ARNOLDIA

A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 27 DECEMBER 29, 1967 NUMBER 12

ROOTING OF CONIFER CUTTINGS[1]

(Seedage is the most common means of propagating most conifer species, but when cultivars or forms of distinct character are to be propagated, vegetative means usually must be resorted to. Propagation by cuttings has been highly successful in some cases. In others, propagators have had to resort to the more difficult and costly process of grafting in order to insure success. The study described here was an attempt to gain fuller understanding of the environmental requirements for successful cutting propagation of several conifer species and cultivars, selected to represent both easy- and difficult-to-root types. This study constituted a part of the graduate study requirements of the senior author.[2] The following is an edited translation by the same authors of their article "Einfluss der Jahreszeit auf die Stecklingsvermehrung von Koniferen" which appeared in the German horticultural journal GARTENWELT, Vol. 67, No. 15, pp. 309–311, 1967.
—EDITOR.)

Procedures

Cuttings of ten different conifers (see Table I) were taken at approximately bimonthly intervals: in December, February, April, June, August, and October. The same stock plants were used throughout in order to eliminate genetic variations. In most cases a single stock plant provided all the cutting material. (The ages of the stock plants were not specifically discussed in this article. As a matter of interest, all stock plants were at least 15 years of age except those of *Juniperus horizontalis* 'Glomerata' which were between 5 and 10 years old. Those of *Abies concolor*, *Juniperus virginiana*, and *Tsuga canadensis* were at least 25 years old.—EDITOR.) Cuttings were treated with the rooting hormone indolebutyric acid (IBA) in talc at 4 different concentrations. A fungicide (Captan 50W) had

[1] Vermont Agricultural Experiment Station Journal Series Paper No. 194.

[2] Jesinger, Rolf. The influence of various treatments on the rooting of cuttings of certain conifers throughout the year. M.S. Thesis, University of Vermont, Burlington, Vermont. 1967.

been added to the preparation. Then the cuttings were inserted in a greenhouse bench in a mixture of equal parts by volume of coarse perlite and peat moss. Thermostatically controlled heating cables kept the temperature of the rooting medium at about 68° F. for half of the cuttings, and at about 79° F. for the other half. Each rooting temperature was replicated 4 times in the greenhouse bench, to allow proper statistical treatment of the results. At each sampling date, 40 cuttings of each species or cultivar were made and assigned to each treatment combination (temperature–IBA concentration). Thus the study involved a total of 1280 cuttings of each conifer.

The air temperature in the greenhouse during the day normally reached about 73° F., but during the summer months occasionally went as high as 86° F., even with the use of an evaporative air-cooling system. Intermittent mist was regulated by a Mist-A-Matic controller. This device controls mist applications in relation to rate of evaporation of water from a counterbalanced screen in the misted area.

The time required for root formation is known to vary among different species of conifers. In this study, the time needed for cuttings taken in December to root was compared. The times required for at least 50% of the cuttings of the following 5 conifers to show root formation were:

Thuja occidentalis 'Globosa'	8 weeks
Juniperus chinensis 'Pfitzeriana'	11 weeks
Juniperus horizontalis 'Glomerata'	11 weeks
Juniperus chinensis 'Hetzii'	12 weeks
Abies concolor	13 weeks

Cuttings of *Picea glauca* 'Conica' were removed after 13 weeks, *Pinus mugo* after 14 weeks, and *Tsuga canadensis* after 18 weeks. Only a small percentage of the cuttings of these 3 species showed roots, but it appeared that no further root formation could be expected. *Picea pungens glauca* and *Juniperus virginiana* were always left in the cutting bench for 15 weeks but showed relatively little rooting throughout the year.

Results

The time of year when cuttings were taken, the temperature of the rooting medium, and hormone concentration played differential roles in the rooting of cuttings of the various conifer species. Time of year was the single most important factor.

All cuttings of *Juniperus chinensis* 'Hetzii' rooted when taken in June. Good rooting was also obtained at both rooting temperatures on cuttings taken in April, August, and October. Similarly, cuttings of *Juniperus horizontalis* 'Glomerata' rooted best in June, August, and October. With both of these junipers, rooting of cuttings taken in the remaining months was improved at the higher temperature of the rooting medium.

Juniperus chinensis 'Pfitzeriana' averaged nearly 90% rooting in April, while

TABLE I

OPTIMUM TREATMENTS FOR ROOTING CUTTINGS OF TEN CONIFERS
(Arranged According to Ease of Rooting)

	Conditions of best treatments			Percentage rooting	
	Month of propagation	Temperature of rooting medium (°F)	IBA concentration (% in talc)	Best treatment	All treatments
Juniperus chinensis 'Hetzii'	June	68	0.3	100.0	87.8
Juniperus horizontalis 'Glomerata'	April	79	0.3	100.0	81.4
	August	79	0.3		
	August	79	0.8		
	October	68	0.3		
Thuja occidentalis 'Globosa'	December	79	1.5	97.5	75.8
	April	68	2.0		
	April	79	0.3		
	April	79	1.5		
Juniperus chinensis 'Pfitzeriana'	April	79	0.3	95.0	68.2
Picea glauca 'Conica'	April	79	1.5	90.0	26.6
Tsuga canadensis	February	68	0.3	70.0	27.4
Abies concolor	December	68	2.0	57.5	30.2
Pinus mugo	June	68	0.3	42.5	18.0
Juniperus virginiana	October	79	0.8	30.0	6.0
Picea pungens glauca	October	79	0.8	15.0	2.8

the most successful treatment resulted in 70% to 80% rooting at other times of the year. As with the previously described junipers, the higher temperature of the rooting medium gave better results than the lower. Higher IBA concentrations, in general, increased rooting at the lower temperature.

Picea glauca 'Conica', too, in several cases rooted better at the higher temperature. However, only cuttings taken in April gave rooting percentages as high as 80% to 90%. Propagation at other times of the year did not appear to be economical.

Thuja occidentalis 'Globosa' rooted successfully throughout the year, with a peak of almost 100% rooting in April. Surprisingly, under our conditions rooting was suppressed when the cuttings were taken in October. This might have been overcome had the cuttings been left a longer time in the propagating bench. The higher rooting temperature almost doubled the rooting percentages over those for the lower temperature in October.

In contrast to the previously described conifer species, best results with *Tsuga canadensis* and *Abies concolor* were obtained when the temperature of the rooting medium was kept at 68° F. Rooting as high as 70% occurred on *Tsuga canadensis* in February and at a slightly lower percentage in April, with the 2.0% hormone concentration. *Abies concolor* is generally propagated by seed, but there is great interest in vegetative propagation of individual plants that are especially desirable because of color or growth habit. They could be propagated by grafting, but cuttings would be preferable if a rooting percentage of at least 50% could be obtained, In this study, this percentage was reached or surpassed in December, February, and October.

Pinus mugo generally showed only small rooting percentages. Relatively good results were obtained when new shoot tips were used as propagating material in June.

Detailed results for 3 of these species are shown in Plate XXV.

Discussion

This brief description of our results indicates that these conifers can be propagated successfully by cuttings at one time of the year or another. The best results varied not only with the time of year but also with the temperature of the rooting medium. Increasing the IBA concentration above 0.8% in most cases did not result in greater rooting.

The maximum rooting percentage for each species, together with the conditions under which it was obtained, is shown in Table I. For comparison, the average rooting percentage for each species is included in the table, considering all treatments and all times of the year.

So far, we have limited our discussion to rooting percentages but, in general, the higher rooting percentages were accompanied by more and larger roots per cutting.

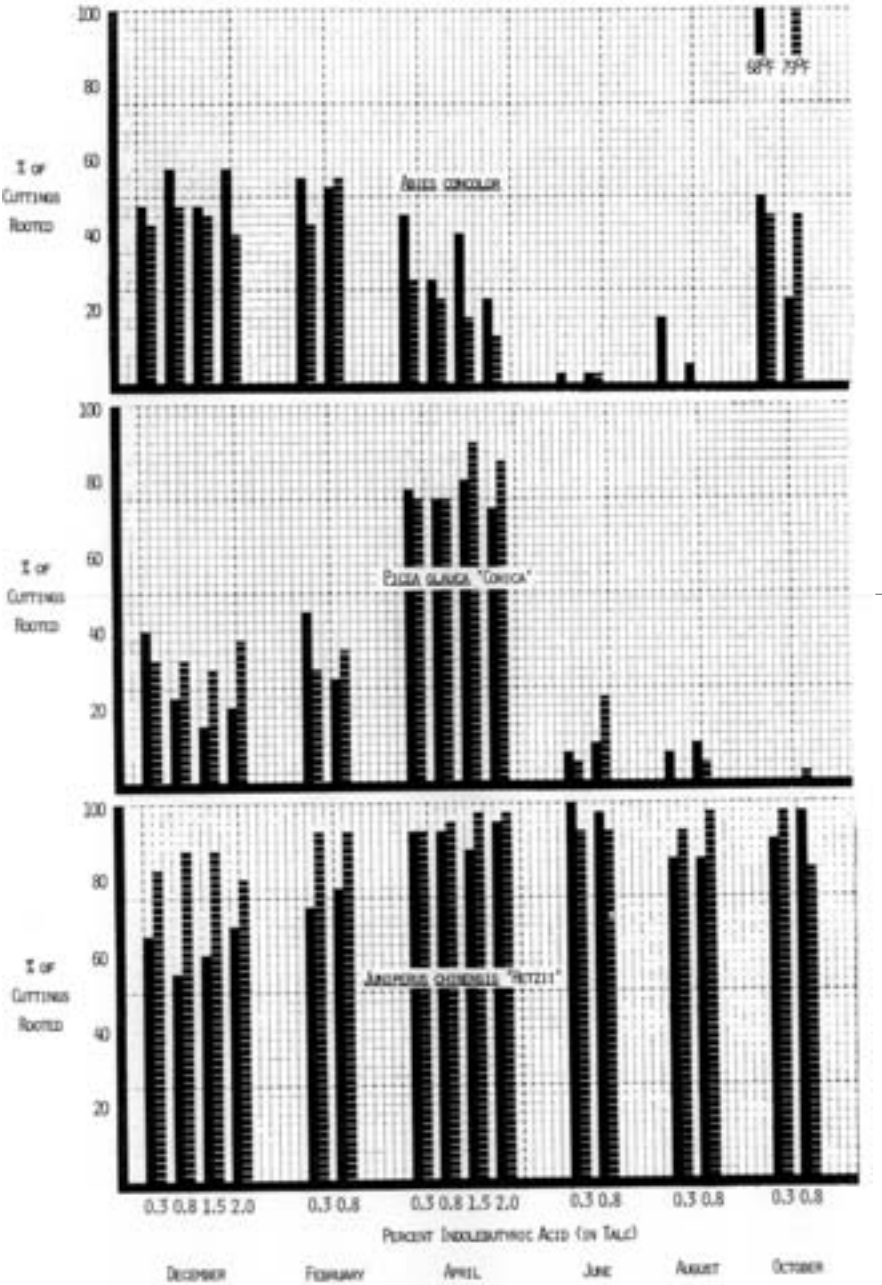

PLATE XXV

Effect of time of year, temperature of the rooting medium, and concentration of indolebutyric acid (IBA) on rooting of cuttings of three conifers.

Additional factors, of course, affect the rooting of cuttings to varying degrees. Nutritional status of the stock plant, rest period, juvenility, and environmental factors all play important parts. These factors were not specifically included in this study.

(NOTE: For the benefit of the European reader, the German article concluded with a discussion of the geographical location, temperature, and light conditions of Burlington, Vermont, where the investigation was carried out, as compared with Hamburg, Germany.)

ROLF JESINGER [3]

RICHARD J. HOPP
University of Vermont
Burlington, Vermont 05401

[3] Present Address: Rohm and Haas Company, Philadelphia, Pa. 19105.