

# Tree Trichomes:

## Big Hairy Tree?

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Trees do not have hair – trees have trichomes. Trees have many different types of thread-like growths on buds, leaves and roots, but none of them are hairs. Mammals have hair and fur. Trees have trichomes.

### NOT HAIRS!

Take a close look at a sycamore leaf. It can be so fuzzy on its underside that the dense trichomes can be rubbed off into small balls of fluff. Sycamore leaf trichomes can cause allergic reactions and respiration problems. The fuzzy materials are not hairs but trichomes.

Animal hair come in two general forms: set length and always growing. Both types of hairs grow from the bottom where they form within the skin of an animal. Trichomes are developed from outer surface layers of cells.

### Location

Trichomes can occur all over the tree – from leaf to root tip. Trichomes are part of the surface structure of tree parts. They are formed from the outermost layers of leaf, buds, and roots. Some remain alive for long periods while other quickly die, leaving an empty shell behind. Trichomes are unique for most taxonomic groups of trees and can be used for identification.

Trichomes can be tall or short, thin or fat, and big or tiny. They develop from a single cell or many cells on new tree surfaces like absorbing roots and leaves. Trichomes can be thickened at the base or have a large bulb at the end. They can stick straight up above the tree surface or recline on the surface. Trichomes can be temporary, lasting weeks, or permanent fixtures on tree surfaces. Trichomes can also be disposable, breaking apart or falling-off over time.

### Forms

Under the microscope, trichomes come in several forms: straight, branched, star-shaped, and tufted. In addition, trichomes occur in many forms throughout the tree. On new roots, trichomes are found just behind the growing tips. These root trichomes are sometimes mistakenly called “root hairs.” Trichomes can form round containers on leaf surfaces which hold water.

Some trichomes are glandular. These trichomes have various materials which accumulate in or on their tips. The stickiness of butternut leaves and fruits come from glandular trichomes exuding materials. Some materials are defensive compounds to prevent animals consuming leaves. Other materials are allelopathic chemicals that are rinsed-off by rain into the soil.



University of Georgia Daniel B. Warnell School of Forest Resources Extension publication FOR99-006

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Glandular trichomes also serve important waste removal functions in trees. Some species of trees which grow on alkaline soils or near the ocean, transport salts and heavy metals into the trichome ends. This material is moved or secreted to prevent tissue damage and help ease the washing away of excessive salts.

A special type of oozing trichome is called a colletter. Colletters are found on the surfaces of new formed leaves inside buds. They ooze a sticky material that permeates the leaves and buds. This process helps strengthen the new, succulent tissues and help prevent some types of pest damage. Buckeyes, hickories and birch are some of the common trees to have these special trichomes.

### Purpose

The underlying purpose for trichomes on tree tissues is as diverse as the trichomes and the tree species involved. Roles for trichomes revolve around light absorption and reflection, tissue protection, water conservation, and microbial interactions.

Young leaves of many species use trichomes to shade photosynthetic cells until they are fully operational. As leaves expand, the effective density of these trichomes declines. Trichomes selectively block ultra-violet wavelengths like a translucent or transparent coating. Trichomes also shade tissues from other wavelengths and reflect heat energy away from leaf and bud surfaces. Trichomes help elevate the primary energy exchange interface of the leaf.

Trichomes tangle, disrupt, confuse, and prevent some types of insect injury and use. Densely woolly trichomes prevent insects from contacting the leaf surface. Trichomes with defensive materials at their ends touch and stab at insect visitors. The tangle and mass of trichomes interferes with chewing caused injuries. Trichomes also provide an elevated platform upon which dust and fungal spores can be swept away by wind and water before they would touch the leaf surface.

Trichomes can help minimize water loss. Tufts of trichomes are positioned around stomates, the water control valves in a leaf, and slow water evaporation. Trichomes also form a thicker boundary layer of higher relative humidity around a leaf which slows water loss. Shading and reflectance by trichomes also lowers tissue temperatures which lessen food use and decreases water evaporation from tree surfaces.

Trichomes on absorbing roots assist with water and essential element uptake. These root trichomes increase surface area and the interaction with the soil. Some root trichomes act as avenues of colonization for beneficial fungi and bacteria in the soil. Unfortunately, some pathogens use these trichomes for attacking the root.

### Problems

Trichomes slow wind movement and shields surfaces from rain erosion. Some trichomes help protect tissues by softening abrasion and bruising contacts. Unfortunately, the trichomes that protect in one way facilitate damage in other ways. Trichomes form centers of surface wetting that can accelerate leaching and cuticle damage. Acid rain damage can be isolated around trichomes. In addition, some pathogens depend upon spore germination above leaf surfaces.

Trichomes come in many shapes. Some trichomes are long and thin, matting down in a thick felt-like surface. Other trichomes have multiple branches that looks like a tree in miniature. Still other trichomes have a circular crown of branches which are star-shaped. Some trichomes are colored with a pigment or develop a color from weathering and from the environment, but most trichomes have no color. Trichomes do not have chlorophyll.

### Species

When feeling some of our native trees, many have trichomes of one form or another. If a tree has trichomes at all, they are usually found on the underside of leaves. Green ash, sycamore, Southern

magnolia, red mulberry, red elm, live oak, black oak, chestnut oak, post oak, river birch are just a few of the many trees possessing trichomes. One common exotic tree, the royal paulownia is so densely covered with thick trichomes its leaves feel like thick felt. An old common name for paulownia is “cottonwood” because of the dense, cottony texture of the leaf surface.

Some trees bear trichomes in selected locations. Black cherry develops reddish-brown trichomes on the underside of the leaf along the main vein. A number of oaks have trichomes in the junctions between side veins and the main vein on leaf undersides. Turkey oak and northern red oak are good examples. One native tree with dense, glandular trichomes which smell very aromatic is mockernut hickory. Oglethorpe oak has unique five-pointed, star-shaped trichomes. Black walnut has glandular trichomes which are swollen at the top and dispense an allelopathic material that damages other plants. Figure 1 presents a diagrammatic representation of various forms of trichomes on the leaves, buds, and roots.

### Terminology

The precision and accuracy about describing trichomes in trees can be hampered by botanical terminology. The English language is a wonderful mess of words with subtle nuances and blatant meanings. One area where words seem stretched to provide clear meaning is when describing tree trichomes. Most of these words are associated with, or derived from, descriptions of animal hair, and so, the word “hair” appears in the definitions.

The first word most people understand about trichomes on leaf surfaces is “pubescent,” meaning clothed with soft, short hairs. “Downy” means clothed with soft, fine hairs. “Puberulous” means minutely pubescent, while “puberulent” means minutely pubescent but with soft, straight, erect, and tiny hairs. “Tomentose” means densely pubescent with matted, wool-like hairs. “Tomentulose” means slightly pubescent with matted wool-like hairs. “Velutinous” signifies a velvety surface texture of the leaf’s surface while “sericeous” means a silky surface texture.

### More Hairs?

“Hirsute” means covered with coarse or stiff, long hairs and “hirsutulous” signifies minutely or slightly hirsute. “Hispid” describes rigid or bristly hairs. A “bristle” is a stiff, strong but slender hair. Both “setose” and “setiferous” mean a tissue which bears bristles. The word “strigose” describes sharp, straight, appressed hairs sometimes with a swollen base. “Canescent” describes a visible gray-colored pubescent and a hoary appearance. “Hoary” is an ancient term meaning covered with a close, whitish, or grayish-white pubescence.

“Pilose” means a tissue surface is hairy with soft distinct hairs. “Villous” represents a surface which is hairy with long, soft, shaggy hairs. “Fimbriate” present a definition problem because it means a surface with tread-like hairs – are hairs thread-like or are threads hair-like? “Wooly” is clearly an animal term meaning covered with long, matted or tangled hairs. “Lanate” is wooly with long, curled or wavy hairs. Describing tree trichomes, we continue to come back to human and animal terms for hair or fur. It is important to remember that trees do not -- can not -- have hairs.

### Conclusions

When you feel a leaf surface on a tree and the texture is hairy, rough, bristly, or silky, you are touching trichomes. Sparsely scattered trichomes or dense wooly mats are all made of the same surface structures – trichomes. Try not to call them hairs.

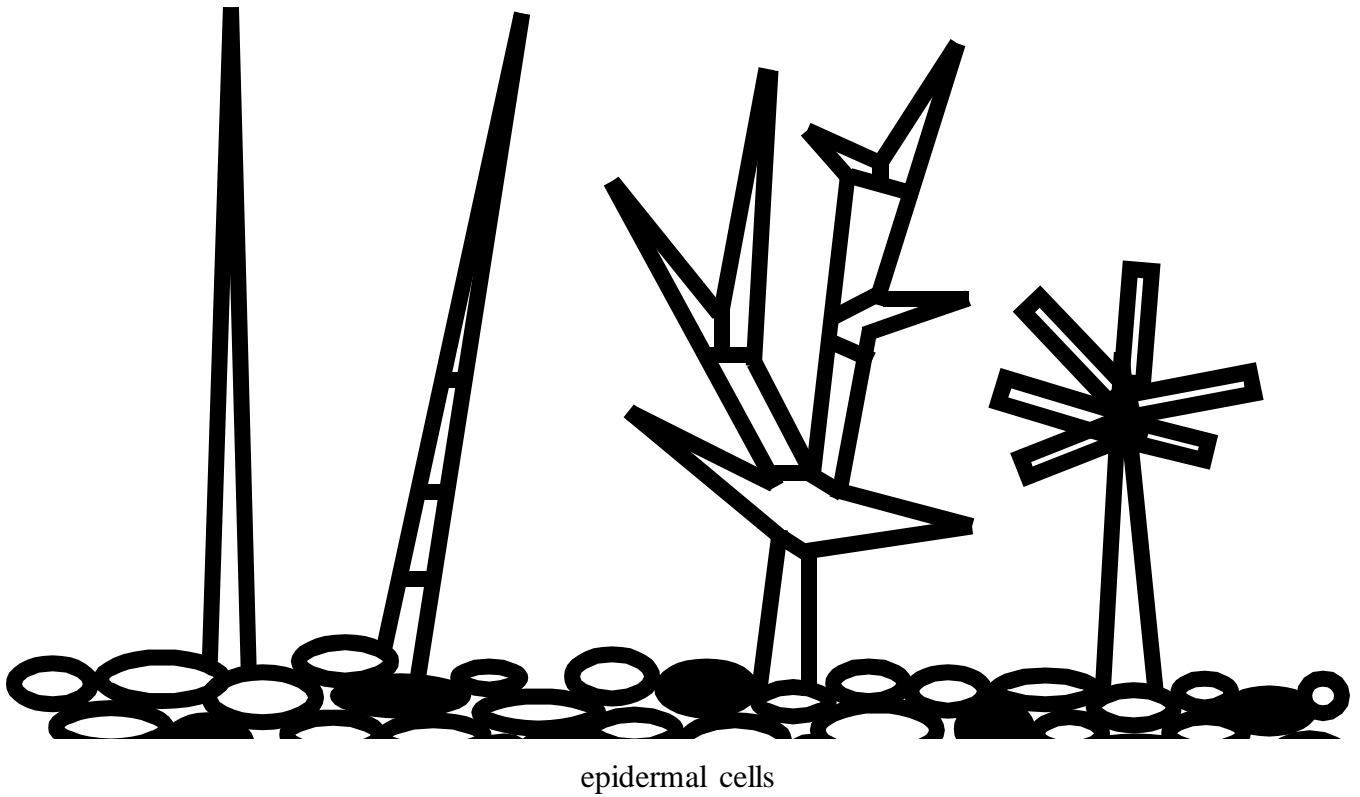


FIGURE 1: Diagrammatic representation of various forms of trichomes on leaf, bud, and root outer surfaces.

