

RUBIACEAE.

Cephalanthus occidentalis L. Common.

CAPRIFOLIACEAE.

Viburnum rufidulum Raf. Common.

 IS QUERCUS ARKANSANA A HYBRID?

ERNEST J. PALMER

In looking over Dr. Trelease's recently published monograph of the American Oaks¹ I note that *Quercus arkansana* Sargent is there treated as a hybrid, *Quercus marilandica* Muenchhausen and *Quercus nigra* Linnaeus being given as the parent species. As only a list of the hybrids is given without descriptive notes the author does not state the grounds upon which he arrives at this conclusion, although in a foot-note a statement from Dr. Roland M. Harper is quoted, in regard to an Oak collected by him in Pike County, Alabama, which has been referred to *Quercus arkansana*, and which Dr. Trelease also includes under the same hybrid parentage, to the effect that it does not there grow in association with *Quercus marilandica*, a circumstance which, as we shall see, is also largely paralleled in the Arkansas localities.

Since few botanists have had a chance to see this comparatively rare Oak growing in its native habitat or even to become acquainted with it through herbarium specimens, it may be worth while to give a brief résumé of the facts known regarding it.

Quercus arkansana was first found in Arkansas by Mr. B. F. Bush, in 1909, growing along Yellow Creek, a small tributary of Little River, near Fulton, or more exactly near the village of McNab, Hempstead County, and was described by Professor Sargent² from specimens collected there by Bush and later by himself. If the Alabama Oak is specifically identical, as I believe to be the case, its first discovery must be credited to Dr. Charles C. Mohr, who collected it along a small tributary of the Conecuh River in 1880, and it was he also who first suggested the theory that it was a hybrid between the species mentioned by Dr. Trelease. Dr. Mohr does not mention this Oak in his Plant Life of Alabama, nor does he appear to have published anything about it elsewhere.

Dr. Harper explored the Alabama locality in 1912 and published an interesting account of the flora,³ including a foot-note on the Oak, which he regarded as an undescribed species. A sheet of the specimens collected by Mohr (no. 22, July 4, 1880. "*Quercus*.—aun [?] var. hybrid inter *Q. aquatica* et *nigra*. Arb. gracilis 20–24' alt. trunco 2–3½" diamet. glaber-

¹ Mem. Nat. Acad. Sci. xx. (1924).

² Trees & Shrubs, II. 121–122, pl. 152 (1911).

³ The "pocosin" of Pike County, Alabama, and its bearing on certain problems of succession. (Bull. Torrey Bot. Club, xli. 209–220 [1914].)

rimo cinereo. In moist but sandy soil, wooded banks near Troy, on a tributary of Conecuh river.") with mature leaves and young fruit, is in the herbarium of the Arnold Arboretum, as are also a set of Harper's specimens (no. 152, Nov. 6, 1912, "In the 'pocosin' between Troy and Brundidge, Pike County."), with mature leaves and separate fruit; and a second collection (no. 154, March 27, 1913), showing young leaves and flowers, and a small photograph of the trunk. There is also in the same collection a series of specimens from the Arkansas stations by Bush, Sargent and Palmer.

In the original description of *Quercus arkansana* Sargent says that it is common at the type station but apparently very local. This statement still holds true, although on numerous visits to southwestern Arkansas during the past twelve years I have been able to extend its range somewhat locally, and it has been found to be much more common than was at first supposed. In addition to the localities on Yellow Creek it has been found along Bridge Creek, Sandy Bois d'Arc Creek and several other small tributaries of Little River and Red River.

The topography of this small area is peculiar and somewhat remarkable, consisting of low hills and sharp ridges dissected by deep ravines, evidently a relic of the old Tertiary peneplain projecting into the lowlands of the Red River valley. Sterile clays and gravels cover the higher levels of the low plateau and remain on the crests of some of the higher ridges; in the ravines and valleys of the small creeks which traverse it and on the slopes and lower levels along its margins, beds of fine loose sand interstratified with clays and a soft sandstone, passing into marly limestone, with large calcareous oyster shells and other typical Upper Cretaceous fossils, are exposed. In this restricted area, nearly surrounded by the stiff black alluvial lands of the river bottoms, which are subject to frequent overflows and are in places permanently swampy, grow many peculiar plants, confined to this environment and some of them now far removed from the general range of their kind. The plants forming these colonies bear every evidence of being relics of a former wider distribution—stragglers left behind in retreat, which have managed to survive in these more favorable areas, beyond which they are unable to extend. Here, as erosion encroaches upon their strongholds, these are gradually becoming more circumscribed, and some of the species inhabiting them perhaps face ultimate extinction, a process and fate that is now being accelerated by the clearing away of the forest from part of the uplands, although this is of little agricultural value. The flora of the lowlands and that of the hills are very different; the majority of the peculiar plants of the latter are found only on the sandy and loamy soils that come to the surface where the later deposits have been removed. *Quercus arkansana* is practically restricted to these strips, although a few specimens have managed to establish themselves on the gravelly tops of some of the narrow ridges. As *Quercus marilandica* is found sparingly on the gravelly uplands the two sometimes

come in contact along this border line, although the former is not found on the sandy soil where *Q. arkansana* is abundant, nor the latter on the more sterile uplands. *Quercus nigra* belongs strictly to the lowlands flora and is not found with *Q. arkansana* nor in its environment.

The fine loamy sand (the Nackitoch sand of the U. S. soil survey map) upon which *Q. arkansana* grows here is not entirely lacking in lime, as is indicated by the presence of such more or less lime-loving plants as *Quercus Muhlenbergii*, *Ulmus fulva*, *Rhamnus caroliniana*, *Bumelia lanuginosa* and several species of *Crataegus* of the Molles group. Samples of this soil tested by Dr. E. T. Wherry, of the Bureau of Soils U. S. Dept. of Agriculture, were pronounced by him to be "minimacid" or almost neutral. The calcium element is, of course, derived from the marly fossiliferous layers. This soil is not extensively exposed but outcrops at intermediate levels between the lowlands and the top of the plateau, and in the ravines and along the courses of small streams traversing the latter. The limits of the plants peculiar to this zone are therefore defined by the comparatively sterile clays and gravels above and by the black stiff soils of the river floodplains below. It should be remarked that within these restricted sandy areas *Quercus arkansana* is nearly always present and is often very abundant; indeed in some places it is not only the commonest Oak, but actually constitutes a large part of the forest growth. I have seen and examined hundreds of specimens in such places and they could doubtless be counted by thousands. I am not aware of any hybrid that has succeeded in establishing itself in such numbers, or of becoming dominant over areas from which both parent species are excluded.

If instead of a hybrid we are, in the case of *Quercus arkansana*, here dealing with a relic colony of a species nearing extinction and limited by peculiar ecological conditions, we might reasonably expect to find similar relics elsewhere, where these conditions are approximated within its probable former range.

In traveling by automobile from Hot Springs to Texarkana, a few months ago, we passed towards evening through an eroded area bordering a small stream in the western part of Clark County, Arkansas. The general aspect of the region and its flora bore a striking resemblance to certain localities in the Hempstead County hills; my attention was first attracted here by the occurrence in ravines of a large fossil oyster (*Exogyra ponderosa*) and other fossils found at McNab. The lateness of the hour and an approaching thunder storm prevented an exploration of the locality, but a little farther down along a small sandy stream I had the satisfaction of finding a few small specimens of *Quercus arkansana*. A few days later on the same trip we passed near the locality in Alabama where Dr. Mohr, and later Dr. Harper, collected the Oak which I believe to be identical with the Arkansas species. Unfortunately I did not realize until too late that we were so near the habitat of this interesting tree, and I did not have the good luck to see it there. While the regions are so widely sepa-

rated and in some respects quite dissimilar they both lie on the border of the coastal plain, just below the piedmont, and there appear to be many points of similarity both in the topography and in the flora. In his note regarding the Alabama Oak, Harper says: "It grows mostly towards the edges of the Pocosin, but not in the sand-hills vegetation. It is one of the commonest species there."

It has been stated that *Quercus arkansana* is intermediate in characters between *Q. marilandica* and *Q. nigra*, but although there is a certain superficial resemblance in the foliage to some small-leaved forms of the former, it really has much less in common with that species than with the Water Oak. The short depressed acorns with very shallow cup, small buds, slender branchlets and its habit of growth all indicate a nearer relationship to the group to which *Quercus Phellos*, *Q. nigra* and *Q. obtusa* belong, and in the fruit and in texture and pubescence of the leaves there is some resemblance to *Q. imbricaria*. Harper compares the Alabama trees also to *Q. myrtifolia* and *Q. microcarya*; all of which suggests the apparent fact that it has no near counterpart amongst living American Oaks. In the original description Sargent compares it with *Q. marilandica*, but only to point out that it differs in almost all essential morphological characters from that species. In the Arkansas localities where it is so abundant I have had excellent opportunities for examining and comparing living specimens. There is a certain amount of variability in the habit and appearance of different individuals, in the character of the bark, the size of fruit, size and lobing of the leaves and amount of pubescence. However, these variations are not greater than are found in any other species with which I am acquainted, and not nearly so great as in most other Oaks. This, of course, should be expected, since the area is so limited and the ecological conditions under which the trees are growing are comparatively uniform. I think it no exaggeration to say that there is no species of American Oak that is more true to type or more easily recognizable in the field. Assuming that *Quercus arkansana* is a valid species, in the generally accepted sense of that term, the possibility must also be considered that it may hybridize with other species of black and red Oaks with which it comes in contact. These, in the order of frequency in which they occur, are *Quercus rubra*, *Q. Shumardii*, *Q. Phellos* and along the margins of its range *Q. velutina* and *Q. marilandica*. On a narrow gravelly ridge near Yellow Creek I found one tree which, from the character of the foliage and rough bark, I suspected of being a hybrid between *Q. arkansana* and *Q. marilandica*. As there has been no fruit on the trees there for the past two years, owing to late frosts, I have not yet been able to confirm this definitely.

Since the discovery of *Quercus arkansana* several attempts have been made at the Arnold Arboretum to propagate it from seeds and to get it into cultivation. At present there is a specimen growing in the Oak group, raised from seed collected by Professor Sargent in 1909. This is now a

thrifty plant more than eight feet in height, and in foliage and other characters it is quite typical and identical with the species as it grows in Arkansas. Another planting was made from seeds collected by myself in 1922 and some of these were transplanted to another part of the Arboretum, but apparently the plants have not survived. Before they were taken from the nursery rows I examined them carefully. There were, perhaps fifty or sixty plants, with from four to ten leaves at that time, every one of which was true to type and without the slightest indication of segregation of forms or of reversion. At the present time there are about 15 plants growing in the nursery, raised from seeds collected in 1923, which are now six to ten inches in height. All of these are remarkably uniform and true to the parent type. Seedlings of *Quercus marilandica*, planted about the same time, are growing just opposite in the next row. The *Q. arkansana* seedlings compared with these are distinguished by their more slender stems, the yellowish instead of bronze or reddish tinge of the older leaves, and the thinner texture, more slender petioles and more obtuse lobes of the latter.

During the past few years I have paid especial attention to hybrid Oaks in the field and have found, and collected from, more than one hundred trees representing supposed crosses between many different species. A number of these have been grown from seeds at the Arnold Arboretum and others have been propagated from grafts. In the case of the former, while unfortunately we have not been able to grow them in the quantity desirable for experimental purposes, segregation of forms and reversion to parent types, as is to be expected under the Mendelian laws, are nearly always noticeable; in the case of *Quercus arkansana*, as stated above, nothing of the sort has ever developed. In most of the hybrid Oaks with which I am acquainted there is a certain instability of type and polymorphism in foliage and other parts, not only between different individuals but also on different branches of the same plant, and a lack of uniformity and symmetry in the individual leaves, which easily betrays them. This is not found in the Oak we are considering, beyond the slight variations common to nearly all recognized species.

The extremely limited and widely interrupted range of *Quercus arkansana*, so far as at present known, and a misunderstanding as to its local abundance both at the Alabama and Arkansas stations, is probably largely responsible for perpetuating Dr. Mohr's first surmise as to its hybrid origin. However, similar if not always such extreme cases are not unknown amongst American woody plants. Such examples as *Quercus georgiana*, *Leitneria floridana*, *Cotinus americanus*, *Alnus maritima*, and *Andrachne phyllanthoides* come to mind. A score of other examples might be mentioned of trees and shrubs of the Southern Appalachian region, of which isolated colonies now exist in widely separated intervals through the mountainous parts of southern Arkansas and eastern Oklahoma; and if herbaceous species were taken into consideration more

striking examples could be cited and the list extended indefinitely. Most of these belong to well recognized species, the validity of which no one has yet ventured to question or to segregate on purely geographical grounds. It is precisely such cases as these referred to here that have the greatest value and significance in throwing light upon certain problems of distribution of species in our existing forest floras and of their former fluctuations; and it is partly because of my interest in these cases that I am not willing to have the testimony of so important a witness as *Quercus arkansana* impeached or to see the bar sinister placed upon its escutcheon, since none of the facts seem to warrant such action.

In this connection there may be mentioned another Oak which was found by Mr. W. W. Ashe in Okaloosa County, Florida, and described by him under the name of *Quercus caput-rivuli*, but which he has more recently referred as a variety to *Q. arkansana*; this I have not referred to for the reason that I am not yet satisfied, after an examination of co-type specimens, that it can safely be identified with the Arkansas Oak. However, without wishing to essay the hazardous role of prophet, I will venture to suggest that it is not improbable, as botanical exploration continues, that other isolated stations may yet be found for *Quercus arkansana*; and investigators of Quaternary deposits containing Oak remains should be on the lookout for it; for from all the evidence I am of the opinion that we are here dealing neither with a hybrid nor a recently evolved form, but on the contrary with an ancient species, probably once widely distributed over the Coastal Plain and now nearing extinction.

RHODODENDRON CHRYSOCALYX LEV. & VANIoT

ERNEST H. WILSON.

Rhododendron chrysocalyx Lévillé & Vaniot apud Lévillé in Fedde Rep. Spec. Nov. II. 113 (1906).

A much-branched twiggy shrub, the branchlets tortuous, clothed with appressed flattened red-brown strigose hairs. Leaves persistent, chartaceous, dimorphic, narrow-lanceolate to oblanceolate, 1.5–4 cm. long, 0.5–1 cm. wide, acute or obtuse, mucronulate, base narrow cuneate, margin revolute, crenate-serrate, ciliate, upper surface shining dark green, reticulate, secondary veins impressed, lower surface pallid with primary and secondary veins elevated, both surfaces with few scattered appressed shining brown flattened strigose hairs most plentiful on costa; petiole flattened, 0.3–0.5 cm. long, densely clothed with appressed red-brown strigose hairs. Flowers terminal, fascicled, 10–12 or more; fascicles 2–3-flowered, subtended by several semipersistent concave dull brown ciliolate acute glabrescent bud-scales; pedicel erect, 1–1.5 cm. long, with calyx and ovary densely clothed with shining red-brown flattened strigose hairs; calyx annular, obscurely toothed, ciliate; corolla rotate-funnelform; tube



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