Laticifers and Resin Canals

Laticifers

A **laticifer** is a type of elongated secretory cell found in the leaves and/or stems of plants that produce latex and rubber as secondary metabolites. Laticifers may be divided into:

- **Articulated laticifers**, i.e., composed of a series of cells joined together, or
- **Non-articulated laticifers**, consisting of one long coenocytic cell.

Non-articulated laticifers begin their growth from the meristematic tissue of the embryo, termed the laticifer initial, and can exhibit continual growth throughout the lifetime of the plant. Laticifer tubes have irregularly edged walls and a larger inner diameter than the surrounding parenchyma cells. In the development of the cell, elongation occurs via karyokinesis and no cell plate develops resulting in coenocytic cells which extend throughout the plant.These cells can reach up to tens of centimeters long and can be branched or unbranched. They are thought to have a role in wound healing and as defense against herbivory, as well as pathogen defense, and are often used for taxonomy.

Laticifers were first described by H. A. de Barry in 1877.

Laticifers are highly specialized cells which can produce a wide variety of proteins. These proteins include enzymes functioning as proteinases and chitinases which help defend the producing plant against insects and other herbivores. In one study it was found that the presence and concentration of some proteins can differ greatly within the genus *Croton* relative to three species studied.

Cell Turgor

Pressurized flow of latex has been studied in multiple *Asclepias* species as a form of defense in addition to the secondary metabolites stored in the latex. In order to augment the defense of the plant some non-articulated laticifer cells contain highly pressurized stores of latex. It has been noted that pressure may be produced by the osmotic uptake of water into the laticifer cell resulting in a turgid cell. When pierced the cell bursts and latex travels quickly through the canal system to stop the herbivore. A desert species, *Bursera schlechtendalii*, pressurizes the canals right where leaves attach to the stem so that when a grazer eats a leaf latex shoots out. This process is termed the “squirt gun” defense.

Resin canals

Left -Resin canals seen as white dots in pine tree viewed under a microscope
Center -Axial resin canal (*Picea abies*)
Right -Pinus; leaf (3 needle type) Resin Canal

Resin canals or **resin ducts** are elongated, tube-shaped intercellular spaces surrounded by epithelial cells which secrete resin into the canal. These canals are orientated longitudinally and radially in between fusiform rays. They are usually found in late wood: denser wood grown later in the season. Resin is antiseptic and aromatic and prevents the development of fungi and deters insects

Types

- Normal resin canals exist naturally in the wood of the genera *Picea*, *Larix*, *Pinus*, *Pseudotsuga* and *Shorea*.
- Traumatic resin canals may be formed in wounded trees that don't have normal resin canals. Wounding occurs from either fire, freezing or mechanical damage. These canals are irregularly shaped compared to normal resin canals.

Characteristics

Resin canal characteristics (such as number, size and density) in pine species can determine its resistance to pests. In one study, biologists were able to categorize 84% of lodgepole pine, and 92% of limber pines, as being either susceptible or resistant to bark beetles based only on their resin canals and growth rate over 20 years. In another study, scientists found ponderosa pine trees that survived drought and bark beetle attacks had resin ducts that were >10% larger in diameter, >25% denser (resin canals per mm^2), and composed >50% more area of per ring.