WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Review on the Medicinal Plant *Hydrastis Canadensis*

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ABSTRACT

Native to North America, goldenseal, or Hydrastis canadensis L. (Ranunculaceae), is a herbaceous species found in deciduous forests. The majority of eastern North America is home to Hydrastis canadensis, which stretches from southern Alabama and Georgia northward to Vermont, then into Ontario, and finally westward to Minnesota. It borders Oklahoma and Kansas on the west. Today, Hydrastis canadensis is one of the most popular medicinal herbs sold in the US and is widely used as a plant. Its bright yellow rhizomes are highly prized and are almost always harvested from the wild. A perennial plant with thick roots is called goldenseal. The sap from the root is orange. Its hairy stem reaches a height of approximately 10 inches and is erect and unbranched. Three leaves are present. At the base of the plant, a single leaf develops. This hairy, toothed leaf can reach up to nine lobes and a width of eight inches. At the tip of the stem grow two hairy leaves. These leaves can range in width from six inches to nine lobes each. The base of the upper leaf is where the lone flower emerges. This flower is on a short stalk and lacks petals. The flower's color is derived from its white stamens. It is a berry, the fruit. There are several berries grouped together.

Keywords: *Hydrastis canadensis*, rhizomes, goldenseal, stamens.

Introduction

Rhizomes, or yellow subterranean stems that resemble roots, are how goldenseal, a slow-growing perennial herb, spreads. Young plants frequently have a single stem. Individuals that are mature (reproductive age) have two leaves arranged alternately on a forked stalk that can grow up to 30 centimeters (one foot) in height. Leaves have toothed margins and are palmately lobed. The stems and leaves are covered in tiny, short hairs. Flowers of goldenseal in April and May. From the uppermost leaf, a short flowering stalk bears a solitary white-green flower. Fruits have a raspberry-like appearance and contain 10–30 smooth, shiny, black seeds. In Michigan, goldenseal is a perennial that blooms at the beginning of May and yields fruit until September (Albert and Penskar 1984). It is possible for colonies to have several hundred shoots, with the taller plants located in the center and the smallest or later-flowering plants on the edges, indicating that colonies grow through vegetative propagation. Long-lasting colonies may gradually grow larger over time. Understanding the biology and ecology of goldenseal will help with managing and safeguarding this species. In order to ascertain the state of any existing historically documented localities as well as to provide better data on known populations, status inventories are also required. Despite the fact that overfishing and habitat destruction have severely reduced and fragmented goldenseal populations, this species is still easily missed when hidden by the typical lush vegetation of its forest habitat. It's likely that some populations have not yet been found, as over half of the known extant populations have been found in the last few years. According to observations made by Albert and Penskar (1984), a large population within a Nature Conservancy preserve, the fruit is extremely palatable to animals, who seem to seek out this species readily as soon as the fleshy achenes are ripened.

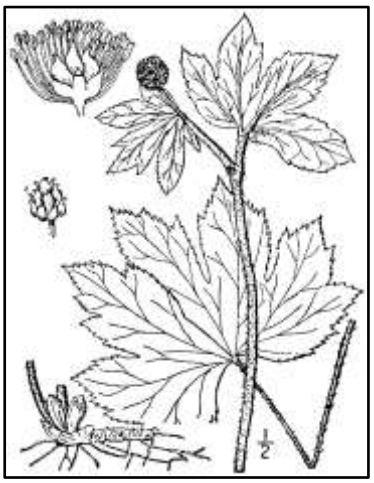

Figure 1—Goldenseal plant

Morphological Character

Kingdom: Plantae

Division/Phylum: Magnoliophyta

Class: Magnoliopsida

Order: Ranunculales

Family: Ranunculaceae

FLOWER: White - a single flower about ½ inch across with no petals on an upright stem.

BLOOMING PERIOD: May

SIZE: 6 to 20 inches tall.

BEHAVIOR: There is usually a pair of leaves on the flower stalk. A clump of scarlet red berries develops after the flowering period. These are inedible.

Geographical Distribution

As of right now, goldenseal has been identified in 53 locations across 21 counties, mostly in the southern three tiers. One locality serves as the representation for nine counties. Since 1980, the species has been found or its existence has been confirmed at twenty-five localities; eight of these sites are based on records from 1930 or earlier, many of which are in now heavily developed areas where it is unclear how current these historical records are. Only two of the nine occurrences that are known to support more than 100 shoots include populations with more than 1000 shoots.

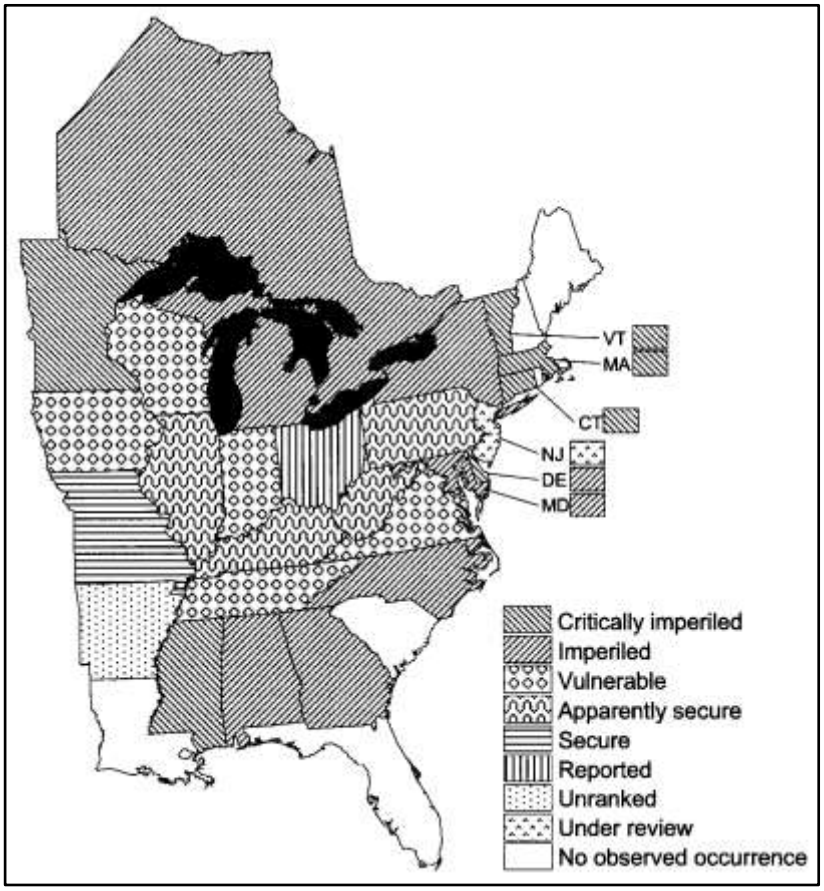

Figure 2—Goldenseal range and distribution

Reproduction

While goldenseal can produce viable seed through both self- and cross-fertilization at approximately 4-5 years of age (Burkhart & Jacobsen 2006), their primary mode of reproduction is vegetative (clonally via rhizomes), as opposed to seed. The distinctively patchy populations of goldenseals are the outcome of this reproductive strategy.

Dispersers and Pollinators: Syrphid flies and certain larger bees in the United States, as well as small bees belonging to the genera Dialictus and Evylaeus in Canada, have been observed as pollinators (Sharp 2003; Sinclair et al. 2000). The animals, particularly the birds, consume the red fruits. However, since seedlings are rarely found in the wild, dispersal techniques might be useless.

Medicinal Use

One of the earliest known medicinal plants from North America is goldenseal (Foster, 2000). The therapeutic effects of goldenseal are thought to be attributed to the alkaloids hydrastine, canadine, and berberine. Goldenseal has been used externally for inflammation and internally by Native Americans for ailments of the gastrointestinal tract, immune system, and respiratory system (Moerman 1998). Goldenseal has been linked to numerous health benefits, such as its antibacterial, antifungal, and anti-yeast properties, particularly in relation to pathogens that affect the digestive system. The use of goldenseal as a first line of defense against colds and flu is being questioned by some herbalists, who prefer more widely available alternatives (Blumenthal 2000; Bergner 1996/7).

Clinical Studies

Alkaloids, specifically berberine, canadine, and hydrastine, are the active ingredients found in goldenseal rhizomes (Foster and Duke 2000). The primary antibacterial and anticonvulsive qualities of berberine also increase bile secretion and reduce blood pressure (Foster and Duke 2000). The other alkaloids are thought to work in concert to lessen muscle spasms. The efficacy is significantly diminished if any of the primary alkaloids are eliminated (Foster and Duke 2000). Berberastine, meconin, chlorogenic acid, phytosterins, resins, albumin, starch, fatty matter, sugar, lignin, and a tiny amount of volatile oil that adds to the root's odor are among the additional ingredients (Bradshaw 1997).

Cultivation

Plants of goldenseal can be moved to wooded areas or raised beds once they become established. Clearing undergrowth that will compete with roots for nutrients is necessary in wooded areas (Davis 1999). The best places to grow goldeneal are forested areas that are home to a number of other plant species related to the herb (Cech 2002). Mulching is necessary for plants grown in cultivated beds in order to prevent weed growth, preserve moisture, and shield roots from freezing temperatures (Davis 1999, Sievers 1949). A shade structure that offers 60 to 75 percent shade is necessary for growing goldenseal (Davis 1999, Grieve 1931, Sievers 1949).

Figure 3 - *Hydrastis canadensis* plant.

Evaluation of Hydrastis canadensis

Preparation of Ethanolic Extract of *Hydrastis canadensis*

The maceration method was used to create the ethanolic extract. 500 ml of ethanol was added to 50 g of finely powdered dried root (Hydrastis canadensis). For three days, the mixture will be shaken often. Following filtration, the filtrate was dried in a rotary evaporator set to 60°C and 80 revolutions per minute. Before being used again, the dried filtrate was placed in sterile, tightly sealed test tubes and refrigerated.

Figure 4: Ethanolic extract of *Hydrastis canadensis*

Animal Modelling

Swiss albino mice weighing between 18 and 30 grams, of both sexes, were given by King Khalid University in Abu Dhabi, Saudi Arabia. The animals were housed in cages with ample space, given standard food and water, and kept on a 12-hour light/dark cycle. Every experiment was conducted with ethical approval from King Khalid University's Ethics Committee. The following (n = 5) groups of animals were created:

• Group I: Tween-80 (negative control)

• Group II: Fluoxetine 10 mg/kg (positive control)

• Group III: *H. canadensis* extract 150 mg/kg

• Group IV: *H. canadensis* extract 250 mg/kg

Antidepressant Activity

The actimeter (Panlab Harvard Apparatus) was used to track the locomotor behavior of the animals. This device features a square arena with a photocell-powered light source. A digital counter was used to record the locomotor activity. Every animal was put into the device separately, and for five minutes, its basal movement was recorded. Subsequently, each animal received the appropriate medication (intraperitoneal injection), and after 30 and 60 minutes, the activity score was recorded. 150 mg/kg and 250 mg/kg of extract were administered. The extract was diluted in 1% Tween-80 to be injected intraperitoneally. Each group's mean activity score was computed and compared. An increased activity score was considered an antidepressant index.

Results

Alkaloids and saponins showed promising results from the phytochemical analysis. Tannins, steroids, and flavonoids were not present .Each group's mean was calculated and compared. When compared to negative control groups, locomotion was higher in the groups treated with fluoxetine and extract at doses of 150 mg and 250 mg/kg at 30 and 60 minutes.

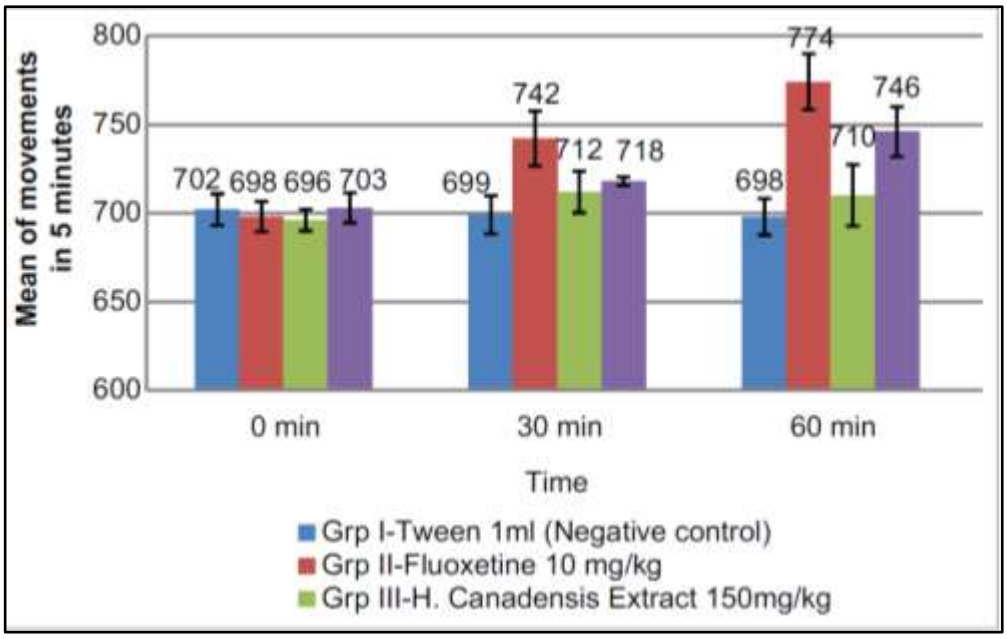

Figure 5: Assessment of locomotor activity

Discussion

This study suggests that the ethanolic root extract of Hydrastis canadensis has antidepressant potential. This might offer a safer, more affordable, and different kind of therapy for depression.

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