

Juniper

Species (Family)

Juniperus communis L. (Pinaceae)

Synonym(s)

Baccae Juniperi, Genièvre, Wacholderbeeren, Zimbro

Part(s) Used

Fruit (berry)

Pharmacopoeial and Other Monographs

BHP 1996^(G9)

BP 2001^(G15)

Complete German Commission E^(G3)

ESCOP 1997^(G52)

Martindale 32nd edition^(G43)

PDR for Herbal Medicines 2nd edition^(G36)

Ph Eur 2002^(G28)

Legal Category (Licensed Products)

GSL^(G37)

Constituents^(G2,G22,G41,G53,G58,G62,G64)

Acids Diterpene acids, ascorbic acid and glucuronic acid.

Flavonoids Amentoflavone,⁽¹⁾ quercetin, isoquercitrin, apigenin and various glycosides.

Tannins Proanthocyanidins (condensed), galloocatechin and epigallocatechin.⁽²⁾

Volatile oils 0.2–3.42%. Primarily monoterpenes (about 58%) including α -pinene, myrcene and sabinene (major), and camphene, camphor, 1,4-cineole, *p*-cymene, α - and γ -cadinene, limonene, β -pinene, γ -terpinene, terpinen-4-ol, terpinyl acetate, α -thujene, borneol; sesquiterpenes including caryophyllene, epoxydihydrocaryophyllene and β -elemem-7 α -ol.^(3,4)

Other constituents Geijerone (C₁₂ terpenoid), juninone (monocyclic cyclobutane monoterpene),⁽⁵⁾ desoxydopodophyllotoxin (lignan),⁽⁶⁾ resins and sugars.

Food Use

Juniper berries are widely used as a flavouring component in gin. Juniper is listed by the Council of Europe as a natural source of food flavouring (fruit N2, leaf and wood N3). Category N2 indicates that the berries can be added to foodstuffs in small quantities, with a possible limitation of an active principle (as yet unspecified) in the final product. Category N3 indicates that there is insufficient information available for an adequate assessment of potential toxicity to be made.^(G16) In the USA, extracts and oils of juniper are permitted for food use.^(G65)

Herbal Use^(G2,G7,G64)

The German Commission E approved use for dyspepsia.^(G321,53>) Juniper is stated to possess diuretic, antiseptic, carminative, stomachic and antirheumatic properties. Traditionally, it has been used for cystitis, flatulence, colic, and applied topically for rheumatic pains in joints or muscles.

Dosage

Dried ripe fruits 100 mL as an infusion (1:20 in boiling water) three times daily.^(G7)

Fruit 1–2 g or equivalent three times daily; 2–10 g (equivalent to 20–100 mg of volatile oil).^(G3)

Liquid extract 2–4 mL (1:1 in 25% alcohol) three times daily.^(G7)

Tincture 1–2 mL (1:5 in 45% alcohol) three times daily.^(G7)

Oil 0.03–0.2 mL (1:5 in 45% alcohol) three times daily.

Pharmacological Actions

Pharmacological actions that have been documented for juniper are primarily associated with the volatile oil components.

***In vitro* and animal studies**

The volatile oil is documented to possess diuretic, gastrointestinal antiseptic and irritant properties.^(G41)

The diuretic activity of juniper has been attributed to the volatile oil component, terpinen-4-ol, which is reported to increase the glomerular filtration rate.^(G60) Terpinen-4-ol is also stated to be irritant to the kidneys although in a later review by the same author there is no such statement and the oil is stated to represent no hazards.^(G58)

An antifertility effect has been described for a juniper extract, administered to rats (300/500 mg, by mouth) on days 1–7 of pregnancy.⁽⁷⁾ An abortifacient effect was also noted at both dose levels when the extract was administered on days 14–16.⁽⁷⁾ No evidence of teratogenicity was reported. Anti-implantation activity has been reported as 60 to 70%⁽⁸⁾ and as dose dependent.⁽⁷⁾ Juniper is reported to have both a significant⁽⁹⁾ and no⁽⁸⁾ antifertility effect. A uterine stimulant activity has been documented for the volatile oil.^(G30)

A potent and non-toxic inhibition of the cytopathogenic effects of herpes simplex virus type 1 in primary human amnion cell culture has been described for a juniper extract.^(6,10) The active component isolated from the active fraction was identified as a lignan, desoxypodophyllotoxin.⁽⁶⁾ Antiviral activities documented for the volatile oil have also been partly attributed to the flavonoid amentoflavone.⁽¹⁾

Anti-inflammatory activity of 60% compared to 45% for the indomethacin control has been reported for juniper berry extract.⁽¹¹⁾ Both test and control were administered orally to rats (100 mg/kg and 5 mg/kg respectively) one hour before eliciting foot oedema.

A transient hypertensive effect followed by a more prolonged hypotensive effect has been reported for a juniper extract in rats (25 mg/kg, intravenous injection).⁽¹²⁾

A fungicidal effect against *Penicillium notatum* has been documented.⁽¹³⁾

Astringent activity is generally associated with tannins, which have been documented as components of juniper. An aqueous decoction of the berries has a hypoglycaemic effect in rats.⁽¹⁴⁾ In rats, oral administration of an aqueous infusion (5 mL) increased chloride ion secretion by 119% and by 45% in similar experiments with rabbits.^(G52)

Side-effects, Toxicity

The volatile oil is reported to be generally non-sensitising and non-phototoxic, although slightly

irritant when applied externally to human and animal skin.^(G41,G58) Excessive doses of terpinen-4-ol, the diuretic principle in the volatile oil, may cause kidney irritation.^(G22)

Dermatitic reactions have been recognised with juniper and positive patch test reactions have been documented.^(15,G51) The latter are attributed to the irritant nature of the juniper extract.⁽¹⁵⁾

Symptoms of poisoning following external application of the essential oil are described as burning, erythema, inflammation with blisters and oedema.^(G22) Internally, symptoms from overdose are documented as pain in or near the kidneys, strong diuresis, albuminuria, haematuria, purplish urine, tachycardia, hypertension, and rarely convulsions, metrorrhagia and abortion.^(G22)

The acute toxicity of juniper has been investigated in rats who were administered extracts for seven days.⁽¹¹⁾ An oral dose of 2.5 g/kg was tolerated with no mortalities or side-effects noted. A dose of 3 g/kg induced hypothermia and mild diarrhoea in 10–30% of animals.⁽¹¹⁾ An LD₅₀ value (mice, intraperitoneal injection) has been stated as 3 g/kg.⁽⁴⁾

Contra-indications, Warnings

Juniper is contra-indicated in individuals with existing renal disease.^(G7,G42,G49,G52) The internal use of the oil should be restricted to professionals.^(G42) External application of the oil may cause an irritant reaction. However, this has been refuted and the oil is stated to have no hazards and is not contra-indicated.^(G58) Juniper has been confused with savin (*Juniperus sabina*) in the literature and this may be the reason for believing that the oil is toxic.^(G58) Juniper may potentiate existing hypoglycaemic and diuretic therapies; prolonged use may result in hypokalaemia.

Pregnancy and lactation Juniper is contra-indicated in pregnancy.^(G7,G22,G49) It is reputed to be an abortifacient and to affect the menstrual cycle.^(G30)

A juniper fruit extract has exhibited abortifacient, antifertility and anti-implantation activities (*see In vitro* and animal studies).

Pharmaceutical Comment

Many of the traditional uses documented for juniper can be supported by documented pharmacological actions or known constituents. There is evidence that the berries are abortifacient and since this is believed not to be due to the oil there must be other toxic constituents present. It is recommended that use should not exceed levels specified in food legislation.

References

See also General References G2, G3, G5, G9, G10, G16, G22, G30, G31, G32, G36, G37, G41, G42, G43, G49, G51, G52, G53, G58, G60, G62 and G64.

- 1 Chandler RF. An inconspicuous but insidious drug. *Rev Pharm Can* 1986; 563-566.
- 2 Friedrich H, Engelshowe R. Tannin producing monomeric substances in *Juniperus communis*. *Planta Med* 1978; 33: 251-257.
- 3 Wagner H, Wolff P, eds. *New Natural Products and Plant Drugs with Pharmacological, Biological or Therapeutical Activity*. Berlin: Springer-Verlag, 1977.
- 4 Fenaroli's *Handbook of Flavor Ingredients*, 2nd edn. Boca Raton: CRC Press, 1975.
- 5 Thomas AF, Ozainne M. 'Junionone' [1-(2,2-Dimethylcyclobutyl)but-1-en-3-one], the first vegetable monocyclic cyclobutane monoterpenoid. *J C S Chem Commun* 1973; 746.
- 6 Markkanen T *et al.* Antiherpetic agent from juniper tree (*Juniperus communis*), its purification, identification, and testing in primary human amnion cell cultures. *Drugs Exp Clin Res* 1981; 7: 691-697.
- 7 Agrawal OP *et al.* Antifertility effects of fruits of *Juniperus communis*. *Planta Med* 1980; 40(Suppl.): 98-101.
- 8 Prakash AO *et al.* Anti-implantation activity of some indigenous plants in rats. *Acta Eur Fertil* 1985; 16: 441-448.
- 9 Prakash AO. Biological evaluation of some medicinal plant extracts for contraceptive efficacy. *Contracept Deliv Syst* 1984; 5: 9.
- 10 Marrkanen T. Antiherpetic agent(s) from juniper tree (*Juniperus communis*). Preliminary communication. *Drugs Exp Clin Res* 1981; 7: 69-73.
- 11 Mascolo N *et al.* Biological screening of Italian medicinal plants for anti-inflammatory activity. *Phytother Res* 1987; 1: 28-31.
- 12 Lasheras B *et al.* Étude pharmacologique préliminaire de *Prunus spinosa* L. Amelanchier ovalis Medikus, *Juniperus communis* L. et *Urtica dioica* L. *Plant Méd Phytothér* 1986; 20: 219-226.
- 13 Hejtmánková N *et al.* The antifungal effects of some Cupressaceae. *Acta Univ Palacki Olomuc Fac Med* 1973; 60: 15-20.
- 14 Sanchez de Medina F *et al.* Hypoglycaemic activity of Juniper berries. *Planta Med* 1994; 60: 197-200.
- 15 Mathias CGT *et al.* Plant dermatitis - patch test results (1975-78). Note on *Juniperus* extract. *Contact Dermatitis* 1979; 5: 336-337.