Q&A from the Miller Library’s Plant Answer Line

LEAF SKELETONS AND SHADOWS

By Rebecca Alexander

This regular column features Q&A selected and adapted from the Elisabeth C. Miller Library’s Plant Answer Line program. If you’d like to ask a plant or gardening question of your own, please call (206) 897-5268 (UW Plant), send it via the library website (www.millerlibrary.org), or email directly to hortlib@uw.edu.

In this season of the dead, here are assorted questions we’ve answered about leaf remains and salvaging the skeleton of a deceased pet.

ANSWER:
Most likely what you found are the decomposing leaf skeletons of one of the Arboretum’s large-leaf magnolia species. A number grow close together in Loderi Valley. And, yes, the leaves do that naturally. Nevertheless, it is possible to skeletonize or “clear” leaves deliberately. It’s an art form that goes back hundreds of years. (See the resources in the bibliography for more information.)

The leaf skeletons of the Washington Park Arboretum’s magnolias are so visually striking that they provoke not only family feuds but also interesting scientific questions. Some may wonder why magnolia leaves can take a long time to decompose. The answer to that question also provides a clue to the persistence of the leaf veins.

Leaves decay at different rates for a variety of reasons, including local climate and soil factors. Their size, thickness, and structural and chemical composition also play a role. I didn’t find any specific information about magnolia leaves, but research shows that leaves containing more lignin are slower to decay. Levels of other compounds such as suberin and cutin—waxy macromolecules that form water-resistant, protective barriers on leaf surface—may also be a factor, though one paper I found suggests that these compounds degrade readily in the soil environment.
Lignin is an integral part of the cell walls of plants. Next to cellulose, it is the most abundant organic compound on Earth. Lignin fills the spaces in the cell walls of various plant tissues, providing mechanical strength to these cells—and thus to the entire plant. (It forms 20 to 35 percent of the dry mass of wood.) It does not degrade easily—that is, it is not easy for bacteria and water (necessary for decomposition) to penetrate the chemical structure of lignin. There is evidence that soil fauna, such as earthworms, may also find it harder to digest leaf matter that’s high in lignin. So, if certain magnolia species have high levels of lignin in their leaves, this would slow their rate of decomposition. Moreover, vascular tissues have a relatively high concentration of lignin, and this may help explain why the magnolia leaf veins degrade at a slower rate than the surrounding leaf tissue, or lamina—creating the foliage “skeleton.”

A related question we have been asked concerns the natural processes involved in making a magnolia leaf skeleton: Which members of the “FBI” (fungus, bacteria or invertebrates) are responsible for which stages of decomposition?

Among fungi, the saprophytes are the primary decomposers of plant debris. They depend on dead organic matter (such as fallen leaves or dead wood and animals) for their nutrients. Bacteria and invertebrates also play a role in the decomposition of the softer parts of the leaves, leaving the veins behind.

Excerpt from “Decomposers: The Unsung Forest Allies,” by Maria Cristina Alves:

“In nature, decomposition takes time, with different decomposers involved at different times, and for different types of plants. The voluminous leaves and stems of deciduous trees are generally decomposed within a year of falling on the forest floor. Leaf litter is quickly invaded by the hyphae of fungi—the white thread-like filaments that are the main body of a fungus. Mushrooms appear mostly in late summer and autumn, and are merely the fruiting bodies of fungi trying to spread their growth during fall and winter. The hyphae draw nutrients from the litter and break down the dead plant material. As the decay becomes more advanced, bacteria—as well as various invertebrates, including springtails, slugs and snails—play a role, with earthworms arriving in the last stages.”

QUESTION:
Each year, in early autumn, I notice tree leaf silhouettes staining the sidewalk. Do all trees do this? I mainly see maples and occasionally oak leaf shapes. What substance in the leaves causes this staining effect?

ANSWER:
Tannins in the leaves are responsible for leaving behind those silhouettes or “prints.” Rain rinses the tannins from the fallen foliage, and these leave a trace. The prints are most visible on lighter-colored surfaces. This is similar to the way strong black tea leaves a tannin stain on porcelain cups and tooth enamel.

“Tannin” has its origins in the Latin word tannum, meaning oak tree bark, which historically was used to tan animal hides to make leather. Oak has especially high levels of tannins, but because its leaves are thick and take longer to decompose, you may notice fewer leaf prints from oak trees.

Tannins are polyphenols that plants produce to protect themselves from herbivores and pathogens. They have a natural astringency that reduces the palatability of plant tissue to various animals. For example, cottonwood trees can
adjust their level of tannins to defend against beavers harvesting their wood.

Tannins are widespread in the plant kingdom and may be present in many parts of a plant. They are especially common in leaf tissues, particularly in the cells of the upper epidermis, on the top surface of a leaf. The substance may also be found in the bark and wood of trees, as well as the buds, stems, fruits, seeds and roots.

**BIBLIOGRAPHY**


**REBECCA ALEXANDER** is the manager of Reference and Technical Services at the Miller Library, located in the UW Botanic Gardens’ Center for Urban Horticulture (3501 NE 41st Street, Seattle). She is also a contributing editor to the “Bulletin.”

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**A SKELETON IN THE COMPOST**

**QUESTION:**

My pet cockatiel died, and I want to know how long it will take to compost the bird in the soil before I can dig up the skeleton and save it.

**ANSWER:**

I am sorry for the loss of your cockatiel. I think that you can either put the body in the compost or find a way to salvage the skeleton, but not both. Bird bones have hollow cavities and would likely break down quickly in the soil. Some permaculture discussion groups online suggest not burying birds, but instead storing them in the freezer until there are active ant nests, and then leaving them exposed for the ants to clean. I was not sure if this would work, so I consulted Dennis Paulson, Director Emeritus of the Slater Museum of Natural History at University of Puget Sound, in Tacoma (see www.pugetsound.edu/slater-museum-natural-history).

He says that “putting something as small as a cockatiel in the ground isn’t the best idea, as their smaller bones would probably suffer. Putting it near an ant nest might not be much better, as the ants could carry off those small smaller bones. To make a good skeleton, you need to skin the bird and remove a lot of the bigger muscles (in particular, the flight muscles on the breast) as well as the intestines and other organs from the body cavity.” The Slater Museum of Natural History can skeletonize small birds by using their colony of dermestid beetles, which eat all the soft tissues. This is the best way to skeletonize something of that size. The museum accepts donations of specimens, but they may also be willing to assist someone who wants to commemorate their pet bird in this way.

In general, dead animals that are not pets and weigh over fifteen pounds must be collected by Seattle Animal Control (www.seattle.gov/animal-shelter/animal-control), but smaller animals that show no signs of disease may be double-bagged and put in the garbage. King County has similar guidelines. Dead wild birds (particularly crows and jays) that may have been affected by West Nile virus should be reported to the King County Public Health Department at 206-205-4394.