



Review Article

A Overview Of Pharmacognostical, Phytochemical, Pharmacological Studies Of Hydrastis Canadensis

Surya Devi. M*, Elakiya. V, Hemamalini. T, Kalaiyarasan. S, Sathish Kumar. R

PSV College of Pharmaceutical Science And Research Krishnagiri

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ABSTRACT

Hydrastis canadensis or Goldenseal is a perennial herb with a rich history of traditional use. Its roots and rhizomes contains the alkaloids berberine, canadine, and hydrastine which exhibits antimicrobial, anti-inflammatory and immune boosting properties. Goldenseal has been traditionally used to treat digestive issues, respiratory infections, skin conditions and infections. Berberine, a key constituents, has antimicrobial and anti-inflammatory effects, as well as antidiarrheal and antiulcer properties. Goldenseal's antimicrobial activity is effective against certain bacteria, viruses and fungi. While its traditional uses are well documented, more research is needed to confirm its efficacy and safety for specific uses. Goldenseal is a plant that is vulnerable to over-harvesting and habitat destruction. As a result, it is important to source goldenseal from reputable suppliers who practice sustainable harvesting methods, look for products that are certified by organizations such as the United Plant Savers or the Forest Stewardship Council. Additionally, consider using cultivated goldenseal, which can help reduce the demand on wild populations. When purchasing goldenseal products, also be aware of the quality and purity of herbs. Ensure that the products is free of contaminants and adulterants, and that the manufacture provides clear labelling and instructions for use.


INTRODUCTION

Goldenseal is also known as orange root or yellow puccoon found in lush hardwood forests across the northeastern united states, goldenseal (*Hydrastis canadensis*) is an herbaceous perennial belonging to the buttercup family (*Ranunculaceae*) [1]. Similar natural environments or shade construction are frequently used to cultivate goldenseal and ginseng. In fact, goldenseal is a

perfect success in crop for ginseng growers because to the comparable culture requirement. Growing condition for cultivated plant need to resemble those found in natural areas. The comprises that is moist, well drained and rich in organic matter. Furthermore, this plants diverse parts particularly the rhizomes, contains a large number of alkaloids such as berberine, hydrastine,

*Corresponding Author: Surya Devi. M

Address: PSV College of Pharmaceutical Science And Research Krishnagiri

Email : elakiyav12345@gmail.com

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palmatine, canadine and hydrastinine as well as a small amount of flavonoids such as sideroxylen, 8-desmethyl-sideroxylen and 6-desmethyl -sideroxylen and organic acids such as chlorogenic acid and neochlorogenic acid [2]. The most pharmacologically active of these constituents is berberine which is used in contemporary clinical operation to treat a range of illness similar as infection, diabetes, dyslipidemia and cardiovascular condition. A quaternary ammonia swab belonging to the protoberberine group is called berberine(3,4). Complaint of the eye, skin and digestive system have all been treated using the dried roots. also, goldenseal has been vended as an vulnerable system supporter(5- 8). Goldenseal has been used historically for a variety of remedial purposes including an eye marshland(hence the common name eye root and eye attar) a bitter alcohol, an appetite goad and digestive aid and mucous membrane remedy(5- 8). Goldenseal has been employed as an antibiotic, immunostimulatory, anticonvulsants, alcohol and opiate in contemporary drug infections of the eyes, cognizance, nose, throat, stomach, bowel, uterus and vagina have been treated with it most constantly(9).

PLANT PROFILE:



Fig no.1

Habitats:
Deciduous forests

Woodlands
Rocky hillsides
Moist soils
Name : Hydrastis canadensis
Common name: Goldenseal
Family : Ranunculaceae
Vernacular names:
Goldenseal
Orange root
Yellow root
Indian Turmeric
Taxonomy:
Kingdom : Plantae
Clade : Angiosperms
Order : Ranunculaceae
Genus : Hydrastis
Species : H. canadensis
Binomial name: Hydrastis canadensis L.
Chemical Constituents:
Alkaloids
Berberine
Canadine
Hydrastine
Medicinal uses:
Digestive issues.
Infections
Skin conditions
Eye infections.

MATERIALS AND METHOD: [15-20]

Collection:

1. Timing:
2. Identification:
3. Harvesting:

Extraction:

Extraction of Hydrastis canadensis (Goldenseal) using

1. Soxhlet Extraction (SOX)
2. Supercritical Fluid Extraction (SFE)

Soxhlet Extraction (SOX):

Materials:

1. Dried and powdered goldenseal root.
2. Soxhlet extractor

3. Solvent (eg., ethanol or methanol)
4. Heating mantle
5. Condenser

Supercritical Fluid Extraction (SFE):

Materials:

1. Dried and powdered goldenseal root
2. Supercritical fluid extraction apparatus
3. Supercritical CO₂ (commonly used solvent)
4. Modifier (e.g., ethanol, if need)

PHARMACOGNOSTICAL STUDIES: MACROSCOPIC EVALUATION OF GOLDENSEAL:[18,19]

1. Appearance:
2. Size and Shape:
3. Colour:

MICROSCOPIC FEATURES OF GOLDEN SEAL (POWDER):

1. Colour:
2. Cork cells:
3. Parenchyma cells:
4. Starch grains:

T.S of Hydrastis canadensis

1. Epidermis:
2. Cortex:
3. Endodermis:
4. Vascular cylinder:

This includes both xylem and phloem.

1. Xylem:
2. Phloem:

CHEMICAL PARAMETERS OF GOLDENSEAL:

CHEMICAL PROPERTIES:

PH:

The PH of an aqueous extract of goldenseal can range from mildly acidic to neutral.

Specific gravity:

The specific gravity of the extract can be measured to ensure consistency in preparations.

Ash value:

Total ash, acid-insoluble ash and water-soluble ash are parameter used to assess the purity and quality of plant material.

Moisture content:

Determining the moisture content is crucial for the storage and stability of dried herb.

Extractive yield:

The percentage (%) of extractable compounds obtained using various solvents (eg.H₂O, Ethanol) can be measured to evaluate the efficiency of the extraction process.

Foreign matter:

It should be less than 2% by weight, ensuring purity.

PHYTOCHEMICAL SCREENING

Detection of Alkaloids:

1. Mayer's test:
 - Detection of Glycosides:
 - Test for Anthraquinone Glycosides:
2. Borntrager's test:
 - Test for Cardiac Glycosides:
3. Keller Killiani test:
4. Detection of Saponins:
5. Foam test:
6. Detection of Tannin:
7. Gelatin test:

PHARMACOLOGICAL ACTIVITY:

1. Anti-obesity Activity:

It is reduced the raised levels of CD36 and CCAAT/enhancer-binding protein α (C/EBP α) that were brought on by a fat diet in mice's epididymal adipose tissue. [21]

2. Hypoglycemic Activity:

Goldenseal insulin-dependent reaction may also be linked under varying circumstances and mechanisms to hypoglycemia the opposite state of diabetes. [22,23]

3. Antibacterial Activity:

Inhibition of bacteria because goldenseal rhizome extract has potent antibacterial properties, it has long been used to treat a range of skin illnesses. The antibacterial activity was examined by determining the Minimum Inhibitory Concentration (MIC). [24,25]

4. Antifungal Activity:



Goldenseal is one of the most significant antifungal plants used to treat a variety of skin infections. Berberine's antifungal effect was linked to change in the integrity of the mitochondrial and plasma membranes as well as DNA damage that caused cell death, presumably through apoptosis. [26,27]

5. Antiviral activity:

The alkaloid berberine found in goldenseal has antiviral properties against a variety of viruses, including enterovirus, influenza and chikungunya. Against H1N1 influenza A, berberine demonstrated substantial growth inhibition capability in an in vitro investigation using human lung epithelial cells and mouse bone marrow macrophages. [28,29]

6. Anti tumour activity:

The natural compounds have strong anti-cancer properties. The phytochemical research has revealed a novel therapeutic idea for employing phytochemicals as pharmacological substitutes against human cancers through medication repositioning. Growth receptor antagonistic and antiproliferative properties have been used in cancer treatment. [30]

7. Immunogenic activity:

The goldenseal plant as an immune booster. Glycan-domain-containing phytochemicals have demonstrated interactions with complexed antigens to functions as immune cell nanocarriers and immunomodulation via CD8+T cell-mediated cytotoxic T lymphocyte immunological response. [31]

8. Anti- inflammatory activity:

The goldenseal extract, in a dose-dependent manner, alter lipopolysaccharide-stimulated macrophage responses, including the lowering of TNF- α , IL-6, IL-10 and IL-12 production. Likewise, berberine dramatically reduced TNF- α -induced expression of IL-6, IL-8 and monocyte chemoattractant protein (MCP)-1 in ARPE-19 cells. [32]

9. Anti-arthritic activity:

By controlling particular immunological responses, berberine has been shown to reduce rheumatoid arthritis caused by collagen and Freund's complete adjuvant. In investigation conducted on animals, berberine has lowering the expressions of TNF- α , IL-1 β , IL-6, IL-17, CD34, and VEGF and elevating those of IL-10 and transforming growth factor- β (TGF- β). [33]

10. Relaxant activity:

Berberine and goldenseal extract have calming properties. Goldenseal extract was shown to contraction guinea-pig trachea induced by carbachol and the contraction of rat uterine smooth muscle induced by 5HT, oxytocin and acetylcholine in in vitro experiments. [34]

11. Anti platelets aggregation:

The clumping of platelets together in the bloodstream is known as platelet aggregation and results in the formation of a thrombus clotting. Numerous therapeutic plants and conventional medical systems have demonstrated the potential of natural supplements to lower platelet aggregation. Research revealed that berberine prevented platelet aggregation caused by collagen.[35]

12. Anti aging activity:

Age-reversing action skin aging results from exposure to ultraviolet (UV) irradiation, which increases the production of IL-6, matrix metalloproteinases (MMPs), and lowers the expression of procollagen type 1 genes. [36]

13. Gastrointestinal activity:

By preventing the growth of enterobacteria and colonic expression of iNOS, COX-2, IFN- γ , IL-17, IL-6, IL-8 and TNF- α as well as raising colonic IL-22 and secretory immunoglobulin A levels, berberine reduced inflammatory responses linked to a variety of gastrointestinal inflammatory diseases. Further it prevented Th17 and Th1 cell development and the phosphorylation of STAT3,



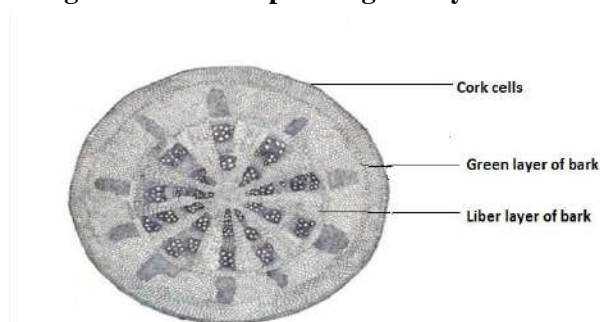
STAT1, and NF-κB while having no effect on regulatory T cells. [3]

RESULT AND DISCUSSION

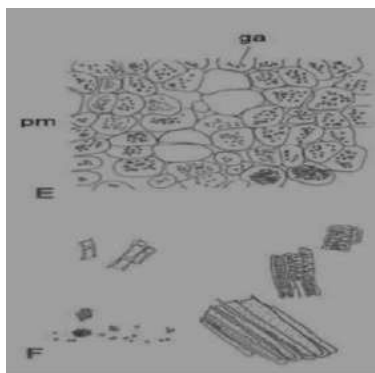
Table 1 Macroscopic Characters Of Hydrastis Canadensis

S. NO	Morphological characters	observation
1	Leaf Colour	Fresh leaves: Dark green. Dried leaves: Brownish green.
2	Oduor	Unpleasant and slightly aromatic Oduor.
3	Taste	Bitter

Fig no 1 Microscopic image of Hydrastis canadensis



Powder Microscopy of Hydrastis canadensis



E- cross section details of medullary

Parenchyma (pm)

ga- starch grains

F-Rhizome powder

PHYTOCHEMICAL STUDIES:

Extraction:

Extract sample	Solvent	Goldenseal roots			Goldenseal Leaves		
		Raw material	Extract	Yield	Raw material	extract	Yield
SOX	70% ethanol	400mg	997±144mg	24.9±3.6%	8000mg	1810mg	22.65%

SFE	H ₂ O	4000mg	1159±129mg	29.0±3.2%	800mg	2770mg	34.6%
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PRELIMINARY PHYTOCHEMICAL SCREENING OF HYDRASTIS CANADENSIS:

S. NO	Chemical test	Presence/absence of phytochemical
1	Alkaloids	+
2	Glycosides	+
3	Tannins	+
4	Saponin	-
5	Starch	+

SUMMARY AND CONCLUSION

Goldenseal, or *Hydrastis canadensis*, is a perennial herb indigenous to North America. The traditional applications, phytochemical composition, pharmacological properties, safety effectiveness, and primary alkaloid, berberine, of goldenseal extract are all covered in detail in this paper. The plant is well-known for its yellow roots, which are rich in beneficial substances like canadine, hydrastine, and berberine. It is thought that the alkaloids possess antibacterial, anti-inflammatory and immune stimulating qualities. Goldenseal is frequently used as a natural treatment for infections, skin diseases, digestive disorders, and respiratory issues. It's also commonly found in herbal supplements, particularly those that are meant to strengthen immunity or treat colds and the flu. Despite its widespread use, *Hydrastis canadensis* is now regarded as an endangered species in many areas due to overharvesting, which has raised questions regarding the species' conservation status..

REFERENCES

- Small E, Cattling PM, Canadian medicinal crops, Canada NRC press.240 ;1999.
- Foster S, Goldenseal (*Hydrastis canadensis*) steven foster group herb monographs; April 26,2000.
- Lloyd JU, Lloyd CG, Drug and medicine of North America; 1884 - 1887.
- Miller RA, Native plants of commercial importance grants pass, OR :OAK Inc.343P;1988.
- Sievers AF, Goldenseal under cultivation, farmer's bull 613.Washington DC:US: Department of Agriculture 14P;1949.
- Bergner, The healing power of Echinaceae goldenseal and other immune system herbs. Rocklin CA: Prima 322P; 1997.
- Bradshaw C, Goldenseal (*Hydrastis canadensis*). In complementary and alternative medicine a scientific reference for health care professionals; 1997.
- Fern K, Plants for a future species data base; 1997-2000.
- Davis JM, Persons, Growing WS and marketing ginseng, goldenseal and other woodland medicinals (revised and expanded); new society publishers: Gabriola island, BC, Canada;2014.
- The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). Publication 847 crops protection guide for ginseng; March 20 ,2023.
- Zuiderveen GH, Burkhart EP, Lambert JD, Benzylisoquinoline alkaloids content in goldenseal (*Hydrastis canadensis*) is influenced by phenological state, reproductive status and time-of day. phytochem;2021.
- Neils AL, Brisco-McCann EI, Harlan BR, Hausbeck MK, management strategies for



- Alternaria leaf blight on American ginseng; 2021.
13. Putnam ML, Du Toit LJ, first report of Alternaria panax on ginseng (Panax quinquefolius) in Oregon and Washington;2003.
 14. Moore M, Santa Fe NM, Red Crane, The medicinal plants of the pacific west; 1993.
 15. Upton R, Hydrastis canadensis, standards of analysis, quality control and therapeutics;2001.
 16. Foster S, Duke JA, A field guide to medicinal plants: Eastern and central North America, Houghton Mifflin Harcourt; 1990.
 17. Singh M, Govindarajan R, "Pharmacological and phytochemical profile of Hydrastis canadensis L"; 2005.
 18. He X, Lian L, Yu Z, "Extraction, isolation and structure identification of alkaloids from Hydrastis canadensis L"; 2012.
 19. Reverchon E, De Marko I, "Supercritical fluid extraction and fractionation of natural matter"; 2006.
 20. Ameer K, Shahbaz HM, "Soxhlet extraction, methods and applications"; 2017.
 21. Bartle KD, Clifford AA, "Supercritical fluid extraction"; 2001.
 22. Pirillo AL, Catapano, Berberine, a plant alkaloid with lipid and glucose-lowering properties: from in vitro evidence to clinical studies, Atherosclerosis.
 23. Schmandke BH, Berberine, an isoquinoline alkaloid of barberry, lowers blood glucose and lipid concentrations, 2007.
 24. Scazzocchio F, Cometa M, Tomassini L, Palmery M, Antibacterial activity of Hydrastis canadensis extract and its major isolated alkaloids, 2001.
 25. Villinski J, Dumas E, Chai J, Pezzuto J, Angerhofer C, Gafner S, Antibacterial activity and alkaloid content of berberis thunbergia, berberis vulgaris and Hydrastis canadensis, 2003.
 26. Freitas DD, Do Nascimento FBSA, De Andrade LND, Sampaio LS, Grangeiro TB, Berberine antifungal activity in fluconazole-resistant pathogenic yeasts: action mechanism evaluated by flow cytometry and biofilm growth inhibition in candida spp, antimicrobial agents and chemotherapy, 2016.
 27. Freile M, Giannini F, Pucci A, Sturniolo L, Rodero O, Pucci V, Antimicrobial activity of aqueous extracts and of berberine isolated from berberis heterophylla, 2003.
 28. Cecil CE, Davis JM, Cech SM, Laster, inhibition of H1N1 influenza A virus growth and induction of inflammatory mediators by the isoquinoline alkaloid berberine and extracts of goldenseal, 2011.
 29. Varghese FS, Thaa SN, Amrun D, Simaramata, Rausalu K, McInerney LF, Ahola T, The antiviral alkaloid berberine reduces chikungunya virus-induced mitogen-activated protein kinase signaling, 2016.
 30. Kirtonia A, Gala K, Fernandes G, Sethi G, Khatrar E, Repurposing of drugs. An attractive pharmacological strategy for cancer therapeutics, 2020.
 31. Gupta B, Sadaria D, Warriar VU, Kant R, Awasthi A, Baligar P, Sethi G, Garg M, plant lectins and their usage in preparing targeted nanovaccines for cancer immunotherapy, 2020.
 32. Clement-Kruzel S, Hwang A, Dasgupta JK, immune modulation of macrophage pro-inflammatory response by goldenseal and astragalus extracts, 2008.
 33. Wang Z, Chen Z, Yang S, Gao J, Rao Z, berberine ameliorates collagen-induced arthritis in rats associated with anti-inflammatory and anti-angiogenic effects, 2014.

34. Sadeghnia HR, Taji AR, Forouzanfar F, Hosseinzadeh H, berberine attenuates convulsing behaviour and extracellular glutamate and aspartate changes in 4-aminopyridine treated rats, 2017.
35. Hirsch GE, Vicili PRN, Nascimento S, Porto FG, Otero A, natural products with antiplatelet action, 2017.
36. Kim S, Chung JH, Berberine prevents UV-induced MMP-1 and reduction of type 1 procollagen expression in human der RCmal fibroblasts, 2008.
37. Yan F, Wang L, Shi Y, Cao H, Liu L, Chaturvedi R, Isreal DA, Cao H, Berberine promotes recovery of colitis and inhibits inflammatory responses in colonic macrophages and epithelial cells in DSS-treated mice, 2012

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