

Occurrence of Lichens in relation to traffic load of Latur city and effect of Sulpherdioxide on Parmotrema tinocorum (Nyl.) Hale

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Abstract- A total of 22 specimens of folioge and crustose lichens are collected from different localities of Latur city in the Marathwada region of Maharashtra state and examined critically in the laboratory. Seven species are identified chemotaxonomically. Parmotrema tinocorum (Nyl.) Hale, is a genus of lichen belonging to the family Parmeliaceae, found to grow on the barks of varieties of angiospermic plants and also on the rocks. Effect of sulphur dioxide pollutant on the thallus of this species is studied on different samples. Deformation and blackening of some of the lichen thalli is quite noticeable. Degradation of chlorophyll pigments has been studied in various samples by using spectrophotometer. The result analysis shows that the percentage of degradation of chlorophyll pigment is maximum in heavy traffic areas and comparatively very negligible in the open areas. The phytoecological aspects of lichens are also studied

Index terms- Lichen, Sulphur dioxide, Chlorophyll degradation

INTRODUCTION

Latur is one of the important cities located in south eastern part of Maharashtra with ancient historical background and one of the developing city in the Marathwada region of Maharashtra. It is the administrative headquarters of Latur district and taluka. The city is a tourist hub surrounded by many historical monuments, including Udgir fort, Ausa fort and Kharosa caves. A total population of Latur city was 3,82,754 (2001 census). The entire city lies on the Balaghat ranges in Latur district. The Latur city extends from 18° 22' North latitude to 18° 25' North latitude and from 76° 32' East Longitude to 76° 36' East Longitude. The annual temperatures of Latur ranges from 24 to 41. Latur is affected by cold waves in cold season, due to cold waves the minimum temperature drop down to about 7 to 9. Heavy rain

fall occurs in monsoon season from June to September but August showed the highest rainfall i.e. 230mm. The city of Latur is located around 636 meters above main sea level for this reason winters in Latur are quite cold. All the metropolitan cities of India show considerable amount of environmental degradation. Latur city is not exception to this, since last ten years, the population of the city has tremendously increased almost two folds and also increasing in such a faster way. There is direct relationship between increase in population numbers and environmental impact. Being Latur is a holy place, lakhs of pilgrims visits every year to the city on the occasion of Mahashivratri festival in the months of summer. Due to heavy vehicular traffic in the city and emission of house hold gases pollute the air into maximum level along with gases from industries, brick manufacturing units etc. The green belt cover has considerably been reduced because of various developmental projects like new settlement areas, widening of roads in the city for the establishment of new industrial units, as a result very harmful gases level of the city increased tremendously.

In the recent years, Lichens are used for monitoring purposes. The lichen thallus is perennial, stable and long lived structure on the bark of the trees or on the barks, rocks. The air borne pollutants are absorbed very effectively over the entire surface of the thallus because there are no protective structures such as waxy cuticles. These elements are bound in the hyphal walls and store harmlessly or taken up by the metabolically active algae, which die off or are damaged. The lichens are very sensitive to air pollution and very lichens grow in a city area and almost absent in a heavily polluted area.

The present investigation has been undertaken to know the distribution of lichen species in different parts of the Latur city. Some aspects of Phyto-ecological association and climatic factors are also studied which are responsible for the occurrence of the species. The effect of sulphur dioxide pollutant on the lichen thalli is also studied.

MATERIALS AND METHODS

During present investigation a total of 22 specimens are collected successfully from the selected sites of the Latur city. The selected sites were Shivaji chowk to AUSA road, Shivaji chowk to Nanded road, Shivaji chowk to Ambajogai road, Shivaji chowk to Barshi road, MIDC (old), MIDC (New) and Lord Siddheshwara temple area. The collections are usually made in the months of July 2015 to February 2016. The collected specimens are kept in blotting paper having high absorption capacity. All the specimens are examined and the accession numbers are given to them. The external morphological details are studied by using binocular microscope. The anatomical studies of the thallus and ascocarps are studied under research compound microscope after taking fine hand sections and mounting in lactophenol on a slide. The colour test and thin layer

Table.1

Sr.no	Name of the lichens	Nature of substratum
1	<i>Arthothelium saxicolam</i> Massal	On rocks (saxicolous)
2	<i>Bulbothrix meizospora</i> (Nyl.)Hale	On rocks (saxicolous)
3	<i>Diploschistes scruposus</i> (Schreb.) Norm.	On rocks (saxicolous)
4	<i>Graphina acharii</i> (Fee) Mull.and Arg.	On rocks (saxicolous)
5	<i>Parmotrema praesorediosum</i> (Nyl.)Hale	On rocks (saxicolous)
6	<i>Parmotrema tinctorum</i> (Nyl.)Hale	On rocks and barks
7	<i>Pyxine petricola</i> (Nyl.)Hale	On rocks and barks

Parmotrema tinctorum (Nyl.)Hale is the only lichen species which is well distributed in different parts of the Latur city. This species grows luxuriantly on the barks of *Azadirachta indica*, *Mangifera indica*, *Ficus benghalensis*, *Plumeria alba*, *Roysonia regia* and occasionally on other angiospermic plants, and hence this species is selected for studying the effect of sulphur dioxide on the thallus. *Parmotrema tinctorum* (Nyl.)Hale is a foliose lichen belongs to Parmeliaceae family the thallus has distinct lobes and whitish grey in colour. Since there is no protective structures such as waxy cuticle or stomata, the

chromatography are carried out to determine the presence or absence of chemical substances in the lichen thallus.

Parmotrema tinctorum (Nyl.)Hale, the only one species found to occur in different selected sites of Latur city, and hence this species is selected for bio monitoring studies. Various samples are prepared and chlorophyll estimation studies are being carried out. The marginal lobes of the thallus (about 15mg) are placed in 3 ml of dimethyl sulphur dioxide for 45 minutes at 60°C in the dark. The extracts are filtered and the absorbance of the extract is then measured in a spectrophotometer at 410 and 440nm. The amount of degradation of chlorophyll a to pheophytin is calculated from the optical density ratio 440/410 (Belnap and Harper, 1990).

RESULTS AND DISCUSSION

The selected sites are surveyed for the occurrence of different lichen species, it has been observed that very few lichen species are growing on limited angiospermic plants and also on the rocks. All the lichen specimens are identified taxonomically. A total of 07 species of lichens are found growing in the Latur city.

soluble sulphur dioxide accumulates on the hyphal wall and takes part in the metabolic pathway. The degradation of chlorophyll-a into pheophytin -a is measured with a spectrophotometer.

The estimation of chlorophyll pigments are carried out in different samples which are collected from both polluted and open areas of the city. Sulphur dioxide gas is effectively absorbed by the thallus during the humid atmosphere. The following data and results recorded in seven samples. The degradation of chlorophyll is expressed by the optical density 440/410 values.

Table 2:

Sr. no	Area	Wavelength in nm	Optical Density	Chlorophyll degradation value
1	Shivaji chowk to AUSA road	440	0.462	
		410	0.260	1.76
2	Shivaji chowk to Nanded road	440	0.466	
		410	0.258	1.78
3	Shivaji chowk to Ambajogai road	440	0.466	
		410	0.252	1.72
4	Shivaji chowk to Barshi road	440	0.462	
		410	0.250	1.74
5	MIDC (OLD)	440	0.570	
		410	0.340	1.84
6	MIDC (NEW)	440	0.582	
		410	0.344	1.92
7	Siddheshwara temple area	440	0.490	
		410	0.320	1.88

The estimation of chlorophyll pigments of different samples are carried out in the month of November, December, February, April and June for two years. It has been observed that the degree of chlorophyll degradation is maximum in MIDC (New) area and followed by Siddheshwara temple area and MIDC (Old) area. The minimum degree of chlorophyll degradation is found in Shivaji chowk to Ambajogai road area where vehicular pollution is minimum.

OBSERVATIONS:

1. In present investigation only 22 species of lichens are encountered in Latur city by visiting the selected sites for collection. The limited number of species is due to the presence of suitable old angiospermic plants.
2. The distribution of each species is also in very limited areas. Many old trees have been cut down for widening of roads and other developmental activities in the entire city.
3. The average temperature of the city is continuously increasing since last five years. The highest 41°C temperature is recorded in the last summer and it was the highest in this decade. High temperature and less humidity in the air prevent lichen communities to colonize on the suitable substratum.
4. In present investigation it is strongly observed that *Parmotrema tinctorum* (Nyl.) Hale is a pollution tolerant species and grows in adverse climatic conditions.

5. Due to the accumulations of various pollutants the blackening of lichen thalli and deformation of lobes are being observed throughout.
6. In the Latur city there is constant increase in the number of vehicles, being Lord Siddheshwara temple, lakhs of pilgrim's visit to the city every year in the month of February – March on the occasion of Mahashivratri Festival, Developing MIDC area, New housing complexes, motor vehicles and bricks manufacturing units causes more pollution in the air.
7. The polluted air does not allow juvenile and delicate lichen thalli to grow and establish on the suitable substratum because they are very sensitive to air pollution.
8. Use of lichens as bioindicator has the advantage of relatively low cost. The biological monitoring of the quality of the air of an urban area has lots of significance. An integrated approach is probably the most appropriate solution for monitoring the air pollution.

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