

SOME OBSERVATIONS ON THE

PROPOGATION OF PLANTS

FROM HARD-WOOD CUTTINGS.

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J. B. THOMPSON.



## OUTLINE.

- 1.- Some observations on the propagation of plants from hard-wood cuttings.
- 2.- The importance of this process of propagation.
- 3.- The nature of the experiment upon which these observations were founded.
- 4.- Notes on the growth of the various species.
- 5.- Conclusion.



Among the many processes of plant propagation,<sup>in</sup> which the horticulturist is most concerned, that of hard wood cuttings is at least one of the most important. It is not important only because of the great number of species that are reproduced in this way, but also for the ease and consequent cheapness of propagating them. The American Horticulturist is indebted to this process for a majority of his currant and gooseberry bushes, and for a large number of the ornamental shrubs that add so much to the attractiveness of the home and the pleasures of life.

While it is not to be expected that the following experiment, which comprises a study of the growth of various plants from hard-wood cuttings, will reveal only unknown facts, yet it is hoped that somethings both interesting and instructive may be gained from it. The conditions of the experiment were as follows:

Sixteen different species, mostly of ornamental shrubs, were selected from available stock and were chosen for the ease with which they are grown by this method. The young wood was taken between the first and tenth days of January and stored in a moist place in the cellar, where the temperature was fairly constant at about 40° F. On January 24th the cuttings were made. They were cut about eight inches in length and twenty-five of each specie were set in fairly coarse sand in a propagating bench where the temperature varied from about 45° F. in the morning to about 65° F. in the afternoon. As the warm season approached, the average temperature, of course, became much higher. These different cuttings must be considered separately and for the sake of convenience it may be best to arrange them in alphabetical order.

Cornus Mascula.- The first signs of growth in these cuttings were observed forty-six days after planting, when the formation of a



callus about the cambium of the lower end of the cutting was first noted. Three weeks later the first leaves appeared and until the present time, one hundred and eighteen days from the time of setting, no roots have appeared. There are, however, 80% of the cuttings in a perfect living condition.

*Cornus Sericea*.— Cuttings from this shrub began to callus forty-five days after being set. Six days later the first roots were observed, first as minute projections upon the bark, which soon split in lateral directions, revealing the young roots. A noticeable and interesting fact in regard to the position of the roots is that they bear no relation to either callus or node.

*Cornus Sibirica*.— The advance process of callusing was first noted on cuttings of this specie on March 2d, or thirty-seven days after the cuttings had been planted. Ten days later the first roots appeared, some being located on or near the callused portion, while perhaps as many sprang from about the nodes, and a few scatterings ones appeared on the inter-nodes.

*Deutzia Gracilis*.— In making cuttings from this and *D. Wellsii* it was found that by using a pair of common pruning shears, the wood, being virtually a hollow tube, was badly crushed. It was thought that this might have some influence over the rooting properties of the cuttings, and with a view of determining the matter, a part of the cuttings were severed through the diaphragm with a sharp knife. The first indications of growth were opening of leaves and the formation of a callus, both of which were first noted thirty-seven days after the cuttings were set, and five days later the first roots appeared. It was found that while callusing progressed from cuttings made in either way, those cut through the diaphragm showed a more



rapid and a more vigorous growth than did those cut with the pruning shears. The reason for this difference is not easily explained. It may be due to simply a mechanical difference, but it seems more reasonable to attribute it to a wound which has a tendency to facilitate root development through a node from whence these cuttings most easily root.

*Deutzia Wellsii*. - The leaves and callus growth were first observed on these cuttings at the time when *D. Gracilis* had reached the same development. The callus grew with moderate vigor but it was seen that, unless this was in close proximity to a node, strong root development did not proceed from it, but appeared from an underground bud in profuse tufts with scattering adventitious ones. Cuttings from this shrub strike very readily and under the conditions of this experiment not one failed to root.

*Eusymus Atropurpureus*. - At the time of this writing these cuttings have been set for four months and the only noticeable growth is that of a few leaves and shoots. Of the cuttings planted, 94% remain in a good healthy living condition, but as yet no rooting or callusing has begun.

*Forsythia Suspensa*. - Cuttings of this shrub showed a moderate callus and fairly vigorous leaf development thirty days after setting in the propagating bench. Root growth is rather slow to start and was not noticed until eighty-five days after planting. Top growth proceeded very nicely for awhile, but was badly injured by a temperature of 95° F. when no other cuttings were affected. All roots proceed from, or very near, the nodes and bear no relation to the callus.



*Louicera Fragrantissima*. - The first apparent change in cuttings of the sweet-scented honeysuckle was observed on February 18th, twenty-five days after planting. This was in the form of a callus, advancing from the cambium at the lower end of the cutting. Callus-ing progressed very rapidly and in ten days the end of the cutting was almost entirely covered. At this time the first roots appeared, being most numerous and in tufts just below the nodes, with a few above the callus collar and an occasional scattering one growing from the inter-node.

*Louicera Sibibica* / - The root growth of this honeysuckle is similar in most respects to that of *L. Fragrantissima*. The callus appeared at about the same time and with about equal vigor. There is however, a noticeable difference in the relative position of the roots to node and callus. The roots of this specie do not spring from the node, as is the case with the sweet scented honeysuckle, but are found growing from or above the callus in matted profusion.

*Marianna Plum*. - This plum grew from cuttings without difficulty, although it required considerable time before root growth started. The callus appeared nineteen days after setting and grew slowly but steadily for several weeks but did not attain a high degree of prominence. Root growth began seventy-two days after planting and proceeded only from or around the callus growth.

*Salix Alba Vittellina*, or Common Golden Willow. - These cuttings rooted with the remarkable ease and quickness characteristic of cuttings of this group. A very slight callus was developed and this only in exceptional cases. The roots appeared from the cambium at the lower end of the cuttings and around the under ground nodes, being first observed February 20th, or twenty-seven days after setting.



*Salix* \_\_\_\_\_. This specie, known as the Black Russian willow, strikes very quickly, in fact it was the first in the list to show root development. This appeared when the cutting had been in the propagating bed eighteen days and the roots were first observed rising from the underground nodes. Later ones sprung from the cambium at the base of the cutting. The callus was not prominent and was not noticed until root growth had begun.

*Spireae Regelina*.- Fifty-one days from the beginning of the experiment these cuttings were seen to be sending out a few scattering roots. These were at first very delicate and of almost gelatinous texture and appeared on or near an under ground bud. No callus is developed on the base of the cutting, yet the root system grows rapidly and vigorously.

*Spireae Billardii*.- Cuttings of this shrub struck more readily than did those of *S. Regelina*. Root growth began just forty days after setting and at the same time the first leaves were seen. The root system was very similar to that of the former specie, both in the absence of a callus growth and in the relation of roots to nodes. The inter-nodes of this specie are shorter than in *S. Regelina*, which makes the root system accordingly more dense. The top growth is also more vigorous than in the former specie.

*Tamarix Sibirica*.- This specie roots very readily. There has been no callus developed but the root system is strong and vigorous. The first roots were observed thirty days after the cuttings were set and appeared in tufts from the leaf scars, with scattering ones elsewhere. In this test 82% of the cuttings planted were found to grow.

*Wisteria Magnifica*.- These cuttings are very slow to start. Leaf growth did not start until forty-five and root growth until



eighty-five days after setting. A majority of the roots are found rising from the nodes but some appear from the inter-node.

Closely connected with the work of this experiment are some notes taken from cuttings set in the college nursery in the spring of 1904. These notes were taken in the latter part of June and comprise an estimate of the per cent of growing plants. The cuttings were handled in the usual manner, being taken during the late fall and winter and stored in moist sand until planting in the spring. Considerable rain fell after setting and some of the soil was heavy and poorly drained. This accounts for the poor showing of some of the species. The results are shown in the following table which also gives the per cent of growing plants obtained in the former experiment, together with the number of days required for rooting.

Species	Per cent of growth		No. days required for rooting.
	1904	1905	
Cornus Mascula	----	80%	-----
" Sericea	60%	88%	51-----
" Sibirica	95%	100%	47-----
Deutzia Gracilis	-----	92%	42-----
" Wellsii	50%	100%	45-----
Euonymus Atropurpureus	-----	94%	-----
Forsythia Suspensa	75%	72%	85-----
Lonicera Fragrantissima	75%	92%	35-----
" Sibirica	--90%	92%	35-----
Marianna Plum	-----	88%	72-----
Spirea Billardii	40%	88%	40-----
" Regelina	5%	84%	41-----
Salix Alba Vittellina	-----	100%	27-----
"	-----	100%	18-----
Tamarix Sibirica	75%	82%	30-----
Wisteria Magnifica	----	76%	85-----



The development of a callus is often looked <sup>upon</sup> as essential to the growth of a cutting. Fuller, in his "Propagation of Plants," speaks of the callus which always proceeds the formation of roots on all kinds of cuttings, whether from ripe or green wood, leaves or shoots: "This suggests a rule which is stringent and unchangeable. But the variation in the root development of different species observed would lead us to conclude that any rule on the subject must be a general one and subject to many exceptions. In fact those species which seemed to strike most readily were those which developed no callus growth or those ~~on~~ which the position of the roots held no relation to that of the callus. Every specie seems to have rooting char<sup>acteri</sup>istics of its own and any thorough knowledge of these char<sup>acteri</sup>istics must be based upon a study of that individual specie.