large number of man-hours. The actual potting of the plant and final quality still relies on a pair of good old "green fingers."

WATER STATUS IN RELATION TO ROOTING HARDWOOD QUINCE CUTTINGS

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Abstract. An antidesiccant polythene wrapping was shown to enhance the rooting of 'Malling Quince A' hardwood cuttings. This increase in rooting was associated with a higher water content in the cuttings. The effect of the antidesiccant was shown to interact with the effect of applied auxin on the rooting of hardwood cuttings.

REVIEW OF LITERATURE

Quince, *Cydonia oblonga*, is used as a pear rootstock and can be propagated by the hardwood cutting technique developed at East Malling Research Station. Using leafless shoot cuttings collected from hedges during the dormant season, this technique depends for its success on the application of synthetic auxin to the cutting bases and the use of a period of basal heat (1).

It is widely recognized that leafy cuttings must be maintained in a turgid condition in order to facilitate rooting. Loach (2) quantified this phenomenon by showing that rooting was suppressed when the water potential of leafy cuttings was low. In a leafy cutting, water stress leads to a closure of stomata and a consequent reduction in photosynthesis; in addition, it is now accepted that water stress itself can cause direct reductions in growth processes and that this generalization applies to the initiation of roots and their subsequent development (2). It was felt that this latter consideration has relevance to the rooting of leafless hardwood cuttings.

METHODS AND RESULTS

The effect of a polythene wrap and basal heat on rooting response. A hardwood cutting may be given an antidesiccant covering by wrapping it with 12.5 mm polythene tape (40 u). In these experiments 40 cm of each 60 cm cutting was wrapped, leaving the basal 20 cm uncovered for planting. In a replicated experiment four treatments were applied to cuttings of 'Malling Quince A' collected in early November, 1977:

(a) control — immediate planting out of doors;

(b) polythene wrapped and immediate planting out-of-doors;
(c) basal heat treatment for two weeks;
(d) polythene wrapped and basal heat treatment for two weeks.

No application of auxin was made to the cuttings. The temperature at the base of the cuttings receiving the basal heat treatment was maintained at 20°C. The mean temperature at the base of the cuttings planted out of doors during the two week period was 4.4°C.

After two weeks all the cuttings were lifted. There was no sign of roots or callus on any of the cuttings which had been planted out-of-doors. Of those given basal heat treatment but no polythene wrap, some callusing had occurred and 3% had rooted. The use of the polythene wrap and basal heat resulted in 80% of the cuttings having roots, many of the roots being longer than 1 cm. At this stage all the cuttings were planted out-of-doors to await suitable conditions for lining out. When the cuttings were again lifted in mid-March, rooting had occurred in approximately one-third of those which had been polythene wrapped but had not received basal heat. The controls were still devoid of roots whilst the degree of rooting in the other two treatments remained unchanged.

The effect of polythene wrap and auxin on rooting response. In a replicated experiment four treatments were applied to cuttings collected in early January, 1978. The treatments were:

(a) control;
(b) auxin application;
(c) polythene wrap;
(d) polythene wrap and auxin application.

The auxin, indolebutyric acid, was applied as a quick dip at 1000 ppm and, after application of the treatments, all the cuttings received basal heat for ten days. At the start of the experiment, and four days later, samples were taken for determination of moisture content. The initial moisture content of the cuttings, expressed on a fresh weight basis, was 44.7%. The results from the second sample are shown in Table 1. The application of auxin and the use of a polythene wrap reduced moisture loss. However, comparing the two auxin treatments the effect of the polythene wrap on moisture content was not statistically significant. If the two polythene treatments are compared, the effect of auxin on moisture content was not significant either.

After ten days of basal heat treatment the cuttings were lifted, and the percentages which had rooted (transformed to angles for statistical purposes) are shown in Figure 1. Consider-

Table 1. The effect of auxin and polythene on the moisture content of 'Malling Quince A' cuttings four days after the commencement of basal heat treatment.

Treatment	Moisture content expressed as a percentage on a fresh weight basis
Control	42.0%
+ Auxin	43.7
+ Polythene	43.4
+ Polythene + Auxin	43.9
Least significant difference at 5% level	1.23

ing the two treatments where the polythene wrap was not applied, there was not a statistically significant effect of auxin on rooting response. In the absence of applied auxin, the polythene wrap enhanced rooting, as was to be expected from the first experiment. In the presence of applied auxin the expected enhancement did not occur and a factorial analysis of these results showed a negative interaction between the polythene wrap and the auxin treatment.

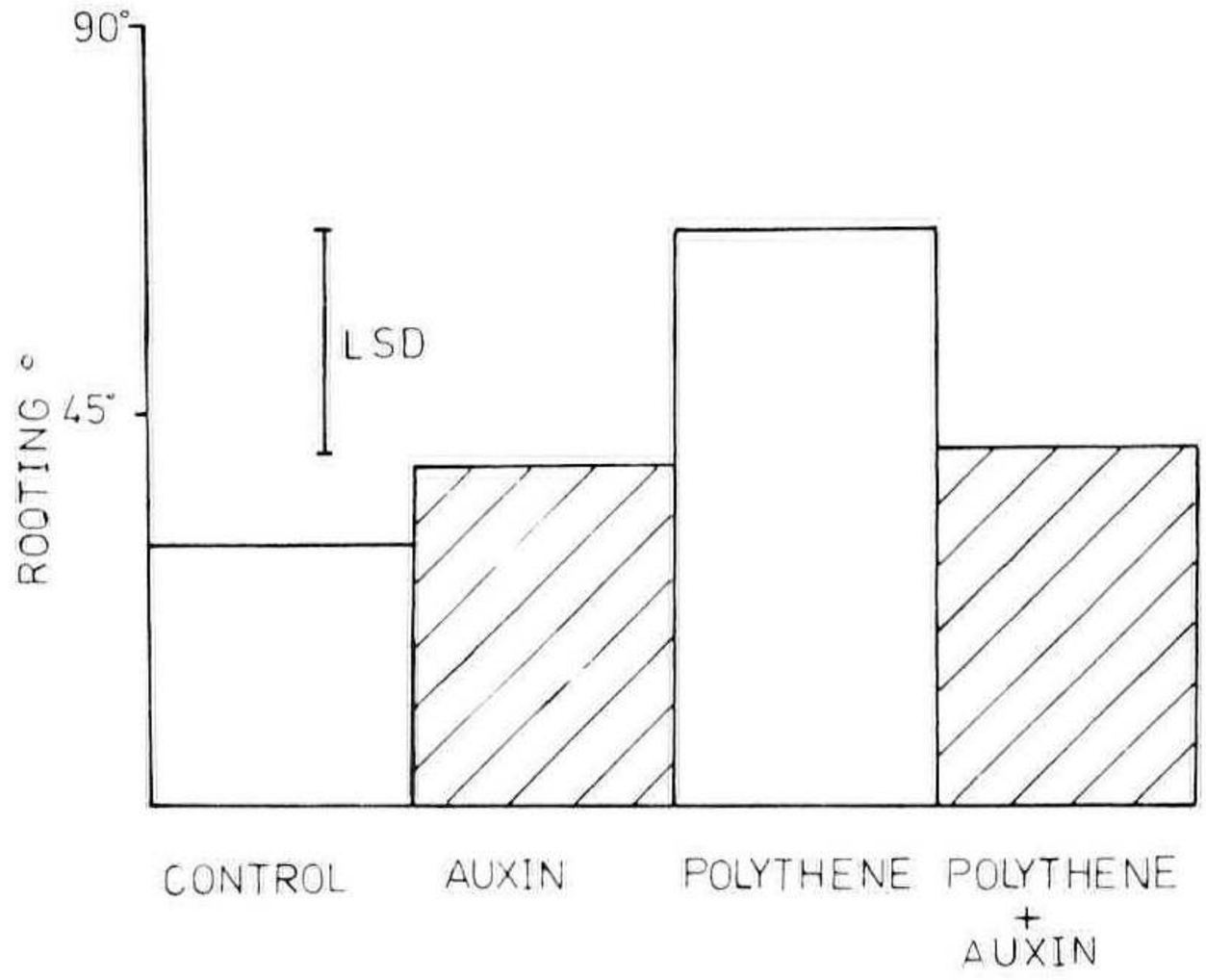

Figure 1. The effect of a polythene wrapping and the application of auxin on rooting of January-harvested cuttings of 'Malling Quince A'.

DISCUSSION

The benefit of polyvinyl resin antidesiccant in the propagation of plums by hardwood cuttings has been demonstrated by Nahlawi (4), and the results of these experiments with quince are in accord with that work. The first experiment showed the beneficial effects of the polythene wrap whilst the second also showed a benefit of the antidesiccant, although only in the absence of applied auxin.

The second experiment showed that the benefit of a polythene wrap was lost when auxin was applied. This can be viewed as an inhibition of rooting by auxin in the presence of the polythene wrap. The effect of polythene alone was to increase rooting and moisture content relative to the control. Auxin-treated cuttings also had a higher moisture content than the control after four days basal heat treatment; this and the lack of rooting response cannot be explained satisfactorily. Interplay between the applied auxin and the antidesiccant has been observed previously in different circumstances (4). The present result serves as a reminder that if antidesiccants were to find more general use in plant propagation the levels of growth regulators used might have to be reviewed.

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LITERATURE CITED

1. Howard, B.H., 1971. Propagation techniques. *Sci. Hort.*, 23:116-27.
2. Loach, K., 1977. Leaf water potential and the rooting of cuttings under mist and polythene. *Physiol. Plant.*, 40:191-197.
3. Nahlawi, N., 1970. Factors affecting root formation in the propagation of plum cuttings. Ph.D. Dissertation, University of London.
4. Whitcomb, C.E., Hall, G.C., Davis, L.T. and Southwell, G.S., 1974. Potentials of anti-transpirants in plant propagation. *Proc. Inter. Plant Prop. Soc.*, 24:342-348.