Growth control of Chinese elm with inhibitor sprays

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Spray applications of growth inhibitors to the foliage of ornamental plants have been known for many years to be effective. Sprays have been used to some extent, but possible hazards from spray drift to nontarget ornamental plants have led to the development of trunk banding and injection application techniques. However, foliar sprays, when safely used, are still the least expensive means of chemical growth reduction.

The Chinese elm *(Ulmus parvifolia)* is widely used in street plantings and requires pruning to accommodate street and sidewalk traffic. We conducted a study in which dikegulac (Atrinal), maleic hydrazide (Slo Gro MH), and chlorflurenol (Maintain CF125) were applied once annually for six years. For the first three years, the trees were severely pruned mechanically when dormant, but they were allowed to grow without pruning in subsequent years. The 0.015 percent chlorflurenol and 0.25 percent MH rates were selected from past experience; dikegulac, a newer chemical, was tested at 0.15 and 0.3 percent. In a second trial, mefluidide (Embark) was applied at 0.1, 0.2, 0.4, and 0.8 percent and was observed for one year.

All spray treatments were applied in April or early May after the trees had leafed out but before much shoot elongation. Complete coverage sprays were applied to run-off with an orchard gun and a power sprayer. There were five single-tree plot replications for the long-term trial and four similar replications for the mefluidide test. Both tests were at Irvine and were furrow irrigated.

Results

For the first three years, when trees were pruned annually, yearly measurements of marked shoots indicated that growth was reduced (table 1). In the following years, when there was no pruning, cumulative growth was again similarly reduced as measured by tree height. At the April 3, 1981, treatment, operator error resulted in a 0.54 percent chlorflurenol treatment. Further chlorflurenol treatments were discontinued; in 1982, those trees were alive but still showing residual effects.

When trees were allowed to grow without pruning, fruiting occurred. All three chemicals reduced or eliminated flowering and fruit set; 0.15 percent dikegulac was less effective than 0.3 percent dikegulac. Trunk diameter, measured at six years, was reduced by all chemicals. At that time, two replications and an additional control were pulled, roots washed and measured, and tops and roots weighed.

The inhibitor treatments all reduced top and root weights. The top/root ratio lacked significance. The larger ratios for treated trees suggest that more replications might show root weight reduced more than top weight. Root length was not influenced. Roots of treated trees were smaller and showed no deformity.

All concentrations of mefluidide reduced growth soon after treatment (table 2). At dormancy, only the 0.4 and 0.8 percent mefluidide treatment showed reduced growth.

Conclusions

Six yearly treatments with dikegulac or MH resulted in persistent growth control with good tree appearance. Chlorflurenol at 0.015 percent gave a similar response. Tree height, trunk diameter, top weight, root weight, and flowering were reduced for the treated trees. Mefluidide showed no growth control at 0.2 percent but significant reduction at the 0.4 percent level. Where spray drift is not a hazard, any of the four chemicals appears to offer an effective means of controlling growth of Chinese elm.

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TABLE 1. Chinese elm responses to six annual inhibitor sprays

Date treated and factor	Days after treatment	Treatments* dikegulac 0.15%	dikegulac 0.3%	MH 0.25%	chlorflurenol 0.015%	untreated control
April 1, 1977						
Shoot growth, in†	206	19b	20b	28b	17b	58a
May 4, 1978						
Shoot growth, in†	221	11b	17b	14b	28b	48a
Shoot growth, in‡	221	35b	49b	30b	59b	99a
April 3, 1979						
Shoot growth, in†	220	5b	8b	5b	16b	46a
April 3, 1980						
Tree ht, ft	246	11.8b	9.8b	11.8b	9.2b	20.0a
Fruiting rating§	246	1.8ab	1.0a	1.0a	1.0a	3.0bc
April 3, 1981						
Tree ht, ft	257	10.8b	10.8b	11.5b	11.5b**	21.0a
Flowering rating§	250	2.6b	1.0b	1.0b	1.0b**	5.0a
April 23, 1982						
Tree ht, ft	185	10.5b	11.8b	12.1b	(15.7)	24.3a
Trunk diam, in	237	4.8a	5.6ab	4.9a	(4.5)	7.5b
Top wt, lb††	237	796a	1,259a	575a	(589)	2,886b
Root wt, lb††	237	165a	179ab	59a	(53)	573b
Top wt/Root wt††	237	5.1	4.1	4.5	(5.1)	2.7
Longest root, ft††	237	8.2	7.7	6.0	(4.6)	7.9

* Values in same horizontal row followed by same letter do not differ significantly (Duncan's Multiple Range Test, 1% significance level).
† Marked shoots.
‡ Growth beyond pruning cut.
§ Scale of 1 to 5: 1 = none; 5 = abundance of fruit.
** Spray error; trees received 0.54%: treatment discontinued.
†† Two replicates only.

TABLE 2. Mefluidide influences on pruned Chinese elm growth

Factor	Days after treatment	Treatments* Untreated control	0.1%	0.2%	0.4%	0.8%
Shoot growth, in†	49	67a	40b	41b	36b	29b
Shoot growth, in	237	123c	102bc	104bc	81ab	50a

* Duncan's Multiple Range Test, 1% significance level
† Growth above pruning cut