# Golden Seal

## Species (Family)

*Hydrastis canadensis* L. (Ranunculaceae)

## Synonym(s)

Yellow Root

Yellow root also refers to *Xanthorhiza simplicissima* Marsh, which is also a member of the Ranunculaceae family and contains berberine as the major alkaloid constituent.

## Part(s) Used

Rhizome, root

## Pharmacopoeial and Other Monographs

BHC 1992[G6]
BHP 1996[G9]
Martindale 32nd edition[G43]
Mills and Bone (Hydrastis root)[G50]
PDR for Herbal Medicines 2nd edition[G36]

## Legal Category (Licensed Products)

GSL[G37]

## Constituents[G6,G22,G40,G41,G62,G64]

*Alkaloids* Isoquinoline-type. 2.5–6.0%. Hydrastine (major, 1.5–4.0%), berberine (0.5–6.0%), berberastine (2–3%), and canadine (1%), with lesser amounts of related alkaloids including candaline and canadaline.[1–3]

*Other constituents* Chlorogenic acid, carbohydrates, fatty acids (75% saturated, 25% unsaturated), volatile oil (trace), resin, meconin (meconinic acid lactone).

## Food Use

Golden seal is not used in foods, although it is reported to be used in herbal teas.[G41] The concentration of berberine permitted in foods is limited to 0.1 mg/kg, and 10 mg/kg in alcoholic beverages.[G16]

## Herbal Use

Golden seal is stated to be a stimulant to involuntary muscle, and to possess stomachic, oxytocic, antihaemorrhagic and laxative properties. Traditionally it has been used for digestive disorders, gastritis, peptic ulceration, colitis, anorexia, upper respiratory catarrh, menorrhagia, post-partum haemorrhage, dysmenorrhoea, topically for eczema, pruritus, otorrhoea, catarrhal deafness and tinnitus, conjunctivitis, and specifically for atonic dyspepsia with hepatic symptoms.[G6,G7,G8]

## Dosage

*Dried rhizome* 0.5–1.0 g or by decoction three times daily.[G6,G7]

*Liquid Extract of Hydrastis* (BPC 1949) 0.3–1.0 mL.

*Tincture of Hydrastis* (BPC 1949) 2–4 mL.

## Pharmacological Actions

The pharmacological activity of golden seal is attributed to the isoquinoline alkaloid constituents, primarily hydrastine and berberine,[3,4] which are reported to have similar properties.[G41] Antibiotic, immunostimulant, anticonvulsant, sedative, hypotensive, uterotonic, choleretic and carminative activities have been described for berberine.[3]

### *In vitro* and animal studies

Limited work has been documented for golden seal, although the pharmacology of berberine and hydrastine is well studied.

The total alkaloid fraction of golden seal has been reported to exhibit anticonvulsant activity in smooth muscle preparations (e.g. mouse intestine, uterus).[5] However, *in vitro*, canadine is reported to exhibit uterine stimulation in guinea-pig and rabbit tissues.[4] Berberine, canadine and hydrastine are all stated to exhibit utero-activity.[G30]

Berberine and hydrastine have produced a hypotensive effect in laboratory animals following intravenous administration.[6,7,G41] High doses of hydrastine are documented to produce an increase in blood pressure.[7] *In vitro*, berberine has been reported to decrease the anticoagulant action of heparin in canine and human blood.[7]

Berberine is reported to exert a stimulant action on the heart and to increase coronary blood flow,

although higher doses are stated to inhibit cardiac activity.[7]

Antimuscarinic and antihistamine actions have been documented for berberine.[7]

In rats, berberine has exhibited antipyretic activity three times as effective as aspirin.[3]

Berberine potentiated barbiturate sleeping time, but did not exhibit any analgesic or tranquillising effects.[7]

A broad spectrum of antimicrobial activity against bacteria, fungi, and protozoa has been reported for berberine. Sensitive organisms include *Staphylococcus* spp., *Streptococcus* spp., *Chlamydia aureus*, *Corynebacterium diphtheriae*, *Salmonella typhi*, *Diplococcus pneumoniae*, *Pseudomonas aeruginosa*, *Shigella dysenteriae*, *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Treponema pallidum*, *Giardia lamblia* and *Leishmania donovani*.[3] Berberine is reported to be effective against diarrhoeas caused by enterotoxins such as *Vibrio cholerae* and *Escherichia coli*.[7] *In vivo* and *in vitro* studies in hamsters and rats have reported significant activity for berberine against *Entamoeba histolytica*.[3]

Anticancer activity has been reported for berberine in B1, KB and PS tumour systems.[G22] In addition, berberine sulfate was found to inhibit the action of teleocidin, a known tumour promoter, on the formation of mouse skin tumours initiated with 7,12-dimethylbenz[*a*]anthracene.[5]

### Clinical studies

None documented for golden seal. Berberine is stated to have shown significant success in the treatment of acute diarrhoea in several clinical studies.[3] It has been found effective against diarrhoeas caused by *Escherichia coli*, *Shigella dysenteriae*, *Salmonella paratyphi* B, *Klebsiella*, *Giardia lamblia* and *Vibrio cholerae*.[3] Berberine has been used to treat trachoma, an infectious ocular disease caused by *Chlamydia trachomatis*, which is a major cause of blindness and impaired vision in developing countries.[3]

Clinical studies have shown berberine to stimulate bile and bilirubin secretion and to improve symptoms of chronic cholecystitis, and to correct raised levels of tyramine in patients with liver cirrhosis.[3]

## Side-effects, Toxicity

Berberine and berberine-containing plants are considered to be non-toxic.[3] However, the alkaloid constituents are potentially toxic and symptoms of golden seal poisoning include stomach upset, nervous symptoms and depression; large quantities may even be fatal.[8] High doses of hydrastine are reported to cause exaggerated reflexes, convulsions, paralysis and death from respiratory failure.[4] The root may cause contact ulceration of mucosal surfaces.

## Contra-indications, Warnings

Golden seal is contra-indicated in individuals with raised blood pressure.[G7,G22,G49] Prolonged use of golden seal may decrease vitamin B absorption.[G22] Coagulant activity opposing the action of heparin, and cardiac stimulant activity have been documented for berberine. The use of golden seal as a douche should be avoided because of the potential ulcerative side-effects.[G22] The alkaloid constituents of golden seal are potentially toxic and excessive use should be avoided.

*Pregnancy and lactation* Golden seal is contra-indicated for use during pregnancy.[3,G7,G49] Berberine, canadine, hydrastine and hydrastinine have all been reported to produce uterine stimulant activity.[G30] It is not known whether the alkaloids are excreted in breast milk. The use of golden seal during lactation should be avoided.

## Pharmaceutical Comment

Golden seal is characterised by the isoquinoline alkaloid constituents. These compounds, primarily hydrastine and berberine, represent the main active components of golden seal. Numerous activities have been documented many of which support the traditional herbal uses of the root. However, in view of the pharmacological properties of the alkaloid constituents, excessive use of golden seal should be avoided.

## References

*See also* General References G5, G6, G9, G10, G16, G22, G30, G31, G32, G36, G37, G40, G41, G43, G48, G50, G62 and G64.


1 Gleye J *et al.* La canadaline: nouvel alcaloide d'*Hydrastis canadensis*. *Phytochemistry* 1974; 13: 675–676.

2 El-Masry S *et al.* Colorimetric and spectrophotometric determination of *Hydrastis* alkaloids in pharmaceutical preparations. *J Pharm Sci* 1980; 69: 597–598.

3 Pizzorno JE, Murray MT. *Hydrastis canadensis*, *Berberis vulgaris*, *Berberis aquitolium* and other berberine containing plants. In: *Textbook of Natural Medicine*. Seattle: John Bastyr College Publications, 1985 (looseleaf).

4 Genest K, Hughes DW. Natural products in

Canadian pharmaceuticals iv. *Hydrastis canadensis*. *Can J Pharm Sci* 1969; 4: 41–45.

5 Nishino H *et al.* Berberine sulphate inhibits tumour-promoting activity of teleocidin in two-stage carcinogenesis on mouse skin. *Oncology* 1986; 43: 131–134.

6 Wisniewski W, Gorta T. Effect of temperature on the oxidation of hydrastine to hydrastinine in liquid extracts and rhizomes of *Hydrastis canadensis* in the presence of air and steam. *Acta Pol Pharm* 1969; 26: 313–317.

7 Preininger V. The pharmacology and toxicology of the Papaveraceae alkaloids. In: Manske RHF, Holmes HL, eds. *The Alkaloids*, vol 15. New York: Academic Press, 1975: 239.

8 Hardin JW, Arena JM. *Human Poisoning from Native and Cultivated Plants*, 2nd edn. Durham, North Carolina: Duke University Press, 1974.