

***Echinacea purpurea* (L.) Moench**  
***Echinacea Purpurea* Root and Rhizome**  
*Radix et Rhizoma Echinaceae purpureae*  
 Asteraceae

**A. Rhizome**

**Transverse section:** Epidermis of dark brown polygonal cells—in older rhizomes, cork; cortex of slightly thickened parenchyma cells with triangular or rectangular intercellular spaces; sclereids, approximately 60  $\mu\text{m}$  diameter, occur singly or in small groups in the cortex; black phytomelanin fills the triangular intercellular spaces around the sclereids, causing them to appear star shaped; groups of fibers occur exterior to the secondary phloem; secondary xylem forms a solid ring of vessels, fibers, and thickened isodiametric parenchyma cells; large pith contains phytomelanin-coated sclereids; secretory ducts, approximately 80–180  $\mu\text{m}$  diameter, occur in the cortex and secondary xylem, with the largest ones in the pith.

**Longitudinal section:** Most vessels are bordered pitted.

**B. Root**

**Transverse section:** Dark brown epidermis of polygonal cells present in primary tissue; cork present in older

roots; thin-walled parenchyma found outside the secondary phloem; secondary phloem cells have slightly thicker walls; secretory ducts occur in a ring along the endodermis between the parenchyma and secondary phloem, mostly in groups of three or four opposite xylem strands; their lumen is ovate, elongated tangentially up to 120  $\mu\text{m}$ , and filled with yellow to orange-brown secretions; secondary xylem consists of fibers and vessels arranged in large cuneiform groups tapering toward the root center; in younger roots, parenchyma is located between these groups, whereas in older roots, the secondary xylem forms a solid ring; some vessels are filled with an orange-brown substance; small pith; small groups of primary xylem are located outside the central pith at the interior ends of the medullary rays; sclereids and phytomelanin are absent.

**Longitudinal section:** Bordered-pitted, scalariform, or reticulate vessels attached to elongated, pointed fibers.

**Powder:** Long bundles of fibers; fragments of bordered-pitted, reticulate, or scalariform vessels; secretory ducts with yellow to orange-brown secretions; few fragments of cork, parenchyma, few isodiametric sclereids with phytomelanin coating (may be absent from the rhizome).

