



Golden Rod

Solidago canadensis

Common names

Canadian golden rod, common golden rod, meadow golden rod

Family

Asteraceae (daisy)

Part used

Aerial parts

Background and traditional uses

Golden rod, also known as Canadian or common golden rod, is a perennial herb with long yellow panicle flowers and lance-shaped leaves.¹

Native to North America, the herb was initially introduced to China in 1935 and is now widely distributed in many countries including Europe and Asia.²⁻⁴ Golden rod has been used in European herbal medicine for over 700 years and it also has a long history of use by native North American tribes.^{1,5-7}

Traditional uses in European phytotherapy include for chronic nephritis, cystitis, urolithiasis, rheumatism and as an anti-inflammatory.^{4,5} Indigenous Native Americans, including the Iroquois, Okanagan-Colville, Potawatomi, Navajo and Haudenosaunee tribes, have variably used golden rod medicinally as an analgesic, emetic, sedative and febrifuge, as well as for gastrointestinal, liver, skin and gynaecological complaints.^{1,6,7}

Actions

Primary:⁷⁻¹²

- Diuretic
- Antibacterial
- Antioxidant

Secondary:⁸

- Spasmolytic
- Anti-inflammatory
- Antifungal

Applications and indications

- Commission E has approved golden rod for management and prevention of urinary tract infections and inflammation, urinary calculi and kidney stones.²

Active constituents and pharmacodynamics

The main chemical constituents that have been identified in the golden rod plant are flavonoids, phenolic acids, terpenoids, saponins and polysaccharides.^{8,13}

Further research is required to confirm the pharmacodynamics of many constituents from this herb, however, actions that have been elucidated are the antibacterial effects of **saponins** and **terpenoids**,⁸ and the antioxidant activity of flavonoids.¹⁴ Preliminary evidence also indicates that polysaccharides and lignans may have antitussive and hypolipidaemic activity respectively.^{15,16}

The flowers have high concentrations of **flavonoids**, including rutin, quercetin, quercitrin, isoquercitrin, isorhamnetin, hyperoside, afzelin, nicotiflorin and kaempferol.^{8,13,14,17,18}

Phenolic acids identified in the aerial parts of golden rod include chlorogenic acid, 5-O-caffeoylquinic acid, 4,5-di-O-caffeoylquinic acid, 3,5-di-O-caffeoylquinic acid, 3,4-di-O-caffeoylquinic acid and 2'-hydroxy-4',6'-di-O-beta-D-glucopyranosyl-butyrophenone.^{13,19,20}

Terpenoid constituents present in the flowers of golden rod are solidagol, 6-beta-angeloyloxykolavenic acid, 6-beta-tigloyloxykolavenic acid, crotonic acid, longispinogenin, solicanolide, alpha-pinene, germacrene D and 6-epi-beta-cubebene.^{4,13,21}

Canadensis saponins 1-4 and 5-8 are the main **saponins** isolated from solidago.^{22,23} The flowers from golden rod contain the polyphenolic polysaccharides rhamnose, arabinose, uronic acids, galactose and glucose.¹⁵

Summary of clinical evidence

Diuretic

Preliminary evidence indicates that the traditional application of golden rod for kidney related issues has a scientific basis. Further evidence is required to confirm its effects on specific clinical outcomes, however, it is suggested that several constituents are responsible for the herbs potential diuretic activity.²⁴

Administration of the flowers of various species of solidago, including golden rod, to rats resulted nocturnal levels of diuresis increasing by 57-88%, along with a reduction in the excretion of potassium and sodium.⁹

Antibacterial

In vitro evidence has observed that golden rod exhibited antibacterial activity against different types of bacterial strains.

One investigation was conducted on the effect of various hexane and ethanolic extracts of three different solidago species, including golden rod, on several gram-negative (*Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*) and gram-positive (*Staphylococcus aureus*, *Staphylococcus faecalis* and *Bacillus subtilis*) bacteria.¹⁰

Above ground parts (stems, leaves and inflorescences) from golden rod were used at a ratio of 1:5 for both hexane and ethanol solvent extracts. Both hexane and ethanolic extracts of golden rod demonstrated strong antibacterial activity against gram-positive bacteria (minimal inhibitory concentration [MIC] values of 5-10 mg/mL) compared to weak effects of the other solidago species (MIC values 100 and >100mg/mL).¹⁰

A separate study assessed the antibacterial properties of plants used by Haudenosaunee traditional medicine including golden rod.⁷ Extracts equivalent to 100mg of fresh plant were used against gram-negative (*E. coli* and *Salmonella typhimurium*) and gram-positive (*S. aureus* and *Streptococcus lactis*) bacteria. Golden rod exhibited antibacterial activity against *S. aureus* with MIC values of 1-10mg/mL.⁷

Antioxidant

Several preliminary studies have suggested that golden rod may have antioxidant properties.

A recent study evaluated the antioxidant effects of methanolic extracts of golden rod derived from leaves and flowers, using HPLC and DPPH methodology.¹¹ The constituents found to contribute antioxidant activity to the herb were chlorogenic acid, rutin and isoquercitrin.

A separate study investigated the correlation between phytochemical constituents and antioxidant activity in different types of preparations of *Solidago spp.*, including golden rod.⁵ The types of preparations used were a decoction, infusion, maceration and tinctures, all with a ratio of 1:40, with the tinctures prepared at 40, 70 and 96% ethanol and aqueous concentrations. The assessments conducted were the quantitative and compositional evaluation of flavonoid content and hydrogen-donating and reducing properties.

Of the phenolic constituents identified, rutin and chlorogenic acid were found to be the primary components present in all preparations, with rutin highest in 70% v/v and 81% ethanol tinctures and chlorogenic acid highest in the 40%, 72% and 78% v/v ethanol preparations. These components were suggested to be responsible for the significant hydrogen-donating characteristics observed, with the reducing power of the extracts dependent on the concentration of the constituents present (ascorbic acid equivalent of 1.05, 0.78 and 0.59 for the 96%, 70% and 40% tincture preparations respectively).⁵

Another study using similar assessment methods observed that golden rod extracts had peroxy radical scavenging activity greater than green tea and ascorbic acid.¹²

Dosage summary

Liquid extract (1:1): 10-30mL weekly²⁵

Dried herb equivalent: 0.5-2g three times daily²⁵

Safety information

- Use during pregnancy and lactation is not advised.⁶
- Safety has not been confirmed in children below 12 years of age so caution is advised.²⁴
- Contraindicated in individuals' sensitive to members of the *Asteraceae* family.⁶
- Use in individuals with abnormal blood pressure or fluid retention associated with heart or lung issues is recommended to be under advisement of a healthcare professional.⁶

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