



Tree Trichomes: Big Hairy Tree?

Dr. Kim D. Coder, Professor of Tree Biology & Health Care / University Hill Fellow
University of Georgia Warnell School of Forestry & Natural Resources

Trees do not have hairs – trees have trichomes. Trees have many different types of thread-like or bristle-like growths on leaves, twigs, buds, and roots, but none of them are hairs. Mammals have hair and fur. Tree “hairs” are called trichomes. Trichomes can occur all over the tree – from leaf to root tip. Trichomes are generated from surface layers (epidermis) of leaf, twigs, buds, and roots.

Any or all current-year tree surfaces may have the same or different trichomes, or none at all. A glabrous tree part has no trichomes. A pubescent tree part is generic jargon for some type of trichomes (i.e. pubescent does have a more precise trichome definition). Some trichomes remain alive for long periods, while other quickly die, leaving an empty shell behind. Trichome presence or absence, and trichome type, are unique for many taxonomic groups of trees and can be used as an aid in tree identification.

Look closely at a sycamore (*Platanus occidentalis*) leaf. It can be so fuzzy on its underside, 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.

Many Locations / Many Types

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 and away from tree surfaces, or recline along the surface. Trichomes can be temporary -- lasting weeks, or permanent fixtures on tree surfaces. Trichomes can also be disposable, designed to break apart or fall-off over time.

Forms

Under a microscope, trichomes come in several forms: straight, branched, star-shaped, and tufted. Trichomes can even form round bowls on leaf surfaces which may hold water. One tree may have several forms which vary by tree part and location for each part. On new roots, trichomes are found just behind the growing tips. These root trichomes are sometimes mistakenly called “root hairs.”

Trichomes come in many shapes. Some trichomes are long and thin, matting down into 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. Figure 1 presents a diagrammatic representation of various simple forms of trichomes which could develop on leaves, twigs, buds, and roots.

Glands!

Some trichomes are glandular. These trichomes have various materials which accumulate in or on their tips. For example, the stickiness of butternut (*Juglans cinerea*) leaves and fruits are due to glandular trichomes. This glandular exudate can be composed of defensive compounds to prevent animals consuming leaves or allelopathic chemicals which are rinsed-off by rain into the soil.

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 trichome tips. This material is moved or secreted into trichomes to prevent tissue damage and help ease the washing away of excessive salts.

A special type of oozing trichome is called a colleter. Colleters are found on surfaces of new formed leaves inside buds. They ooze a sticky material that permeates leaves and buds. This process helps strengthen new, succulent tissues and help prevent some types of pest damage. Buckeyes (*Aesculus* spp.), hickories (*Carya* spp.), and birch (*Betula* spp.) are some common tree species to have these special trichomes.

Multi-Purpose

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

Young leaves of many species have massed trichomes to shade photosynthetic cells until fully operational. As leaves expand, the effective density of these trichomes declines. Trichomes selectively block ultra-violet wavelengths of light like an organic translucent coating. Trichomes can also shade tissues from other wavelengths of light and reflect heat energy away from leaf and bud surfaces. Trichomes help elevate and disperse the primary energy exchange interface of a leaf, twig, or bud away from and above the epidermis and cuticle.

Trichomes can entangle, disrupt, confuse, and prevent some types of insects, mites, and other pests which cause injury. Densely woolly trichomes prevent insects from contacting the leaf surface. Trichomes with defensive materials at their ends touch and impede insects. The tangle and mass of trichomes interferes with insect chewing and associated tissue injuries. Trichomes also provide an elevated platform upon which dust and fungal spores can be swept away by wind and water before they touch leaf surfaces.

Water Savings.

Trichomes can help minimize water loss. Tufts of trichomes are usually positioned around stomates (i.e. water control ports on leaves), and help slow water evaporation. Trichomes help form a thicker boundary layer of high relative humidity air around a leaf, twig, or bud which minimize water loss. Shading and reflectance by trichomes also lowers tissue temperatures which decreases food use and water evaporation from tree surfaces.

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

Trichomes slow wind movement and shields surfaces from rain erosion. Some trichomes help protect tissues by softening mechanical 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.

Species

When feeling surfaces of some of native trees, many have trichomes of one form or another. If a tree has trichomes at all, they are most likely to be found on leaf undersides. Green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), Southern magnolia (*Magnolia grandiflora*), red mulberry (*Morus rubra*), red elm (*Ulmus rubra*), live oak (*Quercus virginiana*), black oak (*Quercus velutina*), chestnut oak (*Quercus montana*), post oak (*Quercus stellata*), river birch (*Betula nigra*) are just a few of the many trees possessing trichomes.

One common exotic tree, the royal paulownia (*Paulownia tomentosa*) 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 its leaf surface.

Some trees bear trichomes in selected locations. Black cherry (*Prunus serotina*) develops red-dish-brown trichomes on the underside of leaves along the main vein. A number of oaks have trichomes in the junctions between side veins and main vein on leaf undersides. Turkey oak (*Quercus laevis*) and northern red oak (*Quercus rubra*) are good examples.

One native tree with dense, glandular trichomes which smell very aromatic is mockernut hickory (*Carya tomentosa*). Oglethorpe oak (*Quercus oglethorpensis*) has unique five-pointed, star-shaped trichomes. Black walnut (*Juglans nigra*) has glandular trichomes which are swollen at the top and dispense an allelopathic material which damages other plants.

NOT Hairs!

Trichomes can be described using one or more classification terms. There are many trichome description combinations including: density (densely woolly to sparse); stiffness (stiff to soft); length (long to minute); shape (straight to star-shaped branched); texture (coarse to silky); and, form (flat scales to bristly). Trichomes can also provide tree surfaces with a scurfy surface, which is made of many short, fat, fragile, scaly trichomes. There are many more accurate and precise descriptive terms used for trichomes covering tree surfaces other than “hairy.”

Terminology

The precision and accuracy of 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. Figure 2.

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

Splitting Hairs?

“Hirsute” is a term used in trees to mean a surface covered with coarse or stiff, long trichomes and “hirsutulous” signifies minutely or slightly hirsute. “Hispid” describes rigid or bristly trichomes. A “bristle” is a stiff, strong but slender trichomes. Both “setose” and “setiferous” mean a tissue which bears bristle-like trichomes. The word “strigose” describes sharp, straight, appressed trichomes 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 with soft distinct trichomes. “Villous” represents a surface which has long, soft, shaggy trichomes. “Fimbriate” presents a definition problem because it means a surface with thread-like trichomes – are trichomes thread-like or are threads trichome-like? “Wooly” is clearly an animal term meaning covered with long, matted or tangled trichomes. “Lanate” is wooly with long, curled or wavy trichomes.

Conclusions

In describing tree trichomes, people continue to come back to human and animal terms for hair or fur. It is important to remember trees do not -- can not -- have hairs. 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 tree trichomes hairs!

Citation:

Coder, Kim D. 2020. Tree Trichomes: Big Hairy Tree?
University of Georgia, Warnell School of Forestry & Natural
Resources Outreach Publication WSNR20-45C. Pp.6.

The University of Georgia Warnell School of Forestry and Natural Resources offers educational programs, assistance, and materials to all people without regard to race, color, national origin, age, gender, or disability.

The University of Georgia is committed to principles of equal opportunity and affirmative action.

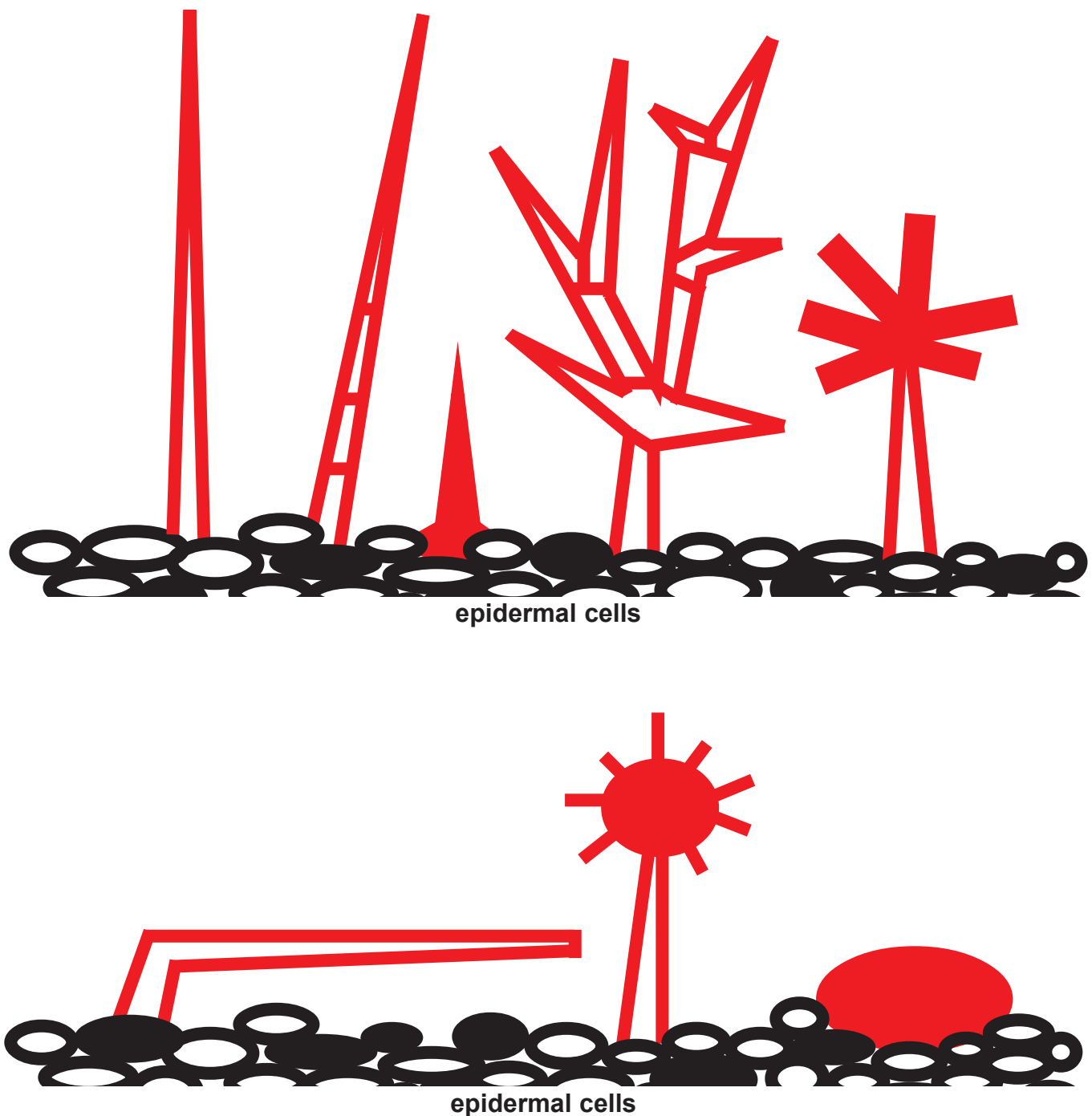


Figure 1: Simple representation of various tree trichome types / forms on leaf, twig, bud, and root outer surfaces (in side view). Not all trichome forms are found on every tree.

trichomes general description	number of different terms used	one example term
very short - soft	5 descriptors	farinose
very short - stiff	5 descriptors	scabrous
short - soft	7 descriptors	pubescent
short - stiff	10 descriptors	strigose
medium length - soft	6 descriptors	downy
medium length - medium soft	4 descriptors	pilose
medium length - stiff	4 descriptors	setose
long - soft	13 descriptors	silky
long - stiff	2 descriptors	hirsute

Figure 2: Tree trichome forms and names showing the complexity of descriptors for tree surfaces with hair-like or bristle-like trichomes. Shown are general physical trichome appearance / description categories, number of different descriptive terms used commonly within each categories, and an example descriptive term.

Note the term “pubescent” is often generically used for the presence of any category or type of tree surface trichome.