THE TREE ADVICE TRUST

Arboriculture Research Note

8	79	ARB

Issued by the DOE Arboricultural Advisory and Information Service.

DAMAGE TO BROADLEAVED SEEDLINGS BY DESICCATION, by H. Insley

Abstract

Research into the effect of drying on the survival of broadleaved seedlings while out of the ground shows that susceptibility varies widely between species, fine rooted species proving more sensitive than species with coarse roots. Although most of the moisture loss occurs through roots, root wrapping alone is insufficient to prevent drying out of seedlings and probably small transplants for more than a very short period. As a result it is recommended that between nursery lifting and planting, seedlings and small transplants should be enclosed completely in polythene bags.

Effect of drying on survival

1. Seedlings of three species, Norway maple *(Acer Platanoides,* Sessile oak *(Quercus petraea),* and *Nothofagus obliqua* were lifted at daily intervals and subjected to drying by leaving them uncovered in an unheated packing shed for periods of up to a week. After exposure batches of each species were replanted on the same day so that all trees received uniform planting conditions.

2. Subsamples were taken from each batch before and after exposure, and by weighing these at the time of sampling and then after oven drying (48 hrs at 100^0C), the % moisture content of the plants in each batch was calculated:

$$[\% \text{ moisture content} = \frac{\text{fresh wgt. - dry wgt.}}{\text{dry wgt.}} \times 100]$$

3. The replanted trees from each batch were assessed for survival during the following growing season and survival was related to % moisture content of each batch at planting as calculated from the subsamples at the time of treatment.

4. *N. obLiqua* plants proved extremely sensitive to exposure and the plants in all batches exposed for more than 24 hrs died. The thicker rooted Norway maple and Sessile oak dried out more slowly and survived better. As shown in Figure 1 there was a strong relationship between % moisture content at planting and subsequent survival.

Mechanics of moisture loss

5. To demonstrate how moisture was being lost from lifted plants a separate experiment was carried out using White birch *(Betula pubescens)* seedlings. One hundred and ninety-five seedlings were lifted and divided into 13 batches of 15 plants by random selection. The plants in one batch were analysed immediately for assessment of moisture content at lifting. Roots and shoots were assessed separately by dividing the plants at the root collar.

6. The remaining 12 batches were subjected to 3 different treatments. The plants in 4 batches were exposed with no protective wrapping; 4 batches had the roots of individual plants sealed in polythene bags and shoots exposed, and 4 batches had shoots sealed in polythene but not roots. These 12 batches were then laid on shelves in an unheated packing shed for 2, 4, 7 and 10 days respectively.

*Note: As % moisture content is related to oven dry weight, freshly lifted plants usually have a %, moisture content greater than 100%.

After each of these exposure periods a batch from each treatment was taken and moisture content of the plants measured by weighing the plants 'fresh' and after oven drying. The 0 moisture contents of roots and shoots were determined separately.

7. The different rates of drying with each treatment is shown in Figure 2.

Implications for wrapping--bare-rooted plants

8. There was a highly significant difference ($p = 0.001$) in % moisture content of the plants in each treatment after each exposure period. Batches in which the whole plant was exposed dried most rapidly, falling to 100% moisture content

after 2 days and 71% after 4 days. In batches which had their roots only sealed in polythene bags, the loss of moisture content was negligible after 2 days but had dropped to about 125% after 4 days.

9. The plants which had the shoots protected but not the roots were intermediate in terms of rate of drying, between the other two treatments. These batches demonstrate that most water is lost through roots which are not morphologically adapted as shoots are to resist water loss in air. After 2 days the moisture content of the plants with shoots only wrapped was down to 118% compared with the 205% for root wrapped plants. In all treatments the moisture content of roots and shoots closely follow each other so that there is obviously a free movement of water from shoot to root and vice versa. This evidence suggests that although most water is lost via the roots, root wrapping alone unsatisfactory if moisture loss from the shoots is extensive.

10. From these results it can be seen that small sized bare root plants dry out rapidly once they have been removed from the soil. It is recommended therefore that from nursery lifting to planting on site, complete wrapping of seedlings and small transplants is essential if losses are to be minimised.

11. For larger trees root wrapping may suffice for short handling and transport periods because of the slower rate of drying out of thicker plant material.

12. This work is being extended to cover more species, larger plant material and to measure the condition of plants being delivered by the trade.

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4th April 1979
(reviewed March 2005)

Figure 1. The relationship between moisture content at planting and survival of seedlings of

● *N. obliqua* ▪ Sessile oak ▲ A Norway maple

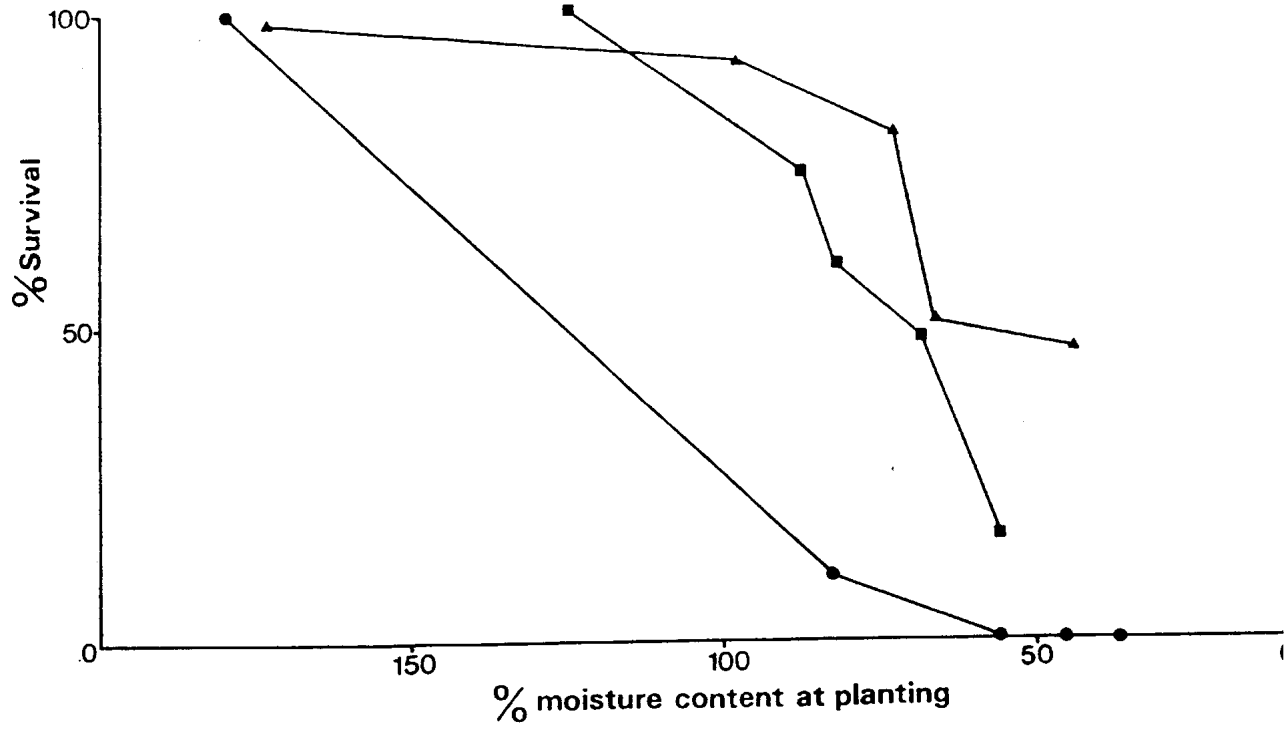
100
50
0
% Survival
150
100
50
% moisture content at planting

Figure 2. Variation in % moisture content of *B. pubescens* seedlings exposed over 10 days