

## ENVIRONMENT

# What are Lichens?

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**F**OR THE past couple of weeks I have focused on organisms that are used as biological indicators with respect to the health of the environment.

One unique type of indicator species is lichens, which can be used to determine air quality as they are sensitive to pollution. In addition to their role as biological indicators, lichens can be regarded as the poster children for symbiotic relationships between living organisms. Lichen is formed by combining a fungus and most of the time an algae, where the fungus encapsulates the algae.

These unique organisms produce over 500 biochemical compounds which carry out an array of functions, such as, repelling herbivores, controlling light exposure, discouraging competition between plants, killing attacking microbes.

Some lichen species also produce antibiotics and pigments which have been used by pharmaceutical companies and the textile industry respectively. Besides their uniqueness, lichens are very important to humans and the environment, all of which will be discussed in the following paragraphs.

As I mentioned previously, lichen is formed by the combination of a fungus and an algae or in some cases cyanobacteria

formerly referred to as blue-green algae. Both of these produce carbohydrates via photosynthesis, as a food supply for the fungus which is unable to make food on its own. The fungus in turn provides the ideal moist environment and substrate for photosynthesis to take place and protection for the algae or cyanobacterium. The latter of which takes up nitrogen in the air and turn into usable compounds, like nitrates which are needed for plant growth. You may not think that we have lichens in Trinidad and Tobago but most of us have seen one of the most common species at least once in our lives and that is Old man's beard (*Rhizopogon baccifera*) hanging from the branches of trees.

Also although most lichens are described as having a symbiotic relationship between the fungus and algae, depending on the species involved, these associations might be considered parasitic, commensal or mutual in nature.

The appearance of lichens varies greatly, and can be placed in three or four main categories. The first are referred to as foliose lichens. These are flat and resemble leaves. They also grow in layers. Fruticose lichens however grow erect or pendulous. Then there are Crustose lichens which as its name implies forms a crust over the substrate it is growing on, and usually form coloured patches. Finally there are the squamulose lichens which resemble scales and form a layer over the substrate they occupy like a layer of shingles.

Although lichens occupy every conti-

nent on the planet and grow in a variety of climates and altitudes, they prefer dry and desert-like locations. Lichens need three basic requirements to inhabit an area; clean air, time and an undisturbed substrate; for example, wood, moss, bark, rock, peat and soil.

Therefore, lichens can tolerate very harsh conditions, including extremes in temperature, sunlight and lack of water. Hence they usually colonise habitats too harsh for higher plants, for example, the frozen soil of Arctic regions. They are also usually the first settlers in habitats lacking soil. But lichens play an important part in soil formation as they trap dust, silt and water. When they die and decay, they contribute organic matter to the environment. They also help hold the soil together and protect it against soil erosion.

For these organisms, reproduction is asexual, which simply means they do not need a mate. Some species produce spores which capture a new symbiotic partner after they germinate or steal them from other lichens. While others produce tiny projections on their surface called Soredia or Isidia which break off and develop into individual lichen. They develop a dry and brittle condition when moisture is unavailable, and when water is available it is quickly absorbed and it becomes soft and fleshy again.

Lichens are of practical use to humans and are used by Native Americans to dye yarns used in weaving fabric. Wolf Lichen (*Letharia vulpina*) is an example of one

used as a dye. It was so valued that coastal communities would trade fish grease, a valued commodity with communities located further inland for these lichens. The common name for this species was derived from its use as a poison for wolves in northern Europe.

In terms of medicinal use, species of the genus *Usnea* contain the compound usnic acid, has antibiotic properties, and has been used in the former Soviet Union, Far East, China, New Zealand and Pacific Islands.

This organism has also been used as food by a variety of cultures, throughout history. It is regarded as a delicacy by some Native American tribes, while regarded as food only to be eaten in the event of a famine by others. Some species were made into a jelly in Turkey and baked into bread in Egypt. Although, most lichen species are edible, a few are poisonous so it is not advisable to experiment. But lichens are also food for animals like squirrels, deer, monkeys, goats and birds.

Other ecological roles include providing homes for spiders and insects such as mites. Also since most species have very slow growth rates, they have been recruited by scientists to estimate the dates of geological events, such as the retreat of glaciers.

Therefore we see that tiny and unique as these organisms are, they serve a variety of functions in the environment; as food for humans and animals, as habitats, medicine and biological indicators.