# CONTROL OF *ACER RUBRUM* GROWTH WITH FLURPRIMIDOL

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**Abstract.** Flurprimidol effectively suppressed growth of *Acer rubrum* when applied as a subsoil injection. Rates of 1.0 and 2.0 g ai/inch of diameter supressed height growth for about three years; whereas, 0.5 g ai/inch of diameter suppressed growth less than the higher rates, and effectiveness subsided during the second year. Diameter growth suppression increased with flurprimidol rates, though suppression was not as pronounced as with height growth. Tree height, diameter, and shoot length were suppressed with all rates of flurprimidol compared to nontreated trees. Tree appearance was affected by flurprimidol. Reduced petiole length and smaller, dark-green leaves were evident with treated maples compared to nontreated plants, though appearance was not objectionable.

**Résumé.** Le produit "Flurprimidol" supprime efficacement la croissance de l'érable rouge lorsqu'il est injecté à la surface du sol. Des taux de l à 2 g par pouce de diamètre ont amené une suppression de la croissance en hauteur pendant une période de trois ans; par ailleurs, un taux de .5 g par pouce de diamètre a amené une suppression moindre de la croissance que les taux plus élevés, et l'efficacité s'est amoindrie au cours de la deuxième année. La suppression du taux de croissance en diamètre a augmenté avec une augmentation des taux du produit, bien que la suppression de la croissance ne fut pas aussi prononcée que pour la croissance en hauteur. La croissance en hauteur et en diamètre des arbres trait' de même que la longueur des pousses furent supprimées à tous les taux d'application du flurprimidol lorsque comparés aux arbres témoins. L'apparence de l'arbre fut affectée par le flurprimidol. La longueur des pétioles fut réduite et les feuilles furent plus petites et d'un vert plus foncé sur les érables traités bien que l'apparence ne fut pas extrêmement désagréable.

Control of woody plant growth in a landscape is desirable for several reasons. First, in landscape situations it would be desirable to maintain plant size once plants reach the size that maximizes the asthetics of the landscape. Secondly, severe pruning of trees under utility lines renders the trees unsightly and functionally lost in terms of their contribution to the landscape. A number of growth-retarding chemicals have shown promise for controlling plant growth. Included among these chemicals is flurprimidol (EL-500), which is effective in retarding growth of several plants (1, 2, 4). Flurprimidol has good activity when applied as a soil drench or as a foliar spray (3). One limitation of previous work is that the research has involved short term studies. Since red maples are widely grown, this plant was selected to evaluate the effectiveness of flurprimidol in limiting growth over a 3-year period.

## Materials and Methods

On April 8, 1981, 45 to 60-cm (18-24 in) bare root seedlings of *Acer rubrum* were planted in a Hartsells fine sandy loam in Crossville, Alabama. A fertilization x irrigation study was conducted and concluded in October 1982 (5). Trees for the current test were selected on the basis of uniform height and diameter measured 30 cm (12 in.) from the soil line. Initially, trees in the test ranged in height from 283 to 293 cm (9,2-9.6 ft.) and in diameter from 2.4 to 2.8 cm (0.9-1.1 in.) and were no closer than 2 m apart. On March 15, 1983, 4 treatments were initiated: 0, 0.50, 1.0 and 2.0 g ai/inch of diameter flurprimidol were applied with a hand-held, subsurface soil injector. Treatments were applied 30 cm (12 in.) from the base of the trunk.

Data collected included height and diameter annually (October), average length of 3 current season shoots per tree selected at random (June 83, October 84, June and October 85), number and length of escape shoots (June 85) and a foliar rating in March 1985 and April 1986, where 1 = dormant bud, 3 = leaf bud just open and 5 = fully leafed out.

## Results and Discussion

Flurprimidol resulted in suppressed height growth of *Acer rubrum* (Table 1). Tree height responded quadratically to increasing rates of flurprimidol with the exception of total height in 1983 and height growth for 1985. Compared to the nontreated control plants, flurprimidol-treated plants at 1.0 and 2.0 g ai/diameter inch had suppressed height growth of 50 and 68 percent in 1983, 68 and 50 percent in 1984, and 24 and 8 percent in 1985, respectively. Trees treated with the 0.5 g ai/diameter inch reduced height growth

by 25 percent in 1983 and 12 percent in 1984 and increased height by 26 percent in 1985 compared to the nontreated control plants.

These reductions in height demonstrated that one application of flurprimidol can suppress height for up to 2 years. By the 3rd year of the study, it appeared that height growth of the flurprimidol-treated trees were nearing the growth rate of the nontreated plants. This indicates that the growth suppression of the 2 higher rates of EL-500 was wearing off. Growth suppression of the lowest flurprimidol rate appeared to be active primarily during the first year.

Diameter growth was also suppressed with application of flurprimidol but not to the extent of height growth. In the first growing season after treatment (1983) neither total diameter nor diameter growth was significantly affected by flurprimidol application. However, there was a trend toward diameter growth suppression with increasing flurprimidol rates. In 1984, both total diameter and diameter growth responded quadratically to flurprimidol application rates. Actual diameter growth suppression compared to the nontreated control trees was 21, 31, and 45 percent for 0.5, 1.0, and 2.0 g ai/diameter inch, respectively. During 1985, there were no differences in actual growth for that year, but total growth continued to respond quadratically to flurprimidol.

With respect to measurement of individual shoots during the growing season, shoot length responded quadratically at all dates to flurprimidol

**Table 1. Effects of flurprimidol on growth of *Acer rubrum*.**

| Treatment | Total height (cm) | | | Height growth/year (cm) | | | Total diameter (cm) | | | Diameter growth/year (cm) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| g ai/diameter inch | 1983 | 1984 | 1985 | 1983 | 1984 | 1985 | 1983 | 1984 | 1985 | 1983 | 1984 | 1985 |
| 0 | 362.7 | 458.8 | 541.7 | 79.5 | 96.1 | 82.8 | 4.4 | 7.3 | 9.2 | 2.0 | 2.9 | 1.9 |
| 0.5 | 342.8 | 427.5 | 531.7 | 60.0 | 84.7 | 104.2 | 4.1 | 6.7 | 8.5 | 1.8 | 2.3 | 1.8 |
| 1.0 | 327.7 | 358.3 | 421.7 | 39.5 | 30.7 | 63.3 | 4.5 | 6.0 | 7.6 | 1.7 | 2.0 | 1.5 |
| 2.0 | 319.0 | 366.7 | 442.5 | 25.6 | 47.7 | 75.8 | 4.4 | 6.0 | 7.9 | 1.6 | 1.6 | 1.9 |
| **Significance** | | | | | | | | | | | | |
| Linear | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| Quadratic | NS | .006 | .013 | .003 | .006 | NS | NS | .025 | .014 | NS | .005 | NS |

**Table 2. Effects of flurprimidol on shoot growth and foliar rating of *Acer rubrum*.**

| Treatment | Average length of 3 current season shoots | | | | Number of escape shoots/tree | Avg. length of escape shoots/tree | Foliar rating[z] | |
|---|---|---|---|---|---|---|---|---|
| g ai/diameter inch | June 83 (cm) | Oct. 84 (cm) | June 85 (cm) | Oct. 85 (cm) | June 85 | June 85 (cm) | March 85 | April 86 |
| 0 | 44.1 | 42.0 | 41.0 | 17.3 | 0.0 | 0.0 | 2.8 | 3.2 |
| 0.5 | 33.3 | 17.7 | 37.8 | 18.6 | 0.0 | 0.0 | 1.6 | 2.8 |
| 1.0 | 19.3 | 4.3 | 5.7 | 7.7 | 3.2 | 59.3 | 1.6 | 2.3 |
| 2.0 | 14.4 | 5.4 | 10.8 | 8.3 | 1.5 | 56.0 | 2.1 | 2.4 |
| **Significance** | | | | | | | | |
| Linear | NS | .0004 | .018 | NS | NS | NS | .04 | .05 |
| Quadratic | .0001 | .0001 | .0001 | .0001 | .0017 | .0001 | NS | NS |

[z]Rating scale: 1 = dormant buds; 2 = swollen buds; 3 = leaf buds just opening; 4 = leaf buds opened 1 week; and 5 = leaves completely unfurled.

application rates (Table 2). Suppression at the 1.0 and 2.0 g ai/diameter inch rates generally ranged from 55 to 85 percent compared to the nontreated trees. Application of 0.5 g ai/diameter inch resulted in suppressed growth during 1983 and 1984, but in 1985 differences were not present. Also, in March (1985) and April (1986) bud development was delayed by flurprimidol application (Table 2).

One problem noted was the occurrence of escape shoots. During the 3rd growing season after application, shoots with excessive growth were observed. These escape shoots were similar to a water sprout but occurred at random on the trees. In June 1985, 3.2 and 1.5 escape shoots occurred, respectively, on trees treated with 1.0 and 2.0 g ai/diameter inch, while no escape shoots occurred on the remaining treatments. These escape shoots ranged in length from 55 to 60 cm (22-24 in.), whereas suppressed shoots on the same trees ranged in length from 6 to 11 cm (2-4 in.). These escape shoots and leaves estimated to be about 2X the size of leaves on nontreated trees.

Tree appearance was affected by application of flurprimidol. While no data were collected on appearance, several observations were made. Trees treated with the 2 higher rates were generally darker green than nontreated trees. Petiole length appeared shorter, resulting in a red maple tree resembling a ginkgo tree with leaves close to the scaffold branching. Leaf size of treated trees (1.0 and 2.0 g ai/diameter) was smaller than nontreated trees. While the flurprimidol-treated trees looked different than nontreated trees, the appearance was not unpleasant. In fact, the darker green foliage color throughout the summer gave the flurprimidol-treated trees the appearance of being healthier than nontreated trees. Nurserymen and other individuals observing the trees did not find the appearance objectionable.

In summary, these data show that flurprimidol will provide growth suppression of *Acer rubrum*. One application at 1.0 or 2.0 g ai/diameter inch resulted in 2 years of growth suppression. Flurprimidol had several physiological effects resulting in dark green, smaller leaves compared to nontreated trees. One problem encountered was excessive growth of individual shoots during the third growing season when the effects of the growth retardant may have diminished.

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