

Methods for Difficult Hardwood Cuttings With Bottom Heat in Hungary

Gábor Schmidt

University of Horticulture and Food, Dept. of Floriculture and Dendrology, H 1118
Budapest XI. Villányi u.35-43, Hungary

INTRODUCTION

The use of leafless hardwood cuttings is a traditional propagation method for easy-to-root woody plants. Hardwood cuttings of some “problematic” species root as well as or even better, than leafy softwood cuttings if special techniques, such as the heated-bin treatment developed at the East Malling Research Station in England (Howard, 1968; Howard and Harrison-Murray, 1988; etc.), are used. Another way is to root the cuttings indoors instead of outdoors, usually under a plastic tunnel in a heated greenhouse (De Boer and Van Elk, 1983; Joustra and Verhoeven, 1984; Macdonald, 1989).

In Hungary, the heated bin technique was tried in the late 1970s and early 1980s. Good initial rooting (or callusing) was usually obtained in the bin, but, owing probably to poor weather during winter and spring, survival in the field was so poor that the method was finally abandoned (Schmidt and Tusnádi, 1979; Horváth et al, 1984).

The aim of the present study was to explore the possibilities for propagating difficult species and cultivars by leafless hardwood cuttings which are usually propagated by other techniques.

MATERIALS AND METHODS

The experiments were carried out during 1992 to 1995 at the experimental field of UHFI Department of Floriculture and Dendrology in Soroksár (near Budapest) and fall into two categories: simple rooting of hardwood cuttings and the method of “nurse hardwood cuttings.”

Simple Rooting of Hardwood Cuttings. One-year-old leafless shoots were collected between 24 February and 10 March; immediately prepared into hardwood cuttings 10, 20, or 40 cm long, dipped for 5 sec in 0.2% w/v alcoholic solution of indole-3-butyric acid, and planted in flats or boxes (according to their size) in a coarse sand and perlite (1:1, v/v) mix. The flats and the boxes were placed on elevated benches in a greenhouse with 18C bottom heat provided by electric cables and covered with a 0.04-mm-thick transparent polyethylene sheet to retain heat and moisture. The greenhouse received no additional heating.

For experimental controls, hardwood cuttings were prepared of the same species and in the same way, but planted in the open field instead of the greenhouse.

The experiments were laid out in the randomized block system, in four replicates, and with 15 cuttings per plot. Rooting was assessed in late August of the same year.

Nurse Hardwood Cuttings. Cuttings of easy-to-root shrubs and semi-shrubs were prepared and planted at the same time and in the same way in the greenhouse as described above, but 6 weeks after planting, when they started to root and

Table 1. Rooting of selected woody ornamentals propagated by hardwood cuttings at the end of winter and stuck in a glasshouse with 18C bottom heat or in the open ground (control) respectively.

Plant	1992		1993		1994	
	Glasshouse ground	Open ground	Glasshouse	Open ground	Glasshouse	Open ground
<i>Ailanthus altissima</i> 'Purple Dragon'	-	-	14	0	8	2
<i>Betula mandschurica</i>	10	0	6	0	-	-
<i>Buddleja davidii</i> 'Royal Red'	98	82	91	80	94	64
<i>B. davidii</i> 'Nanho Blue'	92	76	98	74	86	70
<i>Calycanthus occidentalis</i>	28	0	24	4	-	-
<i>Campsis xtagliabuana</i> 'Madame Galen'	-	-	56	12	62	4
<i>Caryopteris xlandonensis</i> 'Heavenly Blue'	98	21	87	14	96	18
<i>Cercidiphyllum japonicum</i>	12	0	16	0	-	-
<i>Cotinus coggrygia</i> 'Royal Purple'	0	0	0	0	-	-
<i>Ficus carica</i>	84	11	72	24	82	-
<i>Hibiscus syriacus</i> 'Lady Stanley'	48	12	56	10	52	-
<i>H. syriacus</i> 'Puniceus Plenus'	54	14	49	11	53	-
<i>Hydrangea arborescens</i> 'Grandiflora'	-	-	82	44	64	24
<i>Jasminum nudiflorum</i>	100	78	98	82	-	-
<i>Metasequoia glyptostroboides</i>	10	-	12	-	-	-
<i>Parrotia persica</i> 'Firebird'	4	-	6	0	-	-
<i>Potentilla fruticosa</i> 'Elizabeth'	-	-	64	11	81	22
<i>P. fruticosa</i> 'Herbstfreunde'	-	-	68	21	62	8
<i>Prunus cerasifera</i> 'Nigra'	-	-	14	0	8	0
<i>P. tenella</i> 'Pink Carpet'	-	-	2	0	4	0
<i>Punica granatum</i> 'Legrelle'	98	31	84	24	86	-
<i>Rosa rugosa</i>	2	-	4	-	-	-
<i>Rubus thibetanus</i> 'Silver Fern'	-	-	14	0	-	-
<i>R. 'Benenden'</i>	44	22	47	-	-	-
<i>Syringa josikaea</i> 'Emerald'	10	0	8	0	-	-
<i>S. xchinensis</i> 'Saugeana'	0	0	0	0	0	0
<i>S. vulgaris</i> 'Andenken an Ludwig Spath'	0	0	0	0	0	0
<i>Tilia tomentosa</i>	0	0	0	0	0	0
<i>Ulmus xhollandica</i> 'Jacqueline Hillier'	48	21	52	10	-	-

produced viable new shoots, they were pruned back and their upper shoots were prepared as softwood cuttings, dipped in 0.2% NAA in talc and rooted under a low polyethylene tunnel with 22C bottom heat in the same greenhouse and in the same rooting mixtures.

RESULTS AND DISCUSSION

Simple Rooting of Hardwood Cuttings. *Buddleja*, *Campsis*, *Caryopteris*, *Ficus*, *Hibiscus*, *Hydrangea*, *Jasminum*, *Potentilla*, *Punica*, *Rubus* 'Benenden', and *Ulmus* \times *hollandica* 'Elegantissima' rooted fairly well (Table 1) in the greenhouse with bottom heat, although the traditional method of vegetative propagation for most of them is softwood cuttings (Krüssmann, 1978; Macdonald, 1989). A similar method of propagation is mentioned only for *Hibiscus syriacus* by M.A.D. (1988) and for *Corylus* and *Laburnum* by De Boer and van Elk (1983). Krüssmann (1978) notes for *Ficus carica*, that it is sometimes propagated by hardwood cuttings in the open field in countries with warmer climates.

Poor rooting (below 20%) was achieved in the greenhouse with *Ailanthus*, *Betula*, *Cercidiphyllum*, *Cotinus*, *Metasequoia*, *Parrotia*, *Prunus*, *Rosa rugosa*, *Syringa*, and *Tilia*. Most of the poor rooters showed a good initial growth or even callusing in the greenhouse but later (usually in the second or third week after planting) their new shoots suddenly wilted and the cuttings died, in spite of the regular fungicide drenches and sprayings. *Ulmus* \times *hollandica* 'Elegantissima' cuttings usually rooted first and only later died.

In the open field, most of the species and cultivars rooted poorly (under 30%); only the very easy-to-root *Buddleja* and *J. nudiflorum* gave 78% to 82%.

Table 2. Rooting of nurse hardwood cuttings and of the softwood cuttings taken from them (glasshouse with 18C and 22C bottom heat) from February through April.

Plant	Cuttings rooted			
	Nurse hardwood cuttings		Softwood cuttings	
	Cuttings per box	Number rooted	Cuttings per box	Number rooted
<i>Caryopteris</i> \times <i>clandonensis</i> 'Kew Blue'	200	196	324	266
<i>C.</i> \times <i>clandonensis</i> 'Heavenly Blue'	200	192	310	229
<i>Hydrangea arborescens</i> 'Grandiflora'	80	54	140	123
<i>Jasminum nudiflorum</i>	200	200	382	357
<i>Potentilla fruticosa</i> 'Elizabeth'	100	81	168	136
<i>P. fruticosa</i> 'Goldfinger'	100	71	149	136
<i>P. fruticosa</i> 'Gronland'	100	62	182	157
<i>P. fruticosa</i> 'Herbetfreunde'	100	62	152	116
<i>P. fruticosa</i> 'Ochroleuca'	100	80	164	144
<i>P. fruticosa</i> 'Primrose'	100	58	121	87

Nurse Hardwood Cuttings. The results in Table 2 show that the system worked very well with the species and cultivars tried. The leafless hardwood cuttings rooted with 60% to 96% success after 3 weeks, and produced new, readily rooting leafy softwood cuttings. As a result of this "double yield" each hardwood cutting gave altogether 1.5 to 2.3 rooted cuttings within 4 months.

The above methods described have practical advantages as follows: extension of the range of cutting-propagated plants; extension of propagation season, by utilising the relatively "free" months of late winter; shortening the production time, by giving the plants an earlier start into growth; the "nurse hardwood cutting" system gives higher yields of rooted cuttings per stockplant than the simple rooting of hardwood cuttings.

LITERATURE CITED

- De Boer, S.** and **B.C.M Van Elk.** 1983. Het stekken van boomkwekweekwassen. Proefstatiton voor de Boomkwekerij, Boskoop, p. 35-37.
- Horváth, G., G. Schmidt,** and **L. Timár.** 1984. Nehezen gyökeresedô díszfák-díszcserjék dugványozásával elért eredmények. Lippay Sci Session Univ. of Hort. and Food Industry.
- Howard, B. H.** 1968. The influence of 2-indolyl-3- butyric acid and basal temperature on the rooting of apple rootstock. *J. Hort. Sci.* 43:23-31.
- Howard, B. H.** and **R.S. Harrison-Murray.** 1988. Effects of water status on rooting and establishment of leafless winter (hardwood) cuttings. *Acta Horticulturae* 227:134-140.
- Joustra, M.K.** and **P.A.W. Verhoeven.** 1984. Rooting hardwood cuttings of certain woody perennial species. *Plant Propagator* 30(2):3-4.
- Krüssmann, G.** 1978. *Die Baumschule.* Paul Parey, Berlin-Hamburg, p. 372-360.
- M.A.D.** 1988. Het an de wortel brengen van wintersteck rechtstreeks in eindcontainer gestoken. *Verbandsnieuws voor de Belgische Steertelt* 32(4):173-175.
- Macdonald, B.** 1989. *Practical woody plant propagation for nursery growers.* Timber Press, Portland, Oregon.
- Schmidt, G.** and **C.S. Tusnádi.** 1979. Az ezüsthárs fás dugványozása melegtalpas kezeléssel, *Kertgazdság,* 11(5):69-78.