

Rooting of Western Hemlock Cuttings: Effect of Length  
of Cuttings, Shoot Age and Basal Needles

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Introduction

In previous studies, we preferred to use cuttings from current shoots, cut to a length of 6-10 cm, which generally rooted well (Brix and Barker 1975). However, in cutting propagation of plus trees, we often encounter short current shoots from the old trees, in which case, the practice has been to include 2- and even 3-year-old shoots with the current shoots, to give cuttings at least 6 cm long. Cuttings composed of 1+2+3-year-old shoots did not root as well as those of the long current (1 year) shoots, but this may have been due to the inherent lower vigor of branches with short shoots rather than to shoot age (Brix and Barker 1975).

This study attempts to answer the questions:

- (a) for branches with long current shoots, does the length to which the current shoots are cut affect their rooting?
- (b) for branches with current shoots of different length, will rooting be related to the natural shoot length?
- (c) for branches with only short (less than 5 cm long) current shoots, should older shoots be included to produce a longer cutting?

Additionally, we studied whether the procedure previously followed, i.e., to remove needles from the base of cuttings, to be inserted in the rooting medium, will affect rooting.

#### Material and Methods

Cuttings were collected from January 15 to February 4 in the lower half of the crowns of two tree (about 45-year-old) located in the Sooke to Jordan River area. The trees had some long as well as short current shoots so that the cutting material, where required, could be 8 cm or longer. Cuttings from 2- to 4-year-old naturally regenerated seedlings in the same area were also collected.

For trial (a), long (10 cm plus) current shoots were cut in 3-length groups: short (2.5-3 cm), medium (5-6 cm) and long (8-10 cm). The basal diameters for the 3 groups were 1.3-1.7 mm, 1.3-2 mm and 1.5-2 mm, respectively. For trial (b), naturally short, medium- and long-length current shoots were selected from the same branch. For trial (c), cuttings were prepared from the short current shoots and included the 2-year-old shoots to give a medium length cutting.

After cuttings were cut to size, one-half of them had the needles from the basal 1 to 1.5 cm length removed, while the rest remained intact. They were then treated with a 24-hr basal soak in a solution of 100 ppm IBA plus 150 ppm Benlate, inserted in flats with a rooting medium of equal volumes of fine peat moss, washed coarse sand and coarse perlite, and thereafter placed outside in plastic-covered propagation boxes (Brix and Barker 1975). Heating was applied only when the temperature of the rooting medium fell below 2 C.

Each treatment was applied to 45 cuttings divided into 3

replications. The final recording of rooting was made in late September to early October. The statistical test was done with an analysis of variance and the Student-Newman-Keuls' multiple-range test.

Results

Trial (a): Current shoots long and cut to different length.

Results for the two 45-year-old trees and seedling cuttings are given in Table 1.

Table 1. Per cent rooting of cuttings with (+) and without (-) basal needles and cut to different length from long current shoots.

	Cutting length					
	short		medium		long	
	+	-	+	-	+	-
basal needles	+	-	+	-	+	-
tree 1	69	76	62	100	76	98
tree 2	<u>20</u>	<u>51</u>	<u>67</u>	<u>67</u>	<u>33</u>	<u>71</u>
trees, avg	45	64	65	84	55	85
seedlings	71	96	78	91	-	100

The analysis of variance for the old trees showed highly significant effects of shoot length, basal needles and tree source on rooting. Short cuttings did not root as well as medium and long cuttings for the old trees, but length had no effect for cuttings from seedlings. Cuttings with the basal needles removed rooted best.

Trial (b): Current shoots of different length.

Table 2. Per cent rooting of cuttings of different length, with (+) and without (-) basal needles, using naturally occurring short, medium and long current shoots.

	Cutting length					
	short		medium		long	
	+	-	+	-	+	-
basal needles						
tree 1	54	80	29	60	76	98
tree 2	<u>42</u>	<u>56</u>	<u>34</u>	<u>64</u>	<u>33</u>	<u>71</u>
trees, avg	48	68	32	62	55	85
seedlings	82	89	98	100	-	100

The analysis of variance showed no significant effect of cutting length on rooting when current shoots of different sizes were used for either tree or seedling material. Removal of basal needles improved rooting.

Trial (c): Short current cuttings versus current plus 2-year medium length cuttings.

Table 3. Per cent rooting of short current cuttings and medium length cuttings from current plus 2-year-old shoots; basal needles removed.

	Cutting length and age	
	current short	current + 2-year medium
tree 1	80	93
tree 2	<u>56</u>	<u>64</u>
trees, avg	68	79

The inclusion of the 2-year-old shoot with the current short shoot to produce a medium sized cutting, rather than using only the current shoot did not affect rooting significantly. Also, medium sized cuttings, consisting in part of a 2-year-old shoot, rooted as well as medium sized cuttings cut from long current shoots (Table 1) and cuttings from medium sized current shoots (Table 2).

Growth. Rooted cuttings were potted for observation of growth and mortality. About one-half the seedling cuttings potted before June flushed for a second time in that year, with a height growth of up to 20 cm. Those rooted thereafter, as well as cuttings from the old trees, produced only one short flush the year of rooting. The only significant mortality observed when cuttings were examined the following February was in the naturally occurring short cuttings from the old trees for which the mortality was 11 out of 59 cuttings (19%). Many of these cuttings had lignified roots when potted. For all other rooted cuttings, mortality averaged 1.2%.

Growth in height and in total dry weight was recorded for the year following rooting for short and medium sized cuttings from current and current +2-year shoots (Table 4). An analysis of variance showed no significant effect of these parameters on growth, though the tendency was for least growth for current +2-year shoots. Seedling cuttings grew significantly better than those from old trees.

Table 4. Growth in height and dry weight of cuttings in the year following rooting for short and medium sized cuttings.

	Cutting size and shoot age					
	short current		medium current		medium current +2 year	
	height cm	weight g	height cm	weight g	height cm	weight g
tree 1	28	2.7	30	4.0	23	2.4
tree 2	28	4.6	30	5.2	24	3.2
seedling cuttings	42	11.2	42	12.9	-	-

#### Conclusion

Long (8 cm and longer) current shoots should not be cut to a short (2.5-3 cm) cutting length, but rather to a length of 5-10 cm. Naturally short (2.5-3 cm) current shoots will root as well as naturally medium and long current shoots, but their mortality after rooting may be higher. The inclusion of the 2-year-old shoot with the current one to produce a medium sized cutting has little or no effect on rooting but may increase subsequent survival. Needles should be removed from the basal length of the cutting to be inserted in the rooting medium. Cutting size (short or medium) has had no significant effect on growth in the year following rooting. Cuttings from seedlings have grown better than those from old trees.

#### Reference

- Brix, H. and Barker, H. 1975. Rooting studies of western hemlock cuttings. Can. For. Serv., Pac. For. Res. Cent. Inf. Rep. BC-X-131, 13 pp.