

# Chemical Height Control of Florists' Hydrangeas

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## ABSTRACT

*XE-1019 (2 foliar sprays of 10, 20, or 30 mg·liter<sup>-1</sup>) was applied to plants of Hydrangea macrophylla Ser. 'Rose Supreme' during greenhouse forcing. Doses applied resulted in excessive reductions in shoot elongation and inflorescence diameters and delayed anthesis. Shoot growth was reduced with increasing XE-1019 concentration. Shoot length was reduced 46%; stem dry weight was reduced 31%; leaf area per shoot was reduced 44%; inflorescence height was cut by 45%; and inflorescence mass was reduced 48% with the 30 mg·liter<sup>-1</sup> XE-1019 treatment. Specific leaf weight increased with increased XE-1019 concentration (192% increase with the 30 mg·liter<sup>-1</sup> treatment) resulting in thicker leaves at anthesis. XE-1019 is an effective height control agent for florists' hydrangeas, and shows significant activity at very low (less than 0.2 mg a.i. per plant) doses.*

## INTRODUCTION

Florists' hydrangea is a woody perennial that has been adapted to potted plant production. Height control is a major factor in an hydrangea forcing program. Currently, daminozide is used for reducing internode elongation in hydrangeas, but high concentrations (5000 to 7500 mg·liter<sup>-1</sup>) are sometimes needed to control vigorous cultivars such as 'Rose Supreme'. Paclobutrazol also has been reported effective in controlling hydrangea height, but relatively high concentrations (50 to 100 mg·liter<sup>-1</sup>) of the chemical must be utilized for effective control. XE-1019 has been shown to be an effective height controlling agent at relatively low concentrations for woody perennials, including Forsythia, Ligustrum, Pyracantha, and Rhododendron sp.. Therefore, XE-1019 was examined as a potential height controlling chemical for florists' hydrangea.

## MATERIALS AND METHODS

Dormant plants of H. macrophylla 'Rose Supreme' were defoliated and placed into 4.5°C dark storage for 6 weeks beginning 2 December 1987. On 13 January 1988 the plants were removed from the cooler, potted one per 15 cm-diameter plastic container, and placed into a 26°/15° (venting/night) greenhouse. The growth medium consisted of a 1 soil: 2 sphagnum peat: 2 perlite (by volume) mixture amended with 890 g treble superphosphate, 593 g potassium nitrate, 593 g magnesium sulfate, 4.75 kg ground dolomitic limestone, and 74 g Frit Industries Trace Elements No. 555 (Peters Fertilizer Products, W.R. Grace & Co., Fogelsville, Pa.) per cubic meter. The plants were fertilized at each watering with 200 mg·liter<sup>-1</sup> each of N and K supplied from 517 and 367 mg·liter<sup>-1</sup> of potassium nitrate and ammonium nitrate, respectively. Fertilizer solution was maintained at 6.0 pH by injecting 75% (w:w) technical grade phosphoric acid into the system, supplying 37 mg·liter<sup>-1</sup> P at every watering. Each plant was pruned at potting, allowing only 2 shoots per plant to develop, and pots were spaced 40 x 40 cm during forcing.

Ten plants each received the following treatments: 1) control; 2-4) two sprays of 10, 20, or 30 mg·liter<sup>-1</sup> XE-1019. The first applications were made 5 February 1988; shoots averaged 4 expanded leaf pairs and averaged 8.0 ± 0.8 cm (± SD) in length at this time. The second applications were made 22 February 1988. All applications were made spraying 204 ml of solution evenly over 1 m<sup>2</sup> of bench area, and each pot should have received 3.2 ml of spray at each application, using this method.

Days to anthesis was calculated from the date the plants were potted and placed into the greenhouse. Anthesis was recorded when the first floret opened, shedding pollen. Plant height (from the soil surface to the top of the inflorescence) and inflorescence diameter were recorded at anthesis. One shoot per plant was harvested at anthesis, and growth parameters were measured for each shoot. Data were subjected to one-way analysis of variance, and single degree of freedom contrasts were used to test for linear significance.

## RESULTS AND DISCUSSION

Days to anthesis, plant height at anthesis, and inflorescence diameter at anthesis all were affected by the growth retardant treatments applied (Table 1). Time required for plants to reach anthesis increased with an increase in XE-1019 dose applied. Although control plants did not reach anthesis until week 13, their inflorescences were fully colored and salable by week 11. Excessive delay in inflorescence development occurred with XE-1019 treatments, extending the forcing time to salable color by up to 3 weeks or more. Similar delays in hydrangea inflorescence development have been reported for paclobutrazol treatments. Plant height (from the soil surface to the top of the inflorescence) decreased with increasing concentration of XE-1019 (Table 1). Inflorescence diameter also was reduced with increasing dose of XE-1019. The extreme reductions in plant height and inflorescence diameter achieved (47% and 56%, respectively for 20 mg·liter<sup>-1</sup>) are greater than desired for commercial production of hydrangeas.

The shoots harvested at anthesis were affected by XE-1019 treatments. Stem length (from the point of shoot attachment to the base of the inflorescence), stem fresh weight (data not shown), and stem dry weight decreased with increasing dose of XE-1019 (Table 2). Stem percent (w:w) water concentration was not affected by treatments and averaged 89.9% ± 0.9% (± SD). Total leaf area per shoot decreased linearly as XE-1019 concentration increased (Table 2). However, there was no treatment effect in leaf number, fresh weight, dry weight, or percent water concentration: shoots averaged 10.1 ± 1.8 leaves; fresh weight averaged 31.0 ± 6.3 g; dry weight averaged 4.7 ± 1.3 g; and the percent water concentration averaged 84.8% ± 1.8%.

Specific leaf weight increased with increasing concentration of XE-1019 both on a fresh weight (data not shown) and dry weight basis (Table 2). This specific weight increase suggests a thickening of the leaves occurred with increasing XE-1019; no other leaf parameters were affected that could account for increase in fresh and dry weight per unit area. Both inflorescence height (from the base to the top of the inflorescence) and inflorescence dry weight declined with increasing dose of XE-1019. Inflorescence percent water concentration was not affected by treatment and averaged 89.9% ± 0.9%.

XE-1019 is an effective growth retardant for use on hydrangeas. Its activity is sustained over a long period of time after application, as evidenced in the slowed growth and development of hydrangea inflorescences. The last XE-1019 spray was applied more than 12 weeks prior to anthesis on treated plants. The total doses applied in this study (an estimated total of 0.06, 0.13, or 0.19 mg a.i. per plant) were too great to produce commercially acceptable plants. Lower concentrations and single applications need to be investigated to establish feasible height control guidelines for XE-1019 and florists' hydrangeas.

Table 1. XE-1019 effects on hydrangea growth parameters measured at anthesis.<sup>z</sup>

XE-1019 (mg·liter <sup>-1</sup> )	Days from start of forcing to anthesis	Avg plant ht (cm) <sup>y</sup>	Avg inflorescence diam (cm)	Avg diam (cm)
0	95	27.0	17.4	17.4
10	107	19.4	11.3	11.3
20	118	14.3	7.7	7.7
30	122	13.9	7.8	7.8
Linear significance	***x	***	***	***

<sup>z</sup>Means based on 10 replicate plants, 2 shoots averaged per plant.

<sup>y</sup>Measured from soil surface to the top of the inflorescences.

<sup>x</sup>Significant at  $\alpha \leq 0.001$ .

Table 2. XE-1019 effects on hydrangea shoots harvested at anthesis.<sup>z</sup>

XE-1019 (mg·liter <sup>-1</sup> )	Stem length (cm) <sup>y</sup>	Stem dry wt (mg)	Leaf area per shoot (cm <sup>2</sup> )	Specific leaf wt (mg·cm <sup>-2</sup> )	Inflorescence height (cm) <sup>x</sup>	Inflorescence dry wt (g)
0	11.7	789	625	7.8	11.2	6.5
10	9.3	638	405	10.0	8.2	5.3
20	6.3	465	368	13.7	5.2	2.6
30	6.3	543	348	15.0	6.2	3.4
Linear significance	***w	***	***	***	***	***

<sup>z</sup>Means based on 10 replicate shoots.

<sup>y</sup>Measured from the point of shoot attachment to the base of the inflorescence.

<sup>x</sup>Measured from the base of the inflorescence to the top of the inflorescence.

<sup>w</sup>Significant at  $\alpha \leq 0.001$ .