

THE JACK OAK*
(*Quercus ellipsoidalis*)

BY WILLIAM TRELEASE, UNIVERSITY OF ILLINOIS.

Northwestward from the head of Lake Michigan the usual sharp distinction between the red oak (*Quercus rubra*—or *maxima* as people are disposed now to call it), the scarlet oak (*Q. coccinea*) and the black oak (*Q. velutina*) is confused by the occurrence of numerous trees that present various types of fruit, rather like that of the scarlet oak but sometimes suggesting that of the red oak, associated with the multiform foliage for which the scarlet and black oaks are noted. Typical red oak and black oak trees very often occur associated with these aberrants: and, except for an infrequent individual now and then which suggests a hybrid, these suffice to indicate that the questionable trees do not represent a transition by which one of the usually recognized types blends into the other.

Many years ago, Engelmann¹ called attention to these peculiar oaks which he was unable to identify elsewhere than with that tree of the lower St. Lawrence to which the younger Michaux² gave the specific name *ambigua*, though, being preoccupied for another oak, this name was replaced by him shortly³ by *borealis*. A peculiar bulging or thickening of the cup-scales of some of the northwestern oaks was noted by Engelmann, who perhaps indicates his difficulty in their identification when he frankly admits that the fruit of *ambigua* as figured by Michaux does not resemble any form of gray-oak acorns he himself has seen.

Though Engelmann was well acquainted with Dr. George Vasey, then a resident of Illinois but editorially connected with *The American Entomologist and Botanist*,

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¹ *Trans. Acad. Sci. St. Louis*, 3: 401; 4: xx.

² *Hist. Arb. Amer.*, 2: 120, pl. 24, 1812.

³ *N. A. Sylva*, 1: 81;—but the name *ambigua* remains on the plate, 26, and the reason for using it originally is explained in the text.

published in St. Louis, there is no published evidence that he connects his *borealis* oaks with either of the forms into which Vasey had attempted to divide *Q. coccinea* as he understood it. Yet as early as 1870 this attempt had been made,* and one of the forms, his var. *microcarpa*, is unmistakably figured. It may be that Vasey meant to refer this form to *Q. coccinea microcarpa* Torrey, of the South-west—now known as *Q. texana*, from which it is distinct though even the latter species is so like in foliage to *Q. palustris* as to have passed for it. Most of the specimens collected by Dr. Vasey are without definite indication of locality; but he is known to have collected extensively about Ringwood, in one of the northernmost counties of Illinois, and one such specimen is labeled as from Ringwood.

Also before Englemann's short publication on these ambiguous oaks of the lake region, one of the most acute local botanists who has yet appeared in the United States, M. S. Bebb, had puzzled over them as they occur in another of the northern counties of Illinois, where, about Fountaindale, he studied them in numerous individual trees of which he made excellent specimens, some of which were communicated to correspondents and the remainder of which have come to rest as a part of his personal herbarium, now housed in the Field Museum of Chicago. Unfortunately the conservatism for which Bebb was noted kept him from recording even on the labels his determination of most of these specimens, though some few are labeled as *Quercus rubra* or as *Q. coccinea*.

In 1898 Rev. E. J. Hall, to whom the flora of the neighborhood of Chicago was better known than it has ever been to another, described* and figured what he took for a local hybrid of *Quercus coccinea* and *Q. palustris*: and the following year, without indicating its relation, if any, to this hybrid, he characterized† a common oak of that region under the specific name *ellipsoidalis*, given because of the elongated acorns produced by trees that he took to be typical of it. In aspect, bark, and foliage this species was made to compare more or less closely with *Quercus palus-*

*American Entomol. & Bot. 1:344-5, f. 213.

*Botanical Gazette, 16:53, pl. 5-6.—Specimens of this, which I take for what is here called *Q. ellipsoidalis intermedia*, occur from Thornton, Illinois, as Hill, 64/96, 296/97.

†Botanical Gazette. 27: 204, pl. 2-3.

tris; but in fruiting cup, with *Q. coccinea*¹ from which its foliage differed in less intense autumnal coloration. Locally, it seems not to have been distinguished commonly by name from the associated black oak, *Q. velutina*, though Mr. Hill mentions the name yellow oak as applied to it by one person.

Since its publication, *Quercus ellipsoidalis* has been recognized generally as a valid species, and it is figured in a number of books.² It appears to be one of the dominant oaks of the region west of Lake Michigan and south of Lake Superior and extends through Minnesota and Wisconsin to northeastern Iowa, and thence to the country immediately southeast of Chicago. This distribution is indicated on a small map accompanying Hough's excellent account and photographic illustrations of the species.

Though the supposed hybrid of *Quercus palustris* and *Q. coccinea* bore relatively short and thick acorns, and his description of *Q. ellipsoidalis* showed that what he took for this species sometimes produces nearly spherical acorns, Mr. Hill was careful to differentiate his new species from the associated oaks referred to *coccinea* and *velutina*; and this has led those who have dealt with it of recent years to dwell upon the deep turbinate cup and slender elongated acorn as its chief differentials, which, as is shown in the well-drawn figures of the "Minnesota Trees and Shrubs", stand in marked contrast with the otherwise scarcely distinguishable oak called *Q. coccinea*, of the region in which *Q. ellipsoidalis* grows. Though an early contributor to *The American Entomologist and Botanist*, Mr. Hill does not seem to have recognized in these oaks the assemblage that Vasey had considered a generation earlier, nor to have noted that Vasey's *coccinea microcarpa* well pictures his own typical *ellipsoidalis*.

¹ Specimens representing *coccinea* as understood by Mr. Hill, which I take for what is here called *Q. ellipsoidalis depressa*, occur from Thornton (Hill, 161a/95, 78/96, 82/96, 293/97, 165/95, 83/96, 121/01, 122/01, 15/99, Glenwood (Hill 81/96, 90/96, 299/97), Barington (Hill, 215/00, 216/00), and Wauconda (Hill, 334/98, in Illinois, and from Hammond, Indiana (Hill, 73/91), and Liverpool, Indiana (Hill, 334/98, 335/98); and, without name, from Thornton (Hill, 162/95, 164/95, 65/96, 79/96, 81/96), Glenwood (Hill, 170/95, 88/96), and West Pulman (Hill, 147/9/95, 70-72/96). Other specimens, referred to *Q. velutina*, occur from Willow Springs, (Hill, 140/90), and morely (Hill, 156/95) in Illinois, and from Liverpool, Indiana (Hill, 337/98).

² Britton and Brown, Ill. Flora, 2 ed. 1:618, f. 1518.—Britton and Shafer, N. A. Trees, 291, f. 243.—Clements et al., Minnesota Trees and Shrubs, 261, f. —Deam, Rept. Indiana Board of Forestry, 11 202, pl. 56.—Hough, Handbook, 144, ff.—Otis, Michigan Trees, 114, f.—Sargent, Manual of Trees, 234, f. 189.—Robinson and Fernald, Gray's New Manual, 7 ed. 342, f. 683.—Trelease, Proc. Amer. Pilos. Soc. 51, pl. 11.

During several seasons past, in cooperation with the State Laboratory of Natural History, I have spent some little time in the examination of these scarlet and ellipsoid oaks as they occur in northern Illinois, and I have viewed critically such herbarium material of *Q. coccinea* and *Q. ellipsoidalis* as I have been able to see in herbaria, with the result of finding it impossible to recognize the former species in the region in which the latter occurs;—what has passed for *Q. coccinea* west of Lake Michigan and north of, say, the lower Wabash river and the granite mountains about Bismarck, Missouri, being either so-called in the broader and older sense in which even *Q. velutina* has passed for a variety of *Q. coccinea*, or with reference to the rounder-fruited form of *Q. ellipsoidalis*.

While *Quercus ellipsoidalis* seems to be limited on the east by Lake Michigan, and on the north by Lake Superior, its range to the west is not closely fixed; and, particularly, I have had difficulty in finding any reason for its abrupt cessation in the south. So far as evidence has been procurable, it does not occur on or to the south of a line connecting Kankakee, LaSalle, and Rock Island, in Illinois. On the other hand, it is present in quantity about Greenwood and Thornton, south of Chicago, occurs sparingly in the vicinity of Joliet, is abundant on the Fox River about Aurora, in the neighborhood of Samonauk, and around Dixon, and it crosses the Mississippi river somewhere near Fulton, Illinois, and Clinton, Iowa. North of this, it is found everywhere where oaks occur.

No connection is apparent between the southern termination of its range and the soil belts or glacier limits recognized in Illinois, and as yet it has not been found to follow the larger streams, though its abundance on the upper Rock River would lead one to suspect that further search may reveal its presence as far south as Rock Island,—where, however, I have been unable to find it. Though I have seen no specimens from the upper peninsula of Michigan, it is evidently this species that Farwell* reports as there becoming a large tree in the valleys but reduced to a bushy shrub or small scraggy tree along rock ledges, under the name *Q. rubra borealis*.

*Rep. Mich. Acad. Sci. 6:206. 1904.

Though not distinguished by a common name near the limits of its range, it appears to be known in northwestern Illinois as jack oak,—occasionally varied into black jack, though not through confusion with the true black jack, *Q. marilandica*. It is a tree of the timber fringe along water courses in the flat prairie region, forms an abundant constituent of similar belts flanking the more northern rivers, and enters into the “oak openings” that are characteristic of the rolling prairies of Wisconsin.

This jack oak is a tree which closely resembles the black oak (pl. 139), and, like the black oak, it holds its dried foliage far into the winter, so that from a distance individuals of these species may be picked out then when in groves that contain a good deal of red oak. Though on the sandy soil in its type locality it does not become very large, and may fruit when scarcely ten feet high, it reaches a height of sixty feet or more, with a trunk diameter of nearly three feet, on the rich land in western Illinois, as about Morrison. More finely and densely branched than the red oak usually is, in this respect resembling the pin oak and black oak, it is less percurrent than the pin oak usually becomes, and like the black oak and the pin oak it has more glossy foliage than the red oak, and its leaves (pl. 141) are varying and prevailingly as deeply cut as those of the pin oak or of the very variable black oak. In external bark characters (pl. 140), it stands between the red oak and the black oak. Some trees have a smoother trunk than most red oaks, but others are quite as rough as even any of the associated black oak trees. Its inner bark lacks the characteristic yellow coloration of that of the black oak.

As Oersted insisted long ago, and as I have shown for our black oaks collectively,* and Miss Cobb for our eastern white oaks,† the mature buds of oaks afford fairly dependable specific characters. In this respect, *Quercus ellipsoidalis* stands out distinctly among the oaks that it occurs with (pl. 143). *Quercus palustris*, which barely enters its range from the south, is readily known by its rather small conical glabrous brown buds; *Q. maxima* by its much larger equally glabrous red-brown buds; and *Q. velutina* by its still larger often 5-angled or 5-grooved

*Proc. Amer. Philosoph. Soc. 51:167-171. pl. 10-13.

†Proc. Amer. Philosoph. Soc. 54:165-174. pl. 4-6.

very hairy buds. The jack oak has buds more nearly like those of the eastern scarlet oak though smaller,—distinctly smaller and usually blunter than those of the black oak and, like those of *Q. coccinea*, different from those of the red and pin oaks in being more or less silky pubescent. This is a character that varies somewhat in the scarlet oak. In *Q. ellipsoidalis* there is still greater variability, for some trees have nearly glabrous buds, and others distinctly canescent buds. One of the earliest students of bud characters in this country, Dr. Brendel of Peoria, for whom what we now know as *Quercus velutina* represented the scarlet oak, records‡ that after coming to believe that he had found a dependable character for this in its large pubescent angular buds his faith in this mark was shaken by finding that the *coccinea* of northern Illinois has round and smaller buds more like those of the red oak,—this of course referring to the *ellipsoidalis* aggregate of forms, shortly afterward differentiated though not separated from *coccinea* by Vasey.

Though the extremes under which the acorns of *Quercus ellipsoidalis* occur pass into one another so that the recognition of forms based on them is scarcely more than a convenient way of ensuring their reference to this alliance, the fruit of a given tree is fairly uniform: and in this respect the trees will probably be found to breed true. Whether this is equally likely for the different foliage forms seems questionable: but this has never been tested, so far as I know, for either this species or the still more variable black oak. As yet, I have been unable to correlate the bark, bud, foliage, and fruit differences that have been observed, so that for the present it seems possible to differentiate the forms only on the following characters:—
Leaves broadly elliptic, regularly pinnatifid.

Cup more or less turbinate, not dilated much beyond the diameter of the acorn.

Acorn elongated, about in the ratio of 2:3.

Scales of cup not incurved, *Q. ellipsoidalis* Hill.

Scales incurved about the acorn, f. *incurva* Trel.

Acorn broadly ovoid, about in the ration

of 3:4.

f. *intermedia* Vasey.

Acorn subglobose.

f. *depressa* Vasey.

‡Amer. Naturalist 4:248. 1870.

Cup dilated saucer-shaped, abruptly constricted
about the acorn. *f. coronata* Vasey.

Leaves obovate-oblong, irregularly lobed or incised.
f. heterophylla Trel.

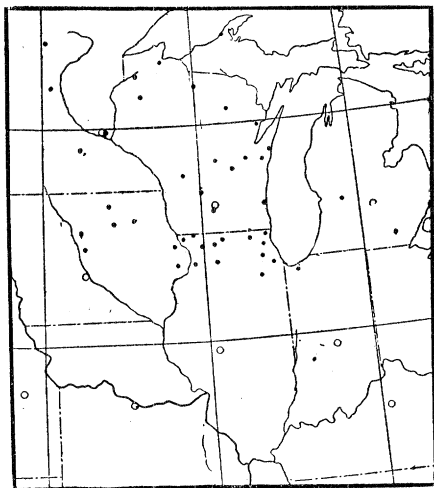
So far as I know, each of the fruit forms (pl. 142) may be expected wherever the species occurs, though the *depressa* and *coronata* forms are less frequent than those with the more typical elongated acorns or narrow cups. The heterophyllous aberrant, comparable with forms offered by many other species of oak, has been collected at Spooner Lake, Wisconsin, (*Miss Ruth Marshall*), and in Clayton County, Iowa (*Pammel*).

The synthetic characters of *Quercus ellipsoidalis* have led to the supposition that one or more of the forms or individuals that are here called by this name may be really of hybrid origin between *Quercus palustris*, *Q. coccinea*, *Q. velutina*,—which is meant sometimes when the name *Q. coccinea* is used in the former broad sense, and possibly *Q. maxima*. The tree which Mr. Hill considered to be a hybrid of *palustris* and *coccinea* before he distinguished his own species, as is noted on one of the sheets representing it was considered subsequently to be rather a cross between *palustris* and *ellipsoidalis* itself; but I should say that it is merely a form of the latter. Though of restricted range, for an oak, this species is too abundant in its region, and too distinct from its congeners, to be considered as of a different nature from these notwithstanding a greater variety in fruit and buds than any of them shows except *Q. velutina*. On the other hand, there is no reason to suppose that it may not cross with one or more of these species, and as it becomes better known in individual trees such hybrids are very likely to be discovered.

Specimens that suggest such an origin are one from Kilbourn, Wisconsin, collected by Miss Marshall in August, 1916, which in leaf and fruit is scarcely more than the less-lobed form of *velutina* though as yet with relatively small buds for the black oak; and an eight-foot bushy tree in the sands of Chicago which Dr. Pepon collected in September, 1916. Though the acorns of this are more persistently downy than is usual in *ellipsoidalis* and its buds are un-

usually large and hairy, the foliage and fruiting cups are as they should be in *ellipsoidalis*. So far as I can see now, therefore, Miss Marshall's tree must be taken for *velutina* and Dr. Pepon's for *ellipsoidalis*.

On the other hand, among the many specimens collected by Mr. Bebb about Fountaindale are three sheets in the Field Museum which really appears to represent a hybrid. Their leaves are of the hard texture, moderate size and rather rounded outline with deep open sinuses that are frequently found in *Q. coccinea*, and they are glabrous except for axillary domatia beneath. The rather large fruit, with acorns 15 mm., and cups over 20 mm. in



Distribution of Jack Oak

diameter, might pass for that of *coccinea*. But the buds, much larger than in *ellipsoidalis* (as much as 3×7 mm.) though not larger than in *coccinea*, are rusty-hairy as in *velutina* as in which they may be somewhat prismatic, thus differing from *ellipsoidalis* and the related but not associated *coccinea*. For this hybrid, represented by sheets 5766 (Bebb, 16), 6129 (Bebb, 47, "Westfield Woods") and 204583, in the herbarium of the Field Museum, I have proposed* the name $\times Q. palaeolithicola$.

Specimens that I have examined show the distribution of *Quercus ellipsoidalis* in its various forms to be as indicated on the accompanying sketch-map and in the following tabulation:—

*Proc. Amer. Philosoph. Soc. 56: 50. pl. 1. 1917.

Minnesota:—Cass County (*Ballard*, 1893). Crow Wing County, (*Sargent*, 1882). Hennepin County (*Engelmann*, 1878; *Mearns*, 617; *Sargent*, 1882; *Sandberg*, 1890; *Schuette*; *Sheldon*, 1895; *Waggoner*, 1916).

Wisconsin:—Bayfield County (*Gillman*, 1876). Forest County (*Johnson*, 1814). Washburn County (*Miss Marshall*, 1916). Oneida County (*Roth*, 1897). Marinette County (*Shuette*). Kewaunee County (*Shuette*). St. Croix Co. (*Miss Mulford*, 1686). Brown Co. (*Schuette*). Waupaca Co. (*Garesche*, 1907). Winnebago Co. (*Kellerman*, 1878). Juneau Co. (*Mearns*, 620). Sauk Co. (*Miss Marshall*, 1916). Dane Co. (*Denniston & Davis*, 5, 6, 8, 9, 12). Milwaukee Co. (*Lapham*,—as "*Q. palustris*").

Iowa:—Fayette Co. (*Fink*, 513, 515; *Gardner*, 335). Mitchell Co. (*Mrs. Tuttle*). Black Hawk Co. (*Hitchcock*, 1889). Hardin Co. (*Pammel, Hume & Fitz*, 1605, 1609). Boone Co. (*Pammel*, 1809). Story Co. (*Pammel & Ashe*, 1836, 1838). Jackson Co. (*Lazell*, 1916). Clinton Co. (*Butler*, 1878). "N. E. Iowa" (*Schultz*).

Illinois:—Jo Daviess Co. (*Pepoon*, 62; *Umbach*, 1896). Stephenson Co. (*Trelease*, 1916). Whiteside Co. (*Trelease*, 1617-8-9). Lee Co. (*Trelease*, 1916). Ogle Co. (*Terry*, 1907). Winnebago Co. (*Bebb*, 1870, 1, 4, 5-10, 12-14, 17-20, 43-5, 47-52, 54; *Miss Marshall*, 1916). McHenry Co. probably about Ringwood (*Vasey*, "Illinois", 1862, 1, 3, 6, 9, 15, 16, 18). Lake Co. (*Engelmann*, 1882; *Gates*, 2981; *Sherff*, 1893, 1912). Cook Co. (*Calkins*, 229; *Mrs. Chase*, 46, 55, 61, 749, 752-4, 1003-5, 1007, 1018-1022, 1515-6); *Hill*, 129/91, 134/91, 26/92, 104/92, 134/2/94, 150/95, 151/95, 152/95, 152a/95, 166/95, 167/95, 168/95, 169/95, 172/95, 173/95, 174/95, 175/96, 64/96, 73-76/96, 84/96, 85/96, 86/96, 91/96, 93/96, 94/96, 98/96, 173/96, 329/98, 330/98, 19/99, 237/99, 85/199, 7/02; *Smith*, 1802, 1902; 1912; *Trelease*, 1916). Will Co. (*Ferris*, 1916; *Hill*, 157/95, 158/95, 298/97, 290/97).

Indiana:—Lake Co. Hammond (*Hill*, 134/91). Liverpool (*Hill*, 333/98, 338/98). Miller (*Duesner*, 1908). Glen Park (*Smith*, 1912).

Michigan:—Ionia Co. Muir (*Smith*, 1-3). Washtenaw Co. Dexter (*Davis*, 1-3).

So far as I have been able to see, nothing very peculiar marks the ecological occurrence of *Quercus ellipsoidalis*. Its associates where I have found it in Illinois are the usual components of groves in the northern part of the State, and there is no evidence that it is influenced by them or influences them materially. As has been stated already, its distribution has not been connected either with evident barriers, drainage systems, or particular superficial glacial deposits. On the other hand, the southern limit of its occurrence in the State coincides in general with the southern limit of underlying geological strata older than the Carboniferous, and its entire known distribution falls in Silurian, Ordovician and Cambrian regions: but in eastern Illinois it does not reach the southern limits of the Silurian. I have no knowledge of its occurrence over these older rocks to the southeast of the Lake, for it is reported for Lake County, Indiana, only, and, so far as I know, is not found in western Ohio, which is of similar geologic age.

The absence of the jack oak from this part of the adjacent older formations requires separate consideration, though its explanation may perhaps be sought in the varying chemical composition of the soil through the territory covered by these older outcroppings; but the failure of the tree to penetrate the Carboniferous territory, which constitutes the larger part of Illinois, apparently bears a very close connection with the circumstance brought to my attention by my former colleague, Dr. J. L. Rich, that the glacial drift which overlies local rocks in this region may be all but exclusively derived from rock of the immediately adjacent country.* If this conclusion be correct, the peculiar and abrupt ending of the range of the jack oak in Illinois may be due primarily to its intolerance of the iron, sulphur, magnesium, etc., with which the rocks of the coal country are charged and the presence of which is very evident in the water of this region.

*Alden, Professional Paper, U. S. Geol. Survey. 34:75, 1904.—In a very extensive study of the soils of southern Wisconsin, though only 50 per cent of the drift materials were found to be of local origin in one case, the general local constituents comprised between 68 and 97 per cent in

all others—and the average of the entire series showed about 87 per cent to have originated locally or at no great distance.

If I understand my colleague, Professor T. E. Savage, correctly, his extensive studies of Champaign County do not warrant a belief that the largest part of even the very deep drift which covers central Illinois has originated more than fifty miles away from its present position.

The University of Illinois, March, 1919.

EXPLANATION OF PLATES.

139. *Quercus ellipsoidalis*. The tree from which type collections were made. Photographed near Thornton by Mr. C. F. Millspaugh in company with the author of the species. Published by permission of the Field Museum of Natural History.

140. *Quercus ellipsoidalis*. Representative but rather rough bark. Photographed near Thornton by Dr. C. F. Millspaugh. Published by permission of the Field Museum of Natural History.

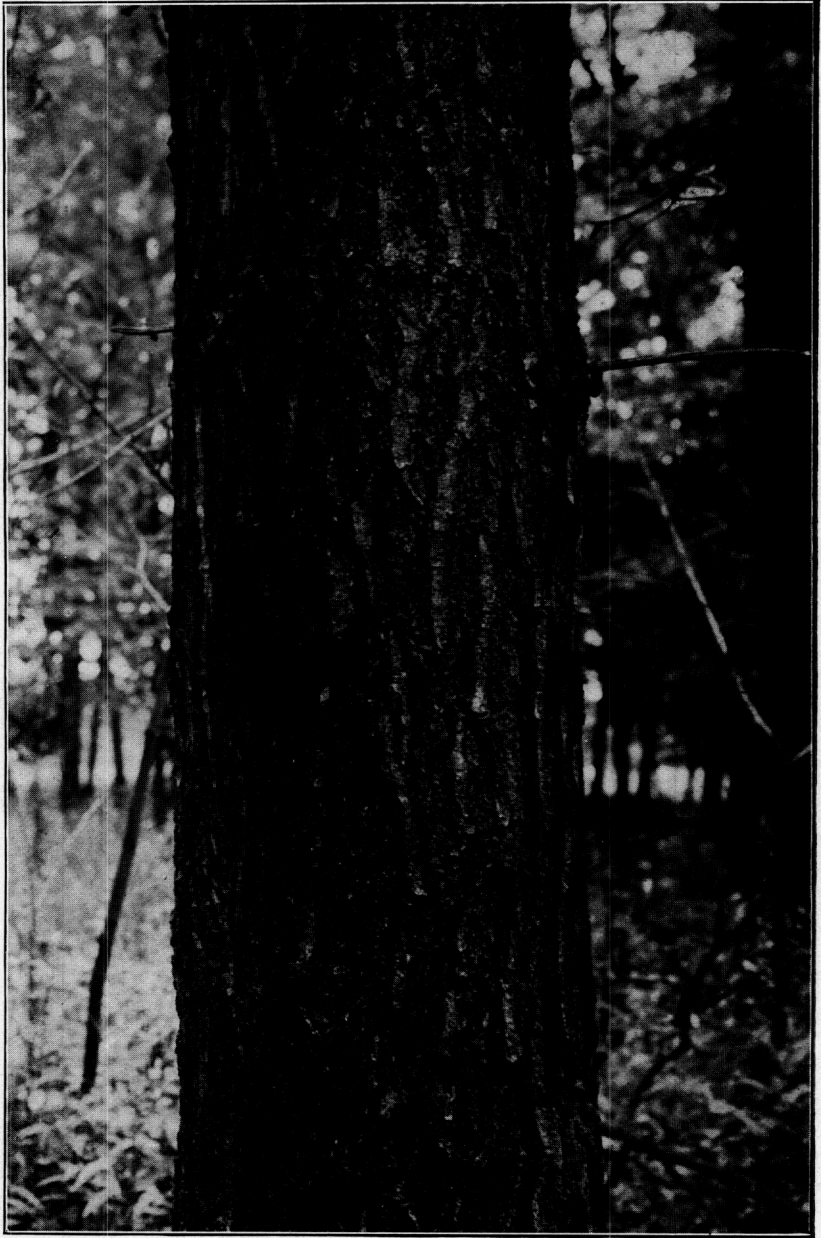
141. *Quercus ellipsoidalis*. Two of the many foliage forms found in the type region of Cook Co., Illinois, about one-third natural size. From specimens in the Hill herbarium at the University of Illinois.

142. *Quercus ellipsoidalis*. Forms of fruit: natural size. Upper row, the typical form. Second row, f. *incurva*. Middle row, f. *intermedia*. Fourth row, f. *depressa*. Bottom row, f. *coronata*.

143. Above: buds of *Quercus ellipsoidalis*, in the upper row; *Q. palustris* in the center, *Q. coccinea* at the left, and *Q. velutina* at the right, in the lower row. All enlarged 4 diameters. Below: Range of variability in the fruit of *Q. velutina*, for comparison with the range in *ellipsoidalis* fruit. All of natural size.

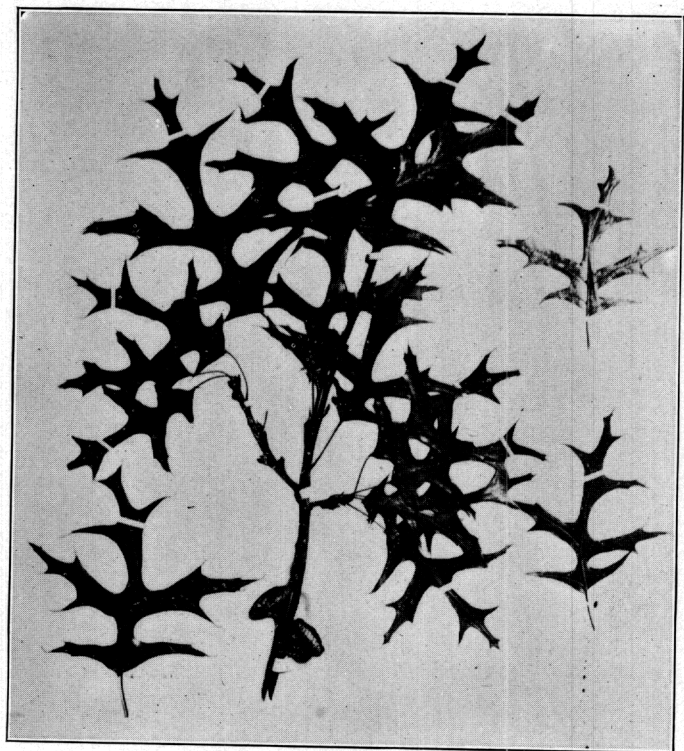


JACK OAK (139)



JACK OAK (140)

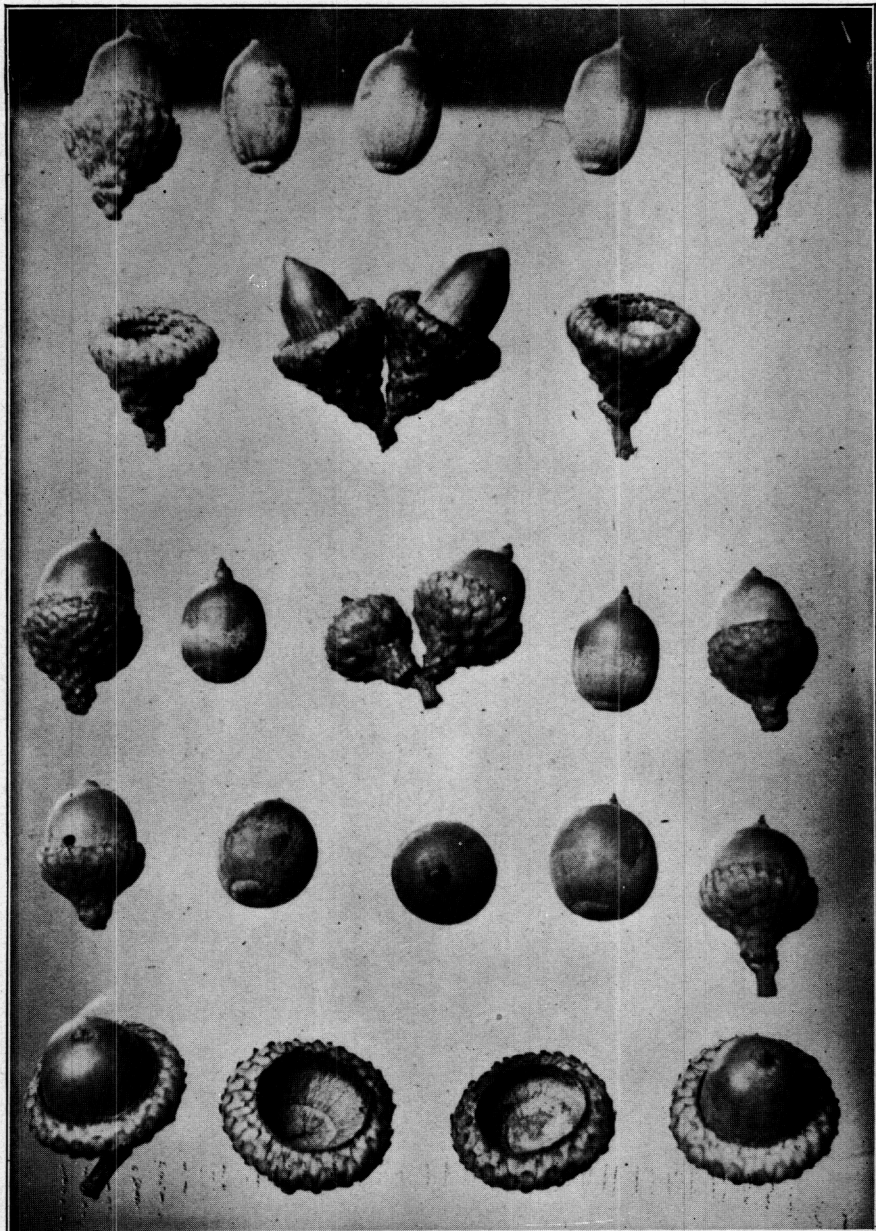
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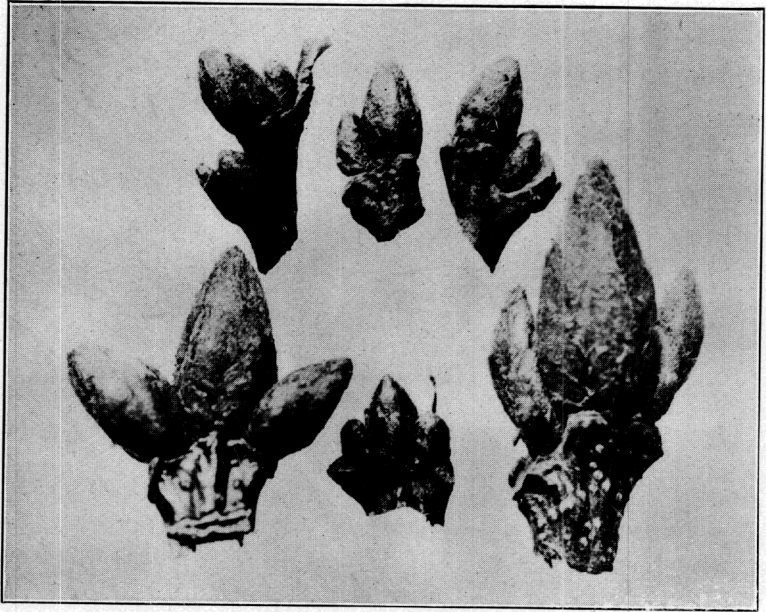
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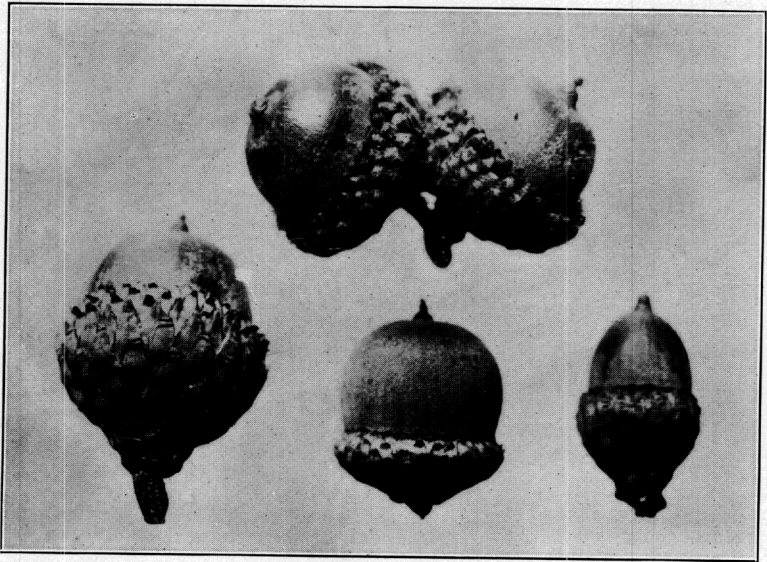
JACK OAK (141)



JACK OAK (142)



JACK OAK.



JACK OAK (143)