



Medicinal plants and medicinal plant materials containing volatile oils

*(Bicyclic monoterpenes and
sesquiterpenes)*

Calamus rhizome –Rhizomata Calami

Calamus (sweet flag) - Acorus calamus

Fam. - Araceae

Sweet Flag Root, is a semiaquatic, perennial plant that grows along lakes and rivers and in muddy swamps and meadows. The plant has a long history of use dating back at least 4000 years as a product of commerce in the Near East. Calamus originated in India, Central Asia, and Eastern Europe but now grows all over the world.

Rhizome horizontal; up to 22 cm long and up to 2 cm thick; very pale orange to weak yellowish-orange to pinkish-brown or pinkish-white, the upper surface longitudinally furrowed, lower surface with circular, pitted scars of rootlets arranged in irregular, zigzag lines; fracture short, sharp and corky; inner surface whitish or pinkish-white and spongy, showing an elliptical endodermis separating the outer cortex from the central cylinder, both of these regions exhibiting yellowish dots; odor aromatic; taste pungent and bitter.

Аир болотный



Active const.

Volatile oil 1.5–3.5%. β -Asarone content varies between genetic species: 96% in tetraploid (Indian), 5% in triploid (European) and 0% in the diploid (North American) species. Other identified components include calamenol (5%), calamene (4%), calamone (1%), methyl eugenol (1%), eugenol (0.3%) and the sesquiterpenes acolamone, isoacolamone.

Tannin

1.5%.

Other constituents

Bitter principles (e.g. acorin), acoric and palmitic acids, resin (2.5%), mucilage, starch (25–40%), sugars, dimethylamine, methylamine, trimethyl amine and choline.

Uses

- Calamus is a carminative, spasmolytic and diaphoretic. Traditionally it has been indicated for acute and chronic dyspepsia, gastritis and gastric ulcer, intestinal colic and anorexia.
- The toxicity of calamus oil has been associated with the β -asarone content. It has therefore been advised that only roots free from, or with a low content of β -asarone should be used in human phytotherapy.
- **Phyto medicine: Olimetine, Vicalin, Vicair**

Elecampane Rhizome, Root - *Rhizomata et radices Inulae*

Elecampane - *Inula helenium*

Fam. - Asteraceae

Synonym(s)

Alant, Horseheal, Inula, Scabwort, Yellow Starwort,

Pharmacopoeial and Other Monographs

BHC 1992, BHP 1996; Martindale 35th edition

The mixture of elecampane alantolactones has been referred to as helenin. Alantolactone is also known as elecampane camphor,

Rhizome fusiform, when entire, branching, usually cut into longitudinal pieces, to which may be attached one or more roots; externally grayish-brown to dark-brown, longitudinally wrinkled, with occasional buds or stem scars; inner or cut surface somewhat concave, yellowish-brown to grayish-brown, longitudinally striate and more or less fibrous near the cambium zone; fracture short; inner surface light brown and showing circular or elliptical markings; roots cylindrical frequently twisted, up to 15 cm. in length and 1.6 cm. in diameter; odor aromatic; taste aromatic, then acrid and pungent.



Act const

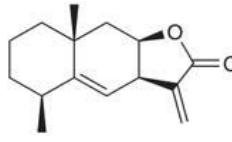
Carbohydrates Inulin (up to 44%), mucilage.

Terpenoids b- and g-sitosterols, stigmasterol and damaradienol (sterols), friedelin.

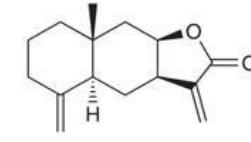
Volatile oils 1–4%. Mainly contains sesquiterpene lactones including alantolactone, isoalantolactone and dihydroalantolactone (eudesmanolides), alantic acid.

Other constituents Resin.

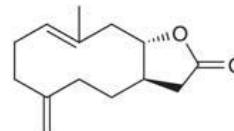
Sesquiterpenes



alantolactone

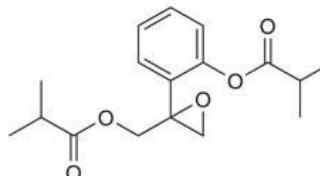


isoalantolactone



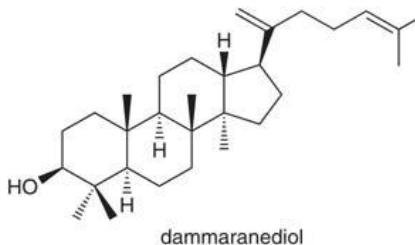
germacrene-D-lactone

Monoterpene



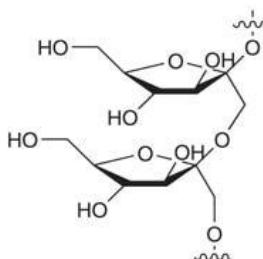
8,9-epoxy-10-isobutyryloxy-thymol isobutyrate

Triterpenes



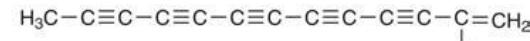
dammaranediol

Polysaccharide



inulin
(30-35 D-fructose residues)

Polyacetylene



C-13 polyacetylene

Uses

Elecampsane is stated to possess expectorant, antitussive, diaphoretic and bactericidal properties.

Traditionally, it has been used for bronchial/tracheal catarrh, cough associated with pulmonary tuberculosis and dry irritating cough in children.

Alantolactone has been used as an anthelmintic in the treatment of roundworm, threadworm, hookworm and whipworm Infection.

Phyto medicine:

Alanton – as antihypertensive, **Pectosol** – as mucolytic.

sesquiterpenoid lactone

German chamomile flowerhead - *Flores Chamomillae*

German chamomile - *Chamomilla recutita (Matricaria recutita, M. chamomilla)*

Fam. - Asteraceae

BHC 1992, BHP 1996, BP 2007 (Matricaria Flower),
Complete German Commission E, ESCOP 2003,
Martindale 35th edition, Ph Eur 2007 (Matricaria
Flower), USP29/NF24, WHO volume 1 1999



Matricaria flower consists of the dried-flower heads.

German chamomile is an annual herbaceous plant about 40 cm in height. Stems are solitary, ribbed-grooved, and naked. Leaves are alternate, sessile. Flowers are numerous, gathered in heads. Marginal florets are ligulate, white, inner ones are tubular, yellow. The fruit is an achene. The bracts of the involucre are obovate to lanceolate, with a brownish-grey scarious margin. The receptacle is essentially conical and hollow. The base of the corolla of ligulate florets consists of a yellow tube extending to an elongated-oval, white ligule.

The corolla of tubular florets is yellow and broadens at the apex, where it splits into five teeth; its base is yellowish-brown to brown. The odor is strong, aromatic; the taste is bitterish-spicy, slightly mucilage-like.

Coumarins Umbelliferone and its methyl ether, heniarin.

Flavonoids Apigenin, apigetrin, apiin, luteolin, quercetin, quercimeritin and rutin.

Volatile oils 0.24–1.9%. Pharmacopoeial standard not less than 4 mg/kg **blue oil**.

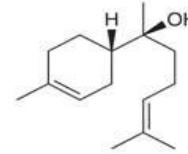
Main components are α -bisabolol (up to 50%) and **chamazulene** (1–15%). Others include α -bisabolol oxide A and B, α -bisabolone oxide A, sesquiterpenes, cadinene, farnesene, furfural, spathulenol and proazulenes (e.g. matricarin and matricin).

Chamazulene is formed from matricin during steam distillation of the oil.

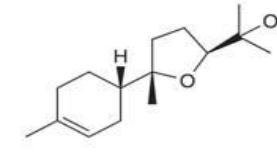
It varies in yield depending on the origin and age of the flowers.

Other constituents Amino acids, anthemic acid (bitter), choline, polysaccharide, plant and fatty acids, tannin and triterpene hydrocarbons.

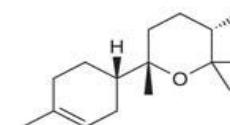
Sesquiterpenes



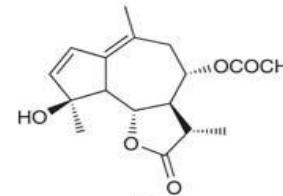
(-)- α -bisabolol



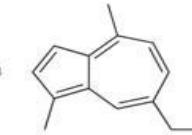
(-)- α -bisabolol oxide B



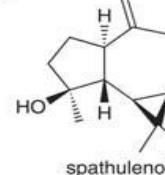
(-)- α -bisabolol oxide A



matricin

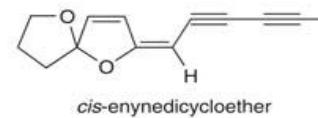


chamazulene

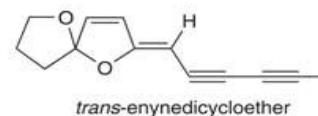


spathulenol

Acetylenes



cis-enynedicycloether



trans-enynedicycloether

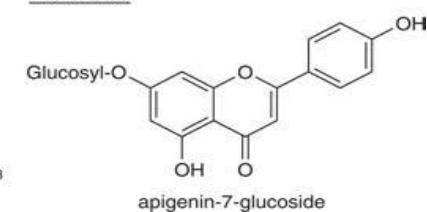
Coumarins



umbelliferone

umbelliferone methyl ether

Flavonoids



apigenin-7-glucoside

German chamomile is stated to possess carminative, antispasmodic, mild sedative, anti-inflammatory, antiseptic and anticitarrhal properties. It has been used for flatulent nervous dyspepsia, travel sickness, nasal catarrh, nervous diarrhoea, restlessness and specifically for gastrointestinal disturbance with associated nervous irritability in children. It has been used topically for haemorrhoids, mastitis and leg ulcers. German Commission E approved use for gastrointestinal spasms and inflammatory diseases of the gastrointestinal tract and externally for skin and mucous membrane inflammation and bacterial skin diseases including oral cavity and gums. It is also approved for inflammations and irritations of the respiratory tract (by inhalation) and ano-genital inflammation (baths and irrigation).

Phyto medicine: Recutan, Romasulan, Alorom.

Side effect

In view of the documented allergic reactions and crosssen sensitivities, German chamomile should be avoided by individuals with a known hypersensitivity to any members of the Asteraceae family.

Flowerhead Chamomile Roman

Chamaemelum nobile (L.) All.

Fam. Asteraceae

Pharmacopoeial and Other Monographs

BHC 1992, BHP 1996, BP 2007, Martindale 35th edition, Ph Eur 2007, USP29/NF24.



The chemistry of Roman chamomile, particularly of the volatile oil, is well documented and is similar to that of German chamomile. Limited pharmacological data are available for Roman chamomile, although many actions have been reported for German chamomile. In view of the similar chemical compositions, many of the activities described for

German chamomile are thought to be applicable to Roman chamomile and thus support the traditional herbal uses.

However, rigorous clinical research assessing the efficacy and safety of preparations of Roman chamomile is required. Roman chamomile is stated to be of low toxicity, although allergic reactions (mainly contact dermatitis) have been reported.



Wild marigold flowerhead- *Flores Chamomillae discoideae*

Wild marigold - *Chamomilla discoidea* (*Matricaria matricarioides*, *M. suaveolens*)

Fam. - *Asteraceae*

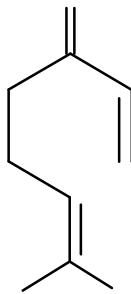
Active const

❖ volatile oil (up to 0,8%): β -farnesene, β -mircene, geraniole,

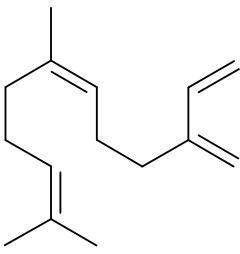
❖ flavonoids: quercetine, luteoline, cinaroside,

❖ coumarines: gerniarine, umbeliferone,

❖ salicilic acid



β -Мирцен



β -Фарнезен



Uses

Externally

Infusion - antihyinflammatory, anthy spasmodic.

Absinthium herb - *Herba Ahsinthii*

Wormwood, Absinth, Maderwort, Mugwort, Mingwort -

Artemisia absinthinm L.

Family – Asteraceae

Habitat. Europe, Asia and Northern Africa.

The plant is extensively cultivated in various parts of Europe mainly for flavoring beer and for the manufacture of a liquor termed "absinthe." The leaves and flowering tops are gathered in August and September, dried and stored in tin containers.

Description. Stems and leaves gray-green, silky hairy and glandular throughout; the largest leaves 10 to 12 cm. in length and of almost equal breadth, 2- to 3-pinnately lobed or divided, the ultimate segments oblong or obovate, obtuse, entire or slightly toothed; upper leaves becoming gradually shorter petioled, small and narrower, the uppermost only about 2 cm. long and resembling the ultimate segments of the larger lower ones; heads greenish-yellow, racemose-paniculate, from 3 to 4 mm. in breadth, globose-ovoid, with a hemispherical involucre

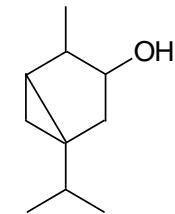
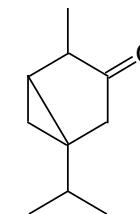
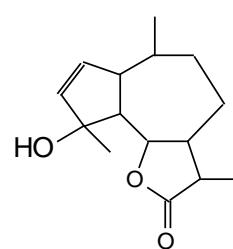
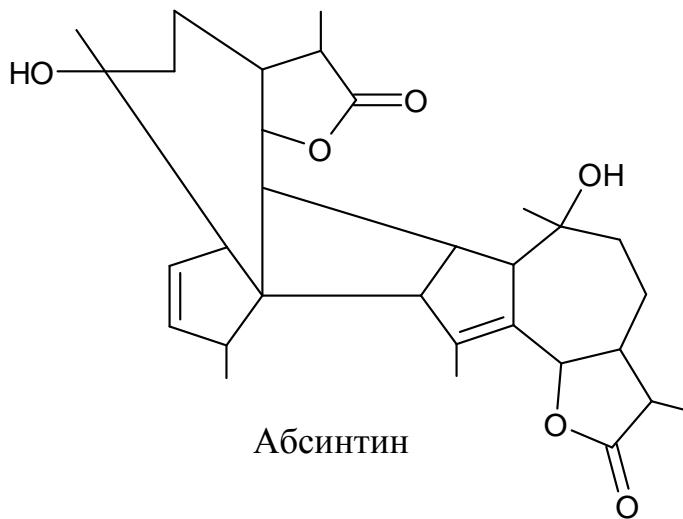
fragments of mesophyll.



Chemical constituents

Volatile oil.

The bitter glycoside – is sesquiterpenoid lactone *absinthin* and also *artabstthin*, *matricin*, tannic acid, resin, etc.



Uses

Plant drug is used as aromatic bitter to stimulate appetite, for gastrointestinal complaints, e.g gastitis with reduced formation of acid, and as diaphoretic and flavoring agent.

Yarrow herb- *Herba Millefolii***Yarrow flos- *Flores Millefolii*****Yarrow- *Achillea millefolium*****Fam. - Asteraceae**

Habitat. North America, Europe and Asia.

The elliptical flower-heads are 3mm broad and 5mm long; and outside they have imbricately arranged and scarious – margined involucres bracts; they have 4-5 white or reddish ray (ligulate) florets, 3-20 disk (tubular) florets, and many narrow scarious bracts on the domed receptacle. The leaves are several times pinnately divided, so that the lamina consists mainly of thread-like or thin segments. The longitudinally ridged stem has pith and is more or less covered with matted hairs.



Anatomical characteristics. Upper and lower epidermis of slightly wavy-walled, epidermal cells with wrinkled cuticle. Both epidermises have stomata. Hairs are long with 4-6 short cells and very long terminal cell. Oil-glands have 8 cells arranged in 2 layers.

Volatile oils Numerous identified components include borneol, bornyl acetate (trace), camphor, 1,8-cineole, eucalyptol, limonene, sabinene, terpinen-4-ol, terpineol and α-thujone (monoterpenes), caryophyllene (a sesquiterpene), achillicin, achillin, millefin and millefolide (sesquiterpene lactones), azulene and chamazulene

(sesquiterpene lactone- derived) and isoartemisia ketone. Azulene has been reported as the major component.

Acids Amino acids, fatty acids (e.g. linoleic, myristic, oleic, palmitic), and others including ascorbic acid, caffeic acid, folic acid, salicylic acid and succinic acid.

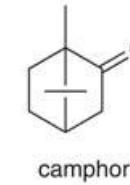
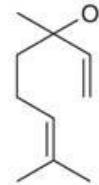
Alkaloids Betonicine and stachydrine (pyrrolidine), trigonelline (pyridine), betaine and choline (bases).

Uncharacterised alkaloids include achiceine,

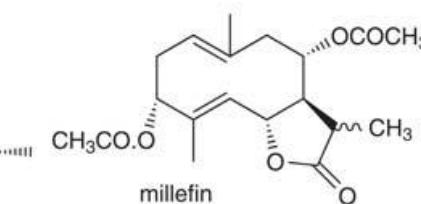
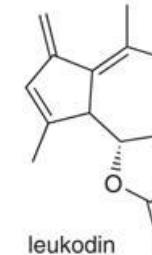
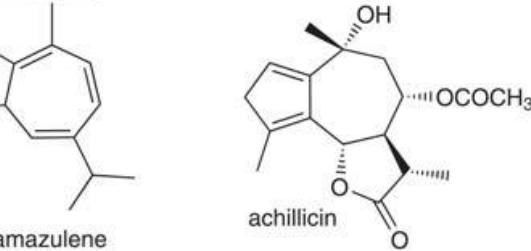
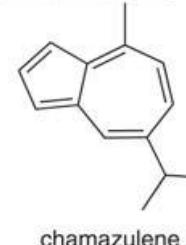
Flavonoids Predominantly flavone glycosides apigenin- and luteolin-7-glycosides.

Tannins Condensed and hydrolysable.

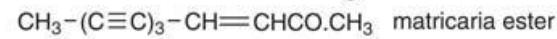
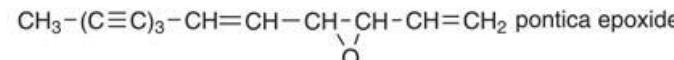
Monoterpene



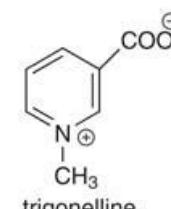
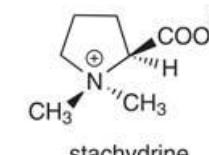
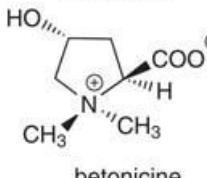
Sesquiterpenes



Acetylenes



Alkaloids



Uses

Yarrow is stated to possess diaphoretic, antipyretic, hypotensive, astringent, diuretic and urinary antiseptic properties. Traditionally, it has been used for bruises, swellings, strains, fevers, common cold, essential hypertension, amenorrhoea, dysentery, diarrhoea, and specifically for thrombotic conditions with hypertension, including cerebral and coronary thromboses.

Side effect

Allergic reactions to yarrow (e.g. dermatitis) have been documented, and positive patch tests have been produced in individuals sensitised to other plants.



Arnicae Flos - Flores Arnicae

Arnica montana L, Arnica chamissonis Less. subsp. foliosa

Fam. Asteraceae

BHP 1996, BP 2007, ESCOP 1997, Martindale 35th edition, Ph Eur 2007



Act. Constituents

Terpenoids Sesquiterpene lactones of the pseudoguaianolid type not less than 0.4%. Helenalin, 11a,13-dihydrohelenalin and their esters. Diterpenes.

Alkaloids Traces of non-toxic alkaloids tussilagine and isotussilagine but these are reportedly artefacts produced during Extraction.

Amines Betaine, choline and trimethylamine.

Carbohydrates Mucilage, polysaccharides including inulin.

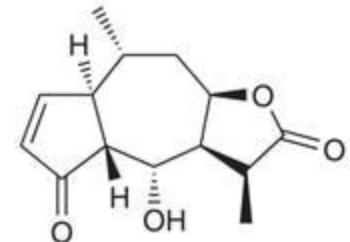
Coumarins Scopoletin and umbelliferone.

Flavonoids Betuletol, eupafolin, hispidulin, isorhamnetin, kaempferol, luteolin, quercetin.

Volatile oils Up to 1%, normally about 0.3%. Thymol and thymol derivatives.

Other constituents Bitter principle (arnicin), caffeic acid, carotenoids, fatty acids, phytosterols, polyacetylenes, resin, tannin (unspecified).

Sesquiterpene lactones



Uses

Arnica is stated to possess topical irritant properties. It has been used for unbroken chilblains, alopecia neurotica, insect bites, gingivitis, aphthous ulcers, rheumatoid complaints and specifically for sprains and bruises.

German Commission E approved external use for injuries and consequences of accidents, e.g. haematoma, dislocation, contusions, oedema due to fracture, rheumatoid muscle and joint pains, inflammation of oral and throat region, furuncolosis, inflammation caused by insect bites and superficial phlebitis.

Arnica is mainly used in homeopathic preparations; it is used to a lesser extent in herbal products.

Side effect

Arnica is poisonous if taken internally. It is irritant to mucous membranes and ingestion may result in fatal gastroenteritis, muscle paralysis (voluntary and cardiac), increase or decrease in pulse rate, palpitation of the heart, shortness of breath, and may even lead to death. Helenalin is stated to be the toxic principle responsible for these effects.

Birch leaf, bud - *Gemmae Betulae, Folia Betulae*

Birch - *Betula verrucosa; Betula pubescens*

Fam. - *Betulaceae*

Active const

❖ volatile oil (5-8%):

betulen, cariophillen,
betulenol,

❖ resins,

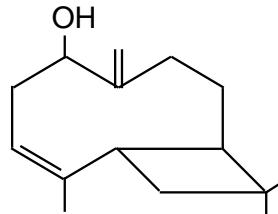
❖ sugar,

❖ flavonoids: apigenine,
kempferol,

❖ tannins,

❖ saponines,

❖ vitamin: C, niacin



α-Betulenol



Uses

Tincture, infusion - diuretic, holagogue, antiinflammatory,

Ginger root- *Rhizomata Zingiberis*

Ginger - *Zingiber officinale*

Fam. - *Zingiberaceae*

Carbohydrates

Starch (major constituent, up to 50%).

Lipids 6–8%.

Oleo-resin Gingerol homologues (major, about 33%)

Volatile oils 1–3%. Complex, predominately hydrocarbons. β -Bisabolene and zingiberene (major); other sesquiterpenes include zingiberol, zingiberenol, *ar-curcumene*, β -sesquiphellandrene, β -sesquiphellandrol (*cis* and *trans*); numerous monoterpene hydrocarbons, alcohols and aldehydes (e.g. phellandrene, camphene, geraniol, neral, linalool, *d*-nerol).

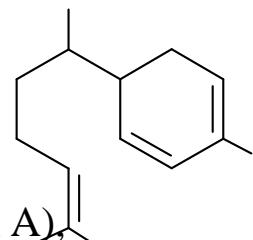
Amino acids,

protein (about 9%),

diterpenes (galanolactone),

vitamins (especially nicotinic acid, vitamin A),

minerals.



Зингиберен
zingiberene



Uses

Ginger is stated to possess carminative, diaphoretic and antispasmodic properties. Traditionally, it has been used for colic, dyspepsia. Modern interest in ginger is focused on its use in the prevention of nausea and vomiting, particularly motion (travel) sickness, as a digestive aid, and as an adjunctive treatment for inflammatory conditions, such as osteoarthritis and rheumatoid arthritis.

Shoots of Labrador tea - *Cormus Ledi palustris*

Labrador tea - *Ledum palustre L.*

Fam - *Ericaceae*

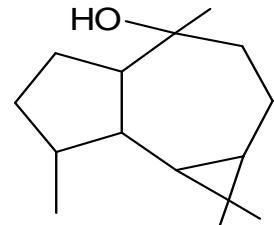
Habitat. Collection. Labrador tea is widely distributed in Russia, North Mongolia, North-eastern China, Korea, North America. The shoots of Labrador tea are collected in autumn in the phase of fruit-bearing and dried at a temperature below 40°C.

Description. The raw material consists of shoots, leaves and fruits. Leaves are alternate, short-petiolate, leather-like; linear-oblong or oblong-elliptical in shape, entire; their margins are curved inwardly. The upper side of leaves is dark-green or brownish-green, shining; the lower ones are covered with rust-tomentose pubescence. The odor is sharp, specific. The plant is poison, the taste is not determined.

Act. constituents.

Labrador tea contains volatile oil. Volatile oil consists of sesquiterpenes: **ledol**, palustrol. Shoots also contain arbutin, tannins, flavonoids and vitamins.

Uses. Labrador tea is used as expectorant and antiseptic. It also possesses antimicrobial, diuretic action.



Ледол