THE EFFECT OF NODULES ON THE ROOTING OF CUTTINGS OF JUNIPERUS AND THUJA

GARY L. WILMS AND F L. S. O'ROURKE

Department of Horticulture
Michigan State University
East Lansing, Michigan

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The side branches of certain species of *Juniperus* and *Thuja*, particularly those on the lower portions of the tree, often have swellings or tissue protuberances along the stem There are termed "nodules" in this report. The cause for the development of these nodules is not known and has been variously attributed to environmental conditions, to genetic factors, and to the physiological condition of the tissues known as juvenility.

Past experience and observations made at the Gwenn-Gary Nursery, Columbiana, Ohio, in large-scale production of cuttings has shown that those cuttings with nodules on the stems rooted more quickly and produced more roots than those without nodules The differences were particularly noticeable with cuttings of Spiny Greek juniper (*Juniperus excelsa* 'Spiny') as those with nodules rooted 70 to 80 percent, while tip cuttings without nodules rooted as low as 10 to 15 per cent A study was therefore made at Michigan State University during the winter of 1960 to compare the degree of rooting between cuttings of several species with and without nodules.

Cutting wood was taken from plants in the Gwenn-Gary Nursery in January, shipped to East Lansing and made into cuttings 7 to 8 inches in length. Lots of 100 cuttings each with and without nodules of three different species were treated with indolebutyric acid and set on January 20. 1960, in a greenhouse bench under mist humidification They were removed on April 10, 1960, and graded into three classes according to the degree of rooting. Arbitrary values of "5", "3", and "I" were assigned to each cutting in the classes "heavy", "medium", and "light", respectively, to use as an index for comparison.

The following table shows the results of the test.

Table 1.—The effect of nodules on the rooting of cuttings of clones of Juniperus and Thuja.

Species and Clones	With Nodules	Total Rooted	Dgree of Rooting			Alive Not Rooted	Dead	Index
			Heavy	Medium	Light			
*Juniperus chinensis**								
'Hetz'	Yes	65	29	22	14	35	0	225
'Hetz'	No	13	5	2	6	88	0	37
Juniperus horizontalis								
'plumosa' 'Andorra'	Yes	72	40	23	9	23	6	278
'plumosa'	No	50	18	18	14	43	7	158
Thuja occidentalis								
'Woodward'	Yes	98	73	17	8	1	1	424
'Woodward'	No	100	66	25	9	0	0	414

* Nomenclature according to "Standardized Plant Names". 1942

This test indicates that rooting of both the 'Hetz' and the 'Andorra' clones of juniper was markedly increased by the presence of nodules on the cuttings while the 'Woodward' clone of arborvitae was not affected. The effect of nodules, therefore, varies with the species of evergreen from which cuttings are taken

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DR CHARLES HESS: Gary, are these nodules actually root initials or are these just young tissue which has to go through the process of developing into root initial?

MR. GARY WILMS. That I don't know for sure. I made some cross sections and it showed that these definitely were initials, but I couldn't tell whether they came from inside this nodule or not.

DR. HESS: As I understand it you made your cross sections at the time you collected your cuttings. The sections showed root initials, is this not right?

MR. WILMS: Not distinctly They showed the cell formation. I might add that it has been stated that these nodules, when placed in water or in moist sand will continue to grow. They will remain dormant indefinitely if they remain on the plant

MR. HOOGENDOORN: I would just like to add this for your information. Years ago when we were making evergreen cuttings, we found that the Spiny Greek juniper could root, but that it would take two years. If they didn't die, they would root We used to look for bubble cuttings on one and two year old plants. It seems they are most prevalent on the younger rather than the older stock. We generally took cuttings from two-year transplants. That is where we found most of the bubbles

MR. GARY WILMS: Mr. Hoogendoorn were these bubbles distributed all over the plant or mostly on the portion of the plant that you could use as cutting wood?

MR. HOOGENDOORN: Some years they would be all over the plant and other years there may not be so many. They were always on the side branches and sometimes on the main branch.

MODERATOR SHAMMARELLO: That was a very interesting talk.

Our next speaker is Mr. Albert Lowenfels. He has been a pioneer with mist gadgets and I think he has both the first one and the last one on the market. Mr. Lowenfels, will now come up here and tell you about those mist gadgets. Mr Albert Lowenfels!

MR. ALBERT LOWENFELS: One of my first experiences with mist propagation was inspired by Jim Wells One hot summer day I went down to Kosters, and watched Jim's mist system. This was in August. It was the hottest day I ever saw and he didn't know me from Adam, but he showed us around a little bit I went home and put in some nozzles and quickly got mist going and kept it going all day We rooted some cuttings.

The next year I read about a time clock, so I put in a clock operating four seconds out of every minute Nobody was there to turn it off when it was raining or when it was cloudy, and for my money you can forget about time clocks unless somebody is in the greenhouse or the field watching them all day. I think the new devices which have been invented since then are much better.

I have here the first electronic leaf that Charlie Hess sold me. I don't know what year it was, but it wore out. I also know Harvey Templeton invented this unit The one that is now being used is put out by White Showers They are in Detroit and I got this unit from them. In fact, it worked so well that I have two of them. This is attached to what you might say is an amplifier, which is a radio tube When the electronic leaf dries it turns on the current which is relayed through the amplifier to a solenoid value operating the line of mist nozzles. Once in a while you have to change the tube, but I have been using it with good success.

The next device I got was from a man named Geiger in Pennsylvania which consisted of two rods. These are connected to a mercury tube sort of system, which turns the current on and off to the solenoid value. There is a minute distance between these two parallel rods. When the rods get wet the current goes off and when it gets dry the current goes on, giving you mist

The last device I have was brought out, I think last year by this same Mr. Geiger It works on the principle of the weight of water, and is self-contained Everything is in the unit, including a small mercury switch. All you do is to attach this to your electric light system, and to a solenoid value and you are in business. There is a leveling device on this so you can keep it absolutely level

Of these various devices, I am inclined to like this last the best because the two rods have to be cleaned frequently If your water is high in salts you might have problems with the electronic leaf

I think that about describes these various mechanisms I will be glad to answer questions on them. I don't see why anybody should use a time clock when these systems are available.

I have one more word I happen to have another line of business in which I make what people consider a pretty good living. I have received several honors as a result of this business and have made a little money. I have also won a number of boat races. However, I am more honored by having been elected as a member of this Society and to speak here today than anything I have done in my long, long life. I think I am the second oldest man at this meeting. Thank you.

MODERATOR SHAMMARELLO. Thank you, Mr. Lowenfels, for your very interesting talk.

Now our next and last speaker will be Mr. Alfred Fordham. Arnold Arboretum. He will talk to us on "Germination of Double-Dormant Seeds" Mr. Fordham!

MR. ALFRED FORDHAM (Jamaica Plain, Massachusetts): This discussion will deal with seeds having dormancies. The reasons for

these natural safeguards were amply covered by Mr. Bergh in his talk yesterday afternoon and need not further be discussed or mentioned.

Mr. Fordham presented his paper and sequence of colored slides.

GERMINATION OF DOUBLE—DORMANT SEEDS

ALFRED FORDHAM
Arnold Arboretum
Jamaica Plain, Massachusetts

The discussion will deal with the two stages of pretreatment necessary for seeds with epicotyl or shoot-bud dormancy, together with the method of shortening the usual time needed for germination. Due to the length of time normally required to germinate them they are in the category of so-called two-year seeds.

CHIONANTHUS RETUSUS

Collection of *Chionanthus retusus* seeds was made in mid-October of 1959. After cleaning they were stored dry until January 18, 1960. This lot was then given five months warm stratification. In this period roots emerged, developed to some extent, and were then ready for cold stratification. If cold is not provided to ripen the shoot-bud the roots will continue to grow until the food stored in the seed is expended. Five months of warm stratification in this case proved to be more than was necessary.

The second lot from the same seed batch was given a three-month warm period followed by three months at 41° F. When sown after these pretreatments a general germination occurred in seven days.

As concerns the method of pretreatment, the seeds are distributed throughout a stratifying medium, which in this case was composed of half sand and half peat moss contained in a polyethylene bag. It is important that the bulk be kept small since at planting time the entire contents of the bag are sown. In proportion, the medium would be two or three times the volume of the seed. It is moistened but is not wet.

Where two stages of treatment are necessary to overcome double dormancy, the bags are first placed on a greenhouse bench to provide the warm stratification requirement In this particular location the temperature ranged between 60 and 101° F. A maximum and minimum thermometer placed in a bag of medium and set on the bench registered this fluctuation. As routine procedure we check seeds with epicotyl dormancy about once a week to see whether or not radicles have emerged. When they do and it becomes a general condition, the bag is moved to the refrigerator to ripen the epicotyl. In the refrigerator a temperature of 41° F. is maintained Wire baskets labeled by months simplify locating bags of seed due to be processed.

VIBURNUM SARGENTI FLAVUM

Viburnum sargenti flavum has been exposed to five months warm stratification. As with *Chionanthus retuses* this length of time was