The surprising world of lichens

One of the most successful alliances in the natural world often goes unnoticed. It involves two organisms: a fungus (the mycobiont) and an alga or a cyanobacterium (the photobiont).

How it works

They live together in a symbiotic association, producing a new body or lichen thallus. Much of the lichen body is a tangle of fungal filaments called hyphae; these filaments clasp alga, sometimes in a mat, or sometimes wrapped as single cells. The photobiont possesses chloroplasts and can photosynthesise, thus providing food for both itself and its fungal partner. The fungus protects the alga by retaining water and providing mineral nutrients for both organisms. This alliance is so successful that lichens have colonised every continent, including Antarctica.

Lichens are a valuable element of many ecosystems and an important tool for understanding greater environmental events, providing a living laboratory for the study of the natural world.

Species

There are about 30,000 species worldwide and they come in a dazzling variety of shapes and colours. Some are almost invisible to the naked eye and grow as a crust on rocks, trees or soil (crustose lichens); others look like leaves (foliose lichens) and others have shrubby forms (fruticose lichens), sometimes growing up to three metres in length. Colours range from dull grey-browns to brilliant yellows and bright orangey reds.

Features

Since lichens are organisms without true organs, their hydratation status is related to the humidity of the air, upon which their mineral nutrition depends. When moisture is available, it is taken up by the fungus leading to a mechanical change which allows more light to get through, triggering algal photosynthesis; new food and new tissue are then made. When the atmosphere is dry, however, the lichen is dormant and does not grow.

Because of these characteristics, lichens are useful bioindicators for air pollution and are widely used throughout the world as pollution indicator organisms. Since they derive their water and essential nutrients mainly from the atmosphere rather than from the soil, they are very sensitive to gaseous pollutants, particularly sulphur dioxide. This pollutant is carried in the atmosphere until rained out or deposited as dry particles or as gas. Sulphur dioxide combines with moisture in the atmosphere to form sulphurous acid or sulphuric acid.



Foliose lichens

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Crustose lichens

When this happens with rainwater, the result is acid rain.

In the past, sulphur dioxide from coal burning and industry was the worst pollutant. It killed lichens, so industrial areas with high levels of sulphur dioxide became lichen deserts. Levels have now dropped thanks to clean air laws and lichens are re-colonising those areas.

Nowadays, the major pollutants are nitrogen compounds from road traffic and intensive farming. These compounds do not destroy all lichens because some species positively thrive on nitrogen. So different pollutants create different patterns of lichen growth and, by analysing them, scientists are able to chart the health of our environment.

1 Match the words underlined in the text to the corresponding Italian equivalent.

1. Normative anti-inquinamento atmosferico: .....
2. Umidità: .....
3. Ad occhio nudo: .....
4. Tessuto: .....
5. Strumento: .....
6. Cianobatterio: .....
7. Delineare una mappa: .....
8. Ricaduto sotto forma di pioggia: .....
9. Stupefacente: .....
10. Cespuglioso, ramificato: .....
11. Cloroplasti: .....
12. Groviglio, ammasso: .....
13. Inattivo: .....
14. Tallo: .....
15. Ife: .....

2 Answer the questions.

a. What are lichens?
b. How does the lichen symbiosis work?
c. What is the lichen thallus?
d. What do lichens look like?
e. Which lichens are the largest?
f. Where do lichens grow?
g. What is the ecological role of lichens?
h. What is the effect of sulphur dioxide on lichens?
i. How do nitrogen compounds affect lichens?
j. How do scientists evaluate the air quality?

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