –March when the ground exist the highest dried dead leaves of thick Sal tree forest fire extent all forest area of the Amarkantak .

### **Encroachment by ashram**

The building construction by total 25 ashram captured the total land were damaged the natural forest of Amarkantak. Sal tree exude an oleo-resin used in religious ceremonies is collected by people in Amarkantak with harming the lichen species on the bark. Plantation of non native species for the purpose of beauty and scenic value lichen has decrease the lichen growth. There are randomly counted 14 tree species of *Ficus bengalensis* were harmed or cut there branch by people in which 3 of them are from Jamunadadar, 4 species from Heliped region 2 at near the Vaitarni river 4 at Mai ki bagiya. All the represented places are situated very dense population site in Amarkantak.

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