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VOICE: Have you tried saligin, which is found in willows? If not, you should try it.

CALVIN CHONG: No, we have not.

COMPARATIVE EFFECTS OF SELECTED ROOTING COMPOUNDS ON THE ROOTING OF *PHOTINIA* × *FRASERI*

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Many commercial root promoting compounds have been offered to the nursery industry since the introduction of indolebutyric acid (IBA) and naphthaleneacetic acid (NAA) in 1935 (7). IBA and NAA form the chemical bases for these commercial preparations which are offered as talc, organic or water-based formulations (3). Many nurserymen make their own preparation by purchasing pure IBA or NAA crystals and dissolving them in an appropriate solvent (usually alcohol). Dip 'N Grow and Wood's Rooting Compound are liquid-based commercial formulations that are becoming more common in commercial propagation. Dip 'N Grow contains 1.00% IBA and 0.5% NAA plus an anti-pathogen agent in an alcohol solvent. Wood's contains approximately the same IBA and NAA but uses a solvent-carrier (20% dimethylformamide) and 80% ethyl alcohol.

This study compared the relative effectiveness of Dip 'N Grow, Wood's, and Hormodin #2 against the pure chemicals using *Photinia* × *fraseri* as the test plant. *Photinia* × *fraseri* is an excellent test plant for rooting studies because without an exogenous root promoting agent it shows limited propensity to root (1,2,4).

MATERIALS AND METHODS

Four to six-inch long terminal cuttings of *Photinia* × *fraseri* were collected from 6 to 8-year-old plants growing on the

University of Georgia campus, Athens, Georgia, on August 26, 1983. Mature cuttings (no red growth apparent) were used. The leaves from the basal half of the cuttings were removed, the end recut, then they were dipped to a depth of 1 in. in the materials (except Hormodin #2) as shown in Table 1. Cuttings were placed in a 2 perlite:1 sphagnum peat (v/v) medium in 10 cm deep flats. Thirty cuttings per treatment constituted the experimental unit. Mist was controlled by a Mist-A-Matic unit (E.C. Geiger, Harleyville, PA.) The entire experiment was conducted in a greenhouse with approximately 28°C/20°C day/night temperatures and natural photoperiod. The experiment was terminated on September 30, 1983, and the rooting percentage, number and length of roots determined. Only roots longer than 2 mm were counted.

RESULTS AND DISCUSSION

Rooting was dramatically affected by the treatments from a low of 0 percent in the water control to 100% with Dip 'N Grow (Table 2). The three control treatments (water, 50% ethanol, and water plus boron) did not stimulate rooting. This agrees with previous work (1,2,4) which showed that a rooting hormone was essential for rooting of this species. Chloromone-treated cuttings rooted only 17%. Chloromone is a mysterious rooting agent, the exact composition of which is not known (3). Obviously, it does not contain appreciable quantities of either IBA or NAA, two compounds that promoted reasonably good rooting of *Photinia* × *fraseri*.

Naphthaleneacetamide is a component of Rootone hormone powders and resulted in 67% rooting and reasonable root number and length. In the mung bean bioassay, it results in many small roots that do not elongate to any degree.

Perhaps the most striking result occurred with Hormodin #2 (0.3% IBA in talc). Rooting was only 3% with an average length of one centimeter. In all cases the liquid preparations, whether in water, alcohol, or dimethyl formamide, were superior to the talc formulation. The difference in response can be explained by the low solubility of IBA. In a talc formulation the IBA must first go into solution before being absorbed into the cutting. Rapid absorption of IBA did not occur from the talc source compared to the liquid formulations.

NAA was more effective than KNAA (potassium salt). NAA was dissolved in 50% ethanol while the KNAA was dissolved in water. The alcohol acts as an effective carrier and penetrant thus facilitating increased movement of the hormone into the cuttings. The same trend was observed with

IBA and KIBA. Interestingly, NAA and KNAA were superior to IBA and KIBA in promoting rooting of *Photinia*.

Table 1. Composition of treatments used for the *Photinia* × *fraseri* rooting study.

Treatment	Growth regulator and concentration	Solvent
Water	—	Water (Distilled-deionized in all cases)
Ethanol	—	Water (50% ethanol)
Water + 50 ppm B	50 ppm B from H_3BO_4	Water
Chloromone	? (5:1 dilution)	Water
Naphthaleneacetamide	Naphthaleneacetamide (0.3%)	50% ethanol
Hormodin #2	Indolebutyric acid (0.3%)	Talc
NAA	∝naphthaleneacetic acid (0.3%)	50% ethanol
KNAA	Potassium salt of ∝naphthaleneacetic acid (0.3%)	Water
IBA	Indolebutyric acid (0.3%)	50% ethanol
KIBA	Potassium salt of indolebutyric acid (0.3%)	Water
KIBA + 50 ppm B	Potassium salt of indolebutyric acid (0.3%) + 50 ppm B from H_3BO_4	Water
IBA + NAA	Indolebutyric acid (0.2%) Naphthaleneacetic acid (0.1%)	50% ethanol
KIBA + NAA	Potassium salt of indolebutyric acid (0.2%) Potassium salt of naphthaleneacetic acid (0.1%)	Water
Wood's	Diluted 5:1 Indolebutyric acid (0.2%) Naphthaleneacetic acid (0.1%) 4% Dimethylformamide	Water
Dip 'N Grow	Diluted 5:1 Indolebutyric acid Naphthaleneacetic acid	Water

KIBA plus boron (B) was particularly effective in stimulating rooting. I have observed this response with other plants. It is suspected that B serves as a carrier or at least facilitates transport of molecules. The B would hasten the movement of IBA into the cutting. Boron, when included with exogenously applied growth regulators, increases the translocation of these compounds (5,6).

Table 2. The effects of selected rooting compounds on the rooting percentage, root number, and root length of *Photinia* × *fraseri* stem cuttings.

Treatment	Root parameters		
	Percent	Number	Length
Water	0	0	0
Ethanol (50%)	7	0	0
Water + 50 ppm B	3	0	0
Chloromone	17	1	5
Naphthaleneacetamide	67	6	28
Hormodin #2 (0.3% IBA)	3	0	1
NAA	87	11	59
KNAA	53	5	30
IBA	63	7	46
KIBA	33	2	8
KIBA + 50 ppm B	83	8	47
IBA + NAA	83	8	47
KIBA + KNAA	23	2	10
Wood's	97	26	116
Dip 'N Grow	100	24	151

The IBA + NAA treatment resulted in 83% rooting while the KIBA + KNAA-treated rooted 23%. The 50% alcohol solvent apparently facilitated auxin movement into the stem tissue. The K-salts of IBA and NAA are as effective as the acids (7). The limiting factor may be the rate of absorption into the stem tissue.

Cuttings treated with Wood's and Dip 'N Grow rooted 97 and 100%, respectively, and had the greatest root numbers and root lengths compared to other treatments. Both were diluted 1:5 which resulted in 0.2% IBA and 0.1% NAA in the treatment solution. The IBA + NAA and KIBA + KNAA treatments contained the same amount of active ingredients (auxins). The only difference was the solvent system. Logically, it must be concluded that the solvent system (carrier) can have a pronounced effect on the effectiveness of a rooting compound. The carrier facilitates rapid absorption of the rooting compound and a more uniform response.

Previous work (1,4) has shown that *Photinia* × *fraseri* roots maximally when treated with 0.5 to 1.0% IBA applied as a concentrated dip. In this study the 0.3% IBA in 50% alcohol, or 0.2% IBA + 0.1% NAA in 50% alcohol was not sufficient to induce 95 to 100% rooting. However, these same levels in a different solvent system (Wood's, Dip 'N Grow) did result in 97 and 100% rooting. By using an appropriate solvent, the effect of the IBA is enhanced. This means that lower levels of the rooting compounds can be used.

Dimethyl formamide is a powerful solvent and care must be exercised in its use. It is considered a universal solvent and is used to dissolve nylon and other synthetic fibers.

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