

GROWTH STUDIES ON GYMNOCLADUS DIOICA (L.) KOCH

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The following studies were made in 1938 in the pecan orchard of the Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma.

Three one-year-old coppice sprouts as nearly identical as possible were chosen for the study. They were growing about six feet apart on separate stumps. In the following discussion, the trees will be referred to as the north tree, the middle tree, and the south tree. Their heights were as follows:

the north tree	18.03 dm. (5'11")
the middle tree	18.54 dm. (6' 1")
the south tree	20.81 dm. (6' 6")

From the similarity in the size and height of these trees one would assume that last year under identical environmental conditions, they had made very similar growth and that they would do the same this year except for the different treatments given them.

PURPOSE

The purpose of the experiment was to determine as nearly as possible:

1. When does diameter growth start in the spring?
2. During what period does the tree grow fastest?
3. In what part of the stem does growth start first or does it grow all over at the same time?
4. What effect on growth does the removal of buds have?
5. What effect on growth does the time of bud removal have?
6. When does growth cease?
7. Where does growth cease first?

METHODS

The method of measuring diameter growth was with the use of sixteen-gauge lead wire. This wire has no resilience and so remains as bent. It spreads easily enough not to retard the growth of the tree. The wire was placed around each internode, given about one and one-half wraps and drawn snugly to the tree. A knife was then drawn across the lead wire to make two notches opposite each other as shown in the figure. Any growth in circumference will spread these notches apart; hence, by measuring the spread between the notches we determine the amount of growth.

The three trees were treated in the following manner: the north tree was kept as a check; on the middle tree the lateral buds were removed as soon as they started growth, only the terminal bud being left undisturbed; on the south tree, lateral buds were clipped with the point of a knife before growth started, so that no growth took place in the lateral buds.

Measurements were taken once a week from February 18 to September 30, 1938. No growth appeared until the week of March 25, and by September 30, all growth had stopped. On April 7 and 8 there was a severe blizzard which froze back all shoots so that the trees had to start from "scratch" again.

At the end of the experiment, the trees were cut down and brought into the laboratory. Measurements of the longest branch of the respective trees were taken. The north tree produced five branches of varying length, the longest branch (the leader) being 12.44 dm. (4' 1") long; the middle tree in which the lateral branches were removed as soon as growth started, produced only a terminal branch which was 21.33 dm. (7') long; the south tree on which lateral buds were prevented from starting had a terminal branch 14.09 dm. (4' 7½") long. The weight of the branch or branches of the respective trees are as follows: the combined weight of the five branches of the north tree was 285.5 g.; the weight of the branch of the middle tree was 468.8 g.; the weight of the branch of the south tree was 265 g. It is evident that the middle tree made the greatest growth in height as well as the greatest amount of dry weight.

Table 1.

Growth variation caused by bud removal

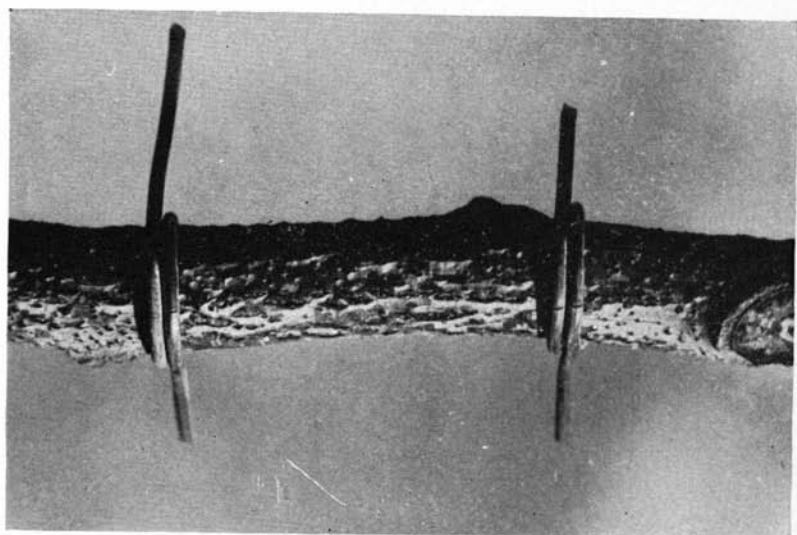
Name	Treatment	Longest	Air Dry	Week of Most*		
		Twig	Wt.	Top	Center	Bottom
		<i>dm.</i>	<i>g.</i>			
North tree	Check	12.44	285.5	9	8	8
Middle tree	Buds removed after growth started	21.33	468.8	8	13	14
South tree	Buds prevented from starting	14.10	265.0	10	10	10

DISCUSSION

Diameter growth started at the top of the stem during the week of March 25 and by the next week it had extended to the base. Growth was not uniform throughout the stem. Certain parts seemed to fill out one week and other parts at some other time. The sum of these growths developed a more or less uniform stem. The top wire of the middle tree dropped off about June 1 owing to differential growth at the junction of the terminal shoot; hence the top wire was not measured after that date. After the blizzard on April 7 and 8, the south tree put out an adventitious shoot three nodes from the top. The top two internodes died and dried up; hence no measurements were taken on them after May 8. After July 15, we were unable to read the third wire from the top because of the nature of growth at the union of the twig with the stem. Growth stopped quite uniformly throughout the stem.

The method of using lead wire in these measurements was quite satisfactory, as compared with measuring with steel tape or calipers. There are, however, possible errors with the lead wire system. First, the quantity measured is not the circumference of the tree but the outside length of the wire which is wrapped around the tree. As this error is uniform throughout the measurements, it does not materially affect the final results. Second, lead wire will stretch, but I do not think that it stretched enough in this case to affect the results. Third, some creature, presumably an insect, gnawed some of the soft lead wire until the marks

*The accumulated data which these results summarize are too cumbersome to be included here but are available in the author's office.



were indistinguishable; hence the wire had to be replaced. Since grasshoppers were very numerous around the trees, I assume that this damage was done by them.

SUMMARY OF DATA

1. The diameter growth started March 25, 1938.
2. Diameter growth started at the top of the stem and came down. (The week of fastest growth for the respective trees is shown in Table 1.)
3. Growth stopped in all parts of the trees at approximately the same time, September 30, 1938.
4. Greatest growth in height as well as in dry weight of the branches was made by the middle tree.

ASSUMPTIONS

The middle tree's greater growth is probably due to the formation of hormones in the lateral buds before they were removed, these growth substances spending all their energy in one shoot. The south tree, whose lateral buds were killed before the formation of hormones, did not receive this stimulus.

This experiment was tried on only one set of plants. The number used is not sufficient to establish definite conclusions. The experiment gives the data on only these three plants and offers a possible interpretation.