## Lichens are the next promising candidates for medicinally active compounds

**Ila Shukla<sup>\*1</sup>**, Lubna Azmi<sup>1</sup>, Arti Gautam<sup>1,3</sup>, Shashi Kant Shukla<sup>2</sup> and ChV Rao<sup>1</sup>

<sup>1</sup>Pharmacognosy and Ethnopharmacology Division, CSIR-National Botanical Research Institute, Lucknow-226 001, Uttar Pradesh, India

<sup>2</sup>Jai Narain Degree College, Affiliated by Lucknow University, Lucknow, Uttar Pradesh, India <sup>3</sup>Department of Pharmaceutical Science, Faculty of Health Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India



## \*Correspondence Info:

Ila Shukla Pharmacognosy and Ethnopharmacology Division, CSIR-National Botanical Research Institute, Lucknow-226 001, Uttar Pradesh, India

\*Article History: Received: 12/07/2018 Revised: 05/08/2018 Accepted: 05/08/2018

DOI: https://doi.org/10.7439/ijpp.v8i4.4911

## Abstract

Biochemical research of lichens went through "exponential" development in recent past only. Lichenized fungi occur in a wide range of habitats from arctic to tropical regions, from the plains to the highest mountains and from aquatic to xeric conditions. Lichens can be found on or within rocks, on soil, on tree trunks and shrubs, on the surface of living leaves, on animal carapaces, and on any stationary, undisturbed man-made surface such as wood, leather, bone, glass, metal, concrete, mortar, brick, rubber, and plastic. Lichens are able to survive in extreme environmental conditions; they can adapt to extreme temperatures, drought, inundation, salinity, high concentrations of air pollutants, and nutrient-poor, highly nitrified environments, and they are the first colonizers of terrestrial habitats (pioneers). In addition, both fungal and algal cells in the lichen thallus are known for their ability to survive in space too. Lichens produce a great variety of secondary metabolites, and most of them are unique to lichen-forming fungi. These chemically diverse (aliphatic and aromatic) lichen substances have relatively low molecular weight. Approximately 1050 secondary compounds have been identified to date. Traditionally many of the lichen have been used to treat a number of ailments. Hence these are the promising candidates for futuristic pharmacological research.

Keywords: Lichen, Secondary Metabolites, Xeric Condition, Pioneers.

## **1. Introduction**

Lichens are symbiotic plant-like organisms, usually composed of a fungal partner, mycobiont, and one or more photosynthetic partners, phytobiont, most often either a green alga or cyanobacterium. Although the dual nature of these lichens is now widely recognized and lichen products have been used in traditional medicine for centuries, they are less studied and understood than the single microorganisms. Lichen species comprise more than 20% of the global fungal biodiversity and as unique symbiotic organisms that occur in some of the most extreme environments on Earth-arctic tundra, hot deserts, rocky coasts, toxic slag heaps, etc. The substances that lichens produce to survive in these extreme environments are also unique but little understood. As our understanding of the bio-regulatory role of different endogenous biomolecules and their mechanism of action develops, more attention is drawn to lichens as a promising source for drug discovery [1]. Although bioactive phenolic compounds with new chemical structures of pharmaceutical interest have been recently reported, most research effort has been focused on the discovery of new lichen species and lichen taxonomy, and despite recent progress, only usnic acid has been used for pharmaceutical and cosmetic product development to date [2].

This review is intended to summarize the past and current research and development trends in the characterization and use of lichens and their bioactive

31