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Study of Lichens from dry region, Dandoba hill, Miraj, Maharashtra, India.

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ABSTRACT

The study lichen species from Dandoba hill, Miraj. Dist. Sangli of Maharshtra is provided. Six species were recorded from the study area which might be due to the typical dry environment. *P. tinctorum* and *P. kamatii* species of the lichen genera *Parmotrema* dominates the area and *P. kamatti* is the endemic lichen species.

Keywords – *Parmotrema, Candellaris*, role, lichen, Dandoba hill.

INTRODUCTION

Lichen is an example of symbiosis means close association, lichens are unusual organisms because they consist of fungal mycelium and microscopic green and blue green algae living together and performing role as a single organism. The main body of lichen is called as thallus and does not resemble either the fungal or algal part and it is difficult to identify them as separate beings due to intense association, both component receive same benefits from each other. Each lichen species has its own form and looks much different from its individual contributing organisms. Lichens are specifically classified by the growth form of the thallus as, 1. Crustose-crust (paint like) 2. foliose- leafy 3. fructicose- branched 4. gelatinous- thick and gluey. The physical and chemical properties of a substrate are very important in determining which lichens develop in a particular area. Secondary metabolities of lichens are called 'Lichen Substances' (Anjali, 2015). Lichens have ability to colonize almost any stable solid substrate like rock surface exposed to adequate light energy. They are commonly found growing on surfaces of trunk and branches of trees, old walls, roofs, etc.

On the basis of their habitat the lichens are classified in to the following categories.
1. Saxicolous- colonise on rocks
2. Endolithic- colonise inside rocks
3. corticolous- grows on bark and branches
4. Terricolous- Species are terrestrial and live in undisturbed soil

Their resistance ability, their low demand for minerals and their ability efficient absorption mechanism enable them to grow usually where no other organism can survive. Approximately 13500 to 17000 sp. Of lichens are recorded. Lichens occur in every type of habitat but widely distributed in terrestrial habitats, occurring from equator to high latitudes and at an altitude of over 900 meters. They can withstand extreme heat, cold and drought. They are more conspicuous in artic-alpine and tundra, where they constitute the dominant vegetation. The lichen community in each vegetation type differs to a great extent. The deciduous and scrub forest exhibit, scarce to poorer lichen diversity in comparison to evergreen forests due to less moisture and more open canopy. Lichens produce acids that play ecological role in breaking down rock and organic materials to form soil (pedogensis) that results in development of terrestrial ecosystem. Lichens prevent the soil from drying out and help stabilize it for other plant. Lichen have the ability to capture fog and dew thus conserving moisture where there is scarcity of water. Lichen accumulate and release nitrogen and phosphorous required by many plants for healthy growth (Smith). In addition lichen cleans the environment by removing and storing air pollutants. They are used as an indicator for air quality or indicator for air pollution. Lichens have great economic value as food, fodder, dye stuffs, spices, perfumes, cosmetics and medicinally they are antioxidants, anticancer agents and have antibacterial and insecticidal property. The studied area recorded six species of five genera

1) *Parmotrema tinctorum*
2) *Parmotrema kamatti*
3) *Chrysothrix candellaris*
4) *Caloplaca pollinii*
5) *Heterodermia isidiophora*
6) *Stourothela nigrozonatum*

Out of these six, *Parmotrema kamatti* is endemic species.

MATERIALS AND METHODS

Study area:

Dandoba hill is a reserve forest in Miraj taluka of Sangli district. It is located between 16° 45' N and 17° 33' N latitude and 73° 41' E and 73° 42' E. this hill range extend towards north to Miraj city (20 km). Dandoba hill is situated between 'Krishna' and 'Yerala' rivers of Miraj tehasil. The altitude varies between 600-900 meters from mean sea level and basin gradually slopes towards the south east.

Methodology

Lichen collection, identification and authentication. The *Parmotrema tinctorum, P. kamtti, Chrysothrix candellaris, Caloplaca pllinii, Heterodermia isidiophora, Stourothela nigrozonatum* lichen samples were collected during July to November 2019 from Dandoba hill to an altitude that varies between 600-900 meters. Identification of these lichen species was done by morphological, anatomical and chemical tests. Finally the lichen samples were authenticated by- Agharkar research institute, Pune.

RESULT

Distribution, structure and roles of studied lichen species.

1. *Parmotrema tinctorum* (Desper, exNyl) Hale

The genus name *Parmotrema* A. massal literally means perforate apothecia (Greek; parmos=cup & trema=perforation). It belongs to family parmeliaceae which is the largest family of lichen in the world and the species are characterized by large foliose thalli with broad lobes. (Uperti and Divekar, 2005, Jayalal etal, 2013, Michling etal, 2014, Vivek etal, 2014) *Parmotrema tinctorum* mostly corticolous and rarely saxicolous it is found to be in the common occurrence and are enumerated. *Parmotrema tinctorum*. thallus is foliose, loosely attached, gloucous grey, lobes round up 2cm wide, margin entire, eciliate, upper surface smooth, shining, sometimes cracked isidiate, isidia laminal, thin to dense, cylindrical, medulla white, lower surface black, rhiziness thin, marginal area brown, erhizinate, sterile. Secondary metabolites are Leconiric acid and Atronorin. *P. tinctorum* is extremely sensitive to air pollution (sugiyam, 1973, sugiyam etal, 1976) therefore it has been used as bio indicator of air pollution, while it has been threatened around and in urban and industrial area (Voshiaki kon) *Parmotrema tinctorum* have antibacterial activity against human pathogenic bacteria like *Salmonella*, *Klebsiella, Escherichia coli, Pseudomonas* and *Proteus* also have antifungal, antibacterial activity [C. T. Swamy etal, 2016] It has insecticidal activity (Sachin etal, 2018) *P. tinctorum* is used as a spicy and flavoring agents for meat and vegetables (Uperti, 2016) *P. tinctorum* have been used in traditional medicines for centuries and it still holds a great interest as alternative treatment in

various parts of the world. (Ronkovic etal, 2007, Richordson, 1991)

2. *Parmotrema kamatii*. Patw and Prabhu.
Thallus corticolous, Pustules forming soredia with uniform sized lobes over 5mm wide (Mishra and Uperti, 2017). It prefers open area in the forests between an altitudes of 1000-2100 m. Thallus foliose, loosely attached; Lobes sub rounded, thinly ciliate, revolute, divided into lobules, upper surface is wrinkled, soredia and isidia absent. Pustules sub marginal, medulla white, lower surface black, marginal zone mottled, rhizinate, sterile. Secondary metabolites atronorin and alectronic acid. *P. kamatii* is the endemic lichen species (Singh K.P.) *P. kamatii* have insecticidal activity. It has larvicidal potential against three mosquito species *Culex quinquefascitus, Aedes aegypti* and *Anopheles stephensi* (Sachin etal, 2018)

***3) Chrysothrix candellaris* (L) J. R. Laudon.**
The lichen genus *Chrysothrix* Mont. is characterized by the yellow, lemon green to bright yellow or golden yellow powdery thallus also known as 'gold dust lichen'. It has a wide distribution around the world. It is corticolous or saxicolous but mostly it was corticolous only and presented on tree bark and it is crustose type. Thallus or apothecia is *Arthonia* type, asci with 3-7 (rare. 1-2) separate spores and contains calycin acid and also pulvinic acid derivatees which makes this group easy to be recognized. Thallus leprose, granular and scattered, continuous or slightly pseudo-aerolate or aggregating in to small patch granules. Thallus ecorticate, margins not delimitation, hypothallus absent, photobiont chlorococcoid round, hyphae hyaline, apothecia and pycnidia not seen. Secondary metabolite is calycin, pulvinic acid. *Chrysothrix candillaris* can be used as an indicator for the air quality. It is a great informer and indicator of chemical substances and elements found in the emission of most industrial objects. [The studied paper from Bangalore (Abida Begum) concluded that heavy metal iron was found in the *Chrysothrix candellaris*.]

4) *Heterodermia isidiophora* (Nyl) D.B. Awasthi.
Heterodermia Trevis. Is a genus of lichenised fungi in the family Physciaceae. *Heterodermia* is a cosmopolitan genus it is most diverse in warm-temperate to subtropical and tropical regions. They grow on rocks, trees, shrubs, decorticated wood and very rarely on soil. It is distinguished from all other foliose genera mainly by its prosoplectenchymatous, upper cortex in combination with atrium as a cortical substances (Moberg R., 2004) It is macro lichen (Negi and Gadgil, 1996) *Heterodermia isidiophora* is corticolous, thallus is yellowish to greyish white, 5-10 cm in diameter, 200-300 mm thick, lobes loosely adpressed to the substratum in central part and discrete only at periphery dichotomously or irregularly branched with short lateral lobes with numerous laminal and marginal isidia, isidia cylindrical and coralloid, upper surface plane with cortex of even thickness. Medulla white, lower surface corticated brown almost black with few short rhizines, apothecia rare. Chemical substances; atranorin and zeorin present (Makhija U. 2004) (ARI Pune) (Roland Moberg, 2009) almost all species of genus *Heterodermia* are used ethonobotanically.

5) *Caloplaca pollinii* (A. massal) Jatta.
Thallus crustose, carticolous, greenish grey, thin,smooth, non sorediate, nonisidiate, apothesia brownish to black, round, emergent, solitary, aboundant up to 1-1.2 mm in diameter, disc brown, brownish to black, flat to slightly concave, epruinose, ascospores hyaline, bipolarilocular, no lichen substances present (ARI, Pune).

Fig. 1 A : *Parmotrema tinctorum*, B : *Parmotrema kamatii* C: *Chrysothrix candillaris* D: *Heterodermia isidiophora*

6) *Staurothela nigrozonatum* (A. Singh and Uperti) A Dube and Makhi

Thallus saxicolous, crustose to buff, irregular in outline, areoles scattered or sometimes grouped together forming continuous areolate crustose, patches closely adnate to substratum, round or irregular in outline, perithesia mostly one per areole but sometimes 2-3 immersed, 0.1-0.2 mm in diameter, small black around the ostiole emerging like a prominent protuberance, ostiole pale, indistinct, dot like, ascospores muriform, no lichen substances detected (ARI, Pune).

CONCLUSION

All of total six species of lichens were recorded from studied area. One is *Chrysothrix candellaris* it can be easily recognized and distinguished by the bright yellowish green colour two species belong to same genus *Parmotrema* i.e. *P. tinctorum* and *P. kamatii* were occurred densely and two species *Caloplaca pollinii* and *Stourothela nigrozonatum* do not have lichen substances and don't record any role but they might play role of pollution indicator. The deciduous and scrub forest exhibit scarce to poorer lichen diversity in comparison to evergreen forest due to less moisture and more open canopy.

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Conflict of Interest

The author declares that there is no conflict of interest.

REFERENCES

Abida Begum, Harikrishnans, (2010) Monitoring Air pollution using lichen species in south Bangalore, Karnataka, IJ of chem tech, research codon (USA), 02(01); 225-260.

Anjali DB, Mohabe S, Reddy AM and Nayaka S (2015) Antimicrobial activities of 2-propanol crude extract from lichen *Parmotrema tinctorium* (Desper ex.Nyl) Hale, collected from Eastern Ghats, India, C.R. in environmental and applied mycology; 5(3); 160-168

Clifford M Wetmore, (1994) the lichen genus *Caloplaca* in North and Central America with brown or black apothesia, mycologia, 86(6), 813-838, (The New York botanical garden, Bronax, NY 104585126)

Conservancy of southwest Florida- Our water, land, wildlife future- Lichen species in the Christopher B.Smith preserve.

Dong liu, soon ok on, (2017) new species of new record of genus *Chrysothrix* (*Chrysothrix*, Arthonials) from South Korea and Chile, Open access, 46(3); 185-191

Joshi Yogesh, Dalip K Uperti, (2009) *Caloplaca himalayana*, a new epiphytic lichen from the Indian subcontinent, the lichonologist 41(3); 249-255., (British Lichen Society)

M.B. Sachin, S.N. Mahlakshmi, (2018), insecticidal efficacy of lichens and their metabolites- a mini review, journal of applied pharmaceutical sciences, 8(10); 159-164

Mishra, Gaurav K and Uperti (2017) the lichen genus *Parmotrema* A. Massal from India with additional distributional record, e-ISSN, 2(2), 245-6-2051, 18-40. Makhija U. Chital G. and Dube A. (2004), the lichen genus *Heterodermia* (Family Physciaceae) from Maharashtra, Geophytology 34(1&2): 43-55

Moberg Roland, (2009), The lichen genus *Heterodermia* (physciaceae) in south America- a contribution including five new species, Nordic Journal of Botany.29, 129-147, (2011)

Moberg, R (2004), *Heterodermia*. Australian National Botanical gardens/ The lichen genus *Heterodermia* in Europe https://www.anbg.gov.au>.abrs

Negi HR and Gadgil M (1996) Patterns of distribution of macro lichens in Western Parts of Nanda Devi Biosphere reserve, current science, 71 (7), 568-575.

Otilia Johansson, Johan Olofssan, Reiner Giesler and Kristin Palmqvist, (2011), Lichen responses to nitrogen and phosphorus additions can be explained by the different symbiotic responses; New Phytologist 191; 795-805. www.newphytosist.com

Pandey SN and Trivedi PS. A textbook of botany volume-I 11th edition. (Vikas publication).

A study of diversity and conservation of lichen in Shettihalli wildlife sanctuary, Western Ghats, India.

Prashith TR, Kekuda, Vinayaka KS and Sachin MB (2018), Chemistry, ethnobotanical uses of biological activities of the lichen genus *Heterodermia* Trevis. A comprehensive review, Journal of Pharmaceutical sciences 8(05), 148-155

Sanjeeva Nayaka and Dalip Uperti (2005), status of lichen diversity in Western Ghats, India Sahyadri E-News, western Ghats Biodiversity information system- issue XVI

Singh KP and Sinha GP (1997) Lichen in floristic diversity and conservation strategies in India. Vol.I Cryptogams and Gymnosperms (Mudugat V. And Hajara P.K. eds), BSI, Ministry of environmental and forest, Government of India, PP 195-234

Sparius LB, Spier L (2006) contributions to the lichen flora of the Hardangervidda, mountain plateau and adjacent areas, Norway, Grophis Scripta 19;53-55, Stockholm, ISSN 0901-7593

Sugiyama K., Kurokawa S. and Okada G.,(1976), Studies of lichens as a bioindicator of air pollution I, correlation of

distribution of *Parmelia tinctorum* with SO_2 air pollution, Japenese journal of ecology, 26 ; 209-212

Swamy CT, Devaraja Gayathri and T.N. Devaraja (2016) Antibacterial activity of lichen *Parmotrema tinctorum* and pyxin sorediata and their secondary metabolites, I.J. of advanced life sciences; 9(3); 373-380

Uperti DK, Divekar PK and Sanjeeva Nayaka (2005) Commercial and ethenic use of lichen in India, economic botany, 59(3); 269-273

Vinoshena Pillai Rajan, S. Gunasekaran (2016), biological activities of four *Parmotrema* species of Malaysian origin and their chemical constituents, journal of applied Pharmaceutical sciences; 6(08); 036-046

Yoshiakikon, Michikomineta and Hirayuki Kashiwadant; 2003, Transportation experiment of lichen thalli of *Parmotrema tinctorum* (Ascomycotina, Parmeliaceae) Journal of Japenese 78(4); 208-213.