Medicinal herbal raw materials and phytopreparations influencing the secretion of digestive glands and biliary tract

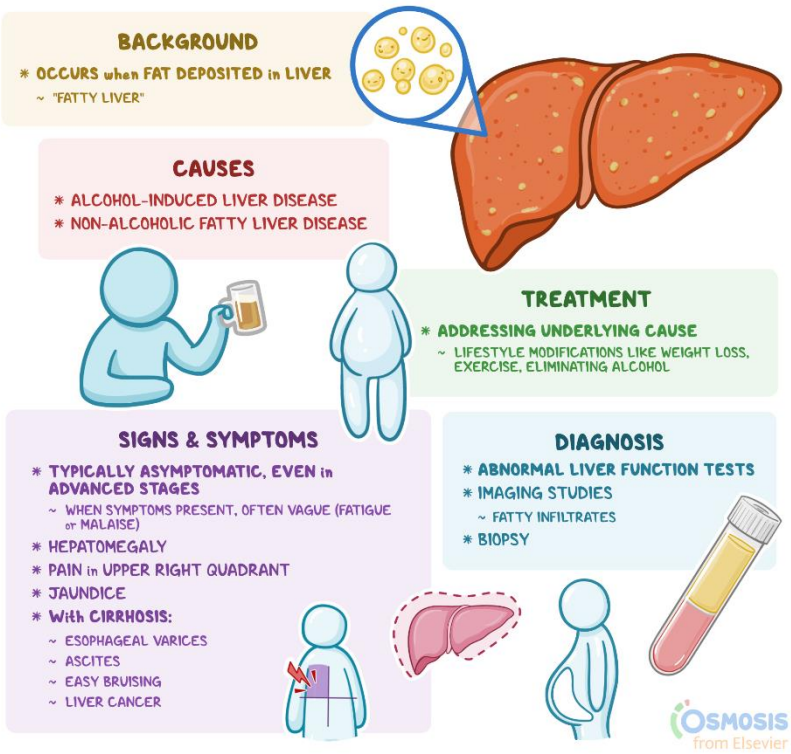
Herbal medicinal products (HMPs), including nutritional supplements, are widely used to maintain health, prevent disease, and for self-medication of chronic and refractory diseases. They are often taken alongside conventional medicines, often referred to as ‘drugs’ in this context. This can lead to interaction between the herbal medicine and the drug, causing changes in blood levels that could, in the most serious cases, lead to toxicity due to increased drug plasma levels or even treatment failure due to decreased levels.

Gastrointestinal (GI) and liver disorders account for minor, everyday complaints as well as major health problems. Dietary measures can improve symptoms that are caused, for example, by poor eating habits, but, if these are not successful, phytotherapy is also useful. In fact, natural products are still the most commonly used remedies in cases of constipation, diarrhoea and flatulence. Plants and their derivatives also offer useful treatment alternatives for other problems such as irritable bowel syndrome, motion sickness and dyspepsia. In the case of some liver diseases, phytotherapy provides the only effective remedies currently available.

Dyspepsia and ‘biliousness’ are closely associated with eating habits and are very common complaints. Patients describe the symptoms as nausea, pain and cramps, distension, heartburn and the ‘inability to digest food’, often experienced after rich meals.

The condition is treated either with cholagogues or with bitter stimulants. A cholagogue is an agent that stimulates bile production in the liver, or promotes emptying of the gallbladder and bile ducts. Although clinical evidence is largely lacking, plant-based cholagogues are frequently prescribed by family doctors in Germany based on observational evidence and a long tradition of use, but they should not be used in cases of bile duct obstruction or cholestatic jaundice.

Liver disease is not treated as such by conventional medicine, but herbal medicine has a number of clinically proven treatments that help to protect the liver from damage and reverse some of the indicators of liver malfunction. The most important of these is silymarin, but other medicinal plants are widely used for liver disease, although mainly with much less clinical evidence in support.



Phytomedicines used as bitter stimulants, such as gentian and wormwood, act directly on the mucosa of the upper part of the GI tract and especially of the bitter receptors on the tongue, stimulating the secretion of saliva and gastric juices and influencing the secretion of gastrin. An aperitif containing ‘bitters’, taken about half an hour before eating, stimulates gastric and biliary secretion; however, it is not known whether these effects are restricted to patients with a reduced secretory reflex, or whether an increase also occurs in healthy people.

Medicinal raw materials and phytopreparations influencing the secretion of digestive glands and biliary tract

I. Medicinal raw materials and preparations that improve digestion
- Taraxaci officinalis radices,
- Acori calami rhizomata,
- Foenicule vulgare fructus.

II. Medicinal plant raw materials and preparations of choleretic action
- Tanaceti vulgaris flores,
- Chelidonii majoris herba,
- Zea maydis stilli cum stigmatis.

III. Hepatoprotectors:
- Sylibi mariani fructus.

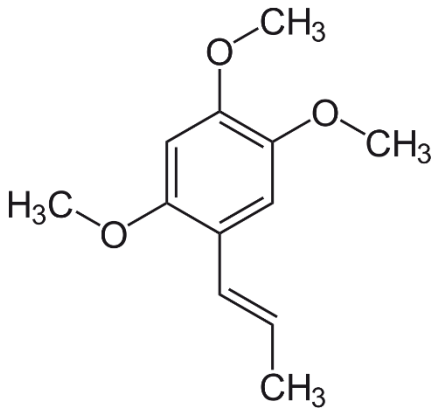
sweet flag – Acorus calamus L.
Family Araceae
sweet flag rhizomes – Acori calami rhizomata

Sweet flag is a herbaceous perennial, 2 m tall. Its leaves resemble those of the iris family. Sweet flag consists of tufts of basal leaves that rise from a spreading rhizome. The leaves are erect yellowish-brown, radical, with pink sheathing at their bases, sword-shaped, flat and narrow, tapering into a long, acute point, and have parallel veins. The leaves have smooth edges, which can be wavy or crimped. The sweet flag can be distinguished from iris and other similar plants by the crimped edges of the leaves, the fragrant odor it emits when crushed, and the presence of a spadix.

Only plants that grow in water bear flowers. The solid, triangular flower-stems rise from the axils of the outer leaves. A semi-erect spadix emerges from one side of the flower stem. The spadix is solid, cylindrical, tapers at each end, and is 5 to 10 cm in length. A covering spathe, as is usual with Araceae, is absent. The spadix is densely crowded with tiny greenish-yellow flowers. Each flower contains six petals and stamens enclosed in a perianth with six divisions, surrounding a three-celled, oblong ovary with a sessile stigma. The flowers are sweetly fragrant.

Sweet flag grows in India, central Asia, southern Russia and Siberia, Europe and North America. Habitats include edges of small lakes, ponds and rivers, marshes, swamps, and other wetlands.

Calamus leaves and rhizomes contain a volatile oil that gives a characteristic odor and flavor. Major components of the oil are beta-asarone (as much as 75%), methyl isoeugenol (as much as 40%) and alpha-asarone, saponins, lectins, sesquiterpenoids, lignans, and steroids.
Phytochemicals in the plant vary according to geographic location, plant age, climate, species variety, and plant component extracted.



β-asarone

Sweet flag has a long history of use in Chinese, Nepal and Indian herbal traditions. Sweet flag was and is used as an herbal medicine by the Chipewyan people.

Acorus calamus has been an item of trade in many cultures for centuries. It has been used medicinally for a wide variety of ailments, such as gastrointestinal diseases and treating pain, and its aroma makes calamus essential oil valued in the perfume industry. The essence from the rhizome is used as a flavor for foods, alcoholic beverages, and bitters in Europe.

It was also once used to make candy.

Common Dandelion - Taraxacum officinale Wigg.

Family Asteraceae

Common Dandelion roots - Taraxaci officinalis radices

Taraxacum officinale, the **dandelion** or **common dandelion**, is a herbaceous perennial flowering plant.

Taraxacum officinale grows from (generally unbranched) taproots and produces several hollow, leafless flower stems 5–40 centimetres tall, but sometimes up to 70 cm tall. The stems can be tinted purplish, they are upright or lax, and produce flower heads that are held as tall or taller than the foliage. The foliage may be upright-growing or horizontally spreading; the leaves have petioles that are either unwinged or narrowly winged. The stems can be glabrous or sparsely covered with short hairs. Plants have milky latex and the leaves are all basal, each flowering stem lacks bracts and has one single flower head. The yellow flower heads lack receptacle bracts and all the flowers, which are called florets, are ligulate and bisexual.

The leaves are 5–45 cm long and 1–10 cm wide, and are oblanceolate, oblong, or obovate in shape, with the bases gradually narrowing to the petiole. The leaf margins are typically shallowly lobed to deeply lobed and often lacerate or toothed with sharp or dull teeth.

The calyculi (the cuplike bracts that hold the florets) are composed of 12 to 18 segments: each segment is reflexed and sometimes glaucous. The lanceolate shaped bractlets are in two series, with the apices acuminate in shape. The 14–25 millimetres wide involucres are green to dark green or brownish-green, with the tips dark gray or purplish. The florets number 40 to over 100 per head, having corollas that are yellow or orange-yellow in color.

The fruits, called cypselae, range in color from olive-green or olive-brown to straw-colored to grayish, they are oblanceoloid in shape and 2–3 mm long with slender beaks. The fruits have 4 to 12 ribs that have sharp edges. The silky pappi, which form the parachutes, are white to silver-white in color and around 6 mm wide.

Taraxacum officinale is native to Europe and Asia, and was originally imported to America as a food crop. The common dandelion grows in temperate regions of the world in areas with moist soils. It is most often considered a weed, especially in lawns and along roadsides, but the leaves, flowers, and roots are sometimes used in herbal medicine and as food.

Dandelion roots contain bitter glycosides - taraxacin and taraxacerin, polysaccharides, among which inulin is characteristic (up to 25%), taraxacin and taraxacerin.
Triterpene compounds have been isolated from the roots (β-amyrin, arnidiol, faradiol), as well as sterols - β-sitosterol and stigmasterol. The milky sap contains resinous substances of rubber nature

Dandelion has been used in traditional medicine in Europe, North America, and China.

Use the roots in the form of infusion as a bitter to stimulate appetite, choleretic, as a mild laxative for constipation. From the root a thick extract is obtained, used in the same way. The roots are included in the composition of appetite, stomachic and diuretic collections.

Western herba lists use the leaves for some diseases, and the roots for others, and in China, the whole plant is used. The young leaves of the plant can be eaten as a spring salad.

Crushed dandelion roots can be used as a coffee surrogate.

Common Fennel – Foeniculum vulgare Mill.
Family Apiaceae
Common Fennel fruits –Foeniculi vulgaris fructus

Foeniculum vulgare is a perennial herb. The stem is hollow, erect, and glaucous green, and it can grow up to 2.5 metres tall. The leaves grow up to 40 centimetres long; they are finely dissected, with the ultimate segments filiform (threadlike), about 0.5 millimetres wide.

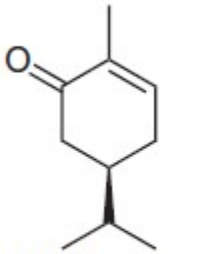
Its leaves are similar to those of dill, but thinner.

The flowers are produced in terminal compound umbels 5–17.5 cm wide, each umbel section having 20–50 tiny yellow flowers on short pedicels. The fruit is a dry schizocarp from 4–10 mm long, half as wide or less, and grooved. Since the seed in the fruit is attached to the pericarp, the whole fruit is often mistakenly called "seed."

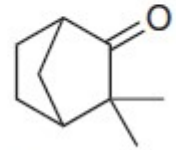
It is indigenous to the shores of the Mediterranean but has become widely naturalized in many parts of the world, especially on dry soils near the sea-coast and on riverbanks.

All of the aerial parts of fennel are rich in essential oil, with bitter fennel fruit containing 2–6%, mostly *trans*-anethole (> 60% of the oil) and fenchone (> 15%), and with not more than 10% estragole. Sweet fennel contains 1.5–3% essential oil, composed of *trans*-anethole (80–90%) but with very little fenchone (< 1%) and less than 5% estragole.

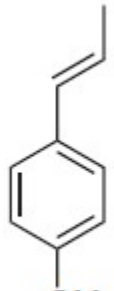
Fatty oil and protein are also found in fennel fruit.



(–)-Carvone



Fenchone



Anethole

Fennel is used empirically as a carminative, for indigestion and colic in children, and clinical data for fennel preparations show encouraging results. It is considered to be a very safe drug and is widely used as a health-food supplement as well as a spice.

However, some safety concerns were raised based on the content of the potential carcinogenic compound found in the essential oil – estragole (methylchavicol 5–10% of the total essential oil), but no clinical reports for toxicity for fennel have been recorded.

Also, the clinical relevance of some studies using pure estragole at high doses has been disputed. Fennel oil (the distilled essential oil of fennel fruits) is used for the same indications and has been shown to be bacteriostatic.

Liver damage, cirrhosis and poisoning should only be treated under medical supervision. There is, however, a useful phytomedicine derived from the milk thistle, *Silybum marianum* (L.) Gaertn. (Asteraceae), in the form of an extract known as silymarin.

Other medicinal plants as shown below, are widely used for liver disease, although with less clinical evidence in support. Medicinal plants used for ‘biliousness’ (see section on Dyspepsia and Biliousness) are also used in mild liver disease.

Greater Celandine herb- Chelidonii majoris нerba
Greater Celandine - Chelidonium majus L.
Family Papaveraceae

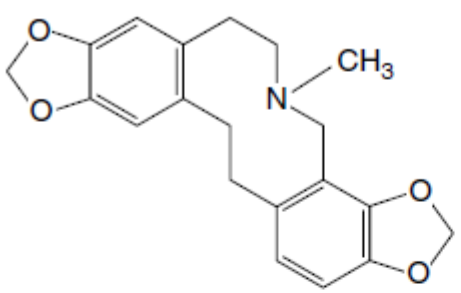
Greater celandine is a perennial herbaceous plant with an erect habit, and reaches 30–120 cm (12–47 in) high. The blue-green leaves are pinnate with lobed and wavy margins, up to 30 cm long. When injured, the plant exudes a yellow to orange latex.

The flowers consist of four yellow petals, each about 18 mm long, with two sepals. A double-flowered variety occurs naturally. The flowers appear from late spring to summer, May to September in umbelliform cymes of about 4 flowers.

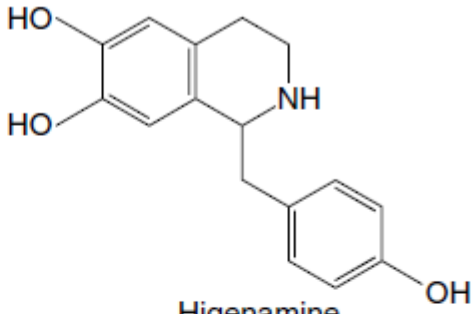
The seeds are small and black, borne in a long, cylindrical capsule. Each has an elaiosome, which attracts ants to disperse the seeds.

Chelidonium majus is native in most regions of Europe. It is also found in North Africa, in Algeria and Morocco. In Western Asia it is found in the Caucasus, Armenia, Azerbaijan, Georgia, Kazakhstan, Mongolia, Siberia, Iran and Turkey.

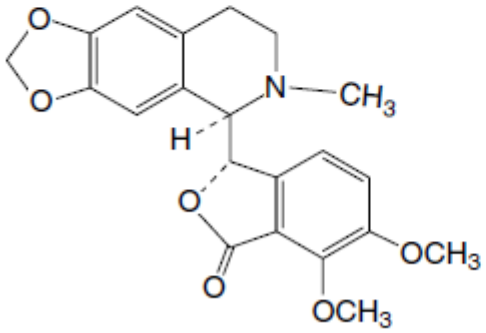
Greater celandine contains up to 4% of alkaloids including α- and β-allocryptopine, berberine, chelerythrine, chelidonine, chelirubine, choline, coptisine, hydroxychelidonine, hydroxysanguinarine, protopine, sanguinarine, sparteine, and others.



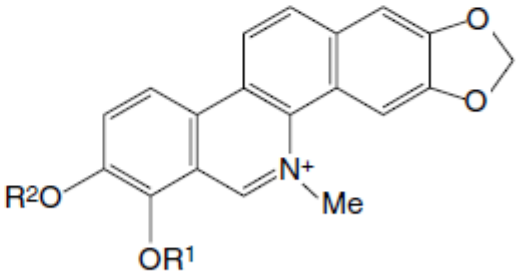
Protopine



Higenamine
(Norcoclaurine)



Hydrastine



Chelerythrine; $R^1 = R^2 = Me$
Sanguinarine; $R^1 + R^2 = CH_2$
(forms methylenedioxy group)

The drug has many traditional uses based on its reputed anodyne, antispasmodic, caustic, diaphoretic, diuretic, hydragogue, narcotic and purgative properties, Some of these activities have support from pharmacological tests involving particular alkaloids. *C*. *majus* is also used in homoeopathic practice and in Chinese medicine.

Tansy flowers - Tanaceti vulgaris flores
Tansy - Tanacetum vulgaris L.
Family Asteraceae

Tansy is a flowering herbaceous plant with finely divided compound leaves and yellow, button-like flowers. It has a stout, somewhat reddish, erect stem, usually smooth, 50–150 cm tall, and branching near the top. The leaves are alternate, 10–15 cm long and are pinnately lobed, divided almost to the center into about seven pairs of segments, or lobes, which are again divided into smaller lobes having saw-toothed edges, giving the leaf a somewhat fern-like appearance. The roundish, flat-topped, button-like, yellow flower heads are produced in terminal clusters from mid-to-late summer. The scent is similar to that of camphor with hints of rosemary. The leaves and flowers are toxic if consumed in large quantities; the volatile oil contains toxic compounds including thujone, which can cause convulsions and liver and brain damage.

Tansy is native to Eurasia; it is found in almost all parts of mainland Europe, as well as Britain and Ireland. It is absent from Siberia and from some of the Mediterranean islands. The ancient Greeks may have been the first to cultivate it as a medicinal herb.

The whole plant has a characteristic camphor odour.odour, as it contains in its flower baskets up to 2% essential oil, which includes thujone (up to 47%), camphor, borneol The raw material contains a significant amount of flavonoids(derivatives of luteolin, apigenin, quercetin), tannins,bitters.

The plant's choleretic properties are due toflavonoids. From the flowers are prepared infusions, which are used as ananthelmintic (ascarids, pinworms) and choleretic. The drug"Tanacephol", which includes the sum of flavonoids and phenolcarboxylic acids,is approved for use as an antispasmodic agent forchronic cholecystitis, biliary dyskinesia. Elderberries are included incholeretic collections and in the collection Zdrenko.

Since the plant is poisonous, it is not recommended to use it in pregnancy.pregnancy.Elderberries are known to be a good remedy against flies thatare afraid of the odour of fir: if you put this plant in the room, the flies will fly away.

Some housewives, fishermen, knowing the dislike of flies to fiddleheads, sprinkle fresh meat or fishmeat or fish with fragrant powder from the flowers or flowering branches. A good service will be rendered by fiddleheads if there is no mothballs at hand.

It is enough to put the flowers of fiddlehead in a gauze bag in thesleeves or pockets of stored things, and moths will not be there. Fearby bedbugs and fleas.

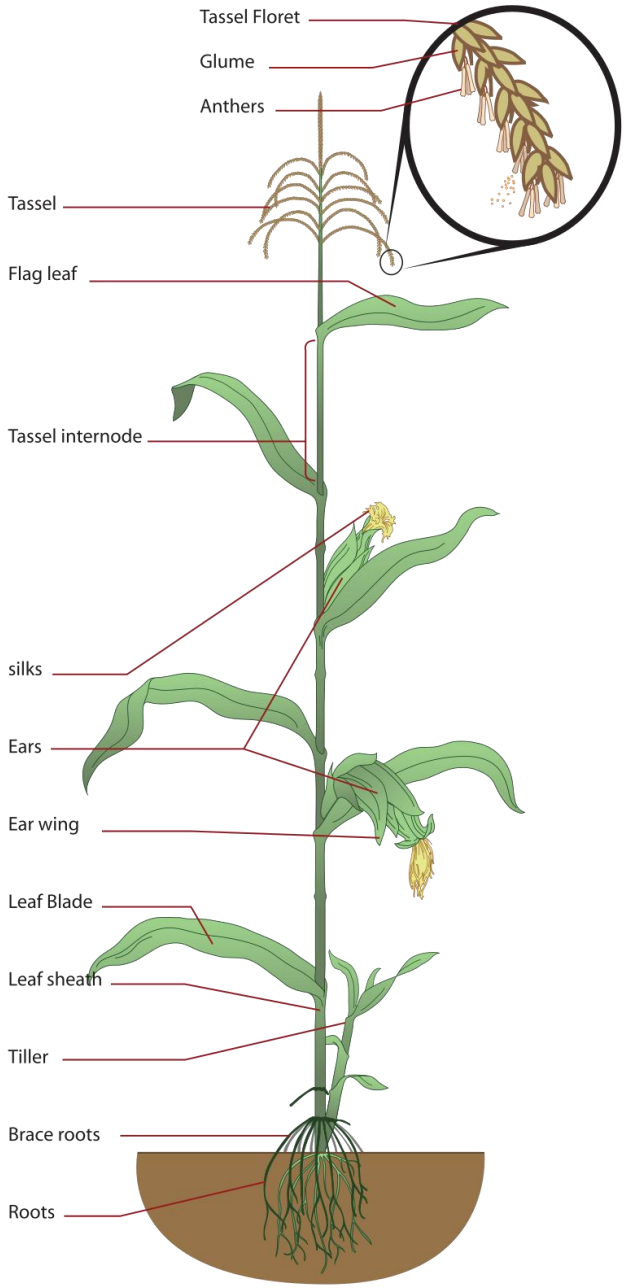
Maize stiles with stigmas - Zeae maydis styli cum stigmatis

Maize - Zea mays L.

Family Poaceae

The maize plant is often 3 m in height. The stem is commonly composed of 20 internodes of 18 cm length. The leaves arise from the nodes, alternately on opposite sides on the stalk, and have entire margins.

The apex of the stem ends in the tassel, an inflorescence of male flowers; these are separate from the female flowers but borne on the same plant. They are female inflorescences, tightly enveloped by several layers of ear leaves commonly called husks. Elongated stigmas, called silks, emerge from the whorl of husk leaves at the end of the ear. They are often pale yellow and 18 cm (7 in) in length, like tufts of hair in appearance. At the end of each is a carpel, which may develop into a "kernel" if fertilized by a pollen grain. The pericarp of the fruit is fused with the seed coat referred to as "caryopsis", typical of the grasses, and the entire kernel is often referred to as the "seed".



Female inflorescence, with young silk

Mature silk

Today, maize is cultivated in many countries.

Corn stalks contain vitamin K,B vitamins, ascorbic acid, carotenoids, fatty oil,traces of essential oil, polysaccharides.

Raw material is used for preparation of infusion, decoction and for production of liquid extract, which are used as a choleretic in cholecystitis, hepatitis with delayed bile secretion, as well asas a haemostatic and diuretic for urolithiasis.

With the use of preparations from corn stigmas is noted not only increase in the secretion of bile, but also qualitative changes in its quality: decrease in viscosity, dense residue, specific gravity of it and decrease inbilirubin content.

Maize and cornmeal (ground dried maize) constitute a staple food in many regions of the world. Maize is used to produce cornstarch, a common ingredient in home cooking and many industrialized food products. Maize starch can be hydrolyzed and enzymatically treated to produce syrups, particularly high fructose corn syrup, a sweetener; and also fermented and distilled to produce grain alcohol.