

Echinacea pallida* (Nutt.) Nutt.**Echinacea Pallida* Root*****Echinaceae pallidae* Radix****Asteraceae**

Echinacea pallida is one of the three primary species of *Echinacea* used in Western herbal medicine for stimulating immune function. It is not widely used but can be confused with other species of *Echinacea*. The roots of *E. angustifolia*, *E. atrorubens*, and *E. pallida* are most commonly mixed up and are difficult to differentiate microscopically. *E. pallida* root is very similar to *E. angustifolia* root, but due to the doubled chromosome number in *E. pallida*, the size of epidermal cells, sclereids, and secretory cavities is, on average, larger than is found in *E. angustifolia*.

Transverse section: Dark brown epidermis of polygonal cells is present in young roots; cork is present in older roots; parenchyma cells outside the secondary phloem are polygonal, but those in the secondary phloem are spherical; secondary phloem and parenchyma exterior to it contain secretory cavities (up to 600 μm diameter) and sclereids;

sclereids are found singly or in groups of two or three (up to 10); solitary sclereids are more or less isodiametric or elongated, up to 80 μm diameter, and those in groups are slender, up to 50 μm diameter; black phytomelanin fills the triangular intercellular spaces around the sclereids, causing them to appear star shaped; secondary xylem consists of radial rows of vessels alternating with broad rays; vessels up to 70 μm diameter are arranged in small groups separated by parenchyma; fibers, usually without phytomelanin coating, are frequently attached to the vessels; xylem sclereids are located in rays only; secretory cavities are scattered throughout the xylem parenchyma; small pith; exterior to the pith, a few groups of primary xylem with narrow vessels are found at the inner ends of the xylem rays.

Longitudinal section: Solitary sclereids more or less isodiametric or elongated, with numerous pit channels; those in groups are elongated and up to 500 μm long; fibers have a less thickened cell wall and slender shape with pointed ends; vessels are reticulate, scalariform, or, rarely, bordered pitted.

Powder: Fragments of epidermis; colorless parenchyma; reticulate or bordered-pitted vessels; frequent sclereids, coated with phytomelanin, mostly in elongated multiserial groups; few bundles of fibers without phytomelanin.

