Response of *Ligustrum* x *ibolium*, *Photinia* x *fraseri*, and *Pyracantha koidzumii* 'Wonderberry' to XE-1019 and Pruning[1]

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Abstract

The use of XE-1019 (uniconazole) [(E)-1-(4-chlorophenyl)-4, 4-dimethyl-2-(1,2,4-triazol-1-yl)-1-penten-3-ol] was investigated as an alternative to pruning of container-grown *Ligustrum* x *ibolium*, *Photinia* x *fraseri*, and *Pyracantha koidzumii* 'Wonderberry'. A soil drench of 2.5, 5.0 or 10.0 mg/plant (in 100 ml tap water) was applied to unpruned and pruned plants on September 19, 1986. XE-1019 reduced plant growth, primarily through a reduction in plant height. Plants pruned at the time XE-1019 was applied had more desirable growth habits than unpruned growth-regulated plants. The maximum level of XE-1019 which caused acceptable growth retardation of *Photinia* was 5.0 mg/plant. A soil drench of 2.5 mg/plant resulted in excessive growth reduction of *Ligustrum* and *Pyracantha*.

Index words: chemical pruning agent, growth retardant, privet, pyracantha, Fraser photinia, growth regulation
Species Used in This Study: ibolium privet (*Ligustrum* x *ibolium* E. F. Coe), Fraser photinia (*Photinia* x *fraseri* Dress), and 'Wonderberry' pyracantha (*Pyracantha koidzumii* [Hayata] Rehd. 'Wonderberry')
Growth Regulators Used in This Study: uniconazole, XE-1019

Introduction

There is a growing interest in plant growth regulator use (PGR) on woody landscape plants to reduce vegetative growth. Plant growth regulators are used by some landscape maintenance firms, and by utility companies as a cost-effective means of controlling woody plant growth near power lines. Chemical control of vegetative growth may prove to be a cost-effective alternative to pruning in the nursery industry as well.

Plant growth regulators labelled for use on woody landscape plants include chlorflurenol, dikegulac sodium, maleic hydrazide, and mefluidide. While growth of many species, including *Ligustrum* (3, 6), *Pyracantha* (9), and *Photinia* (13), can be regulated with one or more of these compounds, phytotoxicity symptoms can occur at the recommended rates (2, 3, 5, 6, 9).

The triazole compound XE-1019, an experimental PGR, effectively retards growth of *Forsythia* (12), *Ligustrum*, *Liriodendron*, *Malus*, and *Platanus* without injury (11). Paclobutrazol, a triazole similar to XE-1019, also inhibits growth of several woody species (10, 14); however, XE-1019 is generally believed to be more active (1, 4). The purpose of this study was to evaluate XE-1019 as an alternative to pruning on fast-growing shrubs.

Materials and Methods

Forty-eight uniform liners each of *Pyracantha koidzumii* 'Wonderberry', *Photinia* x *fraseri*, and *Ligustrum* x *ibolium* were potted in 3.8 l (#1) containers in April 1986 in a pine bark:sphagnum peat:sand medium (2:1:1 by vol). A top dressing of Osmocote 18N-2.64P-9.96K (18-6-12) was applied every 3 months starting April 1986. Plants were grown in full sun with overhead irrigation.

On September 19, 1986 half the plants of each species were mechanically pruned for shaping, and then 2.5, 5.0, or 10.0 mg/plant XE-1019 was applied in 100 ml (3.4 oz) tap water as a soil drench to pruned and unpruned plants. Pruned and unpruned plants serving as controls received 100 ml of tap water only. Plants were arranged in a completely randomized design within each species. On May 22, 1987 all the plants were pruned for shaping and the clippings saved for dry weight measurement. Three randomly selected plants of each species and XE-1019/pruning treatment combination were then repotted in 11.4 l (#3) containers in the same medium. The remaining plants were transplanted to the field for long-term evaluation of the treatments; plants were arranged in a completely randomized design within each species.

Plant height and width, recorded monthly, were used to calculate a growth index (GI = [height + width]/2). All container-grown plants were qualitatively evaluated before they were harvested to determine if the amount of growth reduction was acceptable. A plant with an acceptable level of growth reduction was considered marketable. The maximum level of XE-1019 that caused acceptable growth reduction was defined as the threshold level. *Ligustrum* shoots, leaves, and roots (washed free of medium) were harvested on March 17, 1988 for dry weight measurement. *Photinia* and *Pyracantha* were harvested on April 13, 1988. All data were analyzed utilizing analysis of variance. Data on the amount of growth that occurred during the experiment was also subjected to nonlinear regression analysis.

Results and Discussion

XE-1019 controlled the size (GI; Fig. 1 and 2) of all three species without influencing the shoot to root ratio (dry wt,

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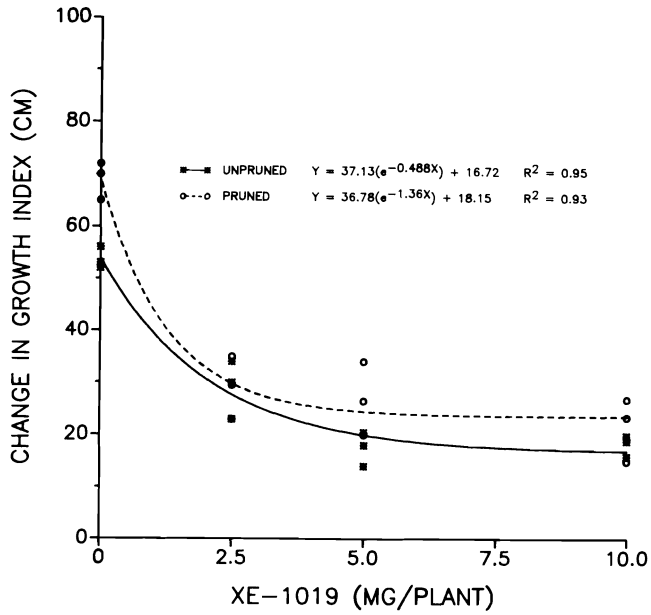

Fig. 1. Effect of an XE-1019 soil drench (± pruning) on change in plant size of *Ligustrum* x *ibolium* 18 months after treatment. Treated on September 19, 1986. Growth index = (height + width)/2. Tests for "lack of fit" were nonsignificant.

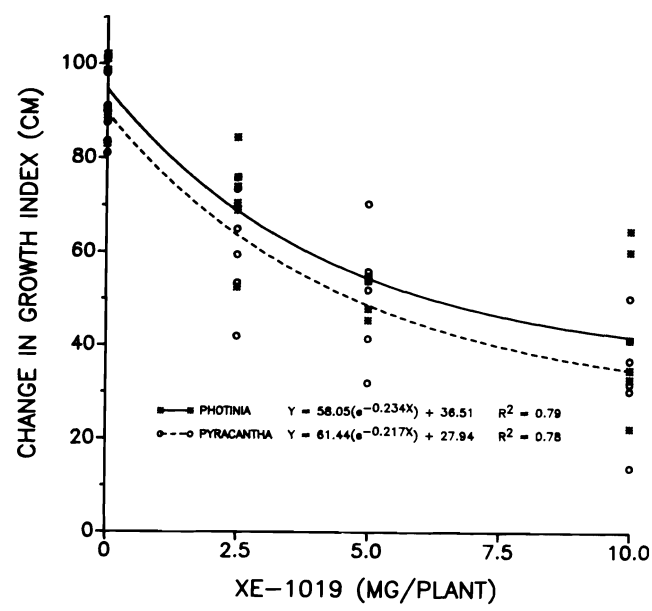

Fig. 2. Effect of an XE-1019 soil drench on change in plant size of *Photinia* x *fraseri* and *Pyracantha koidzumii* 'Wonderberry' 19 months after treatment. Treated on September 19, 1986. Growth index = (height + width)/2. Tests for "lack of fit" were nonsignificant.

results not shown), however, the shoot to root ratio of *Pyracantha* was affected by pruning at the time XE-1019 was applied (unpruned = 1.7; pruned = 2.4). Plant size was controlled by XE-1019 primarily through a reduction in the rate of height increase (Fig. 3—results only shown for *Photinia*; height and width of *Ligustrum* and *Pyracantha* were influenced by XE-1019 in a similar manner.). The greatest suppression of height increase occurred when environmental conditions favored rapid growth; XE-1019 caused little or no reduction in the rate of height increase when conditions favored slow growth. No chlorosis, necrosis, or cupping of leaves was observed on any species.

The maximum level of XE-1019 that resulted in acceptable control of vegetative growth (i.e., threshold level) varied with the species.The threshold level for *Photinia* was 5.0 mg, although a dose of 2.5 to 5.0 mg probably would have resulted in plants with better growth habits. *Ligustrum* and *Pyracantha* had a threshold level of less than 2.5 mg since a 2.5-mg dose of XE-1019 resulted in plants with very compressed internodes. *Pyracantha* treated with XE-1019 even became pendulous by June 1987, a growth characteristic also observed on flurprimidol-treated *Ligustrum japonicum* (6).

The dry weight of clippings was reduced by XE-1019 (Table 1). Unpruned plants treated with XE-1019 on September 19 required about the same amount of (*Ligustrum* and *Photinia*) or less (*Pyracantha*) pruning the following May than plants pruned but not treated with XE-1019. A reduction in the dry weight of clippings caused by plant growth inhibitors was noted by Hield (6) as well. He reported a 69% reduction in the clippings dry weight 12 months after treating *Ligustrum japonicum* with flurprimidol.

Even though the same amount or less pruning was required on XE-1019-treated plants, XE-1019 did not prove to be an alternative to pruning. The plants with the best growth habits were those that had been pruned on September 19, 1986. For example, *Photinia* that had been pruned and treated with 2.5 or 5.0 mg XE-1019 were compact with dark green foliage. Redness of the new growth was not affected by XE-1019.

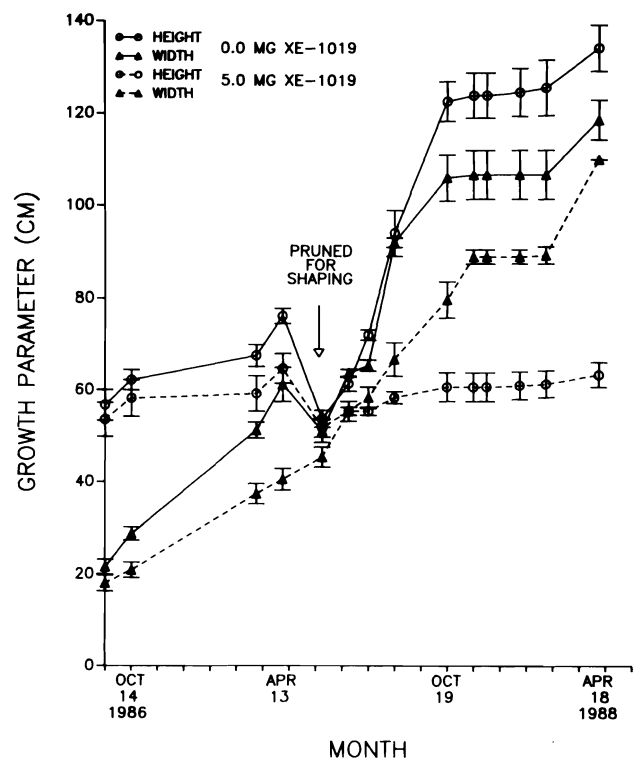

Fig. 3. Effect of a 0.0 or 5.0 mg XE-1019 soil drench on height and width of unpruned *Photinia* x *fraseri*. Treatments applied September 19, 1986. Bars represent ± SE.

Table 1. Dry weight of shoots and leaves pruned from *Ligustrum* × *ibolium*, *Photinia* × *fraseri*, and *Pyracantha koidzumii* 'Wonderberry' on May 22, 1987 after XE-1019 treatment (± pruning) on September 19, 1986.

XE-1019 (mg/plant)	Clippings Dry Weight[z] (g)					
	Ligustrum		Photinia		Pyracantha	
	Unpruned	Pruned	Unpruned	Pruned	Unpruned	Pruned
0.0	12.7 ± 1.4	3.5 ± 0.7	38.7 ± 5.6	14.1 ± 3.7	32.8 ± 12.6	32.2 ± 4.0
2.5	5.4 ± 1.0	0.0 ± 0.0	14.9 ± 3.1	2.0 ± 2.0	16.2 ± 3.6	8.9 ± 2.5
5.0	3.8 ± 1.2	0.9 ± 0.9	7.6 ± 2.5	1.1 ± 1.1	13.4 ± 4.7	6.6 ± 2.3
10.0	3.4 ± 1.0	0.0 ± 0.0	15.1 ± 4.5	1.0 ± 1.0	10.6 ± 2.7	1.8 ± 0.9
SIGNIFICANCE[y]						
XE-1019	***		***		**	
Pruning	***		***		NS	
Pruning × XE-1019	**		NS		NS	

[z]Values represent the mean dry weight of the clippings ± standard error.

[y]NS, *, **, ***Nonsignificant or significant at the 5%, 1%, or 0.1% levels, respectively.

Photinia treated with XE-1019 also had a much showier display of flowers than untreated *Photinia* in April 1988. The flowering of XE-1019 treated plants was more characteristic of that which occurs on larger specimen-type *Photinia*. Some of this showiness could be accounted for by the more compact flower clusters as compared to the controls (see Ref. 7 for flowering data). Paclobutrazol, chemically similar to XE-1019, has also enhanced flowering of some woody ornamentals (8, 15).

Significance to the Nursery Industry

Soil-applied XE-1019 at 2.5 or 5.0 mg/plant (100 ml [3.4 oz] of a 25 or 50 ppm solution, respectively) resulted in acceptable growth reduction of *Photinia*, however, these rates were excessive for *Ligustrum* and *Pyracantha*. Growth inhibition was primarily due to a reduction in the rate of height increase. XE-1019, however, did not substitute for pruning because the plants with the best growth habits received an initial mechanical pruning. Therefore, a combination of XE-1019 plus an initial pruning could reduce subsequent pruning costs and improve plant appearance.

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