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Comparative Studies of the Witch Hazels *Hamamelis virginiana* and *H. vernalis*

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ABSTRACT

An investigation of *Hamamelis vernalis* Sarg. and *H. virginiana* L. was begun in southwestern Arkansas in the fall of 1976. An overlap of flowering periods occurred from late November through December, affording the possibility of hybridization. At one site the two taxa flowered simultaneously only 30 yards apart. Variation occurs in both taxa and there is a degree of overlap in most characters, but the composite of diagnostic features distinguishes the two species. The hybrid origin of *H. vernalis* suggested by Jenne (1966) does not seem likely.

INTRODUCTION

According to most manuals dealing with the flora of the eastern United States, the genus *Hamamelis* L. (Hamamelidaceae) comprises two species, the fall-blooming witch hazel, *H. virginiana* L., and the early spring-blooming or common witch hazel, *H. vernalis* Sarg. A southern entity formerly recognized as *H. macrophylla* Pursh is now often included in *H. virginiana*. *H. virginiana* and *H. vernalis* have been separated primarily on the basis of habitat, flowering period, flower color, petal length, and growth form. The leaves and fruit of both taxa are very similar.

The type species, *Hamamelis virginiana*, ranges from Canada to Florida and the Gulf Coast, and from the Atlantic Coast to Iowa, Missouri, eastern Oklahoma, and eastern Texas. It occurs mostly in open woodlands. Local populations are usually rather uniform, but Anderson (1933) indicated distinctive variation from region to region.

H. vernalis is reported to be confined to gravelly beds and rocky banks of streams in the Interior Highlands of Missouri, Arkansas, and eastern Oklahoma. Variation in local populations is usually conspicuous. Jenne (1966) interpreted this entity as a hybrid between *H. virginiana* and a probably extinct Ozarkian parent. Tucker (1976) suggested that environmental effects rather than hybridization effects might account for much of the local variations in *H. vernalis*.

Steyermark (1934, 1963) in Missouri, reported finding the two witch hazels in adjacent areas where wooded slopes meet rocky streambeds, but he stated that the different flowering times prevented hybridization. Jenne (1966) reported that flowering periods sometimes overlapped.

The present investigation was initiated after observing that both witch hazels were found in close proximity along several streams in the southern Ouachita Province and on the West Gulf Coastal Plain near the "fall line" separating the two divisions. The purpose was to determine the possible overlap in the flowering periods and to compare morphological features and habitat patterns that might indicate the relationships of the two entities.

METHODS AND MATERIALS

Stands of both witch hazels for repeated observations were located in Clark, Hot Spring, and Montgomery Counties. Streams were searched in Clark and Pike Counties to determine the extent of occurrence of *H. vernalis* in the West Gulf Coastal Plain. Single visits were made to other stations in southwestern Arkansas. In addition, several sites were visited in northern Arkansas and eastern Oklahoma. Herbarium specimens were studied at the University of Arkansas at Fayetteville and Henderson State University. Comparisons were made of flowering periods, fragrance, flower color, petal length, pubescence of young branchlets, leaf blade persistence and shape, clonal habits, and habitats.

RESULTS

Hamamelis vernalis is almost entirely restricted to the Interior Highlands, while populations identified as *H. virginiana* occur both in the Highlands and on the Gulf Coastal Plain (Fig. 1). Some Coastal Plain populations may represent *H. macrophylla*, but this was not sufficiently investigated.

H. virginiana was never found in the streambeds, but it did occur on some rocky banks with *H. vernalis*. *H. vernalis* occurred most often in the streambed on gravelly or rocky banks that are often flooded. It was never found on the upland slopes, where most *H. virginiana* occurs.

H. vernalis was found on the Gulf Coastal Plain along the lower De Roche Creek in Hot Spring and Clark Counties, along the lower Caddo River below the re-regulating dam of DeGray Reservoir in Clark County, and along Wolf Creek in Pike County. None of these populations extended more than two miles from the "fall line" between the Highlands and the Coastal Plain.

The dominant flowering period of *H. vernalis* occurred from January to mid-March, but some flowers were found opening in late November on the lower Caddo River in Clark County, and on Pittman Creek and the uppermost Caddo River in Montgomery County. Most petals fell in early March, but a few persisted until April. The dominant flowering period of *H. virginiana* is reported mostly in October and November, with occasional early flowering in September. During the present study most petals expanded in October and persisted until late December. From mid-November until the end of December simultaneous flowering was found where both taxa occurred in the same general area on the upper and lower Caddo. On the upper De Roche Creek in Hot Spring County, simultaneous anthesis occurred where the two taxa were only 30 yards apart. The pronounced fragrant of *H. vernalis* flowers attracted frequent insect visitors, and resulted in our discovery of some stands before they were seen. No insects were seen visiting the very faint-scented *H. virginiana* flowers. All plants including those with overlapping flowering periods at the same location could be placed in either *H. virginiana* or *H. vernalis* by the composite of distinguishing characters (Table 1).

The petals of *H. virginiana* were usually about three times as long as those of *H. vernalis*. *H. vernalis* petals were less than 9 mm in length, often about 6 mm. *H. virginiana* petals were normally more than 10 mm long, often about 20 mm. Although some individual *H. virginiana* flowers had petals shorter than 10 mm, the petal length on most flowers of every plant observed exceeded the maximum petal length of *H. vernalis*.

The petals of *H. virginiana* observed were lemon-yellow, sometimes very pale. Red-flushed petals have been reported but are very rare in *H. virginiana*. The petal color of *H. vernalis* varied from deep yellow to orange or frequently red. In our study areas, petal color varied not only from plant to plant, as Anderson (1933) described, but even among flowers on the same plant. A clone repeatedly visited

on the lower Caddo River had deep red petals which later faded to yellow.

DISCUSSION

Hamamelis vernalis shares the winter and early spring flowering period with the Asian species of the genus. Variable flower color also occurs in the Asian taxa. This and the fossil evidence presented by Berry (1923) suggests that these taxa may have once been a single widespread inherently variable species. The present restricted range of *H. vernalis* suggests that it is a relict. *H. virginiana* may have been derived from the ancestral *H. vernalis* by mutations which provided broad tolerances to the present day woodland environment.

Meehan (1890) failed to find insects visiting *H. virginiana* and concluded that the flowers were self-pollinating. In support of Meehan's view, we found no insects visiting *H. virginiana*, but many insects were attracted to the more brightly colored and fragrant *H. vernalis*. Loss of color and fragrance could logically correlate with the development of autogamy. The advantages of autogamy (Grant and Grant, 1965; Radford et al, 1974) could have provided a segment of the ancestral *H. vernalis* population the means to exploit the present wide range of *H. virginiana*.

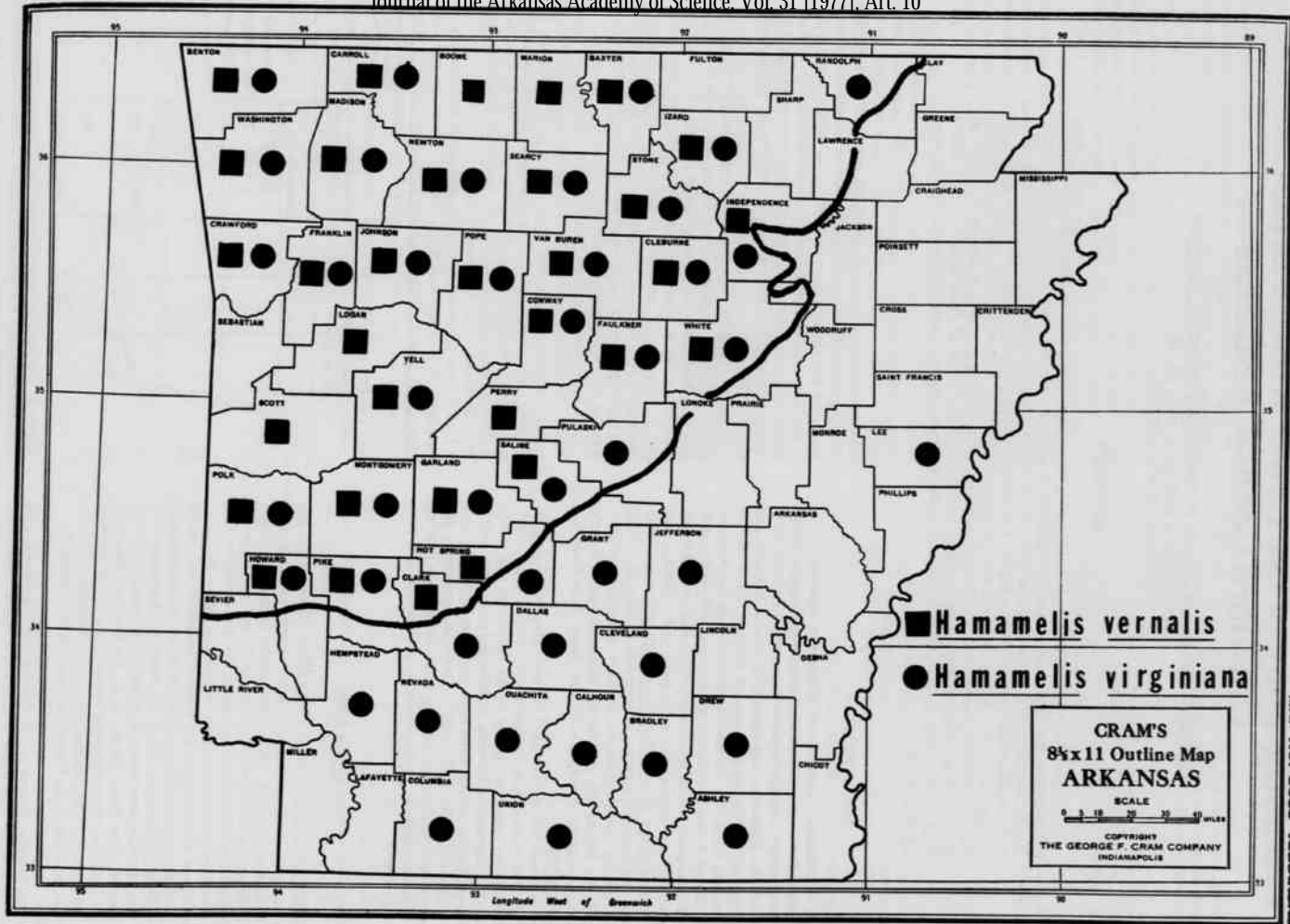
Tucker (1976) suggested that some of the variation of flowers in *H. vernalis* might be induced by flooding. In the present study a high degree of variation was observed in stands which were not flooded during the anthesis period. Further studies will be needed to determine the role of environmental influence on the expression of variation in this taxon.

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Table 1. Distinguishing characteristics of two species of *Hamamelis*.

	COMPARISON OF CHARACTERISTICS	
	<i>Hamamelis vernalis</i>	<i>Hamamelis virginiana</i>
1. PERIOD OF ANTHESIS	November - early April, dominant January - March	September - late December dominant October - November
2. FRAGRANCE	distinctive, clove-like	very faint
3. PETAL LENGTH	5 - 9 mm	10 - 25mm
4. COROLLA COLOR	deep yellow or orange or frequently red-flushed to deep red, highly variable	usually lemon yellow, rarely red-flushed
5. COLOR OF INNER SURFACE OF CALYX	usually red or reddish, sometimes yellow	yellow-green to yellow
6. YOUNG BRANCHLETS	densely stellate-tomentose	somewhat pubescent to glabrate
7. LEAF BLADES	often persistent after withering	readily deciduous
8. BASE OF LEAF BLADES	mostly subcuneate, occasionally oblique	usually oblique
9. STOLONS AND SUCKERS	closely spaced clonal habit, forming thickets	usually rare, occurring more often on the West Coastal Plain
10. HABITAT	gravelly beds of streams or rocky creek banks	upland areas and wooded slopes, sometimes in valleys along streams



MAP NO. COSS-ARKANSAS

Figure 1. Map showing known range of *Hamamelis vernalis* and *H. virginiana* by counties. The "fall line" is indicated by the heavy solid line.