GROWTH REGULATORS AND ROOTING OF CUTTINGS OF WOODY ORNAMENTAL PLANTS[1]

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Abstract. Talc formulations of indolebutyric acid plus benzimidazole or benomyl applied as a basal dip have resulted in improved rooting of woody cuttings. Results are not always consistent with all cultivars nor at all seasons with one cultivar and may be affected by changes in endogenous levels of the cytokinin — auxin ratio.

Since the 1930's when it was found that naturally occurring 3-indoleacetic acid (IAA) (15) as well as some synthetic growth regulators (1, 18) could stimulate adventitious root formation in stem cuttings, there have been numerous papers on the subject. More recently it has been reported that auxins alone would not stimulate rooting in some woody cuttings (6, 9).

Skoog et al. (13) demonstrated that morphogenesis of plant parts was regulated by the interaction of auxin and cytokinin. This is now being applied to propagation of leaf cuttings (16).

Recently it has been reported that some systemic fungicides such as benomyl (Benlate) improved rooting of woody cuttings (2, 14). Some reports on this combination of benomyl and IBA attributed the success to disease control (14). However, the stimulating effect of the fungicide has more recently been attributed to that of a growth regulator (10). Benomyl has been reported to stimulate protein synthesis in wheat leaves (12). Other researchers have found that benomyl or the precursor, benzimidazole, also have growth regulator properties (3, 11, 17). Benomyl appears to act as an adenine analog (12, 5, 8).

It was this potential use of benomyl and its precursors as a growth regulator which lead to the work at the Rhode Island Agricultural Experiment Station. Numerous experiments were done with combinations of benomyl, benzimidazole or N^6benzyl adenine with IBA applied as talc dips on cuttings. This work led to the finding that difficult-to-root cuttings of rhododendron can be rooted in high percentages and with larger rootballs when treated with the combination of Hormex 45* and 5% benomyl in a talc basal dip. Other plant cultivars were also tested and found to respond to the treatment in some but not all cases (10). Further, it was found that results with some cultivars varied from year to year as in the case of *Magnolia denudata* (*M. conspicua*) which rooted very well from cuttings made in early July, 1972, but did not root when treated the

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same way at the same time in 1973. No test was made in 1974 but when repeated in 1975 at the same time results were again positive.

Results with first flush cuttings of *Rhododendron* 'Dr. H. C. Dresselhuys,' *R.* 'C. S. Sargent,' *R.* 'Nova Zembla,' and *R.* 'Mrs. P. den Ouden' have been consistently good with the talc dip treatment and the treatment is currently being used on a commercial scale by many propagators in Rhode Island. When the same cultivars were propagated from late season flushes in October, rooting was not as good. Current research is now being done to attempt to determine why this variability between seasons or years takes place.

It appears that either benomyl or benzimidazole can act as a cytokinin-like material in promoting growth responses when applied to a talc formulation with IBA. They appear to act in a manner similar to kinetin but not with the same degree of activity.

Results are not consistent in all cultivars every year and are not consistent in the same cultivar at all times of the year. This variability may be due to different levels of endogenous growth regulators needed to act with the exogenously applied material. Hewett and Wareing (7) found that endogenous levels of cytokinins in poplar varied with photoperiod. Heide (4, 5) also found hormone levels fluctuated with photoperiod and temperature.

As for variability among species or cultivars it is possible that not every plant will respond to the same cytokinin or cytokinin-like material to the same degree. Osborne (11) speculated that cytokinins will prove to be species specific. It is also probable that efficiency of uptake is different for each plant and time of application.

Work now in progress at the Rhode Island Agricultural Experiment Station is designed to find answers to the discussed problems. Hopefully it will be discovered in the near future just how the combined treatments of benomyl and IBA stimulate rooting and when the treatment is most effective.

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