

# HYDRASTIS CANADENSIS.\*

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BOTANICAL DESCRIPTION.

**H**YDRASTIS grows in patches in rich, open, hilly woods. The stem is produced from a terminal bud of the perennial rhizome. Its growth is very rapid : a week or ten days' continuance of warm weather in May is sufficient for it to grow six inches high, and to expand its flowers.

The fertile stem is from six inches to a foot in height at flowering time, round, erect, and about an eighth of an inch in diameter. It is naked below, and at the top apparently forks, one branch bearing a leaf, the other a smaller leaf and flower.

The leaves at flowering time are only partly developed ; the lower is larger, measuring two to three inches in diameter ; the upper, which is about half as large, encloses the flower in the bud, and is generally but partially unfolded when the flower opens. After the plant has flowered, the leaves grow to be six or eight inches in diameter. In shape they are roundish cordate, and have five to seven palmate lobes. The veins are very prominent on the lower side of the leaf. The three petal-like flowers are small, white, and last but a few days. The sepals are only seen in the bud, falling away when the flower expands. The numerous stamens have white filaments, and they are the most conspicuous part of the flower,

The fruit ripens in July, turning from green to bright red. It is borne on an erect stalk, about an inch long. In shape it resembles a large red raspberry, with coarse drupes,

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\*Reference to literature on the subject is made by figures throughout the text. These correspond with the appended list of titles, which are arranged in chronological order.

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## HISTORY.

Hydrastis has been used from time immemorial by the North American Indians as a yellow dye and as a bitter tonic. The first scientific reference, so far as the author can determine, was made by Mr. Hugh Martin,<sup>1</sup> who, in 1782, read a paper entitled "An Account of some of the Principal Dyes employed by the North American Indian." In this he refers to hydrastis as follows :

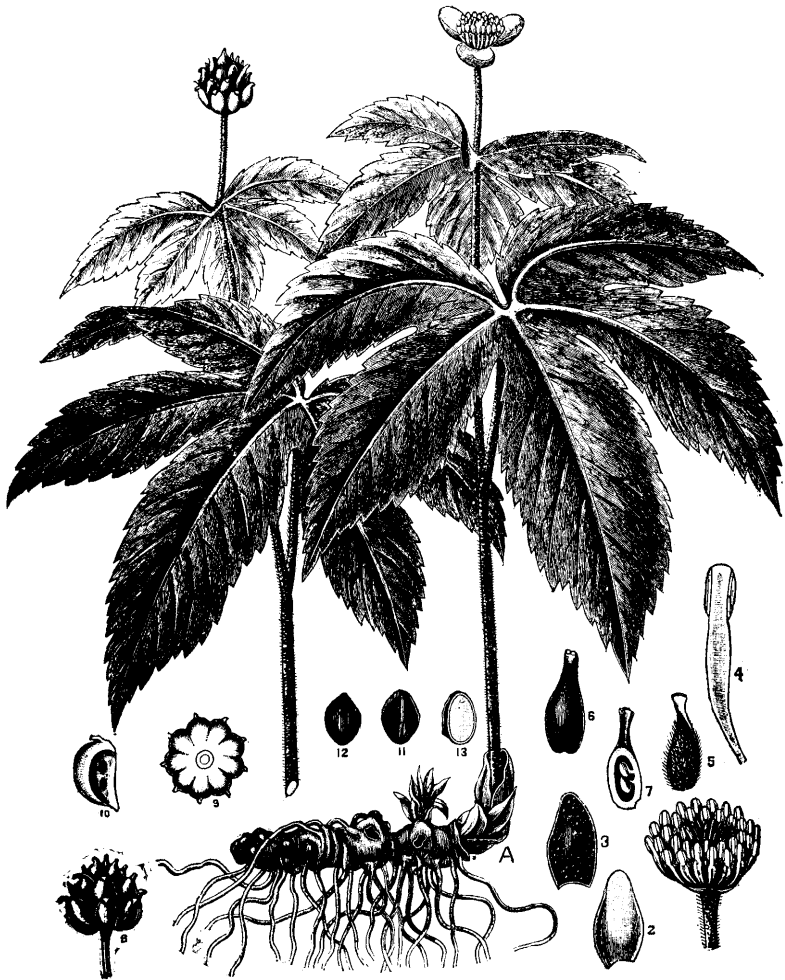
"The Indians dye their *bright yellow* with the root of a plant which might very well be called *radix flava Americana*. This root is generally from one to three inches long, and about one-half an inch in diameter, and sends out a great number of small filaments in every direction except upward ; these filaments are as yellow as the body of the root itself. From the root there grows up a stalk about a foot from the ground, and at the top is one broad leaf. A red berry, in shape and size resembling a raspberry, but of a deeper red, grows on the top of the leaf. This berry is ripe in July. "

The Indians imparted the uses of hydrastis to the settlers of America, and the drug was used by them as a domestic remedy and a dye from the earliest times, but did not attract the attention of the medical profession until 1798, when B. S. Barton<sup>2</sup> mentioned it as a remedy, crediting the Cherokee Indians as his authority. From this date nothing important appeared in medical literature until 1828, when C. S. Rafinesque<sup>3</sup> devoted considerable space to the drug, and gave a rude illustration of the plant,

In 1833 the editor of the Thomsonian Recorder' added to the foregoing the uses of hydrastis in the Thomsonian practice, and in the same year Wooster Beach<sup>5</sup> introduced the drug prominently in his *Materia Medica*. The first edition of the United States Dispensatory<sup>6</sup> (1833) neglected to mention hydrastis, but the second edition (1834) gave it a slighting reference in the appendix, which was carried unchanged through nine revisions, being slightly enlarged in the tenth (1854), and not transferred to the primary department until 1865. The first edition of the Eclectic Dispensatory by King and Newton,<sup>7</sup> 1852, gave the drug the first conspicuous consideration it received in medicine, and at once hydrastis and its preparations became prominent in Eclectic therapy. From this period Eclectic physicians made hydrastis one of their most valued drugs, and both the crude drug and its preparations as devised by them, became so important as to lead to the drug becoming official in the Pharmacopoeia of the United States (1860). Few American drugs are now more important than hydrastis,

## COMMON NAMES.

The term "golden seal," first applied by the Thomsonians, refers to the yellow seal like scars on the fresh rhizome. This name is common to collectors and the drug trade, but the term "yellow root" is also employed. In botanical works the names "orange root" and "yellow puccoon" are sometimes used ; while, owing to the appearance of the



A. Entire Plant. Natural size.

1. Flower without Sepals.
- 2 and 3. Sepals, different aspects.
4. Stamens.
- 5 and 6. Carpels.

7. Longitudinal Section of Carpel.

8. Drupe.
9. Transverse Section of Drupe.
10. Seed Capsule.

HYDRASTIS CANADENSIS.

fruit, the term "ground raspberry" has been used by country people. Owing to the fact that in domestic medicine the infusion of the root was employed in eye diseases, the names "eye balm" and "eye root" have been used. The bright yellow color, so useful to the Indians and early American settlers as a dye, gave the following names : Indian paint, yellow paint, Indian dye, golden root, Indian turmeric, wild turmeric, curcuma, Ohio curcuma, wild curcuma (spelled in old works kurkuma), jaundice root, and yellow-eye.

#### CONSTITUENTS.

*Berberine.*-The conspicuous coloring matter of hydrastis is an alkaloid, and in 1828 Rafinesque<sup>2</sup> named it hydrastine. This name the Eclectics adopted for the salts and alkaloidal compounds used by them so extensively, and adhered to it until after 1880. Then, owing to the fact that the term berberine had been affixed to it, and through persistent use established itself in scientific publications, they relinquished the name hydrastine.

In this connection it may be said that in 1824 Huttenschmid gave the name *jamaicine* to the yellow coloring matter of what he thought was *geoffroya inermis*;<sup>8</sup> that Chevallier and Pelletan (1826) gave the name *xanthropicrite* to the yellow coloring matter of *xanthoxylum clava herculis*; that Rafinesque (1828) gave the name hydrastine to the yellow coloring matter of *hydrastis canadensis*, and that last of all Buchner and Herberger (1830) gave the name berberine to the yellow coloring matter of *berberis vulgaris*; and thus is seen the remarkable fact that the three names which preceded the word berberine were brushed aside by the one least entitled to consideration. It should furthermore be added that all these names were applied to extracts of the drug, and that the alkaloid was not established until Geo. Kemp, in 1839, made a salt of berberine and picric acid.<sup>9</sup>

*Hydrastine* is the characteristic alkaloid of the drug. It was discovered in 1851 by Mr. Alfred P. Durand,<sup>10</sup> again made in 1856 by Prof. E. S. Wayne,<sup>11</sup> and in 1862 by Wm. S. Merrell.<sup>12</sup> Neither of the latter-named gentlemen was aware that the alkaloid mentioned by themselves had been previously discovered by Durand, and none of them obtained it pure. It was reserved for Mr. J. Dyson Perrins<sup>13</sup> to prepare pure hydrastine. The chemistry of hydrastine has subsequently been studied by various workers, and its constitutional formula was established in 1891 by Dr. M. Freund.<sup>14</sup> (Likewise the constitutional formula of berberine was brought to light in 1890 by W. H. Perkins.<sup>15</sup>) Pure hydrastine is colorless, and dominates the therapeutically active constituents of the drug.

*Third Alkaloid of Hydrastis.*-The first intimation of the existence of a third alkaloid in hydrastis root was given in 1873 by A. K. Hale.<sup>16</sup> The observation was confirmed afterward, in 1875, by John C. Burt,<sup>17</sup> who gave additional re-actions, and produced a drawing of the sulphate of the new base. Afterward, in 1878, Mr. Herman Ler-

chen,<sup>18</sup> following the directions of his predecessors,, also obtained the new alkaloid, which he named *xanthopuccine*, on account of the yellow color of the alkaloid as he obtained it. In 1888 F. Wilhelm,<sup>19</sup> in Prof. Schmidt's laboratory, incidentally obtained the alkaloid in minute quantity. In 1891 and 1894<sup>20</sup> Prof. E. Schmidt succeeded in isolating it from hydrastis root in larger amounts, He next received relatively large quantities of the hydrochlorate from E. Merck, and was thus enabled to work out the chemistry of the new alkaloid, which he named *canadine*,<sup>21</sup> rejecting the former name, xanthopuccine, as the pure alkaloid as made by him is white, not yellow.

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