

Tussilago farfara* L.*Coltsfoot Leaf*****Folium Farfarae******Asteraceae***

Coltsfoot has been commonly used in Western herbal medicine for upper respiratory congestion. There is a potential for it to be mixed with Western coltsfoot, *Petasites* spp. Both species contain pyrrolizidine alkaloids (PAs). The two species can be differentiated microscopically.

Surface view: Upper epidermis of polygonal cells with dense cuticular striations and large anomocytic stomata ~35 µm long; the density of the indumentum on the upper surface varies with leaf age: young leaves have tufts of long uniseriate covering trichomes and biseriate glandular trichomes up to 600 µm long, while adult leaves are glabrous; two types of uniseriate covering trichomes ≥ 1 mm long occur: (1) base of few small cells, followed by one larger spherical cell, and one extremely long, twisted, and slightly thick-walled terminal cell; (2) base of brown shrunken cells—the last cell of the base is larger and “inflated” and the terminal cell is extremely long, twisted, and slightly thick walled. Lower epidermis is densely tomentose and most covering trichomes are like type (1) from upper epidermis; the indumentum obscures the

epidermal cells unless it has been removed by processing; if removed, cells with wavy anticlinal walls and numerous large anomocytic stomata ~35 µm long can be seen, and under low magnification the aerenchyma of the mesophyll is visible through the surface.

Transverse section: Bifacial; palisade cells in three or four rows; spongy mesophyll consists of aerenchyma with very large cavities separated by narrow cell layers; sphaerocrystals of inulin may occur.

Powder: Primarily fragments of the long terminal cells of the covering trichomes, frequently in tangles; upper epidermis with polygonal cells, stomata, and cuticular striations; lower epidermis with wavy cell walls and stomata; few bundles of fibers from the petiole.

Microscopic Differentiation of the Leaves of Coltsfoot (Tussilago farfara) and Arctic Butterbur (P. frigidus)

Coltsfoot may be adulterated with leaf material of various species from the genus *Petasites*, such as Arctic butterbur (*P. frigidus*) and purple butterbur (*P. hybridus*). Coltsfoot and Arctic butterbur leaves can be difficult to distinguish macroscopically in cut leaf material, but are readily discernible using microscopy.

Microscopic Differentiation of *Tussilago* and *Petasites* Leaves

Character	<i>Tussilago</i>	<i>Petasites</i>
Glandular trichomes	Biseriate glandular trichomes up to 600 µm long, may be rare	Absent
Upper epidermis	Polygonal with straight walls	Irregularly shaped with sinuous walls
Palisade layer	Broad, three or four rows of cells	One or two rows of very short cells
Leaf mesophyll	Aerenchyma with very large spaces between narrow rows of cells	Aerenchyma, spaces not as large as in <i>Tussilago</i>
Indumentum of upper leaf surface	Upper surface glabrate due to age and/or processing	Covering trichomes on upper surface