Yarrow

Species (Family)

Achillea millefolium L. (Asteraceae/Compositae)

Synonym(s)

Milfoil, Millefolium

Part(s) Used

Flowerhead

Pharmacopoeial and Other Monographs

BHC 1992[G6]
BHP 1996[G9]
BP 2001[G15]
Complete German Commission E[G3]
Martindale 32nd edition[G43]
PDR for Herbal Medicines 2nd edition[G36]
Ph Eur 2002[G28]

Legal Category (Licensed Products)

GSL[G37]

Constituents[G2,G6,G22,G41,G64]

Acids Amino acids (e.g. alanine, aspartic acid, glutamic acid, histidine, leucine, lysine, proline, valine),[1,2] fatty acids (e.g. linoleic, myristic, oleic, palmitic, stearic),[3,4] and others including ascorbic acid,[5] caffeic acid,[6] folic acid,[5] salicylic acid and succinic acid.[1]

Alkaloids/bases Betonicine and stachydrine (pyrrolidine),[1,7] trigonelline (pyridine),[1,7] betaine and choline (bases).[1,7] Uncharacterised alkaloids include achiceine, achilleine[8] (possible synonym for L-betonicine), which is stated to yield achilletine[7] on alkaline hydrolysis, and moscatine/moschatine[7], stated to be an ill-defined glucoalkaloid.

Flavonoids Predominantly flavone glycosides apigenin- and luteolin-7-glycosides,[9] with lesser quantities of artemetin, casticin, 5-hydroxy-3,6,7,4-tetramethoxyflavone and isorhamnetin.[6] Rutin (a flavonol glycoside).[5]

Tannins Condensed and hydrolysable,[3,10] with glucose as the carbohydrate component of the latter[2]

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. The relative composition of the components varies greatly between *Achillea* species, especially the azulene content. Azulene has been reported as the major component.[11] However, true yarrow (*A. millefolium*) is thought to be hexaploid and azulene-free, whereas closely related species, such as *Achillea lanulosa* Nutt. and *Achillea collina* Becker, are tetraploid and contain up to 50% azulene in their volatile oil.[5,10,11] The tetraploid species may be supplied for *A. millefolium*. The azulenes are not present in the fresh herb: they are formed as artefacts during steam distillation of the oil, from unstable precursors called proazulenes (e.g. achillin and achillicin), via equally unstable azulene–carboxylic acid intermediates.[12]

Other constituents Unknown cyanogenetic compound,[13] sugars including arabinose, galactose, dextrose, dulcitol, glucose, inositol, maltose, mannitol and sucrose.[1,2]

The constituents of yarrow have been reviewed in detail.[5]

Food Use

Yarrow is listed by the Council of Europe as a natural source of food flavouring (herb, flowers, essential oil and other preparations: category 4, with limits on camphor, eucalyptol and thujone) (*see* Appendix 23).[G17] In the USA, yarrow is only approved for use in alcoholic beverages, and the finished product must be thujone free.[G41]

Herbal Use

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.[G2,G6,G7,G8,G64]

Dosage

Dried herb 2–4 g or by infusion three times daily.[G6,G7]

Liquid extract 2–4 mL (1 : 1 in 25% alcohol) three times daily.[G6,G7]

Tincture 2–4 mL (1 : 5 in 45% alcohol) three times daily.[G6,G7]

Pharmacological Actions

Some activities documented for yarrow are associated with the azulene constituents, although it is now thought that azulene is absent from true yarrow (*see* Constituents). Presumably some of the documented pharmacological studies have used *Achillea* species other than *A. millefolium.*

In vitro and animal studies

Anti-inflammatory activity has been documented for an aqueous extract of yarrow using mouse[15] and rat[16] paw oedema models, with inflammation induced by yeast[15] and various inflammatory substances,[16] including histamine, carrageenan and prostaglandin. In mouse studies, the active fraction was reported as a series of protein–carbohydrate complexes. Topical anti-inflammatory activity in rabbits has also been documented for the aqueous extract.[15] In general, anti-inflammatory properties are associated with azulenes (*see* German Chamomile). Anti-inflammatory activity has been described for the azulene components documented for the volatile oil of yarrow.[5]

A diuretic effect was also noted in mice administered an aqueous extract of yarrow,[15] but only at a dose more than double that required for an anti-inflammatory effect.[15] Terpinen-4-ol, the diuretic principle in juniper, has been reported as a component of yarrow volatile oil.

CNS-depressant activity has been documented for the volatile oil: a dose of 300 mg/kg decreased the spontaneous activity of mice and lowered the body temperature of rats. In addition, 300–600 mg/kg doses inhibited pentetrazole-induced convulsions and prolonged sleep induced by a barbiturate preparation.[17]

Moderate antibacterial activity has been documented for an ethanolic extract of the herb against *Staphylococcus aureus*, *Bacillus subtilis*, *Mycobacterium smegmatis*, *Escherichia coli*, *Shigella sonnei* and *Shigella flexneri*.[18] Antimicrobial properties have been documented for the sesquiterpene lactone fraction.[5]

Achilleine 0.5 g/kg by intravenous injection has been noted to decrease the blood clotting time in rabbits by 32%.[8] The haemostatic action persisted for 45 minutes with no observable toxic effects.

Antispasmodic activity on the isolated rabbit intestine has been documented for a flavonoid-containing fraction of yarrow.[9] Antispasmodic activity is generally associated with azulene constituents (*see* German Chamomile).

Antipyretic and hypotensive actions have been reported for the basic fraction (alkaloid/base);[G41] the sesquiterpene lactone fraction is stated to possess cytotoxic activities,[5] although no further details were located. Tannins are known to possess astringent activity.

Side-effects, Toxicity

Allergic reactions to yarrow (e.g. dermatitis) have been documented, and positive patch tests have been produced in individuals sensitised to other plants.[5,G33,G51] An instance of yarrow tea causing a generalised eruption in a sensitised individual was reported in 1929. The allergenic properties of some sesquiterpene lactones are well documented, although none of those present in yarrow are recognised sensitisers.[G51] Yarrow has been suspected of being a photosensitiser, although extracts have been reported to lack phototoxicity and to be devoid of psoralens, compounds with known photosensitising properties.[G51]

Yarrow is considered to be non-toxic. In mice LD_{50} values have been reported of up to 3.65 g/kg (by mouth), 3.1 g/kg (by intraperitoneal injection), and greater than or equal to 1 g/kg (by subcutaneous injection).[15,17] In rats, an LD_{50} (subcutaneous injection) has been recorded as 16.86 g/kg, with corresponding LD_0 and LD_{100} values reported as 12 and 20 g/kg, respectively.[16] By comparison, an ED_{25} for anti-inflammatory activity has been estimated as about 0.43 g/kg.[16]

Terpenoid-rich volatile oils often possess irritant properties. Terpinen-4-ol, documented as a component of yarrow volatile oil, is thought to represent the diuretic principal of juniper as a result of its irritant action on the kidneys (*see* Juniper).[12] The known toxic principle thujone has been documented as a minor component of yarrow volatile oil, although concentrations present are probably too low to represent a risk to human health.

A single report of animal poisoning has been documented for yarrow in which a calf died follow-

ing the ingestion of a single plant.[5] No additional reports of animal toxicity were located.

Contra-indications, Warnings

Yarrow may cause an allergic reaction in sensitive individuals, especially those with an existing hypersensitivity to other members of the Asteraceae/Compositae.[19] Individuals with such a known hypersensitivity should avoid drinking herbal teas containing yarrow.[G60] Excessive doses may interfere with existing anticoagulant and hypo- and hypertensive therapies, and may have sedative and diuretic effects.

Pregnancy and lactation Yarrow should not be taken during pregnancy. It is reputed to be an abortifacient and to affect the menstrual cycle,[G30] and the volatile oil contains trace amounts (0.3%) of the abortifacient principle thujone. Excessive use should be avoided during lactation.

Pharmaceutical Comment

The chemistry of yarrow is well documented although there has been some disagreement over the major component in the volatile oil. Various pharmacological actions have been reported in animal studies which support many of the reputed herbal uses although no human data were located. Yarrow is considered to be relatively non-toxic although allergic reactions in susceptible individuals have been documented. The volatile oil is contraindicated in pregnancy and yarrow should be used with caution in patients with epilepsy.[G58]

References

See also General References G2, G3, G6, G9, G15, G16, G22, G28, G30, G31, G32, G33, G36, G37, G41, G43, G51, G58, G60 and G64.

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