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Rough Handling Reduces the Viability of Planting Stock
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Abstract

Experiments have shown that rough handling reduces the root growth potential and survival of barerooted conifer transplants. Plant handling systems should be designed to minimise physical shock; plants must be handled gently.

Introduction

1. Aldhous (1972) listed three possible causes of damage to bareroot transplants as mechanical, heating or drying.

2. Research work has concentrated on drying damage (Insley 1979, Tabbush 1983, 1984). Heating damage may result from direct sunlight shining on plants in clear polythene bags, a danger familiar to most arboriculturists, or wet plants and large stacks of plants may heat biochemically- the compost effect. But the effect of mechanical shock has only recently become apparent; this note should alert nurserymen and those concerned with tree establishment to the finding that rough treatment of planting stock can seriously reduce survival.

The rough handling experimental treatment

3. The standard method adopted to simulate the effects of rough handling was to drop a polythene bag containing transplants, roots downwards, from a height of 3m onto a hard floor. The severity of treatment was determined by the number of times a bag was dropped. This treatment inflicted no visible damage on the root system.

Results

4. Root growth potential (RGP), the amount of new root production after a given time (Ritchie and Dunlap, 1980), fell dramatically with increasing severity of treatment (Figure 1). Bagged plants dropped just once and then planted in the favourable conditions of a controlled environment showed an initial drop in RGP although after 18 days this was not detectable.

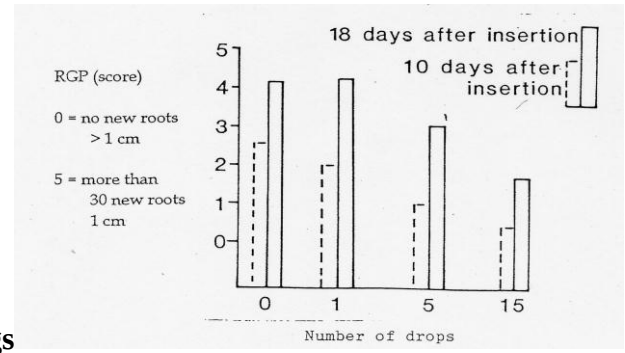

Figure 1. RGP of Sitka spruce after dropping bags

5. Samples of trees were also planted in a nursery bed. Trees given the most severe treatment showed significantly reduced survival and growth after 1 year (Table 1).

Table 1. Sitka spruce survival after 1 year

Number of drops	Survival	1st year increment (1cm)
0	100	11.1
1	97	11.4
5	100	6.6
15	87	7.3

6. Early results are available form a trial designed to assess the importance of rough handling when it is compounded with desiccation damage. The rough handling treatment (bags dropping onto concrete 15 times) and drying (2 hours exposure in a growth chamber at 75% relative humidity and 20ºC) reduced RGP in both species (Sitka spruce and Douglas fir) tested. When rough handling and drying treatments were combined, Sitka spruce survival was reduced by a greater amount than the sum of the reductions in survival caused by the two treatments applied singly (Table 2).

Table 2 RP (measured as total number of white roots after14 days) and survival

	Sitka spruce		Douglas fir	
Treatment	RGP	Survival %	RGP	Survival %
Control	37.1	98.3	0.5	91.7
Rough handling	0.1	95.0	0.1	81.7
Drying	1.0	95.0	0.4	81.7
Rough handling and drying	0.0	46.7	0.0	70.0

Significance of these results to practice

7. At lifting from the nursery bed plants are often knocked to shake soil off their roots. During handling and transport plants may be stacked on each other or walked over to gain access to distant plants. Trees may be buffeted in transit and bagged trees may be thrown off lorries, for example. These shocks and other rough handling may reduce the survival and subsequent growth of plants.

8. These early results are reported because they reveal important effects. Further research is planned to elucidate how rough handling reduces root growth potential and survival and to extend the experimentation to cover broadleaved tree species.

Conclusions and recommendations

9. Rough handling between lifting in the nursery and final planting reduces the root growth potential of bareroot conifer transplants, and hence their ability to survive and grow. Plants with low RGP

because of species or their physiological condition are most likely to succumb following rough handling.

10. Planting stock must be treated gently at all stages if good results are to be obtained after planting.

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