Indian J. Applied & Pure Bio. Vol. 30(1), 1-6 (2015).

Terricolous Lichens of Achanakmar-Amarkantak Biosphere Reserve

Arvind Prajapati* and S. C. Tiwari

Department of Forestry Wildlife & Environmental Sciences,
Guru GhasidasVishwavidyalaya, Bilaspur-495 009 (India)

Abstract

Lichens have capability to grow on a variety of substrates (rock, soil, and trees) under extreme environmental conditions which make them cosmopolitan in nature. Basically there are four main types of lichen thalii recognizable on the basis of their general habit of growth, form and manner of attachment to the substrates; these are Crustose, Foliose, squamulose and Fruticose. Due to variation in topography, soil structure and high rainfall, in combination with perennial and annual diverse environmental condition in Amarkantak lead to the luxuriant growth of lichens which have immense ecological value. The lichen species were collected and identified at the National Botanical Research Institute Lucknow and deposited at the Lichenology lab (LWG), Lucknow. Distribution of terricolous lichens in Amarkantak Maikal Mountain is represented by physical and biological factors: physical and chemical characteristics of the soil, moisture regimes, temperature, insulations, and development and composition of forest. Fruticose species are least abundant in exposed locations. The occurrences of only 3 lichen species in undisturbed site signify the rate of soil degradation in Amarkantak tourist place. This paper describes and discusses terricolous lichen communities of dense Sal forests of Amarkantak.

Key words: Terricolous lichen, Soil degradation, Amarkantak,

Lichens are components of soil crust communities. In some habitats lichens account for a significant proportion of the ground cover, often retains the soil surface and enhancing soil fertility. According to habitat lichens can be divided into three categories namely (a) Saxicolous predominantly grow on stones or rocks, (b) Corticolous generally grow on bark and (c) Terricolous are terrestrial in nature. Anthropological pressure created cutting and felling of trees, including grazing, forest fire, air pollution, leads to threat for *Cladonia*

**Corresponding author* Email:-arvind_forestry2@yahoo.com
Mobile No. 09098974490

pratermissa, a rare dimorphic species of fruticose lichen in Central India occurs in only at Amarkantak in the Achanakmar Amarkantak Biosphere Reserve.

Deforestation has been identified as the major threats to the lichen flora of India, holistic efforts are needed to measure and monitor the extent of actual impact of these land use changes on the lichen abundance and diversity. Soil inhabiting terricolous lichens are good indicator of ecosystem operation and their requirement of greater environmental stability make them highly sensitive indicators of overall ecosystem functioning and various environmental disturbances. Status of lichen was detailed out by Tiwari & Prajapati[8] as epiphytes on the host tree species *Shorea robusta* in Amarkantak forest. Terricolous lichens can indicate different succession stages of vegetation and habitat disturbance studied by Himanshu *et al.*,[6]. However very few studies have dealt directly with soil lichens. The purpose of this paper is to exemplify the lichen component of soil crust communities in Achanakmar-Amarkantak Biosphere Reserve.

Study area :

Achanakmar-Amarkantak Biosphere Reserve lies between latitude of 22°15'N to 22°58'N and longitude of 81° 25' E to 82° 5'E, having an area of 3835.51 sq. km. It constitute of three district namely Diondori, Anupur in Madhya Pradesh and Bilaspur in Chhattisgarh. The general configurations of site are hilly undulating terrain and at places narrow valleys. The altitude varies from 500 msl to 1500 msl at different localities in the area. Satpura Mountain consists of series of parallel ridges between narmada and tapti. The reserve area is a origin place of four rivers viz., Son from east, Narmada from west, Johila from north and Mahanadi from south. Geologically, the Amarkantak hills have underlying basalt (Deccan trap). The overburden consists of bauxite and laterite making the soil ferruginous and clay with an acidic nature.

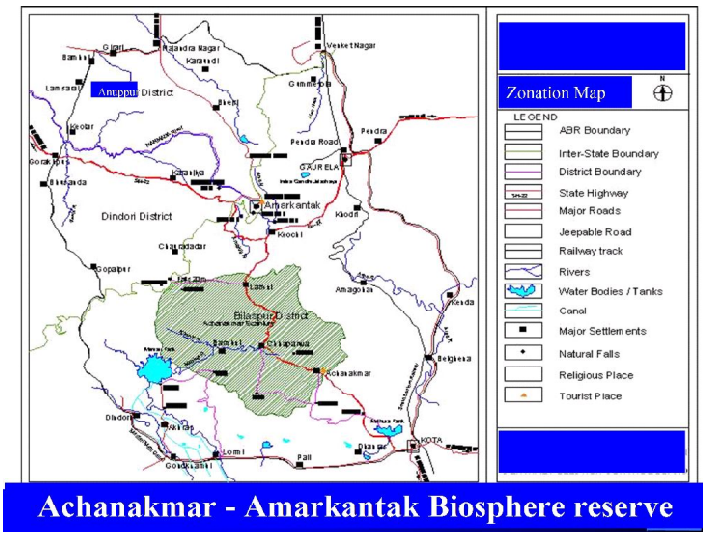

Figure 1, Map of study area Achanakmar Amarkantak Biosphere Reserve.

The climate of the study area is typical monsoonal The annual rainfall varies from 1000 mm to 1600 mm at different localities of the area. Lichens are among the most widely distributed and dominant group of organism of reserve it covers the most successful symbiotic organism in Achanakmar- Amarkantak Biosphere Reserve.

Forest areas of the Biosphere reserve were surveyed and collections were made from soil crust communities. The specimens were dried and labeled are preserved in herbarium of National Botanical Research Institute, Lucknow, (LWG).

The specimens were identified by studying their morphology, anatomy and chemistry following the literature[1,3,4]. The morphology of the taxa was studied under stereo-zoom binocular microscope. The details of thallus anatomy and fruiting bodies were studied by compound microscope. The colour spot test were carried out on cortex and medulla with the usual chemical reagents such as aqueous potassium hydroxide (K), Steiner's stable Paraphenylenediamine (PD) and aqueous calcium hypochlorite (C). Thin layer chromatography was performed for authentic identification of the lichen substances in system (Toluene: 1-4 dioxane: Acetic acid) following Walkar and James[10].

There are 3 species of lichen which were reported from soil crust communities throughout the Reserve Area. Out of these the *Cladonia praetermissa* is the only fruticose species of lichen that is found in Amarkantak in Central India

Cladonia praetermissa A.W.Archer (Fig. c) Archer. Mulleria. *5*: 273, 1984 p 222

Thallus dimorphic, squamules of the primary thallus mediµm to large sized crenate, persistent. Podetia 5 (-10) mm tall, 0.5 mm thick at base, simple, subulate, always escyphose; rarely hymenial disc on tps. Podetial surface corticated, squamulose at base; ecorticated and soredia at apices. Podetia K+ weakly yellow KC_, P+ red, Atranorine, fuemroprotocetraric acid and rarely psoromic acid present.

Habitat: Found in soil, moist and shady places of dense Sal forest near the water stream.

Specimen examined: **Madhya Pradesh,** Anuppur district Shambhudhara, on soil, 10.May.2010 Arvind Prajapati, 10-14003, 10-140039(DUP) (LWG), Shambhudhara Site (A), 10.May.2010, Arvind Prajapati, 10-14002 (LWG).

Diploschistes muscorµm (Scop.) R.Sant. (Fig. d)

Thallus whitish to dark grey,+- continuous , not areolate, the surface uneven, +_ coarsely verrucose; not pruinose. Apothecia 1-2 mm diam, urceolate; disc pruinose; thalline exciple not or slightly raised above the thallus; hymeniµm 75-120 µm tall; hypotheciµm dark brown .Asci 65-80 x 12-15(-20) µm, 4-spored. Ascospores (20-)25-35(-40) x (8-)12-15(-18) µm , with 5 transverse and 1-2 longitudinal septa. Thallus Pd - ,K-,or K+_, yellow or red (Diploschistesic acid always detectable by tlc.) C+ red, UV-,(Diploschistesic acid and lecanoric acid). Initially parasite on cladonia squamules and podetia, on soil.

Habitat: It is found on the moist dene sal forst and was found parasitic on *cladonia* species along the bank of River Narmada

Specimen Examined: **Madhya Pradesh, Anuppur District**, Shambhudhara, on soil, 10.May. 2010 Arvind Prajapati, 10-014001 (LWG)

Lepraria lobificans Nyl**.** Fig (b)

Thallus leprose to subfoliose, membranous to granular; margin delimited, lobes present, distinct, with raised marginal rim; hypothallus present, light brownish; soredia abundant, fine very coarse, (20–)220–340 (–650) µm diam., projecting hyphae present, very coarse.

Chemistry: atranorin, stictic acid, constictic and norstictic acids (traces), zeorin and roccellic acid. K+ yellow to brownish, C–, KC–, Pd+ orange.

Habitat: On bark, rock, soil and various other substrata; in shaded, sheltered places.

Specimen examined:- Madhya Pradesh, Anuppur district Amarkantak mai ki Bagiya, On *Syzygium cumini*10.05.2010, Arvind Prajapati, 10-014048(LWG); On Rock, 10.05.2010 Arvind Prajapati, 10-014049 (LWG); On Rock, 10.05.2010, arvind Prajapati O.N.Gautam,10-014049 (DUP) (LWG); Shambhudhara on soil 10.05.2010, Arvind Prajapati, 10-014055, -014055 (DUP) (LWG); **Dindori district**, kapildhara Forest, on *shorea robusta* bark, 09.05.2010, 10-014050(LWG).

Amarkantak a tourist place is the only site for occurrence of only one fruticose lichen *Cladonia pratermissa* in Centaral india. Lichens are important components of soil crust communities in the forest. Maikal mountain chain of Amarkantak is place of vigorous growth of lichen community along with all the associated species. All 3 terricolous lichen species were found in undisturbed site, especially in areas protected from household grazing, forest fire, and apart from road vehicular activity.

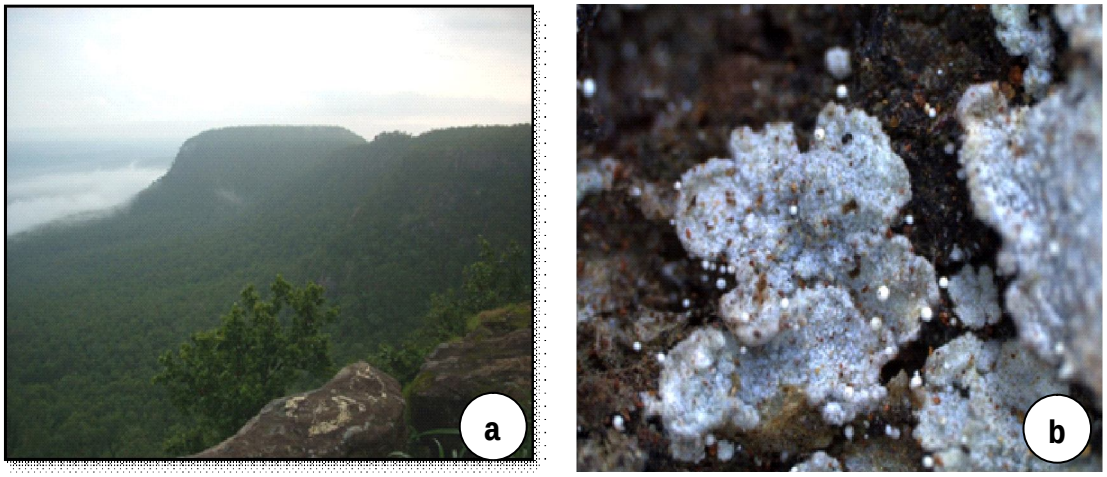

Figure: 1 (a) Forest of Amarkantak **(b)** *Lepraria lobificans* Nyl**.**

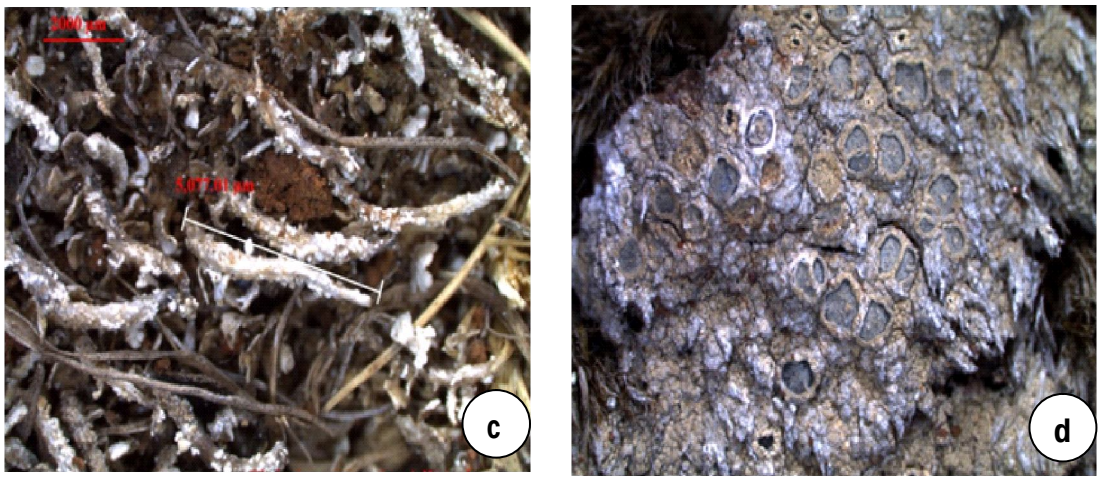

Figure: 1 (c) *Cladonia praetermissa* A.W.Archer
(d) *Diploschistes scruposus* (Schereber) Norman

Upper soil horizon is very sensitive to anthropogenic pressure, and terricolous lichen species are sensitive with respect to soil degradation due to human interference. Amarkantak is situated at 1100 m above mean sea level moderately moist and covered with *Shorea robusta* a dominant tree species reduces wind and water erosion and significantly increasing soil fertility due to thick forest cover. As a number of environmental problem factors such as urbanization, forest fires and tourism has been created the pressure on Amarkantak forest land. Over the last years a significant portion of the soil crust communities of the Jamunadadar, Ajmergadh, Khurkhuridadar, Plateau has been heavily damaged, mostly due to intensive grazing by cattle and other human activity. Soil lichen are generally slow to recover, often requiring many years for full recovery. Terricolous lichen structure in the Maikal mountain area is crushed from large herds of grazing domestic animals. In the rainy and winter season herbaceous plant are wet because of seasonal precipitation and thus they protect less vulnerable to the effects of trampling. However, as the summer months approached thick leaf litter and soil crusts became dry leads to forest fire, every year in the Amarkantak site. Many species of lichens are sensitive to various types of air pollution[7]. Unfortunately; very little is known about the effects of air pollutants on soil crust lichens. It is generally thought that the basic soils of the Intermountain Area ameliorate the effects of air pollution, especially acid generating pollutants. The effects of emissions from solid waste, loss of moisture, grazing pressure and Anthropological pressure due to tourism in Amarkantak affected majo part of diversity loss on soil crust communities.

The authors thank the Director, National Botanical Research institute, Lucknow, for providing Laboratory facility.

References:

1. Awasthi, D.D. (1988). *J Hattori Bot. Lab. 65*: 207-303.
2. Awasthi, D.D. (1991). *Biblioth. Lichenol. 40*: 1-337.
3. Awasthi, D.D. (2000). *Lichenology in Indian Subcontinent.* Bishen Singh and Mahendra Pal Singh, Dehradun, India.
4. Awasthi, D.D. (2007). *A compendium of the macrolichens from India, Nepal and Sri Lanka*. Bishen Singh and Mahendera Pal Singh, Dehradun, India.
5. Hawksworth, D.L., P.W. James and B.J. Coppins (1980). *Lichenologist 12* (1): 1-115.
6. Rai Himanshu, D.K. Upreti and R.K. Gupta (2012). *Biodiversity and conservation 21*(1): 97-113.
7. Nash, T.H. and V. Wirth (1988). *Bibliotheca Lichenology 30*: 1-297.
8. Tiwari S.C. and Arvind Prajapati (2012). *Indn J. Trop. Biodiv. 20*(1) : 13-18.
9. Upreti, D.K. and S. Chatterjee (1999). *Bombay Nat. Hist. 96* (1): 88-92.
10. Walker, F.G. and P.W. James (1980). *Bull. Brit. Lichen. Soc. 46:* 13-29.