BIO414 (CRYPTOGAMIC BOTANY II)

WEEK 2

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HISTORY OF LICHENS

Although lichens had been recognized as organisms for quite some time, it was not until 1867, when Swiss botanist Simon Schwendener proposed his dual theory of lichens, that lichens are a combination of fungi with algae or cyanobacteria, whereby the true nature of the lichen association began to emerge. Schwendener's hypothesis, which at the time lacked experimental evidence, arose from his extensive analysis of the anatomy and development in lichens, algae, and fungi using a light microscope.

Many of the leading lichenologists at the time, such as James Crombie and Nylander, rejected Schwendener's hypothesis because the common consensus was that all living organisms were autonomous.

Other prominent biologists, such as Heinrich Anton de Bary, Albert Bernhard Frank, Melchior Treub and Hermann Hellriegel were not so quick to reject Schwendener's ideas and the concept soon spread into other areas of study, such as microbial, plant, animal and human pathogens.

When the complex relationships between pathogenic microorganisms and their hosts were finally identified, Schwendener's hypothesis began to gain popularity.

Further experimental proof of the dual nature of lichens was obtained when Eugen Thomas published his results in 1939 on the first successful re-synthesis experiment.

In the 2010s, a new facet of the fungi-algae partnership was discovered. Toby Spribille and colleagues found that many types of lichen that were long thought to be ascomycete-algae pairs were actually ascomycete-basidiomycete-algae trios.

ECONOMIC IMPORTANCE OF LICHENS

Lichens are said to be the pioneers in establishing vegetation on bare rocky areas (lithosere). They are the first members to colonize the barren rocky area.

During development they bring about the disintegration of rock stones (biological weathering) by forming acids e.g., oxalic acid, carbonic acid etc. Thus, they play an important role in nature in the formation of soil.

Role in environmental pollution

Lichens are very sensitive to atmospheric pollutants such as sulphur dioxide. They are unable to grow in towns, cities and around industrial sites such as oil refineries and brickworks. So, the lichens can be used as reliable biological indicators of pollution. By studying lichens on trees, a qualitative scale has been devised for the estimation of mean SO2 level in a given season. Thus lichens are used as pollution monitors.

The lichens serve as important source of food for invertebrates. A large number of animals for example, mites, caterpillars, termites, snails, slugs etc. feed partly or completely on lichens. Lichens as food have also been used by man during famines. They are rich in polysaccharides, certain enzymes and some vitamins.

Cetraria islandica (Iceland moss) is taken as food in Sweden, Norway, Scandinavian countries, Iceland etc. Lecanora esculenta is used as food in Israel and Umbilicaria esculenta in Japan.

Species of Parmelia (known as rathapu or ‘rock flower’ in Telgu) are used as curry powder in India. In France the lichens are used in confectionary for making chocolates and pastries.

Cladonia rangiferina (Reindeer moss) is the main food for reindeers (a kind of deer) in polar countries. Cetraria islandica is also used as fooder for horses.

Species of Stereocaulon, Evernia, Parmelia and Lecanora are also used as fodder.

Source of Medicines

Since very early times the lichens are used to cure jaundice, fever, diarrhoea, epilepsy, hydrophobia and various skin diseases.

A yellow substance usnic acid is obtained from species of Usnea and Cladonia. It is a broad spectrum antibiotic and is used in the treatment of various infections. It is effective against gram positive bacteria. Some lichen compounds e.g., lichenin, isolichenin have anti-tumour properties.Protolichesterinic acid, a compound obtained from some lichens, is used in preparation of anti-cancer drugs. Erythrin obtained from Roccella montagnei, is used to cure angina.

Many antiseptic creams such as Usno and Evosin are available in the market and are well known for their antitumour, spasmolytic

Tanning and dyeing

Some lichens are used in leather industry. Cetraria islandica and Lobaria pulmortaria show the astringent property. This astringent substance is extracted from the thallus and is used in tannin industry.

Lichens are also used in preparing natural dyes. Orchil, a blue dye obtained from Roccella and Leconara, is used to dye woollen articles and silk fabrics.

It is purified as orcum and used as a a biological stain. A brown dye is obtained from Parmelia spp. whereas Ochrolechia spp. yield a red dye. Litmus used as a acid-base indicator, is also a dye and is obtained from Roccella tinctoria and Lasallia pustulata.

Cosmetics and perfumes

Evernia, Ramalina, Pseudorina are reported to have perfumed volatile oils. Due to the aromatic substances present in the thallus, the lichens are used in the preparation of various cosmetic articles, perfumery goods, dhoop, hawan samagris etc.

Brewing and distillation

Some species of lichen for example, Cetraria islandica contain carbohydrates in the form of lichenin. In Sweden and Russia alcohol is produced from these lichens. These lichens are also used in confectionary.

Harmful Aspects

1. Lichens growing on young fruit trees and sandal trees are harmful to the plant.

2. During hot season some species of lichens (e.g., Usnea barbarata) become so dry and inflammable that they often help in spreading forest fire.

3. Some lichens act as allergens.

4. The commercial value of glass and marble stone is reduced because of itching of their surface by lichens.

5. Some lichens e.g., Cladonia rangifera, Cetraria islandica accumulate large quantities of radioactive strontium and caesium from atomic fall-outs. These may be incorporated in the food chain, lichen → reindeer → man, leading to their accumulation in human tissues.

REFERENCES

Url 1.: http://www.biologydiscussion.com/lichens

Url1. https://en.wikipedia.org