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Research Article

A preliminary study of bark algae from Daulatabad region of Aurangabad District in Maharashtra, India

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Abstract

Bark of trees provides a suitable substratum for algal growth. Algae growing on barks are subaerial in habitat. As algae, inhabiting bark of tree are also known as corticolous. They are also called as epiphloeophytes. In present research work bark algae on barks of *Tamarindus indica L, Acacia nitotica* (L.) Del and *Magnifera indica L.* were observed from Daulatabad region of Aurangabad district in Maharashtra. A total of 26 species of algae under 20 genera belonged to Chlorophyceae, Bacillariophyceae and Cyanophyceae were recorded. Cyanophycean algal forms dominated the bark algal flora. Maximum number of algal taxa were found on the barks of *Tamarindus indica L.* and *Mangifera indica* L. Present study is useful to the overall knowledge on diversity of subaerial algae of selected study area.

INTRODUCTION

The bark is outermost layer of stems and roots of woody plants, especially of trees. It is a protective corky tissue present on outside of stems of trees. Bark protects the plant from insect and attacks of pathogens, besides maintaining internal temperature of the plant. The bark of trees species harbours number of microbes, insects, worms alongwith a large number of mosses, lichens and algae. It serves as a platform for interaction among different species and with the environment. The bark also functions as a medium for plant excretion and protects the plant from abrupt climatic changes.

Bark provides humus and suitable substratum for algal growth. The algae growing on the bark are called epiphloeophytes. These algae are subaerial in habitat. They receive moisture either solely from the atmosphere or fairly steady source of water seeping through the moss mats. As these algae inhabiting bark of trees are also known as corticolous. Algae most commonly grow on bark of trees in moist tropical climates, but several species are also able to grow on bark of trees even in temperate subtropical climate. For the development of bark algae particular climatic conditions are required such as high relative humidity, high and evenly distributed rainfall, low temperature and low to high photon irriadiance. The bark properties such as texture, fissuring, dust deposition regulate the composition of bark algal flora on bark. Algal propagules brought through wind and rain water flowing through the bark colonizes on bark with the help of favourable climatic conditions.

Julia Snow (1899) scraped the algal material directly from bark as she was exclusively interested in *Protococcus*.

Islam (1960) observed that very heavy rainfall and prevailing humidity provides ideal conditions for growth of subaerial algae. Marion (1969) collected bark algal samples from various trees located in six areas within a thirty mile radius of Charleston, Illinois. *Protococcus, Nanochloris, Stichococcus* and *Ulothrix* were widely distributed genera. Cox and Hightower (1972), Wylie and Schlichting (1973) and Handa and Nakano (1998) worked on corticolous algae. Katharina et. al. (2008) studied role of bark algae to monitor airborne pollutants such as ozone and particulate matter. Neustupu and Skaloud (2008 and 2010) and Neustuph and Anna (2013) extensively studied diversity and distribution of bark algae. Lemes et. al. (2008 and 2012) recorded corticolous cyanobacteria and green algae from tropical forests. Sarim et. al. (2011) reported 40 bark algal species from Pakistan. Alwi et. al. (2015) studied effect of bark pH on diversity and density of bark algal composition. They observed that alkaline pH of bark help in the alteration of microalgal composition.

In India except few reports not much work has been carried out on bark algae. Bruhl and Biswas (1923) studied bark algae from Kerla. Kamat and Harankhedkar (1976) and Ashtekar (1980) reported bark algae from Nagpur and Aurangabad, Maharashtra. Kumar and Paliwal (2006) studied distributional pattern of cyanobacteria on bark of trees. Mikter et. al. (2006) worked on algal flora of bark from Arunachal Pradesh. Chandra and Krishnamurthy (2006) reported species of diatoms from tree trunk. Ghosh (2013) reviewed bark algal flora. Kharkongor and Ramanujan (2014) recorded 85 taxa of algal communities from tree barks of closed undisturbed sacred groves, mixed plantation and open disturbed forest. Ambika and Krishnamurthy (2019) studied diversity of algae and cyanobacteria on tree bark of tropical forest. Present research work deals with the study of bark algae from Daulatabad region of Aurangabad district in Maharashtra. On the bark of Angiospermic plants such as *Tamarindus indica, Acacia nilotica* and *Mangifera indica* patches of algae were found during rainy season.

MATERIAL AND METHODS

Rainy season is considered to be the most favourable season for the growth of bark algae. During rainy season in Daulatabad region of Aurangabad district of Maharashtra algal patches were observed on barks of *Tamarindus indica, Acacia nilotica* and *Mangifera indica*. Collection of bark algal samples were made in the months of August and September 2021. Bark algal samples measuring 1 cm^2 were collected by gently scraping the bark with the help of sterilized scalpel from around the tree trunk at a height of 1.5 meter above the ground. Care was taken to ensure that there was no cross-contamination between samples by sterilizing the scalpel with alcohol after each sample collection. A total of 31 samples were collected throughout the period of study. Samples were collected in collection bottles separately and brought to the laboratory for further taxonomic investigation. Collected algal samples were observed under research microscope and identified by referring to the standard literature on algae.

RESULTS AND DISCUSSION

A total of 26 species under 20 genera belonged to Chlorophyceae, Bacillariophyceae and Cyanophyceae were identified and recorded. Cyanophycean algal forms dominated the bark algal flora which is followed by Chlorophyceae and Bacillariophyceae. Wylie and Schlichting (1973), Kamat and Harankhedkar (1976), Mikter et. al. (2006), Gupta (2008). Neustupu and Skaloud (2008) and Kharkongor and Ramanujam (2014) also reported dominance of Cyanophycean algae in bark algal flora. In present study algal taxa *Chlorella vulgaris, Chlorococcum humicola, Pinnularia* sp., *Aphanothece nidulans, Myxosarcina burmensis, Phormidium molle* and *Lyngbya major* were found dominant. Marion (1969) observed dominance of *Protococcus, Nanochloris, Stichococcus* and *Ulothrix.*

Table 1: Algal taxa growing on barks of trees.

Sr. No.	Name of Algal taxa	*Tamarindus indica L.*	*Acacia nilotica (L.) Del*	*Magnifera indica L.*
I	**Chlorophyceae**			
1	*Tetraspora* sp.	-	-	+
2	*Chlorococcum humicola* (Naea.) Rabenhorst	+	+	+
3	*Trebouxia humicola* (Treboux) West et Fritsch	+	-	+
4	*Chlorella vulgaris* Beyerinck	+	+	+
5	Spirogyra sp.	-	-	+
II	**Bacillariophyceae**			
1	*Fragillaria* sp.	+	-	-
2	*Pinnularia* sp.	-	+	+
3	*Cymbella aspera* (Ehr.) Cleve	+	-	+
III	**Cyanophyceae**			
1	*Chroococcus minor* (Kutz.) Nag.	+	-	+
2	*Gloeocapsa rupestris* Kutz	-	-	+
3	*Gloeothece palea* (Kutz.) Rabenh.	-	-	+
4	*Aphanothece nidulans* Richter, P.	+	+	+
5	*Chlorogloeo* sp.	+	-	-
6	*Myxosarcina burmensis* Skuja	+	+	-
7	*Phormidium abronema* Skuja	-	+	-
8	*Phormidium foveolarum* (Mont.) Gomont	-	-	+
9	*Phormidium molle* (Kutz) Gomont	+	+	+
10	*Phormidium subincrustatum* Fritsch et Rich	-	+	-
11	*Phormidium usterii* Schmidle	+	-	-
12	*Lyhngby ceylanica* Wille	-	-	+
13	*Lyngbya cryptoveginata* Schkorbatow	-	+	-
14	*Lyngbya major* Menegh.	+	+	-
15	*Microcoleus subtorulosus* (Breb.) Gomont	+	-	-
16	*Nostoc commune* Vaucher	+	-	-
17	*Plectonema putale* (Kirchn.) Hansg.	-	+	-
18	*Scytonema bohneri* Schmidle	+	-	+

+ = Present, **-** = Absent

Table 2: Total number of algal genera and species recorded from barks of trees.

Sr. No.	Class	Genera	Species
1	Chlorophyceae	05	05
2	Bacillariophyceae	03	03
3	Cyanophyceae	12	18
	Total	**20**	**26**

Table 3: Treewise total number of algal taxa observed on barks.

Tree	Class			Total
	Chlorophyceae	Bacillariophyceae	Cyanophyceae	
Tamarindus indica L.	03	02	10	15
Acacia nilotica (L.) Del.	02	01	08	11
Mangifera indica L.	05	02	08	15

Ashtekar (1980) recorded abundance of *Oscillatoria, Phormidium, Lyngbya* and *Microcoleus.* Katharina et. al. (2008) reported dominance of *Apatococcous lobatus, Chlorella ellipsoidea, Chlorella vulgaris, Chlorella saccharophila* and *Demococcus endolithicus*.

Maximum number of algal taxa were found on the bark of *Tamarindus indica* and *Magnifera indica.* The bark properties regulate the composition of bark algal flora. Bark algae are a micro-habitats developed on various tree barks. The pH of bark surface has been considered as one of the most important factors affecting community structure of corticolous organisms (Neustupa and Anna 2013). Abundance of cyanobacteria was strongly related to increasing bark pH. Green algae as compared to other algal groups normally grow better at a higher pH. Alwi et. al. (2015) observed that alkaline pH of bark alters microalgal composition of bark. Bark algae are highly sensitive to the pollution and temperature fluctuations. Algae most commonly grow on trees in moist tropical climates but several species are also able to grow on trees in temperature subtropical climate. Bark algae study is useful to the overall knowledge on diversity of subaerial algae from any geographical areas.

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