

MICROSTRUCTURE OF WOOD OF *JUNIPERUS VIRGINIANA* L. X *J. ASHEI* BUCHH.¹MARGARET KAEISER
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Twenty-five random samples of juniper woods from a population of hybrids of *Juniperus virginiana* L. and *J. Ashei* Buchh. were collected from McVey Knob, Ozark County, Missouri, by M. T. Hall² and given to the writer. Taxonomic determinations of all samples were made by him. Although *J. virginiana* belongs to the polyspermous series of junipers and *J. Ashei* to the monospermous series, the chromosome morphology is similar. Introgression (1) obtains within the genus. The two species are highly inter-fertile. Figure 1 shows twigs of *J. virginiana*, *J. Ashei*, and the hybrid. Introgression is reported to account for the peculiar shapes of some of the junipers in the Ozarks.

Of the twenty-five samples, each from a separate tree, four are considered taxonomically as *J. Ashei*, although these are reportedly slightly different from *J. Ashei* of the Edwards Plateau of Texas, the present center of distribution of the species. Five samples are regarded as "near" *J. Ashei* (possible recombinations). The remaining sixteen specimens are regarded as hybrids. Their respective collection numbers are given in the accompanying tables.

The wood of the twigs from the hybrid population varied in age

from three to ten years. When compared with both young and mature wood samples of *J. virginiana* and *J. Ashei*, the hybrid samples all showed many microstructural features shared by both species. These include: wood parenchyma metatracheal, vertical walls "pitted," transverse walls with "nodular thickenings"; horizontal walls of ray parenchyma cells "pitted," indentures present, end walls "nodular"; tracheids with intercellular spaces between them in cross section; some pitting on tangential walls of late (terminal) wood; cross-field pits cupressoid; tracheids with radial bordered pits relatively abundant for conifers and sometimes crowded; bordered pits when more than one vertical row per tracheid arranged oppositely (2, 3, 5, 6, 7, 8).

Since the woods of the two species are so closely similar in most microstructural features, additional analyses of taxonomically determined specimens were made to check for any possible differences. These included one specimen of mature wood of *J. Ashei* from Austin, Texas, provided by the U. S. Forest Products Laboratory, Madison; one eighteen-year-old branch of the same species from the Arbuckle Mountains of Oklahoma, provided by G. J. Goodman; and twigs from four sheets on loan for use by B. C. Tharp, of the University of Texas. Three of the

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² Formerly of Washington University, now at Cranbrook Institute.

TABLE 1.—TANGENTIAL SECTIONS OF RAYS

Source	Location	Coll. No.	Age in yrs.	Counts of 50 H.P. fields (X440)				
				Cell range ht.	Most freq. range	Total cells in rays	Total rays	Mean ray cell ht. (10 counts in microns)
<i>Juniperus virginiana</i> L.								
G. J. Goodman	Wilburton, Okla..	K-25	8	1-9	2	680	292	20.1
M. Kaeiser....	C'dale, Ill.....	A	9	1-6	2	667	285	20.4
" "	" "	B	9	1-7	2	683	296	21.6
" "	" "	C	9	1-10	2	684	275	20.4
E. S. Harrar..	Durham, N. C....	11	1-7	2	642	297	19.8
E. Quarterman	Davidson Co., Tenn.....	N-1	10	1-6	2	698	347	21.7
" "	" "	N-2	12	1-8	2	594	298	21.6
" "	" "	N-3	14	1-8	2	637	334	21.9
" "	" "	N-4	10	1-7	2	650	343	20.8
<i>Juniperus Ashei</i> Buchh.								
D, M, Moore..	Carrol Co., Ark...	321151	9	1-8	2	800	418	21.6
V. L. Cory....	Uvalde Co., Tex..	39389	9	1-10	2	1283	479	19.2
" " "	McCulloch Co., Tex.....	38464	9	1-7	2	947	415	21.6
" " "	Val Verde Co., Tex.....	39725	6	1-11	2	1078	409	19.5
G. J. Goodman	Arbuckle Mtns., Okla.....	K-24	18	1-10	2	902	461	20.7
M. T. Hall....	McVey Knob, Mo.	5-A	6	1-9	2	926	436	20.4
" "	" " "	8-A	5	1-11	2	944	346	19.1
" "	" " "	9-A	3	1-9	2	986	366	23.1
" "	" " "	14-A	4	1-9	2	980	444	19.8

Source	Location	Coll. No.	Age in yrs.	Counts of 50 H.P. fields (X440)				
				Cell range ht.	Most freq. range	Total cells in rays	Total rays	Mean ray cell ht. (10 counts in microns)
"Near" <i>J. Ashei</i> Buchh. (possible recombinations)								
M. T. Hall. . . .	McVey Knob, Mo.	3-A	5	1-7	2	762	311	21.3
" "	" " "	7-A	7	1-10	2	846	386	22.2
" "	" " "	11-A	10	1-9	2	860	435	22.2
" "	" " "	19-A	8	1-11	2	970	391	20.0
" "	" " "	25-A	8	1-15	2	1132	358	22.5
<i>Juniperus virginiana</i> L. X <i>J. Ashei</i> Buchh.								
M. T. Hall. . . .	McVey Knob, Mo.	1-A	6	1-13	2	1097	327	24.0
" "	" " "	2-A	8	1-12	2	738	299	21.3
" "	" " "	4-A	5	1-10	2	940	337	21.0
" "	" " "	6-A	4	1-11	2	836	344	21.0
" "	" " "	10-A	6	1-12	2	867	388	23.4
" "	" " "	12-A	6	1-11	2	803	355	22.8
" "	" " "	13-A	8	1-10	2	1164	441	20.1
" "	" " "	15-A	8	1-9	2	819	296	21.3
" "	" " "	16-A	4	1-8	2	724	364	21.6
" "	" " "	17-A	5	1-11	2	1058	364	23.1
" "	" " "	18-A	4	1-9	2	966	307	22.2
" "	" " "	20-A	8	1-12	2	913	301	22.5
" "	" " "	21-A	5	1-11	2	856	367	21.0
" "	" " "	22-A	4	1-19	2	1092	364	22.8
" "	" " "	23-A	7	1-6	2	886	389	23.7
" "	" " "	24-A	6	1-14	2	934	295	23.6

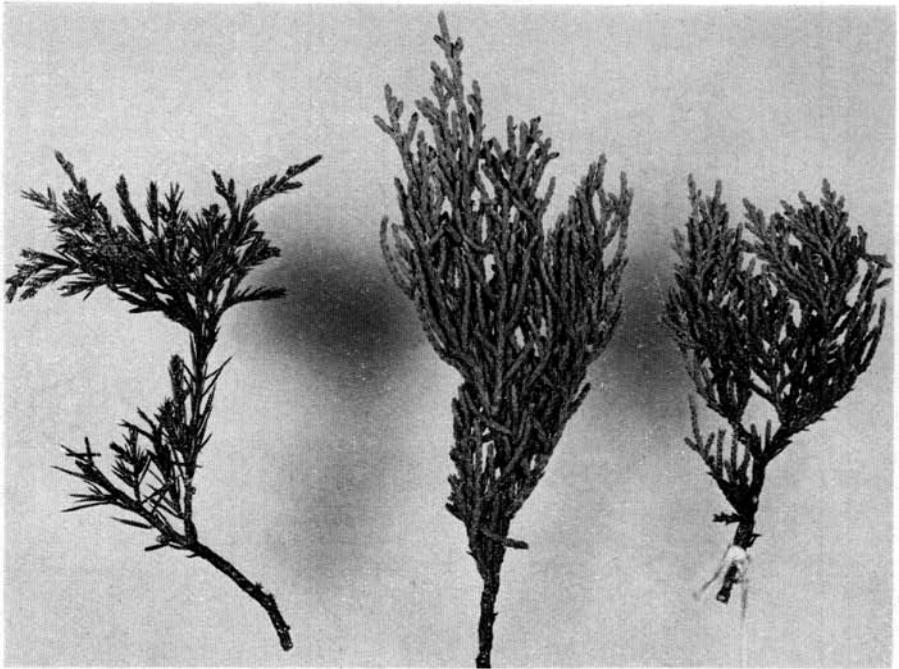


FIG. 1.—Twig of *Juniperus virginiana* L. (left) showing both awl and scale leaves; middle, *J. Ashei* Buchh. twig; right, hybrid twig.

collections marked *J. Ashei* were made by V. L. Cory from the Edwards Plateau region of Texas, and the fourth was made by D. M. Moore in northwestern Arkansas. Likewise, mature wood of *J. virginiana* from Linn, Florida, was provided by the Madison laboratory; mature wood from Durham, North Carolina, provided by E. S. Harrar; young wood from twigs from Durham, eastern Oklahoma, and southern Illinois; and four twigs from trees growing in the Nashville basin sent by E. Quarterman. Because of the confusion of *J. Ashei* Buchh. (4) with other taxonomic names, a number of wood collections analyzed had to be disregarded in this present account.

The present center of distribution of *J. Ashei* is regarded to be the

Edwards Plateau of Texas. The species is likewise found in the Arbuckle Mountains and on limestone bluffs in Mayes County in Oklahoma, in the bald knob country from Taney to Ozark counties in southwest Missouri, and in similar areas in northwest Arkansas. McVey Knob is regarded as the easternmost extent of range of *J. Ashei* in Missouri, the region from which the Hall samples were procured. This species is not to be confused with *J. mexicana* Spreng., which does not come into the United States, nor with *J. mexicana* Schlect. (9), which is referable to a polysperous form.

Tables 1-3 give data of some of the analyses made on the hybrids, "near" *J. Ashei* specimens, and controls. Table 3 which gives average

TABLE 2.—SUMMARY OF TANGENTIAL SECTIONS OF RAYS

Plant	No. of samples	Age range in years	Counts of 50 H.P. fields (X440)				
			Cell range ht.	Most freq. range	Total cells in rays range	Total rays range	Mean ray cell ht. (10 counts in microns) range
<i>Juniperus virginiana</i> L.	9	8-14	1-10	2	594-698	275-347	19.8-21.9
<i>J. Ashei</i> Buchh.	9	3-18	1-11	2	902-1283	346-479	19.1-23.1
"Near" <i>J. Ashei</i> Buchh. (possible recombination)	5	5-10	1-15	2	762-1132	311-435	20.0-22.5
Hybrids	16	4-8	1-19	2	724-1164	295-441	20.1-24.0

TABLE 3.—SUMMARY TANGENTIAL SECTIONS OF RAYS

Plant	No. of twigs	Av. age of twigs yrs.	Average of counts of 50 H.P. fields (X440)		
			Total cells in rays	Total rays	Mean ray cell ht.
<i>J. virginiana</i> L.	9	10.2	659.4	307.4	20.9
<i>J. Ashei</i> Buchh.	9	7.6	982.2	419.3	20.5
"Near" <i>J. Ashei</i> Buchh.	5	7.6	914.0	376.2	21.6
Hybrids	16	5.8	917.0	346.0	22.2

counts of rays and total numbers of cells of rays shows both relatively fewer rays and fewer total numbers of cells of rays in *J. virginiana* than in the other forms studied. The hybrids and "near" *J. Ashei* specimens appear more similar to the *J. Ashei* parent than to *J. virginiana* with respect to total number of ray cells. The hybrids are somewhat closer to *J. virginiana* in total number of rays, whereas the "near" *J. Ashei* more closely resemble the *J. Ashei* parent.

There is also a tendency toward slightly greater range in pit aperture length of cross-field pits of early wood in *J. virginiana* L. than in *J. Ashei* Buchh. The hybrids and possible recombinations more closely resemble the latter parent in this respect as they do, also, in the possession of tracheids with slightly narrower lumina and thicker walls (4).

The foregoing treatment deals with only a limited number of random samples. However, it is sug-

gestive of a possible correlation between external morphological features and internal structure—in this case wood microstructure. It also has a possible application as an aid in studies in introgression.

REFERENCES

1. ANDERSON, EDGAR, Introgressive hybridization. John Wiley & Sons, Inc. New York. 1949.
2. BANNAN, M. W., Wood structure of the native Ontario species of *Juniperus*. Amer. Journ. Bot. 29: 245-52. 1942.
3. BROWN, H. P., A. J. Panshin, and C. C. Forsaith, Textbook of wood technology. Vol. I. McGraw-Hill. New York, 1949.
4. BUCHHOLZ, JOHN T., The Ozark White Cedar. Bot. Gaz. Vol. XC, No. 3: 326-332. 1930.
5. KAEISER, MARGARET, Microscopic anatomy of the wood of three species of junipers. Trans. Ill. Acad. Sci. Vol. 43: 46-50. 1950.
6. PEIRCE, ALAN S., Types of pitting in conifers. Trans. Ill. Acad. Sci. Vol. 28, No. 2: 101-4. 1935.
7. ———, Systematic anatomy of the woods of the Cupressaceae. Trop. Woods. 49: 5-21. 1937.
8. PHILLIPS, E. W. J., The identification of coniferous woods by their microscopic structure. J. Linn. Soc. of London (Bot.) LII, No. 343: 259-320. 1941.
9. REHDER, ALFRED, Manual of cultivated trees and shrubs. 2d ed. The Macmillan Co. New York. 1947.