Effects of P-ITB and IBA on the Rooting Response of 19 Landscape Taxa[1]

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Abstract

A new root promoting chemical, P-ITB (phenyl indole-3-thiolobutyrate) was compared with IBA (1*H*-indole-3-butanoic acid) for activity on 19 woody taxa. P-ITB at 0.5% was as effective as 0.5% IBA for the plants tested. For difficult-to-root taxa like *Amelanchier arborea*, *Photinia* × *fraseri* and *Zelkova serrata*, P-ITB promoted excellent rooting. The chemical is as effective as IBA and was not injurious at the 2.0% level.

Index words: growth regulator, cutting, propagation

Species Used in This Study:

Common periwinkle (*Vinca minor* L.); Compact Amur maple (*Acer ginnala* Maxim. 'Compactum'); Downy serviceberry (*Amelanchier arborea* Fern.); Dwarf yaupon (*Ilex vomitoria* L. 'Nana'); English ivy (*Hedera helix* L.); Flowering dogwood (*Cornus florida* L.); Fortune's teaolive (*Osmanthus* × *fortunei* Carr.); Fraser photinia (*Photinia* x *fraseri* Dress 'Birmingham'); Glossy abelia (*Abelia* x *grandiflora* Rehd.); Heritage river birch (*Betula nigra* L. 'Heritage'); Japanese maple (*Acer palmatum* Thunb.); Japanese zelkova (*Zelkova serrata* Makino); Natchez crapemyrtle (*Lagerstroemia indica* L. 'Natchez'); Nellie R. Stevens holly (*Ilex* L. 'Nellie R. Stevens'); October glory red maple (*Acer* rubrum L. 'October Glory'); Royal beauty bearberry cotoneaster; (*Cotoneaster dammeri* Schneid. 'Royal Beauty'); Shore juniper (*Juniperus conferta* Parl.); Small anise-tree (*Illicium parviflorum* Michx.); Virginia sweetspire (*Itea virginica* L.)

Chemicals Used in This Study:

IBA (1*H*-indole-3-butanoic acid); P-ITB (phenyl indole-3-thiolobutyrate)

Significance to the Nursery Industry

With the chemical arsenal under constant scrutinization by the Environmental Protection Agency, any potentially equivalent and safe root promoting compound deserves consideration and testing. This study shows that P-ITB is an excellent root promoting chemical for a wide range of woody taxa. For those taxa, it is equivalent, but not superior to IBA, and will serve as a useful alternative.

Introduction

Thousands of chemicals positively impact rooting of cuttings (1, 2). However, only IBA, naphthaleneacetic acid, and naphthaleneacetamide are used regularly (2). IBA is the most universal chemical for promoting rooting over a wide range of herbaceous and woody taxa, and is the principal active ingredient in commercial root promoting preparations (2). Naphthaleneacetic acid is used in combination with IBA in liquid formulations, but is generally less effective. Typically, if a cutting does not respond to IBA, other root promoting material will not compensate.

Haissig (3, 4) demonstrated rooting enhancement from various aryl esters of IAA and IBA. Cuttings used in his studies were derived from seedlings of *Pinus banksiana* Lamb., Jack pine, and *Vigna radiata* (L.) R. Wilcz., mung bean, both in a highly juvenile state and, hence, easier to root than cuttings from mature plants.

The objective of this study was to determine the relative effectiveness of P-ITB and IBA for rooting cuttings of 19 mature woody landscape taxa.

Materials and Methods

Cuttings of all taxa were collected from specimens on the University of Georgia campus. Cuttings varied in length from 7–13 cm (3 to 5 in) depending on amount of firm new growth available. Only current season's growth was utilized. The leaves were removed from the lower one-half of the cutting. The bases of the cuttings were dipped for 5 seconds to a 2.5 cm (1 in) depth in 0.5% IBA, 0.5% or 2.0% P-ITB or 95% ethanol. Ninety five percent ethanol was used as the solvent because of the difficulty of solubilizing 2.0% P-ITB. This high concentration of P-ITB was included to determine phytotoxic effects. Cuttings were air-dried before insertion in the perlite:peat medium (2:1 by vol) in 10 cm (4 in) deep fiberglass flats. Cuttings were placed under intermittent mist for 2½ sec/5 minutes from 8:00 am to 7:00 pm. Cuttings were shaded with 55% saran. Photoperiod was natural. Temperatures ranged from 23–27°C (73–83°F) day/18–21°C (64–70°F) night in the glass greenhouse. The experiment was initiated on June 3, 1986 and terminated July 15, 1987. Three replicates with 10 cuttings per replicate constituted a treatment and were arranged in a completely randomized design. Rooting percentage, number and length were the parameters used to assess treatment effects. ANOVA and Duncan's multiple range test were performed on the data.

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Results and Discussion

The P-ITB at 0.5% was as effective as 0.5% IBA in promoting rooting. No significant differences were noted between the two treatments which is remarkable considering the diversity of taxa (Table 1). IBA at 0.5% promoted significantly greater root numbers on *Cornus florida, Lagerstroemia indica* 'Natchez' and *Zelkova serrata*, while P-ITB did so with *Ilex* 'Nellie R. Stevens.' The differences were of no practical consideration since root development was excellent in both treatments. Root lengths were virtually equivalent on cuttings treated with 0.5% P-ITB compared to 0.5% IBA. The only significant exception was *Zelkova serrata*, where root length was doubled by 0.5% IBA.

The 2.0% P-ITB did not produce any phytotoxic effects as is evident from rooting percentage, number and length (Table 1). From a practical aspect, the high concentration of P-ITB did not produce any significant rooting benefit over the 0.5% concentration. Haissig (1983) reported that P-ITB at a concentration equivalent to IBA promoted greater rooting of Jack pine and equivalent rooting of mung bean. This study did not indicate any difference in the root enhancement potential of P-ITB over IBA. Struve (5) also showed no great difference in rooting response from P-ITB and other aryl esters compared to IBA on the rooting of *Acer rubrum* L. 'Red Sunset.' Lewandowski (Morris Arboretum) and Struve (The Ohio State University) determined the effects of P-ITB and IBA at the same concentrations

Table 1. Effect of indolebutyric acid and phenyl-indole-3-thiolobutyrate on the rooting of 19 woody taxa.

Taxa	Treatment	Rooting (%)	Roots per rooted cutting (No.)	Total root length/ rooted cutting (cm)
Abelia × grandiflora	EtOH[z]	100a[y]	13b	45b
	0.5% P-ITB	97a	45a	180a
	0.5% IBA	93a	48a	184a
	2.0% P-ITB	100a	56a	199a
Acer ginnala	EtOH	60a	5b	16a
'Compactum'	0.5% P-ITB	67a	7ab	39a
	0.5% IBA	63a	9a	48a
	2.0% P-ITB	67a	4b	18a
Acer palmatum	EtOH	87a	4b	26b
	0.5% P-ITB	83a	8ab	95ab
	0.5% IBA	83a	10a	121a
	2.0% P-ITB	63a	10a	98ab
Acer rubrum	EtOH	40b	6b	83b
'October Glory'	0.5% P-ITB	67a	27a	345a
	0.5% IBA	63a	29a	304a
	2.0% P-ITB	53ab	21ab	250a
Amelanchier arborea	EtOH	30b	2b	7c
	0.5% P-ITB	67a	3b	26ab
	0.5% IBA	83a	2b	18bc
	2.0% P-ITB	100a	4a	38a
Betula nigra	EtOH	63a	8b	47b
'Heritage'	0.5% P-ITB	90a	17a	103a
	0.5% IBA	77a	21a	114a
	2.0% P-ITB	83a	17a	75ab
Cornus florida	EtOH	47b	10c	26b
	0.5% P-ITB	83a	28b	86a
	0.5% IBA	87a	36a	89a
	2.0% P-ITB	80a	36a	82a
Cotoneaster dammeri	EtOH	100a	13c	39b
'Royal Beauty'	0.5% P-ITB	97a	23b	74a
	0.5% IBA	100a	25b	69ab
	2.0% P-ITB	100a	31a	70a
Hedera helix	EtOH	90a	12b	56a
	0.5% P-ITB	93a	20ab	80a
	0.5% IBA	87a	22a	76a
	2.0% P-ITB	77a	18ab	74a
Ilex	EtOH	100a	9c	20b
'Nellie R. Stevens'	0.5% P-ITB	100a	29a	77a
	0.5% IBA	100a	21b	46b
	2.0% P-ITB	100a	35a	91a
Ilex vomitoria	EtOH	27a	7a	9a
'Nana'	0.5% P-ITB	13a	6a	5a
	0.5% IBA	13a	1a	4a
	2.0% P-ITB	13a	4a	11a
Illicium parviflorum	EtOH	97a	22a	62a
	0.5% P-ITB	93a	29a	80a
	0.5% IBA	97a	26a	57a
	2.0% P-ITB	97a	24a	62a
Itea virginica	EtOH	100a	55a	197a
	0.5% P-ITB	100a	58a	189a
	0.5% IBA	100a	51a	152a
	2.0% P-ITB	100a	55a	156a

Table 1. (*continued*) Effect of indolebutyric acid and phenyl-indole-3-thiolobutyrate on the rooting of 19 woody taxa.

Taxa	Treatment	Rooting (%)	Roots per rooted cutting (No.)	Total root length/ rooted cutting (cm)
Juniperus conferta	EtOH	40a	5a	32a
	0.5% P-ITB	43a	2a	16a
	0.5% IBA	43a	3a	16a
	2.0% P-ITB	63a	3a	16a
Lagerstroemia indica	EtOH	100a	7c	71b
'Natchez'	0.5% P-ITB	100a	15b	143a
	0.5% IBA	100a	18a	150a
	2.0% P-ITB	100a	17ab	130a
Osmanthus × *fortunei*	EtOH	57a	5a	11a
	0.5% P-ITB	43a	4ab	8a
	0.5% IBA	30a	3b	5a
	2.0% P-ITB	47a	4ab	8a
Photinia × *fraseri*	EtOH	83b	4b	17b
'Birmingham'	0.5% P-ITB	100a	9ab	71a
	0.5% IBA	100a	13a	96a
	2.0% P-ITB	100a	13a	96a
Vinca minor	EtOH	90a	6ab	7b
	0.5% P-ITB	90a	4b	6b
	0.5% IBA	70a	5ab	7b
	2.0% P-ITB	87a	7a	16a
Zelkova serrata	EtOH	47b	1c	2c
	0.5% P-ITB	77a	4b	22b
	0.5% IBA	70ab	6a	43a
	2.0% P-ITB	80a	4b	15bc

[z]Means not followed by the same letter or letters within a column are significantly different by Duncan's Multiple Range Test, 0.05 level.

used in this study on 38 woody taxa and showed equivalent rooting responses from IBA and P-ITB at 0.5% (Data available from Gro/Tech, Inc., P.O. Box 347, Rapid City, SD 57709). If equated on a mole basis, the 0.5% P-ITB was 41% less concentrated than the 0.5% IBA. This indicates that lower concentrations of the P-ITB could be utilized. However, in reality, nurserymen work on a weight basis when formulating rooting powders or solutions.

Haissig (3, 4) suggested the increased effectiveness of the aryl esters of which P-ITB is included is related to greater absorption because of lipid solubility, protection of auxin from oxidation, and/or delayed hydrolysis.

Environmental Protection Agency-Federal Insecticide, Fungicide and Rodenticide Act (EPA-FIFRA) studies indicate P-ITB is non-toxic to the environment. The acute oral LD_{50} is 5 g/kg while IBA is 0.1 g/kg on an intraperitoneal basis. A complete list of all EPA-FIFRA toxicity studies is available from Gro/Tech, Inc., P.O. Box 347, Rapid City, SD 57709.

Currently indolebutyric acid is under scrutiny by the EPA and must be registered for use as a root promoting chemical. P-ITB has been through the majority of the EPA-FIFRA mandated tests for registration as a root promoting chemical and final approval is expected by the summer of 1990.

(*Ed. Note*) This paper reports the results of research only, and does not imply registration of a pesticide under amended FIFRA. Before using any of the products mentioned in this research paper, be certain of their registration by appropriate state and/or federal authorities.)

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