FACTORS WHICH AFFECT THE RESPONSE OF CUTTINGS TO HORMONE TREATMENTS

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Hormones applied to plants to influence their development are important horticultural tools and have become widely used in stimulating cuttings to root. Since the initial discovery of the role of hormones in rooting and the production of synthetic hormones such as [4 (indolyl-3) butyric acid] (IBA) 40 years ago little work has been done to identify the factors which determine the effectiveness of hormones when applied to cuttings. This is part of an on-going study at East Malling in a programme of research into the use of hardwood cuttings for the propagation of fruit and ornamental trees. Interim results have been published (2) and the purpose of this contribution is to summarise these findings in relation to practical propagation.

This work has been done with leafless hardwood cuttings of fruit rootstocks collected between autumn and spring and rooted in heated bins of peat/grit compost (1). Hormone treatment was by the "quick-dip" method using IBA dissolved in 50% alcohol. Evidence is already being obtained to show that different factors are important when cuttings are treated with powder formulations, as might be expected, and evidence from other workers shows that softwood cuttings may respond differently than hardwood cuttings.

Duration of treatment. The time for which a cutting is dipped in the hormone solution greatly affects the rooting percentage but the response to dipping time is modified by the hormone concentration. Approximately similar levels of rooting have been obtained with dipping times of 5 sec., 30 sec. and 18 min. at 5,000, 500 and 50 ppm IBA respectively.

The need for treatments up to 24 h. in aqueous solutions is probably due to the very low solubility of IBA in water.

Moisture tension. Leafless hardwood cuttings dry out mainly by losing water from their cut ends after removal from the stock plant. The longer the time elapsing between collection and treatment, the more moisture is lost, resulting in increased uptake of IBA solution. Rooting was markedly affected, at first improving with increasing uptake and then declining as maximum delays of 24 h. resulted in supraoptimal uptake of IBA. Evidence of this was also seen by the emergence of roots at increasing distance from the base with increasing treatment delay, with decay of the basal portion. Delayed treatment was relatively more beneficial at low hormone concentration (500 ppm) and relatively detrimental at high concentration (5,000 ppm).

Depth of dipping and epidermal run-off. Cuttings treated with both 500 and 5,000 ppm IBA at depths from as shallow as possible up to four inches showed that the shallowest dip gave the best results at both concentrations; dipping more than one inch was also beneficial, but only at the lower concentration. Observations of cuttings dipped relatively deeply showed that when laid out to dry with their bases projecting over the edge of a table the natural curve of the shoot resulted in many having their bases below the level of the table top, and liquid collected in a droplet at the basal end. Subsequent experiments showed that the absorption of these droplets during the drying period could account for an improvement in rooting at deeper dipping depths at 500 ppm and a depression in rooting at 5,000 ppm.

The decline in rooting between the shallowest treatment and a depth of one inch appears to be related to the position of IBA application to either the basal cut surface or the epidermis on the side of the cutting. When IBA was applied separately or jointly to these areas, application to the epidermis was less effective than to the cut end and it reduced the level of rooting obtained by the latter treatment. Examination of sections through the bases of these cuttings showed that a large number of roots were initiated by treatment jointly to both the cut end and the epidermis but these failed to develop.

Conclusions It is likely that such factors as mentioned lead to inconsistency in the response of cuttings to hormone treatment and also make it difficult to specify reliable treatments for cultivars which are not the subjects of actual experiments. The following guidelines for nurserymen are suggested:

(1) Standardise time between collection and treatment to about half a day and store and treat all cuttings under the same environmental conditions.

(2) Dip cuttings as shallowly as possible.

(3) Dip for 5 sec. only

Under these conditions determine the optimum concentration for each subject on the scale 1250, 2,500, 5,000, and 10,000 ppm.

LITERATURE CITED

1. Howard, B.H. 1971. Propagation techniques. Sci. Hort., 23, 116-26.
2. Howard. B.H. 1973. Factors affecting the rooting response of plants to growth regulator application. *Acta Horticulturae* (34), Symposium on Growth Regulators in Fruit Production I: 93-105.

QUESTION BOX

1. *DENIS McCARTHY:* There appears to be a problem with 'rosetting' in *Laburnum x vossii* to such an extent that some nurserymen don't grow it now. However certain nurseries have no problem. What is the cause?

   ARTHUR CARTER indicated that Tortrix moths and thrips were apparently the causal agents.

2. PETER HOWARTH: What is the normal method of propagation for *Embothrium lanceolatum*? Several members indicated that seed was easy to germinate but that selected forms requiring vegetative techniques (e.g. Norquinco form) could be readily raised from root cuttings provided suitable young stock plants with a pruned root system were available.

3. MARTIN REID: Has anyone had experience in rooting *Prunus tenella* 'Fire Hill'? It was agreed by several members that this plant was still problematical and few had achieved real success. The most satisfactory method to date appeared to be — forced stock plants, using 3-4 inch cuttings under mist; this produced a 75% rooting response after 4 weeks.

4. MICHAEL ZAIR: Is there any work being undertaken on stock plant management, particularly in relation to nutrition?
   ARTHUR CARTER responded by saying that a research project was underway but that no useful data was yet available.

5. HILARY NEWMAN: Would Chris Thomas please explain why he excised shoots from root cuttings and did not use root cuttings as a technique for bulking up and did he consider that the root material used was ideal (i.e. it came from older trees)? In reply Chris Thomas indicated that he wished to bulk up rapidly and that material for root cuttings was not available in sufficient quantities and he would have preferred young roots from young trees.

6. J. C. GILFORD: John Gaggini has exhorted us not to regard rockwool as a panacea. What are the problems inherent in its use? John Gaggini replied that it was unreliable when field planted, that nutrition was a problem and that it could easily be overwatered.

7. VALERIE BUNCE: Would Ray Evison comment on the regime for clematis cuttings to prevent bud decay on a cutting which would otherwise root? Ray Evison's reply indicated the use of a well-drained compost was important and that shading the beds would reduce the water required through the mist system.