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Cutless Controls Shoot Growth of 'China Girl' Holly[1]

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Abstract

Ilex x *meserveae* 'China Girl' plants were sprayed with a single application of different rates of Cutless (flurprimidol) during container production. Growth index, shoot length and shoot dry weight decreased with increasing rates of Cutless. Growth index of plants treated with 500 ppm Cutless was about 17% less than that of control plants 120 days after treatment, but were similar after the spring flush the following year. Growth inhibition persisted for at least two growing seasons when plants were treated with rates of 1500 to 2500 ppm; foliage of these plants was smaller and more cupped than that of control plants. Treated plants were noticeably more compact and uniform, and foliage was darker green than that of control plants.

Index words: flurprimidol, growth retardant, growth regulator.

Growth regulator used in this study: Cutless (flurprimidol), α-(1-methylethyl) -α-[4-(trifluromethoxy)phenyl]-5-pyrimidinemethanol.

Species used in this study: 'China Girl' holly (*Ilex* x *meserveae* S.Y. Hu. (*I. cornuta* x *I. rugosa*) 'China Girl').

Significance to the Nursery Industry

During nursery production, container-grown 'China Girl' holly requires frequent pruning or shearing to maintain a compact growth habit. Cutless may provide nurserymen with a labor-saving alternative for controlling growth. A single foliar application of 500 ppm (0.14 oz Cutless 50 WP/gal) suppressed growth during the season of application but not thereafter. Rates above 1000 ppm inhibited growth for at least two growing seasons. While these higher rates may have limited application in nursery production, potential may exist for landscape utilization. Treated plants were more compact and uniform and had darker green foliage and, excluding plants treated with the two highest rates (2000 and 2500 ppm), were considered higher in quality and more marketable than control plants.

Introduction

Hollies as a group are one of the most widely planted genera in the southeastern United States. 'China Girl', a selection from a cross between *Ilex cornuta* and *I. rugosa*, is a Meserve hybrid introduced in 1979. Meserve hybrids were bred for cold hardiness and generally perform poorly in USDA Zones 8 and 9; however, 'China Girl' has shown excellent heat tolerance. Like many shrub-type hollies, 'China Girl' requires repeated pruning during container production to maintain a compact growth habit. Numerous growth retardants have been evaluated as inhibitors of woody plant growth, but most remain uneconomical or cause undesirable side effects (4, 6). The retardant flurprimidol, registered as Cutless for use on turfgrasses, has reduced shoot growth without causing visible injury (10). Cutless effectively inhibited shoot elongation of several tree species when applied as a trunk (1, 10) or subsoil injection (7), and several shrub species when applied as a foliar spray (2, 5). In a recent study using container-grown butterfly-bush, Cutless applied foliarly at 62.5 ppm provided short-term control of shoot growth, with no effects on flowering while higher rates provided longer control (9). This study was conducted to determine the effects of foliar-applied Cutless on shoot growth and foliar color of 'China Girl' holly during container production.

Materials and Methods

Liners of 'China Girl' holly with a mean height and width of 17 cm (6.7 in) and 24 cm (9.4 in), respectively, were transplanted on April 28, 1992, into 26.5 l (#7) pots of a pine bark:sand (7:1 by vol) growth medium. The medium was amended per m^3 (yd^3) with 8.3 kg (14 lb) Osmocote 18N-2.6P-10K (18-6-12), 3 kg (5 lb) dolomitic limestone and 0.9 kg (1.5 lb) Micromax. Plants also were topdressed with 46 g (0.25 cup) of 24N-1.7P-13.3K (Polyon 24-4-16) (Pursell Industries, Sylacauga, AL) on April 13, 1993. Plants were placed in full sun and were watered with overhead irrigation. On June 9, 1993, plants were transplanted into 38 l (#10) pots using the same amended medium.

On May 14, 1992, plants were pruned to a uniform height of 13 cm (5 in), and seven days later a single foliar spray of 0, 500, 1000, 1500, 2000 or 2500 ppm Cutless was applied to runoff. Approximately 15 ml (0.5 oz) of solution was applied to each plant. Growth index [(height + width at the widest point + width 90° to first width) ÷ 3] was determined 30, 60, 90, 120, 364 (May 25, 1993, following the spring 1993 growth flush), and 534 days after treatment (DAT) (November 11, 1993). When growth indices were determined 364 and 534 DAT, it was noted that most plants needed some pruning to improve quality. Plants were pruned to shape, similar to the pruning that occurs during typical nursery production of vigorous upright hollies. Clippings were bagged, dried at 70°C (158°F) for at least 15 days and weighed to determine shoot dry weights. Foliar color was rated (1, 3, 5 = light, medium, dark green) 30 and 534 DAT, and the lengths of the three longest shoots per plant were measured 364 DAT. Treatments were completely randomized and replicated four times. The response to rates of Cutless was determined by regression analysis.

Results and Discussion

Growth index at 30 DAT, although not significant ($P = 0.0545$), indicated a suppression of shoot growth by Cutless;

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Table 1. Effects of single foliar sprays of Cutless on growth index of 'China Girl' holly.

Cutless rate (ppm)	Growth index[z] (cm)					
	30 DAT[y]	60 DAT	90 DAT	120 DAT	364 DAT	534 DAT
0	65.7	78.9	82.5	91.3	106.6	99.2
500	61.6	65.7	69.4	75.7	105.3	102.7
1000	61.6	63.6	66.7	69.9	71.1	101.5
1500	60.5	63.9	63.0	65.1	70.9	77.3
2000	59.8	61.5	60.0	65.0	76.4	88.9
2500	53.2	53.7	54.2	54.5	56.9	76.9
Significance[x]	NS[w]	L**	L***Q*	L***Q**	L***Q*	L***

[z]Growth index = (height + width at widest point + width 90° to first width) ÷ 3.

[y]DAT = days after treatment.

[x]Regression response nonsignificant (NS), linear (L) or quadratic (Q) at the 5% (*), 1% (**) or 0.1% (***) level.

[w]P = 0.0545.

Table 2. Effects of single foliar sprays of Cutless on foliar color, shoot length and shoot dry weight of 'China Girl' holly.

Cutless rate (ppm)	Foliar color rating[z]		Shoot length[x] (cm)	Shoot dry weight[w] (g)	
	30 DAT[y]	534 DAT		364 DAT	534 DAT
0	1.6	3.3	18.1	321.3	154.5
500	2.3	3.8	22.3	211.3	192.8
1000	2.9	3.8	17.3	57.5	165.6
1500	2.8	3.5	14.4	48.8	117.9
2000	2.8	4.0	16.5	43.8	99.6
2500	2.6	5.0	8.3	0.0	54.3
Significance[v]	L**Q**	L***Q*C*	L***	L***Q***	L***

[z]Foliar color rating: 1, 3, 5 = light, medium, dark green.

[y]DAT = days after treatment.

[x]Shoot length: mean length of 3 longest shoots/plant taken 364 DAT.

[w]Dry weights of shoots removed when plants were pruned for uniformity.

[v]Regression response linear (L), quadratic (Q) or cubic (C) at the 5% (*), 1% (**) or 0.1% (***) level.

mean values for plants receiving the 500 ppm and 2500 ppm rates were 6.2 and 19.0% less, respectively, than those for control plants (Table 1). Growth index decreased linearly or quadratically with increasing Cutless rate at all other sampling dates. Growth index of plants treated with 500 ppm and 2500 ppm Cutless was 17% and 32%, 16% and 34%, and 17% and 40% less than that of control plants 60, 90 and 120 DAT, respectively. This range of growth suppression was relatively consistent during the first growing season, particularly for plants receiving the lowest rate (500 ppm). The widening of the range over time (between 60 and 364 DAT) reflected continued growth of control plants and almost no growth of plants treated with 2500 ppm Cutless. Following the spring 1993 growth flush (364 DAT), mean growth index of plants treated with the 500 ppm rate was similar to that of control plants, indicating a more rapid growth rate of treated plants. Accelerated growth of retardant-treated plants has been observed after growth suppression effects dissipate (8) and may relate to the accumulation of carbohydrate reserves during the period of growth inhibition. These reserves stimulate rapid growth as effects of growth retardant lessen (3). Evidence of continued growth

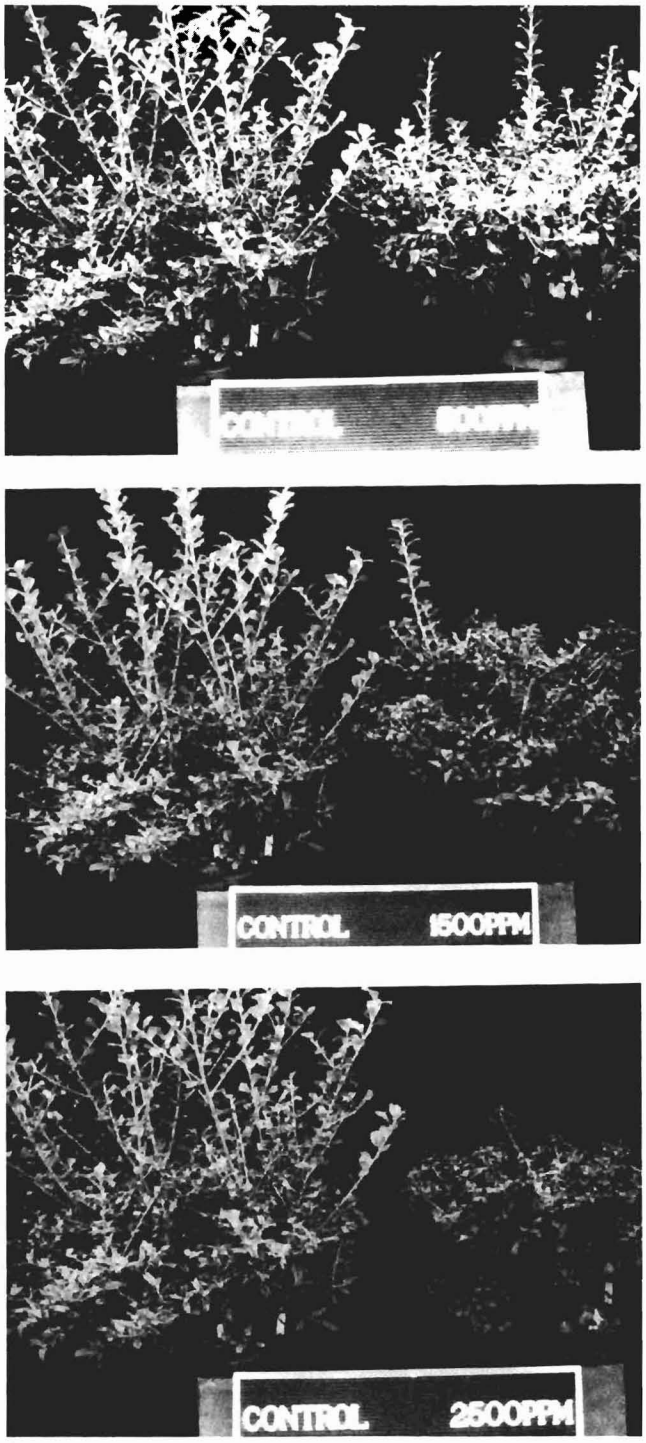

Fig. 1. 'China Girl' holly 90 days after treatment with 500, 1500 or 2500 ppm Cutless.

suppression was present 364 DAT with plants treated with rates above 500 ppm having a growth index 33.3% to 46.6% less than that of control plants. Plants were pruned to shape following data collection 364 DAT. By the end of 1993, growth index of plants treated with 500 or 1000 ppm Cutless was similar to that of control plants. Growth index of plants treated with higher rates was 10.4% to 22.5% less than that of control plants, indicating growth suppression for at least two growing seasons.

Fig. 2. Reduced size and pronounced curling (left) of 'China Girl' holly foliage treated with 2500 ppm Cutless.

Following the spring 1993 growth flush (364 DAT), shoot lengths of plants treated with 500 or 1000 ppm Cutless were similar to those of control plants (Table 2). Shoots of plants treated with higher rates tended to be shorter, especially those of plants treated with 2500 ppm Cutless (54% shorter than controls).

Shoot dry weights of clippings removed 364 DAT decreased quadratically with increasing Cutless rates; means ranged from 34.2% to 100% less than those of control plants. Most of the decrease in shoot dry weights occurred in plants sprayed with rates above 500 ppm. A somewhat different trend was present at the end of 1993. Shoot dry weights of prunings from plants treated with 500 and 1000 ppm Cutless were 24.8% and 7.2% greater than those of control plants indicating a greater vigor of treated plants perhaps resulting from accumulated carbohydrates. Shoot dry weights of plants treated with higher rates were 23.7% to 64.9% less than those of control plants.

Beginning as early as 60 DAT, plants treated with Cutless were noticeably more compact and uniform than control plants. This effect was more pronounced with higher rates of Cutless (Fig. 1). Foliage color of plants treated with Cutless also was noticeably darker green than that of control plants 30 DAT. This difference in foliar color continued throughout 1992 and 1993, although it was less noticeable at the end of the second season in plants treated with the lower rates. Foliage of plants treated with 1500 ppm Cutless appeared slightly smaller and more cupped than that of control plants; effects were more pronounced with the 2000 and 2500 ppm rates (Fig. 2). Although greater cupping was apparent when plants were compared to controls, the natural cupping of 'China Girl' foliage made the effect less obvious; treated plants were considered marketable.

Shoot growth of 'China Girl' was suppressed for one to two growing seasons with a single foliar application of 500 to 2500 ppm Cutless. The magnitude and duration of growth suppression was rate dependent, with rates above 500 ppm suppressing growth for longer than one growing season. Plants treated with Cutless were more compact and uniform than control plants and, excluding those treated with the two highest rates (2000 and 2500 ppm), considered more marketable. Even with the use of most rates of Cutless, minimal pruning for shape was required for highest quality.

(*Ed. note*: This paper reports the results of research only and does not imply registration of a pesticide and/or growth regulant 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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