

Crataegus laevigata (Poir.) DC.

Hawthorn Leaf and Flower

Folium cum Flore Crataegi

Rosaceae

Hawthorn is one of the most widely used of all cardiotonics throughout Europe and the United States. It possesses myriad beneficial actions on the cardiovascular system, including documented effects as an antioxidant, an ability to increase coronary output and mildly lower blood pressure and cholesterol, and the promotion of a slow and steady heartbeat, among other uses. The two most widely used species are *C. laevigata* and *C. monogyna*. These are considered to be interchangeable. Additional species of *Crataegus* that share a similar chemical profile may also be used interchangeably. However, most research has been done with the aforementioned species. Traditionally, the berry was used more than the leaf and flowers. However, modern research has focused on the leaf and flower, which have become two of the most extensively studied herbal medicine ingredients. The European pharmacopoeia considers many different species of *Crataegus* leaf and flower to be acceptable, including *C. laevigata*, *C. monogyna*, and their hybrids, as well as *C. azarolus*, *C. nigra*, and *C. pentagyna*.

A. Leaf

Surface view: Upper epidermis of polygonal cells, stomata absent, cuticular striations absent (*C. laevigata*) or conspicuous (*C. monogyna*); underlying palisade parenchyma with cluster crystals of calcium oxalate up to 25 μm in diameter; calcium oxalate prism sheaths surround the veins; lower epidermal cells have sinuous anticlinal walls, and cells found along veins are elongated and may have beaded walls; numerous anomocytic stomata, ~35 μm (*C. laevigata*) or 42 μm (*C. monogyna*) in length; melted

cuticular wax may be present as small droplets; unicellular covering trichomes can be absent or present; if present, they occur primarily at the margin and along veins; trichome wall slightly to heavily thickened, tapering, base inserted into the epidermis, or surrounding cells appearing like a pedestal, often arranged like a rosette; variable trichome length—short at the margin, longer (up to ~500–600 μm) along the veins.

Transverse section: Bifacial; palisade cells in two or three rows (*C. laevigata*) or one row with possibly a second row of smaller cells (*C. monogyna*); cluster crystals of calcium oxalate occur in the palisade cells; spongy mesophyll of loosely arranged cells; calcium oxalate prisms form a sheath along the veins; collateral bundles are associated with fibers; collenchyma may occur near veins.

B. Flower

Surface view: Very small sepals, with short unicellular covering trichomes with undulating walls; anomocytic stomata on the outer surface only; mesophyll contains cluster crystals of calcium oxalate; veins without a prism sheath; hypanthium internal surface with a dense indumentum of unicellular trichomes; petals with a papillous surface; five anthers turn deep red upon boiling with chloral hydrate solution; endothelial cells have reticulate wall thickenings; filaments contain cluster crystals; roundish or triangulate pollen grains (depending on viewing angle), ~40 μm in diameter, tricolporate, with a smooth exine.

Powder: Fragments of leaves with cuticular striations, cluster crystals, and with or without anomocytic stomata; leaf veins with calcium oxalate prism sheaths; unicellular covering trichomes; calyx with cluster crystals and short unicellular covering trichomes; papillous petals with cluster crystals; tricolporate pollen grains.

