



## THERAPEUTIC ASPECTS OF GOLDENSEAL

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## ABSTRACT

Goldenseal, commonly known as yellow puccoon has wide therapeutic activity. The bioactive components present are isoquinoline alkaloids, hydrastine, berberine and canadine. Berberine is used to treat heart failure also have sedative actions, anti secretory, anti parasitic, anticancerous actions. Hence an attempt was taken to review the pharmacological actions of Goldenseal with respect to its role in dental practice.

**Keywords:** Goldenseal, therapeutic, pharmacological, dental practice.

## INTRODUCTION

Goldenseal (*Hydrastis canadensis*) is a perennial herb and a member of the buttercup family Ranunculaceae. It is widely distributed throughout the hardwood forests of Canada and Northeast United States. Some of common names of *Hydrastis canadensis* are yellow puccoon, orange root, yellow root, Indian dye, ground raspberry, eye root, eye balm, jaundice root. Is widely used for its anti microbial, anti inflammatory, anti parasitic, anti spasmodic, anti secretory, anti cancerous actions, also for treatment of digestive disorders, snake bite, nasal congestion, canker sores, chronic candidiasis, vaginitis.

## Plant description

Buttercup family Ranunculaceae, the lower leaves are deeply divided into 3-7 ovate wedge shaped segments, the stem leaves are similar but smaller. Golden seal plant emerges during early spring.

## Roots

Roots have horizontal rhizomes with numerous fibrous rootlets<sup>1</sup>. The colour of the root is bright yellow colour hence got the name “Goldenseal”.

## Stem

The mature plant has a pubescent, cylindrical stem that reaches a height of 12 inches.<sup>2,3</sup> The colour of the stem above the ground is bright yellow and below it is purple with several small scales at the base.<sup>4,5</sup> Each stem is forked with two terminal five to seven lobed palmate leaves.<sup>6</sup>

## Leaf

One leaf is larger than the other, the dimensions of the leaves are 3-12 inches width and 3-8 inches in length.<sup>7</sup> Leaves are dark green, prominently veined, with serrate margins.<sup>2</sup> Flowers appear in April and May, lasts only for 5 or 6 days.<sup>6,7</sup>

## Flower

Flowers have five erect sepals, five glossy yellow petals and numerous stamens.

## Fruit

Each berry has 10-20 hard, small, shiny black seeds. Fruit resembles a large raspberry ripens and turns red in July and August.<sup>2</sup>

## Local names

Yellow puccoon, orange root, yellow root, Indian dye, ground raspberry, eye root, eye balm, jaundice root

## Alkaloidal constituents

Isoquinoline alkaloids, hydrastine, berberine and canadine

## Traditional uses of Goldenseal

Every part of the plant has its medicinal properties, goldenseal is traditionally used for its<sup>8,9,10</sup>

- anti-catarrhal,
- anti-inflammatory,
- antiseptic,
- astringent,
- laxative,
- Muscular stimulant.

Goldenseal is used in

- gastritis,
- colitis,
- duodenal ulcers,
- loss of appetite
- liver disease
- to stimulate bile secretions
- snake bites
- canker sores
- Vaginitis.

## Pharmacological Actions

The pharmacological action of Goldenseal is due to the presence of two main phyto-chemical constituents Berberine and Hydrastine. Goldenseal is widely known for its antibacterial effect. Some of its other pharmacological actions include

- anti-parasitic,
- anti-inflammatory,
- anti-fungal,

- anti-carcinogenic,
- anti-biotic,
- Smooth muscle relaxant.

And are also used in the treatment of

- immune disorders,
- eye infections,
- diabetes,
- herpes simplex infection
- Hypercholesterolemia.

#### Anti-bacterial effects

Goldenseal is mostly used for its anti-bacterial effect; most of the researches of Goldenseal involve the anti-bacterial effects of berberine and hydrastine. Berberine have demonstrated to have anti-bacterial effect against *Vibrio cholera*,<sup>11,13,15</sup> *Escherichia coli* significantly reduces smooth muscle contraction,<sup>12</sup> delays intestinal transistance time in humans<sup>14</sup> *Staphylococcus aureus*, *Leishmania*, *Proteus*, *Shigella*, *Klebsiella*, *Streptococcus pyogenes*.<sup>17,18,19</sup> The anti-bacterial effect may be due to the inhibitory effect of berberine on fimbrial structure formation on the surface of the bacteria.<sup>16</sup>

#### Anti-parasitic effects

Berberine extracts and salts have demonstrated growth inhibition of *Entamoeba histolytica*, *Trichomonas vaginalis*,<sup>20</sup> *Leishmania donovani*<sup>21</sup> and *Giardia lamblia*,<sup>23</sup> with crude extracts being more effective than berberine salts.<sup>22</sup> Clinical trials conducted in India showed berberine administration improved gastrointestinal symptoms and resulted in a marked reduction in *Giardia*-positive stools. In comparison to metronidazole (Flagyl), another popular giardiasis medication, berberine was nearly as effective at half the dose.<sup>24</sup>

#### Cardio vascular effects

Animal research and clinical trials showed that berberine administration prevented ischemia induced ventricular tachyarrhythmia, stimulated cardiac contractility, and lowered peripheral vascular resistance and blood pressure.<sup>25,26</sup> The mechanism for berberine's antiarrhythmic effect is not clear, but an animal study indicated it may be due to suppression of delayed after-depolarization in the ventricular muscle.<sup>27</sup>

#### Anti-candidal effects

The antifungal activity of trial denture cleansers prepared with berberine hydrochloride was examined against *Candida albicans*, *C. tropicalis*, and *C. glabrata*. A commercial denture cleanser and a trial denture cleanser that exhibited strong antifungal activity were tested for their effects on *Candida* sp., the colour stability of the denture and the surface roughness of acrylic resin plates. The results of these tests revealed that the trial denture cleanser removed 64 % to 89 % of adhered cells from acrylic resin surfaces and had little effect on the other physical properties tested.<sup>28</sup>

#### Anti-inflammatory effects

*In vitro* studies utilizing human cell lines demonstrated that berberine inhibited activator protein 1 (AP-1), a key transcription factor in inflammation and carcinogenesis. Another study, utilizing human peripheral lymphocytes, showed berberine to exert a significant inhibitory effect on lymphocyte transformation, concluding that its anti-

inflammatory action may be due to inhibition of DNA synthesis in activated lymphocytes. The *in vitro* treatment of splenocytes with berberine showed that the anti-SRBC antibody synthesis was influenced in a different manner depending on the time course of its application. Oxycanthine was less effective than berberine in the tests used.<sup>29</sup>

#### Immune modulation

Goldenseal is used as an immune stimulant. In a study, the innate effects of goldenseal on pro-inflammatory cytokines produced by cultured macrophages were examined. The results obtained indicate that goldenseal was found to exhibit abilities to modulate macrophage responses during stimulation and were found to regulate macrophage immune responses and activation events.<sup>30</sup>

#### Eye infections

Studies have been conducted with berberine for treatment of trachoma, 0.2 % berberine chloride drops were compared to sulfacetamide eye drops over 8 weeks of treatment or a combination of the two. The berberine groups tested negative for *C. trachomatis* at 3 weeks and had no relapse at one year.<sup>31</sup> In another study of double-blind, placebo-controlled trial involving children with trachoma, researchers compared 0.2 % berberine eye drops to berberine plus neomycin, sulfacetamide and placebo. An 84 % clinical cure and a 50 % microbiological cure with berberine alone was observed in the study. The cure rates were higher with the addition of neomycin but were lower for the sulfacetamide group.<sup>32</sup>

#### Anti-carcinogenic effects

Ethanollic extract of *Hydrastis canadensis* has been tested for its possible anti-cancer potentials against p-dimethylaminoazobenzene (p-DAB) induced hepatocarcinogenesis in mice. Mice were chronically fed p-dimethylaminoazobenzene (p-DAB) and phenobarbital (PB), two hepato-carcinogens for 1, 2, 3 and 4 months and then they were fed diet mixed with p-DAB and PB at the same daily dose plus crude extract of *Hydrastis canadensis*. Several biochemical parameters like acid and alkaline phosphatases, alanine amino-, aspartate amino-, and gamma glutamyl-transferases, lipid peroxidation, reduced glutathione content, lactate dehydrogenase, catalase and glucose-6-phosphate dehydrogenase activities and electron microscopy of liver in different groups of treated and control mice were studied. The results revealed the anti-carcinogenic potential of *Hydrastis canadensis* and can be used as a supportive complementary medicine in liver cancer.<sup>33</sup>

#### Diabetic ketoacidosis

A clinical report of a severe reversible hypernatremia in an 11 year old girl with new onset type1 Diabetes mellitus presented with diabetic ketoacidosis is treated with the herbal extract of *Hydrastis Canadensis*.<sup>34</sup>

#### Hypercholesterolemia

A study showed that berberine is highly effective in upregulation of liver LDLR expression in HepG2 cells and in reducing plasma cholesterol and low density lipoprotein cholesterol (LDL-c) in hyperlipidemic hamsters. Canadine is identified as a new regulator in LDLR expression. These findings identify goldenseal as a natural LDL-c lowering agent.<sup>35</sup>

**CONCLUSION**

Various studies indicate that Goldenseal is biologically very active plant which makes it a very attention-able one. The need is to do more research to identify active constituents which are responsible for its biological activity. It has very potent anti-microbial, anti mycotic and hypoglycaemic activity due to the presence of alkaloids. The pharmacological actions of goldenseal are mainly due to berberine and hydrastine most of the researches of goldenseal are about the actions of these alkaloids. Medicinal use of goldenseal is confined to traditional or folk medicines which give clue that higher research should be made for new drug molecules of definite activity.

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