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.

MASSACHUSETTS COLLEGE OF PHARMACY.

CASCARA.*

BY T. J. STARKER.[1]

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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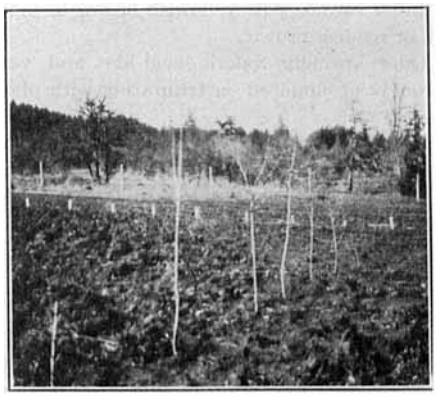
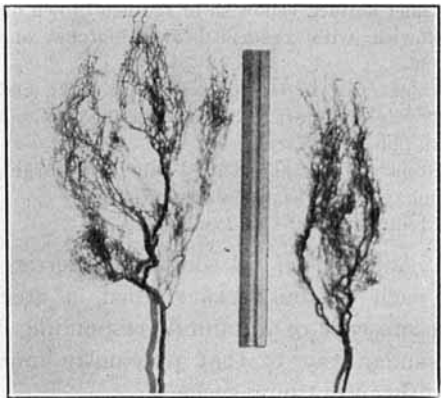
of Lewis & Clarke. It was first noted on the California coast in 1816 by a Russian naturalist, Eschscholts. It has been grown under cultivation at the Arnold Arboretum since 1873.

The tree is claimed to have been known since the early part of the nineteenth

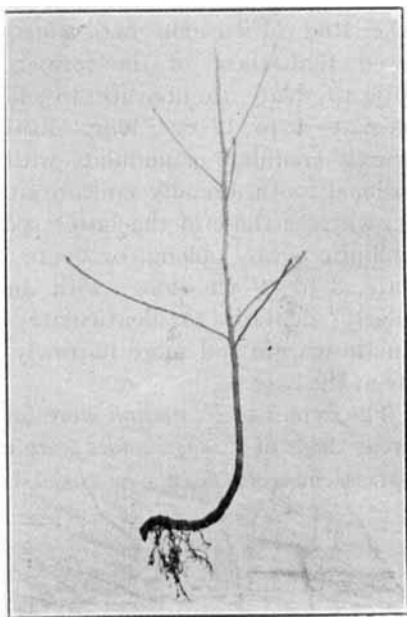


View of Oregon State College Cascara plantation.



Root system after 1 year in transplant bed.

Animal damage to sprouts.



New Cascara plant from Layering.

century to the Mexican and Spanish priests of old California. It was known by the Spanish name "Cascara Sagrada" (sacred bark), so named because the wood was supposed to be identical with the "Shittim" or "Chittim" wood used in the Arc of the Covenant. The same wood was also said to have been used for dowel pins in the construction of King Solomon's Temple.

The diameter of the average cascara tree is about six inches, twelve inches being rare. In height the tree seldom exceeds 60 feet; with approximately half this altitude the rule. The normal yield per tree is about 25 pounds of green bark.

On account of the scattered and remote growth of the species, the industry is followed by few persons and only the expert and experienced collector is able to wrest a livelihood from the business which, on account of peeling conditions is only profitable in late spring and early summer.

PROPERTIES.

The American Indians were the first to teach the properties of the bark, the gathering of which differs in no essential aspects from the methods of the original homesteaders sixty years ago. The tree looks much like common white alder and favors most lowlands, cut over timber lands and stream margins, persisting commonly with species of fir, hemlock and spruce.

Prof. Justin Powers, of the School of Pharmacy, Oregon State College says, "Although species closely related to it have been used as cathartics from a very early date, it is only within comparatively recent times that Cascara Sagrada has come into general use. Among the related species which it has largely replaced are *Rhamnus cathartica* and *Rhamnus frangula.*

Without doubt Cascara Sagrada was first used by the American Indian from whom its virtues were learned by the Spanish priests of old California. Since being introduced to the medical profession in 1877, there is probably no single drug which so quickly attained popularity as did Cascara Sagrada. That this popularity was deserved is shown by the fact that it is still held in high esteem and has in a large measure replaced several similar drugs of our materia medica.

The first publication concerning the medicinal value of Cascara Sagrada was that of Dr. J. H. Bundy of Calusa, California in 1877. To Parke, Davis & Co., of Detroit, belongs the credit of first offering a legitimate preparation of the drug to the medical profession immediately following Dr. Bundy's publication.

The extended use of Cascara Sagrada during a period of over fifty years, and numerous investigations have not resulted in a definite determination of the chemistry of its active constituents. In this field lies an unusual opportunity for research.

For the treatment of habitual constipation due to the lack of functional activity of the intestine or lack of digestive secretions, Cascara Sagrada has no peer. It is said to be more active and more certain in its action than any one of the closely allied species which are used similarly. In the use of most laxatives, gradually increasing doses are necessary to produce their effect, but this is not true of Cascara Sagrada. It not only increases the secretions of the gastro-intestinal canal, but, due to its bitter principle, it acts as a tonic, improves the appetite and digestion, and prevents the constipation which usually follows the use of similar drugs. In fact so marked are those characteristics that the dose may be gradually diminished and finally discontinued without the return of constipation.

PLANTINGS.

In 1914, experimental work on the planting of Cascara was started at the Canadian Experimental Station of the Dominion Department of Agriculture at

Sidney, on Vancouver Island. Unfortunately, the area which the trees occupied was needed for other purposes and the planting was later destroyed before satisfactory data on its growth under cultivation could be obtained.

Several small plantings in the Willamette Valley have been started, principally, by nurserymen. It should prove interesting to watch the development of these young seedlings under cultivation. To date they have been growing very well and in 12 or 15 years the trees should be large enough for peeling.

The Forest School has successfully transplanted wild stock and has also produced plants from seed and layers. Thus far cuttings have been a failure.

About $^1/_4$ acre of seedlings are now growing nicely in the Forest Arboretum near Corvallis.

PEELING OPERATION.

A tree is "spotted" and if small is peeled standing, otherwise it is peeled as high as the operator can reach and then felled for the easy removal of the remainder. A lateral incision is made in the bark with a sharp knife, then by means of a thin metal spud, usually made from an auto spring leaf, the bark is cleft from the trunks and limbs. The strips are then placed in gunny sacks and carried on the peeler's back to a horse trail, where the sacks are placed upon animals' backs and conveyed to drying grounds.

Drying consists of exposing the raw bark to the sun's rays on wooden platforms or canvas spread upon the ground, which prevents mold. During the rainy months the bark is dried under shelter.

The bark is then reduced to chips, usually by hand, although recently several motor breakers have been installed in the region. After reducing to chips they are sacked and ready for sale.

Good peelers under favorable conditions can peel from 100 to 250 pounds of dry bark per day, and with a price of from 10¢ to 12¢ per pound, have been known to make twenty to thirty dollars per day.

MERCHANDISING.

The first buyers are usually local warehousemen who in turn sell to pharmaceutical house agents, the material moving to water or rail transportation. The commercial Cascara is then ready for shipment to the world markets. London, England, is the largest single purchaser of Cascara, about 1200 tons yearly finding its way to this market, and thence to other European cities. From 5,000,000 to 7,000,000 pounds on the average are cut annually in the coast ranges of Western Oregon, Washington and California. A much smaller amount being produced in British Columbia, the only other place where this tree grows in commercial quantities.

FUTURE.

Dealers and forestry officials who have studied the methods practiced by the industry, prophesy the end of the crop within a few years if the present conditions continue. According to Government estimates in 1922, over 500,000 trees were peeled.

Each year it is necessary to gather from the more remote and inaccessible areas to meet the increasing demands. Areas are already being peeled over for

the second and third time. This second and third peel is said to come from trees that were too small to yield heavy enough bark at previous cuttings. The trees peeled to-day are much smaller in the aggregate than trees peeled twenty or thirty years ago.

One means of lengthening the life of the industry would be to find a satisfactory method using more of the tree.

In view of the fact that the thinner bark yields the highest per cent of constituents, it may be possible and profitable in the future to grind up the smaller twigs and limbs for extraction of the contents. This process would permit of much closer utilization, and should make the growing of the tree on a commercial basis more profitable.

CHINESE BOTANICAL SOURCES OF EPHEDRINE AND PSEUDOEPHEDRINE.*

BY B. E. READ AND J. C. LIU.[1]

After the very illuminating note upon the botanical sources of ephedrine by Holmes (7) it appears quite clear that the European source of these alkaloids is not the same as the Chinese Mahuang as was assumed by Chen and Kao (3). A private communication from Merck's assures us that contrary to recent statements (2) their European supplies are yielding ephedrine and only a small amount of pseudoephedrine. Various publications from these laboratories (4) show that ephedrine and pseudoephedrine (12) occur in Chinese Mahuang. Hence it is plain that there are good sources for these two alkaloids in both Europe and Asia.

The work of Neilsen, *et al.* upon American ephedras confirms our results (14), namely that California ephedra contains no ephedrine nor pseudoephedrine. We found a small amount of a basic substance in the Nevada species which we should like to try out further.

The article published by Neilsen (10) dealing with Chinese species of *Ephedra* shows the great need for definite identification and classification of the Chinese plants. The purpose of this paper is to provide this as adequately as possible.

Material has been sent by us to Dr. O. Stapf, the world's authority upon *Ephedras*. His well-known monograph (16) sets forth the characteristics of the various species quite clearly. It is now definitely known that the material collected and sold as Mahuang consists chiefly of *Ephedra sinica*, Stapf, an entirely new species described by him (17) from incomplete material in the *Kew Bulletin*.

This plant we have made unusual efforts this year to personally collect in numerous out-of-the-way places, and to secure it from remote areas through friends. We have now obtained plenty of complete material providing the male, female and flowering plants, which come from the exact areas where the drug collection is made. This plant grows abundantly in North China particularly on the mountains running up through Shansi, Northern Chihli, and around the edge of the Mongolian plateau down to the sea near Peitaiho. At the latter place Cowdry (5) listed *Ephedra equisetina*, Bunge, in 1922. This species is quite common in

* Received for publication December 15, 1927.

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