We produced 200,000 plants by this method in 1971 using a variety of species, Scots pine, Lodgepole pine, *Thuya*, *Abies procera* [*A nobilis*], *Abies grandis*, Sitka spruce and Corsican pine.

As we were the first nursery to use this system outside Finland we have run into quite a number of problems, some we have overcome, while others have still to be solved.

Some of the improvements already carried out are as follows:

1. We have reduced the number needed to operate the machine from 12 to 9. This has been made possible by placing a knife at the beginning of the conveyor to cut the polythene through the centre instead of having to cut the rolls as a final operation.
2. By incorporating a bell that rings when 50 seedlings have been placed on the conveyor. In conjunction with the bell there is also a counter to record the number of rolls per day.
3. By removing the rear roller from the machine and placing a conveyor belt in its place to transport rolls direct to trailer. We have also improved on the spacing device; the object of this is to divide one seedling from the next to avoid root damage and loss of peat.

A major problem has been that the trees grew too fast; to overcome this we are holding the seedlings in cold store and rolling in April, May and June. By doing this we are hoping to reduce the plants' growing season.

Weed attached to roots and foliage of seedlings is another problem which we are hoping to overcome by using sterilized seedbeds.

We have had some good results with ornamental seedlings. Species tried include *Berberis*, *Araucaria*, *Quercus cerris*, *Thuya plicata*, *Chamaecyparis lawsoniana*, and *Acer*.

NUTRITION OF CUTTINGS UNDER MIST

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There is considerable evidence that nutrients are leached from cuttings under mist (1) and that cuttings deteriorate during propagation due to the dilution of existing nutrients in the cutting when new growth occurs on the propagation bench. Various

methods of replacing lost nutrients and maintaining the nutrient supply for new growth have been investigated. The use of nutrient mist is reported by John Wott in this volume (p. 000) and elsewhere (3). McGuire and Bunce have reported on an alternative method using slow release fertilizers incorporated into the rooting medium (2). It is this aspect that has been the subject of trials at G.C.R.I. using the slow release fertiliser, Osmocote.

For these trials a mist unit under glass was used with mist application controlled by an "electronic leaf". Base temperature was controlled at 20°C and the cuttings were rooted in small trays using a basic rooting medium of 50% peat, 50% grit.

Trial 1. 1972 Cuttings 12 cm long of *Cotoneaster dammeri* *'Skogholm'* ['*Skogsholmen*'] and *Symphoricarpos orbiculatus* were taken in early August. The basic rooting medium was used with and without the addition of 4 oz/bushel of 18-6-12 Osmocote. Batches of cuttings were lifted from the propagation bench after 3, 5 and 7 weeks and their rooting performance assessed. In both the trials reported here all the cuttings rooted with all the treatments; the differences where they occurred were in the number of roots and the type of root system which developed. After 3 weeks there was little difference between treatments but after 5 weeks under mist it was noted that the cuttings with Osmocote were taller and had developed side shoot growth (Fig. 1). Those without fertiliser had made virtually no new growth during

Fig. 1. Cuttings of *Cotoneaster dammeri* 'Skogholm' after 5 weeks under mist. *Left*. Peat:grit only. *Right*. With added Osmocote.

propagation. After 7 weeks these differences between treatments were even more marked. In addition, the root systems of those cuttings with Osmocote were whiter and more succulent than the browner and more fibrous roots of those without fertiliser (Fig. 2).

All the cuttings were potted into a standard 75:25 peat/sand compost with complete nutrients added. At the end of the season plant height and spread was measured. Those lifted after 3 weeks showed no difference between treatments; those rooted with Osmocote and lifted after 5 and 7 weeks were, on the average, 25% larger than those rooted without fertiliser.

Fig. 2. Cuttings of *Cotoneaster dammeri* 'Skogholm' after 5 weeks under mist. *Left*. With Osmocote added. *Right*. Peat:grit only.

Trial 2. 1973. Cuttings of the same two subjects were taken in mid-June. There was an additional treatment of 4 oz/bushel of 14-14-14 Osmocote. After 5 weeks under mist a marked improvement of shoot growth was again noted with both types of Osmocote.

Some cuttings were potted off as before into a standard potting compost; others were retained for more detailed analysis. They were partitioned into roots, original stem and leaves, and

new stem and leaf growth. The separate parts were dried and weighed to get a more accurate measurement of the influence of Osmocote on the distribution of growth in the rooted cuttings (Fig. 3). As expected there was little effect on the weight of original stem but the weight of new stem and leaves was considerably increased by Osmocote with slightly more favourable results with 14-14-14 Osmocote. There was not, however, a corresponding increase in the weight of roots and in the case of *Symphoricarpos*, some evidence of a reduction with Osmocote. It is probably that this imbalance in the distribution of growth between roots and shoots may limit the development of these rooted cuttings after potting off. The dramatic differences in growth seen at this stage from this earlier propatation may not be so evident by the end of a long growing season. Further dry weight measurements of plants in this trial are to be taken to verify this point.

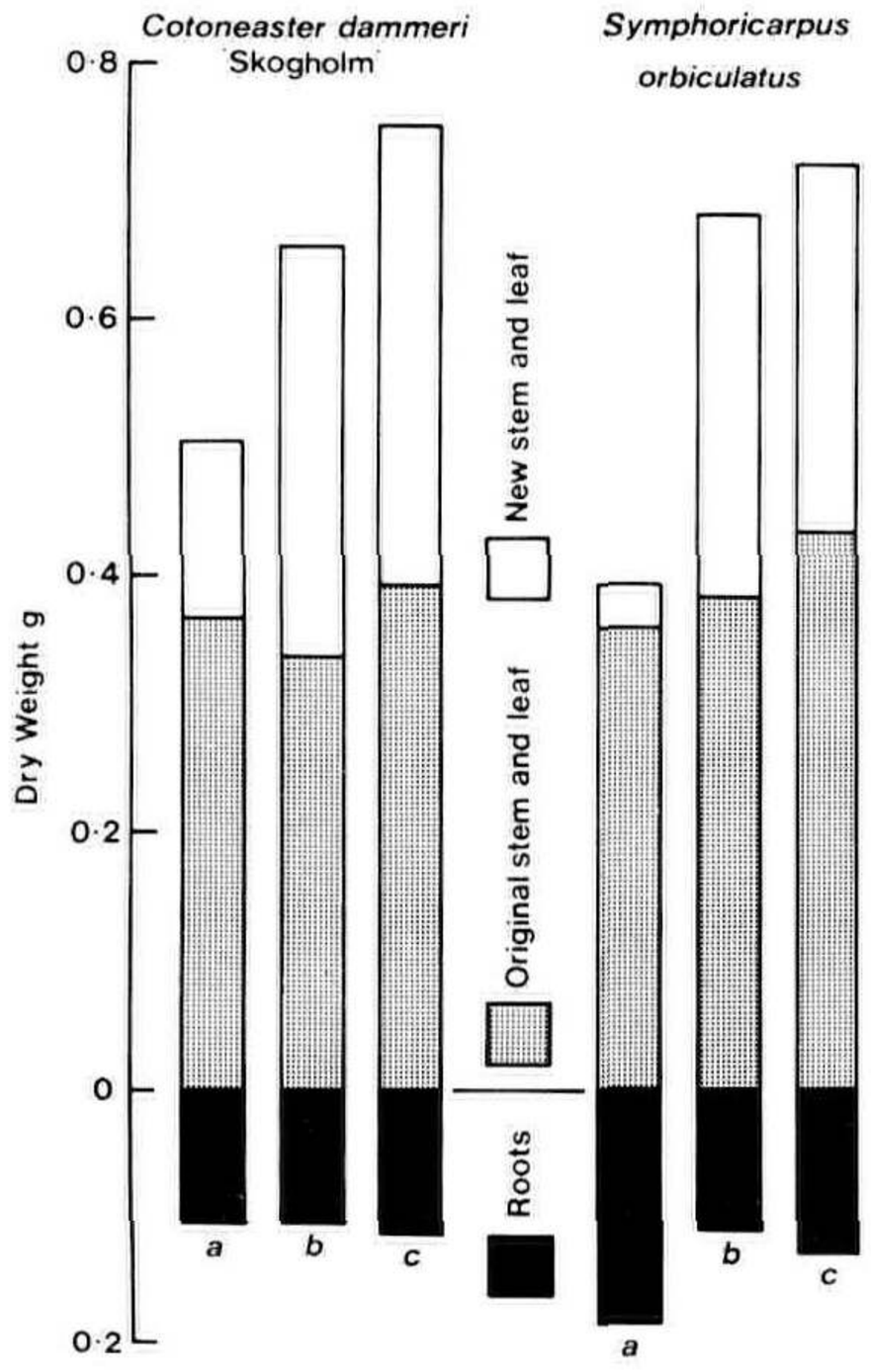

Fig. 3. Dry weight of cuttings after 5 weeks under mist. (a). Peat:grit only. (b). With 18-6-12 Osmocote added. (c). With 14-14-14 Osmocote added.

A range of other subjects were screened at the same time as Trial 2 for their response to Osmocote. In most cases increased shoot growth was noted where Osmocote was used.

It would appear that the incorporation of Osmocote into the rooting medium may have a useful part to play in propagation practices particularly for quick rooting subjects taken late in the season when enhancement of shoot growth on the propagation bench may help to produce a larger, stronger plant for overwintering.

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DISCUSSION

In reply to questions, Jim Deen indicated that he had not used fritted trace elements and the analysis of the Osmocote additives were 18:6.12 and 14:14.14, both used at 4 oz./bushel.

THE ABSORPTION OF NUTRIENT MIST INTO CUTTINGS

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Abstract. Cuttings, especially softwood and herbaceous, grew tremendously in new roots, shoots, and leaves during propagation Those propagated under nutrient mist had a higher N, P, and K content than those propagated under water mist Cuttings of *Chrysanthemum morifolium*, Ram rooted in special containers showed that almost all of the P absorbed by the cuttings during propagation was absorbed by the stems and foliage from the nutrient mist and either utilized in new growth or translocated into the developing roots.

INTRODUCTION

Symptoms characteristic of nutrient deficiencies have been reported in cuttings propagated under mist (1, 3). These symptoms may be due to leaching of nutrients or the growth of the

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