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Short Communication

Lichen Endosymbionts an Untapped Bioresources for Biotechnological Products

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An endosymbiont or endobionts is any organism that lives within the body or cells of another organism most often, though not always, in a mutualistic relationship. Endosymbiosis is key process in the evolution [1] Lichens are unique taxonomic paradox and remarkably fascinating group of lesser known cryptogams consisting of two separate entities, the phycobiont and mycobiont living together in a balanced symbiotic relationship. It comprises a complete hierarchy of taxonomically treatable organisms. They are well deserved reputation as pioneers in plant succession and form a long lived stable communities. They occur in cold to hot desert and temperate to tropical conditions; on tree bark to leaf and rock to soil i.e. they refer as ubiquitous in nature. In lichen about 95% of ascomycetes and 85% of green algae as symbionts [2]. In addition to the mycobiont and phycobiont in lichen thalli, the occurrence of nonobligate microbes inside lichen thalli has recently been identified. These microbes occur asymptomatically within thalli and names as endosymbionts. These endobionts have not been studies extensively. According to the principle of evolution the host and endosymbionts evolved simultaneously on this earth, spores of microbes are spread in all environments similarly endobionts spread within lichen thallus.

They have been recognized as a rich source of secondary metabolites since the beginning of the 20th century. However, the application of biologically active lichen substances has remained relatively unexplored until recent times. It has been reported that lichen substances have a wide range of antibiotic properties [3]. Among the different compounds of lichens usnic acid is very important in terms of therapeutic properties. Lichens were also used extensively in traditional medicines and for cosmetic purposes [4,5].

Microbial endophytes have been found in the leaves, bark and xylem of higher plants and also in lowered forms of plants [6-10]. Endolichenic microbes also reported as parasymbionts in lichens [11-13]. There are about 300 genera and 1000 species of obligatory lichenicolous fungi known which form parasitic, saprophytic, parasymbiotic and obligatory symbiotic mode of biological relationships on lichen species. Endolichenic microbes those are live within their host thallus causing any noticeable symptoms of disease [14]. These are distinct from lichen mycobionts, phycobiont or any other previously recognized fungal associates of lichens. They represent the same major lineages of Ascomycota as do fungal, bacterial endmicrobes, largely parallel the high diversity of endosymbionts from the arctic to the tropics [15]. A recovery of endolichenic fungi from tissue segments of lichen thalli showed that these fungi not found on surface sterilized lichen thalli [11,16,17]. Although there are several studies on endophytic microorganisms of higher plants, very few studies were carried out on the isolation of endosymbiontic microbes from the lichen [12,18,19].

Right selection of drugs for treating various human health problems such as cancer, anti-fungal, antidiabatic, anti-bacterial and anti-viral infections increased importance now a day. The synthetic drugs have many side effects with many problems they have. At present, scientists are trying to develop alternative drug compounds from biological source from environmental samples worldwide. Endosymbiotic microbes are one of such bio-agents provide anti-fungal, anti-bacterial, anti-viral, anti-cancer drugs [20-23].

Though many potentially therapeutic substances have isolated from lichen endophytic organisms, few have been commercially exploited because of the inadequate quantities being produced and many microorganisms are uncultivable, as their specific growth requirements are not known, and this must be a hindrance to the discovery of many more bioactive compounds. In this context would be an alternative and can play a vital role in the discovery of novel bioactive molecules. Lichen endosymbionts microbes continue to be a productive resource of exceptional secondary metabolites with interesting structural features, a considerable number of which exhibit potential biological activities. Due to a current setback in natural product research in terrestrial habitats, there is rising concern in the exploration of endomicrobes for novel metabolites using biological and chemical methodologies.

Many biosynthetic pathways and enzymes remain unexplained. How an endosymbiont inside a host tissue, coordinates metabolic biosynthesis remains unidentified. Very few genes relevant to biosynthetic enzymes have been identified, and inadequate research has been conducted so far on the expression of these genes at the

molecular level. Further research will need to take into an account on development of advance molecular tools to study the endosymbionts of lichen for their future application.

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