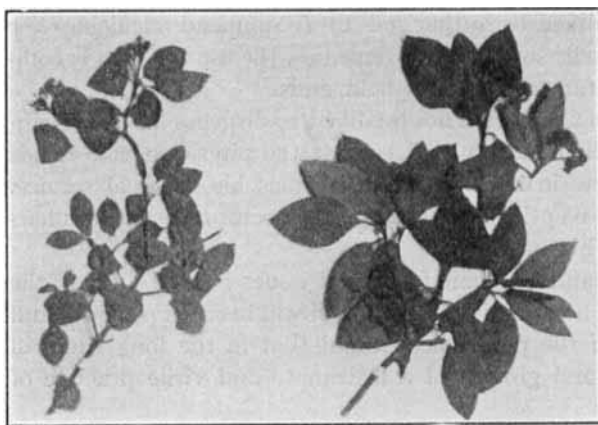


## SCIENTIFIC SECTION

### VIBURNUM CASSINOIDES, A RECENT SUBSTITUTE FOR VIBURNUM PRUNIFOLIUM.\*

BY HEBER W. YOUNGKEN.

About two years ago, while examining a commercial sample of a bark labeled "Black Haw," the writer's attention was attracted to the rather dark colored peculiarity of the specimen which in many other respects resembled what he had been accustomed to recognizing as the root bark of Black Haw or *Viburnum prunifolium* L. He had heard of the adulteration and the substitution of Black Haw with the bark of Shawnee Haw, as first reported by McManus, and determined



↑  
*Viburnum prunifolium*

↑  
*Viburnum cassinoides*

Fig. 1.—Branches of Black Haw (*V. prunifolium*) and Withe Rod (*V. cassinoides*) showing leaves and inflorescences.

to obtain some of the substitute bark with a view toward acquainting himself with its characteristics.

A short time before receiving the first lot of materials, news came to the writer of the use of considerable quantities of Shawnee Haw or *Viburnum nudum* L. bark by certain pharmaceutical manufacturing houses who regarded it as superior to Black Haw in their preparations.

A problem which at first appeared rather small gradually developed, because of the close natural relationship existing between several species of the genus *Viburnum*, into an investigation upon which I have continually worked for more than a year.

Two sets of samples were obtained from different sources for purposes of investigation. The first of these sets comprised about 2 oz. of a root bark and 2 oz. of a stem bark labeled respectively, "Shawnee Haw Root Bark (*Viburnum nudum* L.) and Shawnee Haw Tree Bark (*Viburnum nudum* L.). The second set included about 2 pounds each of (1) "A variety of Shonny Haw Root Bark," (2) "A variety of Shonny Haw Tree Bark," (3) True North Carolina Black Haw Root Bark," and (4) "True North Carolina Black Haw Tree Bark." The "Shonny Haw" barks in this set were collected in North Carolina. Not satisfied with the barks, alone, the writer obtained from the collector of this second set representative portions of the root systems, stems and leafy branches of the plants from which the bark had been gathered.

\* Scientific Section, A. PH. A., St. Louis meeting, 1928.

Upon sectioning and studying representative specimens of each of the barks in the two sets, I found both sets of root bark which were labeled "Shawnee Haw" and "Shonny Haw" identical structurally. This was also the case for the tree or stem barks labeled "Shawnee Haw" and "Shonny Haw" respectively. The Black Haw root and tree barks proved to be authentic specimens.

A comparative examination of the "Shawnee Haw" and "Shonny Haw" root barks with the commercial sample labeled Black Haw showed that these three barks were identical histologically.

The writer next visited the Arnold Arboretum at three different seasons of the year and there collected authentic material including portions of root systems,

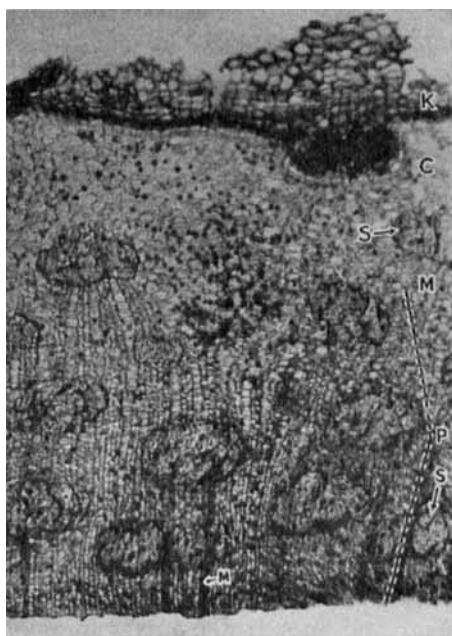


Fig. 2.—Photomicrograph of a cross-section of the root bark of North Carolina Black Haw (*Viburnum prunifolium* L.) *k*, cork; *c*, secondary cortex; *s*, group of stone cells; *m*, medullary ray; *p*, phloem.

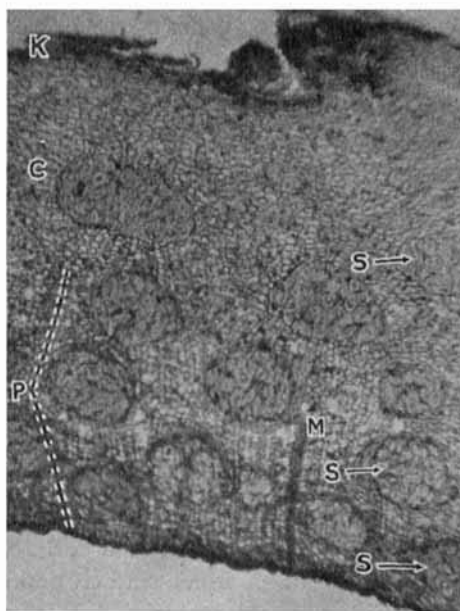


Fig. 3.—Photomicrograph of a cross-section of the root bark of a so-called "variety of Shonny Haw" and identified as *Viburnum cassinoides* L.) *k*, cork; *c*, secondary cortex; *p*, phloem; *s*, stone-cell group; *m*, medullary ray.

stems and leaves, flowers and fruits from a series of living *Viburnum* species including *V. prunifolium*, *V. Lentago*, *V. nudum* and *V. cassinoides*. A comparative macroscopic and microscopic study of the leaves, stems, bark and roots of the material from North Carolina with the authentic material gathered in the Arnold Arboretum showed that the "Shonny Haw plant" was structurally identical with *Viburnum cassinoides* L. of the Arnold Arboretum.

The Shawnee Haw root and tree barks of the first set were also identical structurally with similar barks gathered from *V. cassinoides* L. in the Arnold Arboretum, but differed structurally from authentic samples of root and stem barks taken from *Viburnum nudum* L. growing in the Arnold Arboretum.

To further confirm that the substitute labeled "Shonny Haw" was derived from *V. cassinoides* L., the writer next visited the Gray Herbarium of Harvard University and compared the dried leaves in the material labeled "Shonny Haw from North Carolina" with the leaves on herbarium sheets of *Viburnum cassinoides* L. gathered at Pinehurst, N. C. by Otto Katzenstein and of *Viburnum nudum* L. collected in a swamp at Parksville, N. C. by L. F. and Fannie R. Randolph and found the leaf material designated as "Shonny Haw from N. C." structurally identical with that of *Viburnum cassinoides* L. The dried leaf material was further compared as to its structural characters with the leaves found on a living plant of *Viburnum cassinoides* growing in the Harvard University Gardens at Cambridge, Mass. and found to be similar in morphologic details.

#### DESCRIPTION OF VIBURNUM CASSINOIDES L.

*Viburnum cassinoides* L. is a shrub or small tree rising to the height of from 1 to 4 meters. It is found in swamps and wet thickets from Newfoundland to North Carolina and west as far as Minnesota and Manitoba. Its leaves are subcoriaceous, elliptic, ovate, oblong or ovate-lanceolate, up to 10 cm. in length, acute or bluntly acuminate at the apex, irregularly dentate to denticulate and undulate along the margin, dull green on the upper surface which is glabrous or glabrate, paler green on the lower surface, the veins on this surface being scurfy-punctate. Its petioles, twigs and inflorescences are very scurfy. Its inflorescences consist of cymes, 5 to 12 cm. in breadth which are usually longer than the peduncles. The flowers are perfect and white. Its fruits are bluish, ovoid or subglobose drupes containing a flattened stone.

#### DESCRIPTION OF ROOT BARK OF VIBURNUM CASSINOIDES L.

In irregular, transversely curved or quilled pieces from 0.5 to 3 mm. in thickness and 1.5 to 14 cm. in length, outer surface grayish brown to dark brown or blackish brown, or, where the cork has been scraped off, brownish red, longitudinally wrinkled, inner surface pinkish brown to reddish brown and yellowish in areas, longitudinally striated, fracture short and uneven, the cut or fractured surface showing in bark of medium thickness, a thin, blackish or dark brown cork, a brownish red or pinkish middle bark, and a whitish or brownish red or pale yellowish inner bark in which pale yellow groups of cells may be seen with a hand lens; odor slightly valeric acid-like, becoming more pronounced when the bark is ground and very strongly valeric acid-like, when it is triturated in a mortar with phosphoric acid; taste bitter and astringent.

A 1-100 solution of ferric chloride gave a greenish black coloration to the inner surface of the whole bark.

#### HISTOLOGY OF THE ROOT BARK OF VIBURNUM CASSINOIDES L.

Under the microscope, this bark exhibits a somewhat lignified cork, a cork cambium, a secondary cortex and a broad phloem. The latter being the broadest region.

Scattered throughout the cortex and phloem are numerous circular to oval groups of stone cells with somewhat scalloped and toothed margins as seen in cross-sections. The stone-cell groups vary in size, but the larger groups predomi-

nate. They appear for the greater part less deeply indented along the margin than the stone-cell groups in the root bark of *Viburnum prunifolium*. The individual stone cells examined varied in size from 20 to 79.2 microns in width to from 40 to 96.56 microns in length.

Numerous rosette aggregates of crystals of calcium oxalate as well as crystal fibers containing rosette aggregates are scattered through the cortex and phloem. Monoclinic prisms of calcium oxalate also occur but are relatively few. The rosette

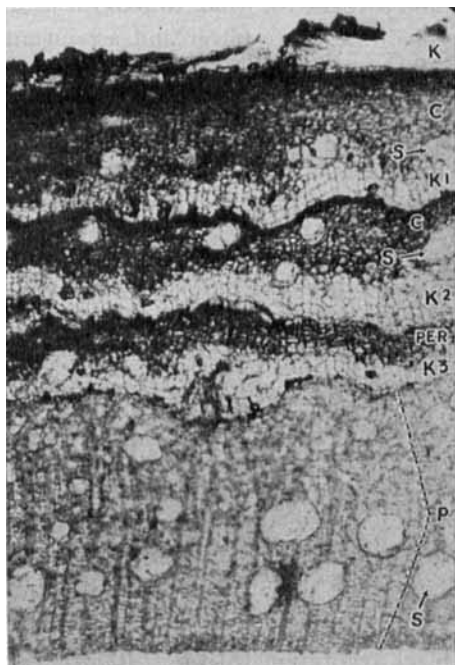


Fig. 4.—Photomicrograph of a cross-section of North Carolina Black Haw stem bark (*Viburnum prunifolium* L.). *k*, cork; *c*, cortex; *k*<sup>1</sup> and *k*<sup>2</sup>, cork layers formed at successive depths in cortex, and *k*<sup>3</sup> in pericycle (*per*) as result of activity of cork cambia of secondary origin; *p*, phloem; *s*, group of stone cells. The margins of the stone-cell groups tend to become more deeply notched in both the root and stem barks of this species than in corresponding barks of *V. cassinoides*.

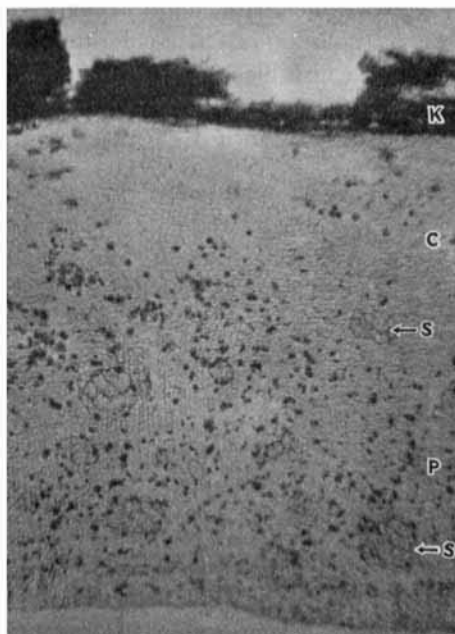


Fig. 5.—Photomicrograph of a cross-section of the stem bark of a variety of the so-called "Shonny Haw" and determined as *Viburnum cassinoides* L. *k*, cork; *c*, cortex; *p*, phloem; *s*, stone-cell group. The black objects in the thin-walled cells of this and other sections figured in this article represent rosette crystals of calcium oxalate.

aggregates are mostly under 40 microns in diameter. The largest one found measured 51.76 microns. The medullary rays are 1 to 3 cells in width.

The parenchyma of the cortex and phloem and the medullary ray cells contain starch grains and a tannin giving a greenish to greenish black coloration with 1-100 solution of ferric chloride. The starch grains are mostly simple, more or less circular, the larger ones being mostly up to 12 microns, a few up to 15 microns in diameter. A few 2 to 3 compound starch grains also occur.

## DESCRIPTION OF THE STEM BARK OF VIBURNUM CASSINOIDES L.

In transversely curved pieces, quills or irregular oblong chips, 1.5 to 20 cm. long and from 0.5 to 3 mm. thick, outer surface gray on young stems and showing circular to elliptic lenticels, to grayish brown, blackish brown or black and rough on older stems, reddish brown where the cork is abraded, showing occasional moss and foliaceous lichens, inner surface pale yellowish brown to pinkish or reddish brown, longitudinally striate, fracture short, irregular, showing a grayish to black cork, a greenish phelloderm on young bark, and a yellowish white to pinkish white or yellow inner bark, odor strongly valeric acid-like, taste bitter and astringent. A 1:100 solution of ferric chloride, when applied to the inner surface of this bark, gave a greenish black coloration.

## HISTOLOGY OF THE STEM BARK OF VIBURNUM CASSINOIDES.

Under the microscope, this bark exhibits a broad, more or less lignified cork, a cork cambium, a narrow secondary cortex, a broader primary cortex and a phloem. A few scattered groups of stone cells occur in the secondary cortex. Numerous groups of stone cells occur in the primary cortex while smaller and larger groups of stone cells and bast fibers occur in the broad phloem region. While the stone-cell groups are frequently indented along the margin, they are not as deeply lobed and cleft as are many of these groups in the stem bark of *Viburnum prunifolium*. The individual stone cells measured were up to 85 microns in breadth and 146 microns in length. The medullary rays were mostly 1 to 2 cells in width, but a few were seen from 1 to 3 cells wide.

Numerous rosette crystals of calcium oxalate and crystal fibers occur in the cortex and phloem parenchyma. A few monoclinic prisms are also present in these regions.

Tannin, giving a greenish to greenish black coloration with a 1:100 solution of ferric chloride, and a greenish brown resinous substance also occurred in many of the parenchyma cells of this bark.

## DISTINCTIONS BETWEEN THE ROOT BARKS.

*Viburnum prunifolium*:

Outer surface grayish brown to brown, or where cork has scaled off, pinkish brown.

Inner surface reddish brown to yellowish.

Odor valeric acid-like, becoming more pronounced when triturated with phosphoric acid.

Larger stone-cell groups irregularly oblong to ovate and usually with very irregular margins, as seen in cross-sections. More deeply indented.

Medullary rays 1 to 2 cells in width, very rarely, 1 to 3 cells wide.

*Viburnum cassinoides*:

Outer surface grayish brown to dark brown to blackish brown, or, where cork has scaled off, brownish red.

Inner surface pinkish brown to reddish brown and yellowish, in area.

Odor slightly valeric acid-like, becoming strongly pronounced, when triturated with phosphoric acid.

Larger stone-cell groups circular to oval with somewhat scalloped and toothed margins, as seen in cross-sections. Less deeply indented.

Medullary rays frequently 1 to 3 cells wide, although the 1- to 2-celled type is also found.

## DISTINCTIONS BETWEEN THE STEM BARKS.

*Viburnum prunifolium:*

Outer surface silvery gray on young bark, grayish brown on older bark, or reddish brown where cork has scaled off.

Inner surface yellowish or reddish brown or, yellowish with reddish brown blotches and streaks.

Odor faint to faintly valeric acid-like and only slightly more pronounced, when treated with phosphoric acid.

Stone-cell groups indented along the margin, in many cases, deeply lobed and cleft.

Medullary rays 1 to 2 cells wide.

*Viburnum cassinoides:*

Outer surface gray on young stems to grayish brown, blackish brown or black, or, reddish brown where cork is abraded.

Inner surface pale yellowish brown to pinkish or reddish brown.

Odor strongly valeric acid-like and very strongly pronounced on triturating with phosphoric acid.

Stone-cell groups frequently with irregular margins, but not as deeply lobed and cleft.

Medullary rays mostly 1 to 2 cells wide, occasionally 1 to 3 cells wide.

When a 1:100 solution of ferric chloride was applied to the inner surface of each of the barks studied, a greenish black coloration resulted, indicating the presence of a tannin, responding in a similar way to that previously found in other *Viburnum* species.

A comparison of the leaf material of the true Shawnee Haw or Shonny Haw (*Viburnum nudum* L.) with that of the Withe Rod (*Viburnum cassinoides* L.) showed that those of the former are elliptic to ovate to obovate to elliptic lanceolate, 5 to 12 cm. long, entire or obscurely crenulate or undulate with an occasional tooth, broadly cuneate at the base, whereas those of the latter species are elliptic ovate, oblong, or ovate lanceolate, 3 to 10 cm. long, with an irregularly dentate to denticulate and undulate margin and more narrowly cuneate at the base.

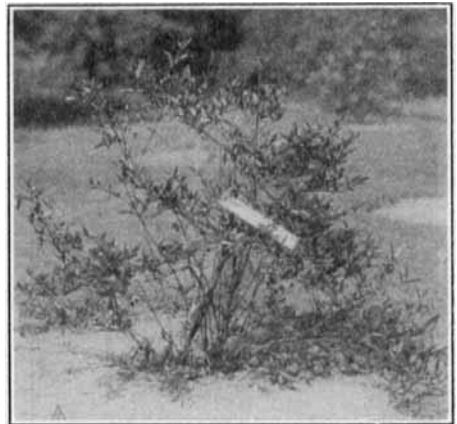


Fig. 6.—The true Shonny Haw or Shawnee Haw, (*Viburnum nudum* L.), photographed as growing in the Arnold Arboretum.

The cymes of *V. nudum* were found to be usually shorter than the peduncles whereas those of *V. cassinoides* were usually longer than the peduncles.

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## CASCARA.\*

BY T. J. STARKER.<sup>1</sup>

For the last four years the cascara tree has been under the observation of the faculty and senior students at the Oregon State College, and it is the purpose of this paper to summarize briefly the general methods of the industry and the results we have obtained.

Cascara, (*Rhamnus Purshiana*, De Candolle) was discovered on the banks of a tributary of the Columbia about 1805 by members of the exploring party

\* Section on Historical Pharmacy, A. PH. A., Philadelphia meeting, 1926.

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