

10 Things You Should Know About Lichens

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“...the lichens, gray, crisp, brittle, and crusted...deriving their food from certain kinds of small algae which they hold enslaved in their meshes.”

— W. F. Gamong

It has been our observation during our years spent in education, diagnosing plant samples and insect specimens that come into Extension offices, that a number of us are a bit lost when it comes to organisms outside the “higher” plants and animals. This is especially true of the miniature worlds of bacteria, protists, and other less well-known organisms. What is a moss? And is “reindeer moss” a true moss? What are slime molds? Are fungi plants or animals? (Neither, actually). What about horsetails or club mosses or liverworts or water molds? We will not answer all of these questions in this article, but let’s start with 10 questions about a most unusual component of our natural world — lichens.

What Is a Lichen?

Thoreau once penned: “I find myself inspecting little granules as it were on the bark of trees — little shields or

apothecia springing from a thallus — such is the mood of my mind — and I call it studying....” He was talking about lichens, a few examples of which have such exotic names as rock pimples, earth wrinkles, angel’s hair, freckle pelts, fog fingers, dragon’s funnel, tar-jelly, and old man’s beard.

What are lichens? They are a mutualistic symbiosis, or in the words of Irwin Brodo, Sylvia and Stephen Sharnoff, in their wonderful *Lichens of North America*, they are a “composite of a fungus and an organism capable of producing food by photosynthesis.” The usual symbionts are a member of the Ascomycetes or “sac fungi” in the Kingdom Fungi and a green alga in the Kingdom Protocista or a cyanobacterium (formerly blue green alga) in the Kingdom Protista. The “apothecia” of which Thoreau speaks are a type of cup-like fruiting body common in the Ascomycete fungi. The “thallus” of which he speaks is “the vegetative body consisting of both algal and fungal components” (glossary entry from *Lichens of North America*).

The alga or the cyanobacterium (the photobionts) produce carbohydrates through photosynthesis which then serve as food for the fungus. The fungus, in its turn, provides a steady supply of moisture to the photobiont, provides a substrate helpful in providing the right amount

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of light to the photobiont, and protects this alga or cyanobacterium photobiont within the fungal tissues. There are many variations of this relationship, including the fact that sometimes club fungi, rather than sac fungi, and brown algae, instead of green algae, are involved. Bottom line, as the great lichenologist Trevor Goward once said: Lichens are a case of “fungi that have discovered agriculture.”

What Is Not A Lichen?

A lichen is not a true bryophyte, such as a moss or a liverwort (which are photosynthetic plants), though some of the common names of certain lichens, such as “reindeer moss,” fool people into confusing lichens with true mosses. So the velvety green moss that often grows on the side of trees, in lawns, and on other surfaces is completely different biologically from the lichen symbiosis. The sphagnum mosses used for peat in horticulture are true mosses — and not lichens. Bryophytes are green and leafy and often live in the same places as lichens, but they are plants, not the symbioses between fungi and algae (or cyanobacteria) that we call lichens.

What Do Lichens Look Like?

The thallus body, which in structure is mostly composed of the fungal symbiont, is the most recognizable part of a lichen. There are three or four basic lichen body types:

- Lichens that produce leaf-like, two-dimensional, flattened, lobed thalli with upper and lower surfaces that grow in layers are known as *foliose lichens*.
- *Fruticose lichens* grow erect or pendulous in three dimensions and have no distinguishable upper and lower surfaces.

- *Crustose lichens* look somewhat like the name implies. They form a crust over their substrates, like rocks, trees, and sidewalks. The lower surface of crustose lichens attaches firmly to many surfaces and forms brightly colored patches of a thick, rough naturalized texture.
- *Squamulose lichens* can be described as intermediate between foliose and crustose growth forms. Their shape is scale-like, and they attach by the lower surface like tiny shingles. We should note, however, that there are other intermediate types that include one or more characteristics of the previously mentioned growth forms.

Where Do Lichens Grow?

Lichens are located on every continent on planet Earth, including both the Arctic and Antarctic. They survive in all climates and altitudes. Specific lichens have their specific requirements, but in general they need three things — undisturbed surfaces, time, and clean air.

Lichens will make themselves at home on most any undisturbed surface commonly known as their substrate. Bark, wood, mosses, rock, soil, and peat are all natural substrates. Thalli will also establish itself on glass, metal, plastic, and cloth. Most lichens are restricted to certain types of substrate; lichens normally found on tree bark, for instance, are rarely found on rock, and vice versa.

Lichens established on stone in the landscape give the garden a mature look. Discovering a lichen growing on your tree is not a bad thing. In fact, it should be celebrated by giving you peace of mind knowing that the environment in your neighborhood is clean enough to support this amazing dual organism.

What Is the Ecological Role of Lichens?

Lichens are important partners in nature's ecosystem and should be admired and studied when seen on landscape plants and hardscapes. They are an early colonizer that reestablishes life on rock and barren disturbed sites. Lichens play an important role in soil formation over much of the earth. As lichens colonize rocks, they trap dust, silt, and water.

Because of their association with cyanobacteria, lichens can provide themselves with nitrogen compounds. Lichens contribute to the nitrogen cycle by converting the nitrogen in the air into nitrates that contribute to their growth and development. Their ability to "fix" atmospheric nitrogen is beneficial to other plant life as well. When it rains, nitrogen is leached from both living and dead lichens and is available to plant life in the immediate areas. When lichens die, they contribute decayed organic matter to the area they inhabited, which enables mosses and seeds from vascular plants to begin developing among the pockets of new soil.

Animals utilize lichens in many interdependent ways. It is well documented that numerous animals use lichens for either food or shelter. Some 50 species of birds are known to regularly use fruticose-type lichen as their preferred nesting material. Small animals commonly use lichens to hide from natural predators through camouflage and direct cover.

What Are the Economic Benefits of Lichens?

Historically, lichens have had economic benefit. For many years, over different parts of the world, they have been a source of natural dyes for wool and fabric. These dyes were distinguished by the type of

lichens used and the way the color was extracted. Lichen dyes are extracted by the boiling-water method or the fermentation method. Today, they are still used by local artisans as they demonstrate their crafts.

Some lichens have antibiotic properties that are valuable commercially. The genus *Usnea* is used in Europe in ointments and other commercial products and is said to aid healing in superficial wounds. Lichens have been used in such preparations as deodorants, laxatives, expectorants, tonics, and healing pastes throughout the years. Research with lichens around the world is suggesting these organisms hold promise in the fight against certain cancers and viral infections, including HIV.

In the ornamental horticulture profession, lichens are preserved in glycerine, painted different colors, and made available commercially to the floriculture industry for dried-flower decorative arrangements. These same materials are utilized by model railroad enthusiasts, architects, and others as miniature "plant" forms for their scale reproductions of new building concepts and old railroad towns.

Do Lichens Damage Plants?

We know that lichens occur when a sac fungus and a green or blue-green algae take a "lichen" to each other. One of the applied questions often asked is: Do lichens damage plants?

The short answer is no; lichens do not cause plant damage. The lichen symbiosis is not damaging bark in any direct ways. It does not rob bark of significant amounts of moisture. The fungal symbionts of the lichen do not parasitize living plant cells, and lichens do not appear to be associated with providing entranceways for pathogens into plant tissue. So why do so many people, including many

horticulturists, think lichens damage plants? Perhaps it is because when branch decline occurs due to other factors, lichen growth sometimes proliferates. This is due to increased sunlight that penetrates to the bark which favors the algae that are photosynthesizing, resulting in enhanced growth. The lichens did not cause the branch decline, but rather, one of the effects of the plant decline was an increase in lichen growth.

If we really want to stretch things, perhaps we could come up with a few indirect or unusual examples of lichens negatively impacting plants. For example, where lichens are especially abundant on bark, their presence may obscure desirable ornamental features of certain plants, e.g., the beautiful bark features of crape myrtles in the South.

Another unusual example of indirect lichen effects is reported in *Lichens of North America* (Brodo, Sharnoff, and Sharnoff). In Canada, hemlock looper (*Lambdina fiscellaria*) is a serious forest pest. And guess what? This moth “lays its eggs almost exclusively on hair lichens such as *Bryoria trichodes*,” and so lichen is an important cog in this pest’s life cycle.

Finally, in states more southernly than Ohio, there is an unusual role of lichens in plant disease. There is an algal plant pathogen, *Cephaleuros virescens*, which causes scurfy leaf spots and fissured twig cankers on many plants, including magnolias and azaleas.

Jim Chatfield and Nancy Taylor have noted this disease occurring abundantly in North Carolina woodland and parkland areas. Well, guess what? In some cases, the *Cephaleuros virescens* alga teams up with a *Strigula* spp. fungus to develop a lichen symbiosis, causing leaf spots and twig cankers due to the algal activity.

However, the bottom line is the few-and-far-between exception rather than the almost universal rule that lichens most definitely do not damage plants.

Are Lichens Good Eating?

Well, caribou, and their European cousins, Rudolph and the rest of his reindeer friends, certainly think so. They have a rumen digestive system and the bacterial flora to properly digest the complex carbohydrates that lichens have in rich abundance.

Overgrazing of lichens can even result in periods of starvation and population crashes for herds. In some cases more than 90% of winter food for caribou is derived from lichens. Many species of deer, mountain goats, flying squirrels, and voles also use lichens as an important food.

In some cases, western North American wildlife managers fell trees to deliberately make arboreal lichens more accessible for winter food. Finally, there are many mites, springtails, and other smaller fauna that consider lichens as food substrates.

As for humans, lichens have several disadvantages. It is tough for us to digest the complex carbohydrates, and a few lichen species are even poisonous. So “extreme cuisine” aficionados need to follow the usual precautions familiarized by the old saying that “there are old mushroom hunters — and bold mushroom hunters — but no old, bold mushroom hunters.” Lichens are not mushrooms, but we trust that you get the point. However, there are some reports of native cultures eating certain species of lichens in times of famine.

Sometimes lichens are made palatable by going to great extreme, from adding wild onions and saskatoon berries in barbecue pits to the ages-old trick of

adding them to sugar, raisins, and apples (just about everything tastes good with these additives). There is even the practice of arctic populations mixing partially predigested lichens from caribou stomachs with raw fish eggs to make what is called “stomach ice cream.” We will pass on that one. And yes, certain lichens have also been used on occasion as laxatives.

Finally, lichen history includes use for various value-enhanced beverages, from a bitter flavoring for beer in Siberian monasteries to fermented corn beverages in Mexico to a source of sugar for Swedish brandy distillers. All in all, though, using lichens as a food source is pretty limited, except for animals and their role in the food web.

How Are Lichens Named?

The Chinese philosopher Krishtalka said that “the beginning of wisdom is calling things by their right name.” One way to indicate the right name of an organism is to use the universal language for a species, namely the Latin binomial name, specified according to the International Code of Botanical Nomenclature. But what about lichens?

Lichens are dual organisms, composed of two species living together in a mutually beneficial symbiosis. One species in the lichen symbiosis is a fungus, which provides a substrate and helps with mineral and water management, and the other species is an alga or a cyanobacterium (the photobiont), which uses water and carbon dioxide and the energy of sunlight to photosynthesize and produce food for the dual organism.

So what could the Latin binomial of a lichen be? Are the Latin binomials for lichens given as both the fungal and photobiont binomials? No. As it turns out,

by convention of the Botanical Code of Nomenclature, lichen names are simply given as the Latin binomial of the fungal component of the dual lichen organism. This seems somewhat inelegant, but since the recognizable form of the lichen is the fungal component, the Latin name of the lichen is simply given as the Latin name of the fungus in the symbiosis.

So, when the *Cladonia cristatella* sac fungus gets together with the green alga *Trebouxia erici* to form a lichen, the official Latin name of the lichen is simply *Cladonia cristatella*. So, now you know. Having gotten that little detail out of the way, let’s face it — the real fun with lichens comes with their common names. Though common names can cause confusion because of local variations, there are some wonderfully evocative lichen names.

The can-of-worms lichens (*Conotroma urceolatum*) is the fungal and lichen Latin binomial, so named for the long segmented spores of the fungus. How about these: powder-tipped antler lichen; black-eye lichen; bloody heart lichen; cowpie lichen; elf-ear lichen; five-o-clock shadow lichen; hairball lichen; naked kidney lichen; tattered rag lichen; and blackened toadskin lichen.

And after that motley crew, a number of lichens have foodie names, such as candy lichen, rock licorice lichen, and chocolate chip lichen. *No mas.*

Where Can I Learn More About Lichens?

Finding information on lichens is simple enough. Start by asking your children if you can see their science class book. It should be in there.

Numerous informational tidbits can be found online. A few of the web sites that

caught our attention include:

www.lichen.com

<http://mgd.nacse.org>

www.earthlife.net .

But if you really want to touch bases with the big leagues of lichenology, check out:

Lichens of North America, by Brodo, Sharnoff, and Sharnoff. It is a 795-page masterpiece of truly magnificent photography and information, including

both accessible general information and details for the lichen aficionado.

“Sharing the stillness of the unimpassioned rock, they share also its endurance; and while the winds of departing spring scatter the white hawthorn blossoms like drifted snow, and summer dims on the parched meadow the dripping of its cowslip-gold — far above, among the mountains the silver lichen-spots rest, star-like, on the stone.”

— John Ruskin

