

When the majority of the plants have swollen buds we head back each understock to the union and move the young trees to a shadehouse so that they may leaf out under normal outdoor temperatures.

Aftercare — Growth is rapid after bud-break (Figure 1) and extreme care is necessary to avoid damaging the graft. We transfer the newly-grafted plants into their final pot size when they have made about 30 cm of new growth, removing rubber ties (if they haven't already dropped off), and staking at the same time. Any shoots from the understock are carefully broken or cut out until the shoots from the scion dominate completely.

Rapid growth continues throughout the summer and, by autumn, we have a young tree, often over two metres tall, ready for sale.



Figure 1. *Betula albo-sinensis* var *septentrionalis* six weeks after grafting.

PROBLEMS IN HANDLING FORESTRY AND SHELTER TREES THROUGH THE RETAIL NURSERY TRADE

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When considering nursery and establishment practice of forestry or other mass produced trees, it should be appreciated that outside the state or large forestry companies, large numbers of trees are handled by various types of nurseries. These range from growers who supply their customers direct, to retail garden centres who buy in all trees from a wholesale

source. Many nurseries fall between these limits, doing some direct selling and some buying in for resale.

This paper looks at problems associated with packing, transport, storage, shelf life and ultimate survival. The species involved are used primarily for forestry, orchard and shelter establishment, or for some large scale amenity planting schemes.

Objective. The primary aim must be the high survival of wind firm trees of good genetic quality. Problems in meeting this objective are:

1. Insufficient seed supply from recognised sources, with no genetic selection in the field of shelter. Seed is, therefore, obtained where available. Many retailers are unaware of provenance differences. This is complicated by the fact that customers of a nursery may be planting on widely different climatic sites. For example, *Eucalyptus regnans* seedlings may be obtained at a Hamilton nursery for planting in coastal Bay of Plenty or in severe frost areas in the central plateau. It would be unrealistic to expect a retailer to have two provenances of *E. regnans* for these sites unless he had forward orders a year in advance.

2. Few retail garden centres have adequate facilities for handling and storing bare-root trees, or for storing large numbers of small containers like peat pots, tubes, or small planter bags. Bundles of bare-root trees are often kept unopened for many days after considerable transport time. Roots may be dry or overwet. Foliage may be heating and subject to mildew. Heeling-in beds may be old decaying sawdust or inadequately cultivated soil having poor drainage or poor irrigation. Space is often limited at the height of the season so that trees are packed in too close with insufficient light and air circulation. Containers are often not placed in frames on level ground, so they blow over and miss watering.

3. Orders are usually placed with growers many months ahead to be assured of supply, but delivery dates may not be specified. Trees tend to come early in winter in large batches for economy of transport, so time until sale could vary from hours to several months.

4. There is often insufficient communication between the garden centre and the customer. The customer usually does not appreciate the perishable nature of the goods and may delay collection.

5. Root pruning may be necessary after long storage. Customers need to be aware of the relationship between root-bound trees in planter bags and subsequent wind throw.

Good Practice: Ideally, bulk trees should be taken from the growers' nursery to the planting site with minimum delay. They should not be packed tightly for long periods and should be kept out of the sun and in cool conditions until planted. If these criteria are met they could eradicate much retail handling, result in higher survival, better early growth, and lower prices to the consumer.

It is not anticipated that this will occur except where customers are knowledgeable and fussy and, indeed, as in most commodities, the chain of producer to retailer to customer will continue. If the following practices are carried out, then this system should still allow for delays but ensure that the trees grow well:

1. Bare root trees should, if possible, be sent directly from the grower to the customer.

The retailer can hold sample stock, but provide his labels and freighting information to the grower. The customer must be given an expected arrival date of trees. In this case the grower bills the retailer who adds a reduced mark-up to the customer. There needs to be trust between the grower and retailer so that the customer is unaware of the grower's participation.

2. Trees grown in peat pots would also be best handled directly to the customer, although retailers could hold these and other container trees if they are kept in frames on a flat to gently sloping area with metal spread on ground surface. For long storage, frames with netting bases clear of the ground are to be preferred as they prevent roots from penetrating the soil, with the resultant air wrenching hardening the tree for transplanting onto hard sites.

3. Packaging. Bare root trees need roots protected by moist hay, shavings, sphagnum moss, etc., wrapped in hessian or polythene with the top $\frac{1}{3}$ or so of foliage open. Polythene bundles should be wrapped in paper or put in multiwall bags if they are likely to be subject to sunlight.

Cartons for container stock need to be strong enough to prevent collapse during many handlings. In the case of wet weather or with peat pot stock, a polythene liner may be necessary to prevent the carton from absorbing moisture.

4. Education of customers through the distribution of sound planting advice on the care of nursery stock in written form is desirable. Customers should be told of the advantages of good site preparation and the correct planting of small hardy trees.

5. Both the nurseryman and the customer should have

readily available information in what to look for in good trees and on good handling and establishment techniques. M.A.F. "Ag Links", N.Z.F.S. Extension Officers, Catchment Authorities, Farm Forestry Associations, and the N.Z. Nurserymen's Association should all have pamphlets giving this information.

6. The present nursery registration system should be scrapped in favour of a well informed group of advisors sponsored by M.A.F., N.Z.F.S., or N.Z.N.A. who can advise growers, retailers, and customers on the suggested techniques outlined above.

INFLUENCE OF SEVERAL PRE-SOWING TREATMENTS ON GERMINATION OF *CYCLAMEN PERSICUM* SEED

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Abstract. Several pre-germination treatments were given to *Cyclamen persicum* Mill. seed with the objective of improving germination percentage, speed, and uniformity. Soaking seed in water and in gibberellic acid improved germination speed, but the latter reduced survival. Etridiazole, benomyl, thiram, and sodium hypochlorite treatments did not reduce or delay germination as has been reported elsewhere, but gave no consistent advantage.

INTRODUCTION

Improvements in germination of *C. persicum* seed have been achieved through sodium and calcium hypochlorite surface disinfection treatments (1,8) but optimum germination has not been attained on a routine basis (12). *C. persicum* seeds show variability in uniformity, speed, and germination percentage, and are highly sensitive to environmental and pathogenic factors.

In 1977, 1.13 to 2.75 cents (NZ) were paid per cyclamen seed. Low and irregular germination of this expensive seed contributes to already high production costs particularly with increasing use of the more highly priced F₁ hybrid seed.

Germination of freshly harvested cyclamen seed tends to be slow and irregular (6,9), therefore, the following series of experiments used aged seeds. Heydeker (4) states that the ideal assessment of germination is taken when a viable, self-supporting photosynthesising plant has been produced. To avoid discrepancies between results, seedlings must be grown

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