

## A PHARMACEUTICAL STUDY OF HYDRASTIS CANADENSIS.\*

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## HISTORY.

*Hydrastis canadensis* (1) is a native of North America belonging to the *Ranunculaceæ* family. Once abundant in the thick woodlands of the territory bordering the Ohio River from Illinois to Virginia and in Northern Wisconsin, it is now, in its native home, practically exterminated. The rhizome of this plant having a golden yellow color, was used by the Indians as a cuticle stain, and also as a dye for garments. The latter application was adopted by the early settlers. As would be expected, the general use of this native plant in trade and barter resulted in a host of names, some of which are as follows (2):

Yellow Puccoon, Yellow Root, Indian Dye, Ground Raspberry (due to its red fruit), Eye Balm, Ohio Curcuma, Indian Paint, Indian Turmeric, Yellow Seal, Yellow Eye Root, Orange Root, Jaundice Root, Gelbes Blutkraut (German), Sceau d'Or (French), *Warneria canadensis* (Latin).

The name "Hydrastis" (3) is derived from "hudor" water and "drao" to act, alluding to the growth of the plant in marshes and the active properties of the juice. The name (4) "Hydrastis" was also given by Linnæus. Peter Kalm collected a few leaves between 1749 and 1751, which were sent to Linnæus (1753), who called the plant *Hydro-phyllum verum canadense*. In 1759, he, after seeing a complete specimen, renamed it "Hydrastis."

The Indians not only used the plant as a dye, but are credited with its use in medicine and introducing such use to the settlers. Mixed with grease it was found to be a good insecticide, presumably because of the bitter taste. In form of an infusion it was used in the treatment of skin diseases and for sore or inflamed eyes. It was used as a stimulant for indolent ulcers and as an internal tonic. Many others uses have been reported as having been employed by either the Indians or the early settlers. The drug as a whole was of little importance commercially until introduced to the medical world by the American Eclectics (1), who first prepared the alkaloidal salts for medicinal uses. Then in 1828 (5), Martin and Reinesque mentioned the drug in their *Materia Medica*.

Captain Lewis (6) (1804) included among the herbarium collected by the Lewis and Clark expeditioners a short article on "Hydrastis canadensis." In the log, Hydrastis was said to be "a sovereign remedy in a disorder common to the inhabitants of that locality." The preparation and application of this remedy is given as follows:

Having procured sufficient quantity of the roots, wash them clean and dry them in the shade, break the roots as fine as possible with the fingers, place them in a glass vessel about two-thirds full, add rain or river water until the vessel is filled, shaking it frequently, and it will be fit for use in the course of six hours. The water must be decanted, but remaining with the root is to be frequently applied by wetting a piece of linen and touching the eye gently with it.

Hydrastis appears in the 1830 (N. Y.) revision of the U. S. Pharmacopœia, then again in the secondary list of the 1860 revision. All subsequent revisions of the U. S. P. have retained it. The 1870 revision introduced the Fluidextract and

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<i>U. S. Pharmacopoeia.</i>												
<b>TINCTURA HYDRASTIS</b> .....								L	L	L	L	...
Tincture of Hydrastis.....								E	E	E	E	...
Tincture of Golden Seal.....												S
Tr. Hydrast.....												A
<i>National Formulary.</i>												
<b>ELIXIR HYDRASTIS COMPOSITUM</b> .....												L
Compound Elixir of Hydrastis.....												E
Alkaline Elixir.....												S
Elix. Hydrast. Co.....												A
<b>EXTRACTUM HYDRASTIS</b> .....												L
Extract of Hydrastis.....												E
Powdered Extract of Hydrastis.....												S
Ext. Hydrast.....												A
<b>LIQUOR HYDRASTINÆ COMPOSITUS</b> .....												L
Compound Solution of Hydrastine.....												E
Colorless Hydrastine Solution.....												S
Liq. Hydrast. Co.....												A
<b>TINCTURA HYDRASTIS</b> .....												L
Tincture of Hydrastis.....												E
Tincture of Goldenseal.....												S
Tr. Hydrast.....												A
<b>HYDRASTINÆ HYDROCHLORIDUM</b> .....												L
Hydrastine Hydrochloride.....												E
Hydrastine Chloride.....												S
Hydrastin. Hydrochl.....												A
<b>MISTURS RHEI ALKALINA</b> .....												L
Alkaline Mixture of Rhubarb.....												E
Neutralizing Cordial.....												S
Mist. Rhei. Alk.....												A

REFERENCES.

- (1) Lloyd, "Origin and History of Vegetable Drugs," Vol. 1.
- (2) Culbreth, "Materia Medica and Pharmacology."
- (3) "Homeopathic Pharmacopœia of the U. S.," 3rd Edition (1914). "U. S. Dispensatory," 21st Edition (1926).
- (4) *Pharmaceutical Era*, 46 (1913), 67.
- (5) *YEARBOOK, A. PH. A.*, 1 (1912), 115.
- (6) *Journal of Pharmacy*, 6 (1834), 201.
- (7) Langenhan, "A Century of the U. S. P. 1820-1920." "Titles, Synonyms and Abbrev." (1923).
- (7) Langenhan, "A Half-century of the N. F. Titles, Synonyms and Abbrev." (1927).

CULTIVATION OF HYDRASTIS CANADENSIS.

Since the first appearance of Hydrastis into medicine in 1828, the drug plant has become scarce. In 1860, a commercial demand was created. In 1880, the prices ranged from 18 cents per pound to 12 cents per pound. These prices were based on the cost of collecting the drug and curing it. In 1890, the coming scarcity of the drug plant caused an increase in prices, and at the end of ten years the price had advanced to 58 cents per pound. In 1904, Hydrastis brought \$1.00 per pound, gradually advancing to \$1.35 to \$1.50 per pound at the close of the year (1).

Up to 1912, the prices did not fluctuate to any great extent and the prices paid to collectors ranged from \$3.00 to \$4.25 per pound. Parallel to this steady advance in price came the gradual extermination of the natural grown plant and at the same time its increasing use in the medical field.

The collectors had diminished the natural supply (2) by careless harvesting. As a result, the Bureau of Plant Industry in the Department of Agriculture in 1911 introduced a campaign to induce artificial cultivation. In 1912 (3), Lloyd visualized the danger in Hydrastis shortage, took steps to protect the popular drug plant. He experimented (6) in the culture by transplanting the fresh green Hydrastis collected from various parts of Kentucky. One lot was planted in rows, about two feet apart, the plant separated from each other about six inches in the row. All grew that season. These plants were set out the first part of May. Small number of plants were set out a little later to prove whether the time of transplanting had any effect on the thriftiness and hardiness of the plants. The experiment showed that early planting is better. Next, five lots were planted in a woodland with a southeast exposure, the thicket so dense as to prevent the hot sun shining upon them during the summer. At the same time fresh roots were cut up into pieces, each bearing one or more reserve buds and these were planted. In both cases the plants developed successfully. The experiments demonstrated that Hydrastis is a plant easily propagated by transplanting the entire roots, or even cuttings.

At the beginning of the experiment, Hydrastis was said to grow best in its natural habitat (7), but further investigation proved that it will grow in most any climate provided proper care is given. Hydrastis has been grown successfully in Russia (4) and Austria (5).

The artificial condition for cultivation must be made as near as possible to the natural habitat since the plant is very sensitive to any disturbance (8). A light rich soil is best, and either clay or sand will do, if the ground is manured well to give the right lightness and fertility. Humus should be worked into the ground six to eight inches in depth to assure the lightness and moisture retaining the property resembling that of the natural soil. Manure and straw will do, but leaf mold is recommended. The ground should be mulched every fall; this also prevents the weeds from growing (7). All stones, lumps and grass must be removed. Good drainage is required in the successful growing of Hydrastis (9). The soil cannot be made too rich, for Hydrastis is a hardy plant and depletes it readily.

The soil is best prepared in the summer and the plants set out in the fall, so that by spring they will be growing well. The plants are more vigorous during the succeeding year (6).

When the plants were numerous in the wilds, the growers collected the green plants in the early spring (10) and transplanted them, preferring this to seed planting. Very frequently the birds feast on the seeds and the development requires a long time before marketing, whereas, three to four years is the time required for plants grown from cuttings or buds, and five or more years, from the seed.

The plant is best propagated (7) by division of the rhizome for continuous growth; by transplanting the entire root; or by buds, having a good fibrous root attached (9).

The cuttings will thrive best if they are planted an inch below the surface, a few inches apart in rows to afford access to plants in the weeding and the tilling of the soil. When the plants commence to peep out from the soil they are ready for transplanting to a new bed. In a few months, all of the plants will be growing well (11).

The beds must be protected from the hot sun, hence artificial shade must be provided. This is done by erecting a lattice framework (8), which is better than trees or vines, as the latter draw their share of the food from the soil.

Late in the fall, the beds should be covered with forest leaves or straw to the depth of two or three inches to protect the plants from the extreme cold; too deep a covering is harmful, because it invites the field mice to infest the field (9).

In four to six years, and after the leaves are all withered, the rhizome should be dug out and three-fourths of it cut off; the growing and carrying the terminal bud, being replaced in the earth, to continue the growth. Small plants that thrive from the mother plant can be transplanted to a new place for another (3) crop.

Successful growers have an output of about two thousand pounds of dried root per acre after five years of growth from seed (1) and similar returns from the cuttings.

The above summary represents the information on *Hydrastis* cultivation obtained from available literature. It will be noted that no references are given later than 1913. During the last decade much has been done on improved methods of cultivation by private growers. However, little information is available as to these improvements. Unquestionably the climatic conditions influence the technique of cultivation and collection. There can be no doubt but that the procedure of the growers of the Wisconsin and Ohio differs from that of the Puget Sound area, because of the difference in the climate.

The question of spring digging *versus* fall digging is yet unsettled. The value of September digging as compared to November digging must also be investigated. Fortunately, materials can be obtained from the Skagit Valley Golden Seal Farm at any time, and as time passes it is hoped that some specific data may be obtained that will clear up these questions, at least for the Puget Sound area.

#### REFERENCES.

- (1) U. S. Department of Agriculture, *Bulletin* No. 61.
- (2) *Bulletin of Pharmacy*, 25 (1911), 400.
- (3) *YEARBOOK, A. PH. A.*, 1 (1912), 115.
- (4) *Ibid.*, 2 (1913), 211.
- (5) *Ibid.*, 8 (1919), 235.
- (6) *PROC. A. PH. A.*, 53 (1905), 307.
- (7) *Bulletin Pharmacy*, 19 (1905), 325.
- (8) Bureau of Plant Industry, *Circular* No. 6.
- (9) *A. J. P.*, 85 (1913), 143.
- (10) *Ibid.*, 84 (1912), 299-300.
- (11) *JOUR. A. PH. A.*, 1 (1912), 5.

(To be continued)

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"The greatest single administrative need of the Public Health Service is uniformity of method of appointment and status of this scientific personnel."—The Parker Bill was signed by President Hoover on April 9th, it is a step in progress of the Service.