

are — “THERE IS ALWAYS A BETTER WAY.” So don't be complacent. In these days of rapidly escalating costs it is vital that we keep on searching for ways of producing plants more cheaply.

RECENT DEVELOPMENTS IN THE PROPAGATION OF RHODODENDRONS AT BOSKOOP

ir. B. C. M. VAN ELK

*Proefstation voor de Boomkwekerij
Boskoop, The Netherlands*

Abstract Briefly, the propagation of rhododendron cuttings in Boskoop is described. A soil temperature of 20°C (68°F) proved to be the best. When the pH of the cutting medium, pure blond peat, is too low this can be raised by adding 1-3 g/l of a chalky compound. With only small losses one can make cuttings at the beginning of October. The best time proved to be the second half of November or the beginning of December.

After quick-dip treatment of 2,500 to 30,000 ppm, rooting was poor in comparison to the rooting of cuttings treated with a powder of 8% IBA + captan (83% spray material).

INTRODUCTION

Altering the words of a famous saying, I should like to say “What is in a rhododendron cutting”. We, in fact, do not know so much about it. By concluding and deciding, people all over the world try to solve problems; we also do so at the Proefstation voor de Boomkwekerij in Boskoop. With the aid of ideas gathered in literature and the conclusions of our own trials, still existing problems must be solved. Working with living plant material, growing each year in totally different circumstances, it has been seen in several experiments that repeats of the same propagation experiment in one year often produce almost identical rooting percentages.

Because it sounds less scientific, statistical analysis of one experiment for one year does not convince a Dutch nurseryman. The importance of a certain method must be proved over the years. For that reason we try to develop repetition over the years by making cuttings of as many cultivars as can be obtained in the same trial, sometimes the details are altered but the trial will be repeated till the regularity of the results has been proved. This means that every trial will be repeated at least three years in succession, for the second year's results could have been reached by chance.

Briefly, I will speak about the normal way of rhododendron propagation and mention some of the trials and the results ob-

tained with the temperature of the cutting compost, raising the pH of the peat, time of making the cuttings, shallowly or deeply wounding of the cuttings and the use of quick-dip solutions.

For a long time easy-to-root *Rhododendron* cultivars like *R. catawbiense* selections or hybrids, *R. 'Cunningham's White'* and *R. 'Pink Pearl'* have been propagated from cuttings during summer, just after the first flush of growth, normally in mid-July under double-glass in a cold frame. Although results were different from year to year, due to the growing season and the weather conditions after the cuttings had been stuck, rooting percentages were very different.

Because of the shortage of rootstocks of *Rhododendron ponticum* seedlings at the Proefstation, cuttings were made of the tops of these rootstocks in the beginning of December and the rooting percentages were sufficiently interesting. This was the start for the propagation of *Rhododendron* cultivars from cuttings by the growers.

I will exclude *R. impeditum*, *R. praecox* and the cultivars of *R. repens* and *R. williamsianum*, for these can be propagated rather easily from forced cuttings early in spring, from summer cuttings, and also better from late autumn or winter cuttings.

With the hybrids or cultivars, best rooting was reached when cuttings were made in the second half of November and the first weeks of December. One should ask; "Why not later in the season?" One never can predict the weather conditions during this time of the year. When the cuttings had received sufficient cold, differing from cultivar to cultivar, they started producing shoots instead of rooting. When, however, cuttings start growing, rooting can be improved by taking away the newly formed shoots, but this costs very much labour and what is also of importance, these cuttings, which have been stuck with care, are not sufficiently fixed in the medium, so rooting is diminished.

The cutting medium is pure brown peat. In experiments in which a mixture of 9 parts brown peat and one part sand was compared with brown peat only the rooting percentages, even from *R. 'Catawbiense Boursault'*, dropped from 90 in peat to 10 in the other mixture. This difference is more extreme than in the experiments of Kelly (1), but more experiments have been made with about the same results, also under a mist system at the research station and, therefore, only peat has been used in further experiments. Mr. Wells states, during the same conference with Kelly, that liming could be of interest: I believe he overlooks the fact that he raises pH by adding 50% of coarse river sand to his cutting medium, while he places his cuttings under a mist system where the water-air ratio of the cutting medium is very important.

In Boskoop, propagators try to take thin cuttings without a flower bud from the lower, more or less shaded, part of the plant. Rhododendron cuttings grown in a half-shaded woody area, root better, as has been outlined by Vanderbilt (3) but in the flat area of Boskoop this type of cutting cannot be found. In the early experiments there was a remarkable difference in rooting between cuttings treated with 1% and 2% IBA in favour of 2%. When van Doesburg started his experiments with equal mixtures of captan and IBA, he mixed the same quantities of 4% IBA and captan dust to be certain of 2% of the active ingredient for the cuttings. In further experiments, captan spray material (83%) proved to be of more value than captan dust material (10%). Also when the cuttings of the difficult-to-root hybrids were treated with 4% IBA + captan spray material (83%), with which nowadays the difficult-to-root hybrids (cultivars) are treated before sticking in the medium of pure brown peat. Actually the cuttings receive 4% IBA plus the captan protection.

For a long time cuttings have been really pushed into the medium and not placed in preshaped holes because the stated stripping of the growth hormone (2) was of no influence on the rooting percentages, as has been proved in several experiments in Boskoop.

EXPERIMENTATION

Soil temperature. In several publications temperature for rooting rhododendron cuttings is discussed (5,7).

In Boskoop the practical side of propagation must be kept in mind too. In general, the number of cuttings of just one cultivar is limited because of the great number of cultivars grown at one nursery. So the best average temperature had to be found.

During the first experiments — making cuttings between mid-November and mid-December — the temperature was held between 18° and 20°C (64° to 68°F) and, although there were differences, the more easy-to-root cultivars reacted very well to this temperature.

In America, however, 70° to 75°F was favoured. In one of the experiments, therefore, part of the cuttings was placed at a soil temperature of 23°C (73.5°F) and the rooting was rather bad. In the following experiments, about 4 weeks of 20°C was given till callus formation had started and, after that, the temperature was raised to 23°C, until the cuttings were rooted. Temperature was maintained by hot water running through plastic tubes spaced one foot at a depth of one foot below the base of the cuttings.

Table 1 Rooting percentages of rhododendron cuttings¹ placed in a ground level bench and a raised bench in a glasshouse on different soil temperatures

Cultivar	Ground Level Bench		Raised Bench
	20°C, later 23°C	20°C	18-20°C
'Catawbiense Boursault'	100	99	94
'Madame de Bruin'	96	98	90
'Professor J H Zaayer'	88	86	77
'Professor Hugo de Vries'	94	92	94
'Souvenir de Dr. S. Endtz'	99	99	98

¹At least 50 cuttings per treatment

Sometimes the rooting percentages in the raised benches were a little bit better. In general, no advantages have been seen in raising the soil temperature after callusing had started. Conclusion: why should we raise the soil temperature to about 20°C, when the rooting percentages are hardly influenced, while heating costs will be much higher.

Raising the pH of the medium. In Oldenburg (Germany) the nurserymen use freshly ground peat from their own fields. In this material the rooting was rather poor. After a mistake of using too much captan dust against *Rhizoctonia solani*, rooting of a bench of cuttings was very good. Nowadays 3 g/l of a chalky compound is added to the peat to neutralize the decomposed (?) or unsaturated (?) fresh humic acids and the rooting is good.

The pH of peat which can be bought in the Netherlands is lowering. Sometimes the pH-water measured is only 2.9 to 3.1. To see the influence of raising the pH, 1.2 and 4 g/l of a chalky compound were added to the peat and cuttings were placed under the same regime of temperature and water. The results can be seen in table 2.

Table 2. Rooting percentages of rhododendron cultivar cuttings¹ as influenced by different acidities of the rooting medium (pH-water)

	0	1	2	4	g/l
chalk added					
pH beginning	3,6	4,7	5,5	5,9	
pH end	3,7	4,4	5,6	6,6	
r 'Catawbiense Boursault'	91	90	93	81	
r 'Edward S Rand'	91	94	90	85	
R 'Louis Pasteur'	58	61	47	55	
R Madame de Bruin'	100	90	95	93	
R 'Professor J. H. Zaayer'	95	99	84	94	
R 'Van Wilgen's Ruby'	99	90	99	98	

¹at least 50 cuttings per treatment

In the first experiment some positive influence of raising the pH was observed. In the above mentioned table the rooting diminished at the higher calcium rate. I have to say that the pH of the blond peat was not so low as it should have been, because this material had been stored for one year. In practice, when the pH is low, 1 to 3 g/l chalk is added without any harmful effect on the rooting of the cuttings. In the future this probably will become of more importance when younger peats with unripened or unsaturated humic acids must be accepted.

Timing of making cuttings and wounding. The propagator in Boskoop is limited in time and space on his small nursery. He has to follow a very strict scheme of propagation. For about the last 7 years *rhododendron cuttings have been made in mid-November*, but at that time there is much other work to be done too. You can imagine that people will take a chance to spread the time of making cuttings. According to Wells (5) and others, September is a good time to make cuttings of rhododendron. Others liked to do it earlier and others later.

In Boskoop, experiments were set up with cuttings taken at about the beginning of October, November and December.

Normally only a thin slice of the bark was cut off. In these trials a part of the cuttings was also wounded heavily; that means part of the wood had been taken away over a length of 2-3 cm. This has also been done to convince growers that wounding is important, but that it is not so accurate (almost scrupulous) a job as thought. In his research, Wells (5, 6) has proved that deeply wounded cuttings very often root as well, or even better, than shallowly wounded ones. As can be seen, the results of the timing experiments differ too much to justify a conclusion at this moment.

Some cultivars can be made over the whole period. Some root better when made early; most do better when made rather late in the season. When a propagator asks for advice at the moment, he will be told to make the cuttings during November or the beginning of December. When he is restricted in his possibilities during this time he can make them in October, although we cannot forecast for him optimal results. This subject is still under research.

When a choice has to be made between the types of wounding, shallow wounding is preferable in almost all cases, for the occasional figures which are smaller in comparison to the deeply wounded ones, I believe, must be seen as exceptions, confirming

the rule. More research needs to be done on this subject. In my opinion, this is less a case of roughening of our profession but more a case of dismantling the mysteriousness around propagation.

Table 3. Rooting percentages of normally and deeply wounded cuttings¹ of rhododendron cultivars made on three different dates.

Season 1970-1971	Wounded Normally			Wounded Deeply		
Cultivar	Oct. 2	Oct 29	Dec 1	Oct 2	Oct 29	Dec 1
'Direcktor E Hjelm'	74	76	84	44	52	84
'Dr H C Dresselhuys'	28	36	50	50	28	58
'Hollandia'	24	20	22	28	34	14
'Mrs. Lindsay Smith'	16	28	64	52	54	90
'Pink Pearl'	96	86	84	96	84	92
'Professor J. H. Zaayer'	84	90	100	82	94	100

Season 1971-1972	Wounded Normally			Wounded Deeply		
Cultivar	Oct 4	Nov 8	Dec. 7	Oct. 4	Nov 8	Dec. 7
'Britannia'	44	32	50	62	10	50
'Direcktor E. Hjelm'	68	70	58	34	46	72
'Doncaster'	56	42	64	70	60	56
'Dr H C Dresselhuys'	18	14	44	32	60	44
'Hollandia'	42	28	48	52	16	16
'Mrs Lindsay Smith'	18	6	6	58	70	12
'Pink Pearl'	90	96	70	90	96	84
'Queen Mary'	58	34	80	84	52	84

¹at least 50 cuttings per treatment

Quick-dip solutions. A new idea for our research was born in 1969 after personal communication with Dr. Howard and Mr. Humphries, our first president.

Of course, the experiments in the U.S.A. (3, 4) were known, but 2, 4, 5 - TP never was a success in the series of experiments with this product carried out by my predecessor, van Doesburg, and myself. The solutions for the IBA quick-dip treatments to the base of the cuttings were prepared according to the advice of Dr. Howard. The check cuttings were treated with 8% IBA plus captan spray material (83%).

The check cuttings were wounded slightly; the others were cut as horizontally as possible and only treated at the base. One group was wounded in the normal way.

Table 4. Rooting percentages of rhododendron cultivar cuttings ¹ after a quick-dip treatment, as compared with the controls

Treatment	'Britannia	'Doncaster'	'Edward S. Rand'	'Nova Zembla'	'Pink Pearl'	'Van Weerden Poelman'
8% IBA + captan spray	46	88	66	98	93	80
2500 ppm IBA	2	4	4	30	58	20
5000 ppm IBA	10	8	24	55	56	15
10,000 ppm IBA	12	24	16	73	58	28
10,000 ppm IBA, normally wounded	—	—	44	—	90	49
30,000 ppm IBA	—	—	28	—	76	30

¹at least 50 per treatment

In this table it can be seen that the treatment with the normally used powders is far the best. Remarkable are the results with the normally wounded cuttings treated with 10,000 ppm IBA. This underlines the importance of wounding of the cuttings.

Perhaps there has been made a fault in one or other way during the treatment or after the plants have been stuck, but on the basis of these results a treatment with quick-dip solutions cannot be advised to the Dutch propagator.

LITERATURE CITED

1. Kelly, J. S. 1969. Propagation of Rhododendrons and Azalea's at Kinsealy. *Proc Int. Plant. Prop. Soc* 19; p. 208-210
2. Stroombeek, E. 1959. Hormone applications by the quick dip method. *Proc Int Plant. Prop. Soc* 9; p. 51-57
3. Vanderbilt, R. T. 1965. Rooting of broad-leaved evergreens especially hybrid rhododendrons and species. *Proc. Int. Plant. Prop. Soc.* 15; p. 177-180
4. Wells, J. S. 1955. *Plant Propagation Practices*. The Macmillan Company, New York.
5. Wells, J. S. 1951. Propagating rhododendrons from stem cuttings. *Proc Int. Plant Prop Soc.* 1; p. 12-14
6. Wells, J. S. 1962. Wounding cuttings as a commercial practice. *Proc Int Plant Prop Soc.* 12; p. 47-53

7. Whalley, J. 1967. Rooting rhododendron in plastic bands. *Proc. Int Plant Prop. Soc* 17; p. 173-175
Yearbooks of the Proefstation voor de Boomkwekerij at Boskoop 1967-1973

Discussion

An enquiry from Peter Brazier on the availability of information regarding rhododendron species elicited the response that the Experimental Station had included some species in their trials and results could be obtained by a written request to the Director.

Discussion also revealed that it was the practice to take cuttings from both flushes of growth during the season without any apparent differences in response.

Although considerable discussion revolved around the concentrations of IBA employed and its placement, no conclusion was determined.

THE ROLE OF THE PLANT PROPAGATOR IN THE AMERICAN MAIL-ORDER COMMUNITY

RALPH SHUGERT

Spring Hill Nurseries Co
Tipp City, Ohio 44371

The topic at hand is a fascinating one and I suppose plant propagators do not vary in their daily activities a great deal in most of the nursery community enterprises. Mail-order is somewhat different in that most mail-order propagators are requested to supply a range of plant material from houseplants through all the woody ornamentals indigenous either to their geographic location, or to a profit and loss statement in a mail-order catalog. Mail-order, be it nursery stock or any other commodity, is a game of arithmetic. The only interest is, of course, complete customer satisfaction, which is the only way you can obtain a reasonable profit on a fantastic advertising investment. There are nursery mail-order concerns throughout the world whose advertising percentage costs will range from 30 to 55% of their sales dollar. Those of us in a wholesale growing operation, or a garden center endeavor could, of course, not live with this horrendous advertising cost.

I will have to limit my remarks primarily to my own company — Spring Hill Nurseries, Tipp City, Ohio because, naturally, this