Effects of Pistill and Atrimmec on production of Lagerstroemia©

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Three studies were conducted to determine the effect of Pistill (ethephon) and Atrimmec (dikegulac-sodium) on flower abortion, fruit set, and axillary shoot stimulation of *Lagerstroemia* 'Tuscarora' when applied at full flower. Flower abortion increased for Pistill (1000 ppm) at 7 days after treatment (DAT). Pistill similarly caused a significant decrease in fruit set during all three experiments. Atrimmec had no effect on flower abortion at 7 DAT in any year except 1999. Pistill applications resulted in more new shoots than the control in all years and than Atrimmec in 1997. Applications of Pistill at full bloom can be an effective tool to abort crapemyrtle flowers resulting in reduced fruit set and increased number of new shoots.

INTRODUCTION

Lagerstroemia spp. are major crops in the nursery industry in both container and field production. Plants are grown in many sizes from small liners to large specimens and may be in production at nurseries for several years before marketed. Most cultivars of *Lagerstroemia* are vigorous growers under nursery conditions, however some cultivars begin flowering in early summer resulting in termination of the current year's growth. Flowers are born in terminal panicles which, depending on cultivar, are up to 36 cm (14 in) long and 23 cm (9 in) wide (Dirr, 1990). These large panicles can result in weighted-down branches during irrigation and precipitation events, leading to split trunks, an undesirable growth habit, and an increase in blow-over in container production. Similarly, the abundance of heavy fruit causes the same problem later in the season. One possible solution to heavy flowering and fruiting is flower removal.

Ethephon at 1000 ppm applied at full bloom eliminated fruit formation in *Pyrus calleryana* Decaisne and 99% of fruit formation in *Liquidambar styraciflua* L. (Perry and Lagarbo, 1994).

Ethephon also caused from 89% to 100% flower abortion and from 91% to 96% reduction in seed formation in three cultivars of *Kalmia latifolia* L. (Kiyomoto, 1997). Kiyomoto (1997) also showed that ethephon significantly stimulated shoot production and elongation in cultivars of *Kalmia latifolia*. The effects of ethephon on crapemyrtle have not been determined. The plant growth regulator (PGR), dikegulac-sodium, reduces or eliminates apical dominance and induces growth of axillary buds (Sachs et al., 1975). Dikegulac-sodium has been shown to increase lateral branching in several woody and nonwoody plant species (Foley and Keever, 1992; Malek et al., 1992; Smith et al., 1979), but not crapemyrtle. Therefore, the objective of this study was to evaluate the effects of the PGRs Pistill (ethephon) and Atrimmec (dikegulac-sodium) on flower abortion, fruit set, and lateral branching in crapemyrtle with the ultimate goal of addressing several production-related problems.

[1]Graduate Student Research Paper Winner. 2nd Place.

MATERIALS AND METHODS

Lagerstroemia 'Tuscarora' were grown in 3.8-liter (#1) (1997 and 1998) or 11.4-liter (#3) (1999) containers in a pinebark and sand substrate (6 :1, v/v) amended per m^3 (yd^3) with 8.3 kg (14 lb) of 17N-3.1P-10K (Osmocote 17-7-12, The Scotts Company, Marysville, OH), 0.9 kg (1.5 lb) Micromax (The Scotts Company), and 3.0 kg (5.0 lb) dolomitic limestone. Plants were selected for uniformity from a stock block, and grown outdoors in full sun. Plants received 1.27 cm (0.5 inches) water daily split into two applications using overhead irrigation at a rate of 2.54 cm (1 inch) h^{-1}.

Plants were treated when flowers were at or near full bloom. In 1997 and 1999, plants had already reached full bloom and peaked. Hence, they were subsequently pruned in late June to remove inflorescences, and subsequent blooms were treated. Treatment dates were: 5 Aug. 1997, 2 July 1998, and 6 Aug. 1999. The PGRs were applied to dry foliage using a CO_2 sprayer with a flat fan nozzle at 1.4 $kg{\cdot}cm^{-2}$ (20 lb per $inch^2$). All shoots were sprayed until wet. Irrigation was withheld overnight. Treatments included: (A) Atrimmec at 723 ppm (1997 and 1998 only), 1445 ppm, or 2176 ppm; (B) pruning plus Atrimmec at 1445 ppm or 2176 ppm (1999 only, shoots were manually pruned just below the inflorescence prior to application of Atrimmec); (C) Pistill at 333 ppm, 667 ppm, or 1000 ppm; (D) a pruned treatment (shoots were manually pruned just below the inflorescence), and (E) a nontreated control.

Prior to treatment, two inflorescences were tagged per plant at full bloom (~90% open flowers), but with no visible fruit. Data collected were percent flower abortion 7 days after treatment (DAT), percent fruit set 14 DAT, axillary shoot count of whole plant 21 DAT (14 DAT in 1997), and axillary shoot count of the terminal 30 cm (12 inches) of two tagged shoots 21 DAT (1999).

RESULTS AND DISCUSSION

In all three experiments, Pistill increased the percent flower abortion compared to the unpruned control and Atrimmec (Tables 1 and 2). Percent flower abortion 7 DAT increased linearly with increasing rates of Pistill during 1997, 1998, and 1999, respectively 84.4%, 84.2%, and 64.4% reduction for Pistill (1000 ppm) compared to 17.1%, 16.7%, and 2.1% for the nonpruned control, respectively. Pistill similarly caused decreased fruit set in response to rate as well as lowering percent fruit set when contrasted with Atrimmec during all three experiments. These results with Pistill are consistent with other studies using Pistill on other genera to abort flowers and reduce fruit set (Kiyomoto, 1997; Perry and Lagarbo, 1994). Flower abortion increased with increasing rate of Atrimmec at 7 DAT in 1998 and 1999 (Table 2). Atrimmec had little effect on fruit set except during the 1998 (Table 1) study when fruit set at 14 DAT was approximately 40% for all Atrimmec rate compared to 65% for the control.

With respect to new shoots in 1997, there was no rate response with either PGR tested. In 1997, when contrasted across all rates, Pistill resulted in more new shoots at 14 DAT (Table 1) than Atrimmec and the nonpruned control; however, there was no difference between Pistill and pruned plants. In the 1998 experiment, new shoots were counted at 21 DAT (Table 1), and results differed from 1997 with the pruning treatment yielding more new shoots than Atrimmec.

There were no differences with the Pistill treatment. However, both Pistill and Atrimmec treatments yielded more new shoots than the nonpruned control plants.

Table 1. Percent flower abortion, percent fruit set, and new shoots for *Lagerstroemia* 'Tuscarora' treated with Pistill and Atrimmec, in 1997 and 1998.

Treatment	Rate (ppm)	Flower abortion (%) 7 DAT[y]		Fruit set (%) 14 DAT		New shoots[z] 14 DAT	New shoots[z] 21DAT
		1997	1998	1997	1998	1997	1998
Control	0	17.1	16.7	69.4	65.0	4.9	9.5
Atrimmec	723	20.0	16.7	71.7	42.0	2.3	15.7
Atrimmec	1445	12.8	45.0	47.2	38.3	9.9	17.5
Atrimmec	2176	38.9	34.0	62.2	42.5	6.2	22.2
Significance[x]		NS	L*	NS	NS	NS	NS
Pistill	333	56.7	41.7	25.6	33.3	14.9	20.7
Pistill	667	52.2	60.0	13.9	27.5	12.0	20.5
Pistill	1000	84.4	84.2	2.2	14.5	18.3	21.5
Significance		L**	L*	L***	L*	NS	NS
Pruned		—[w]	—	—	—	11.6	29.7
Contrast[v]							
Atrimmec vs. Pistill		***	*	***	*	***	NS
Atrimmec vs. prune		—	—	—	—	NS	**
Atrimmec vs. control		NS	NS	NS	*	NS	*
Pistill vs. prune		—	—	—	—	NS	NS
Pistill vs. control		***	**	***	**	**	

[z]New lateral shoots on whole plant.
[y] Days after treatment.
[x]Nonsignificant (NS), or linear (L) response at the 5% (*), 1% (**), or 0.1% (***) level. Control included in regression (n=9).
[w]No data was collected for pruned treatment for indicated response variable.
[v]Nonsignificant (NS), or significant at the 5% (*), 1% (**), or 0.1% (***) level (n=9).

Data collection differed in the 1999 experiment in that new lateral shoots on the terminal 30 cm (12 inches) of tagged shoots were counted as well as whole plant new shoots at 21 DAT. New shoots in the Atrimmec treatments were not different from the control, while pruning again yielded more new shoots than Atrimmec (Table 2). Pistill again yielded the greatest number of new shoots on the whole plant when compared to Atrimmec or the non-pruned control plants but not the pruned plants. Atrimmec plus pruning did not yield more new shoots than pruning alone; however, Atrimmec plus pruning did yield more new shoots on the terminal 30 cm (12 inches)

Table 2. Percent flower abortion, percent fruit set, and new shoots for *Lagerstroemia* 'Tuscarora' treated with Pistill and Atrimmec in 1999.

Treatment	Rate (ppm)	Flower abortion (%) 7 DAT[z]	Fruit set (%) 14 DAT	New shoots/ terminal 21 DAT	New shoots/ whole plant 21 DAT
Control	0	2.1	55.4	0.0	10.1
Atrimmec	1445	3.8	59.4	0.1	7.5
Atrimmec	2176	11.3	55.9	0.0	10.4
Significance[y]		L**	NS	NS	NS
Pruned	0	—[x]	—	5.2	32.1
Atrimmec + prune	1445	—	—	7.1	36.6
Atrimmec + prune	2176	—	—	6.1	40.4
Significance		—	—	NS	NS
Pistill	333	18.1	50.0	0.0	22.6
Pistill	667	45.6	35.6	0.1	39.1
Pistill	1000	64.4	27.8	0.2	45.1
Significance		L***	L*	NS	L*
Contrast[w]					
Atrimmec vs. Pistill		***	***	NS	***
Atrimmec vs. prune		—	—	***	***
Atrimmec vs. control		NS	NS	NS	NS
Atrimmec + prune vs. control		—	—	***	***
Atrimmec + prune vs. Atrimmec		—	—	***	***
Atrimmec + prune vs. Pistill		—	—	***	NS
Atrimmec + prune vs. prune		—	—	*	NS
Pistill vs. prune		—	—	***	NS
Pistill vs. control		***	**	NS	***

[z] Days after treatment.
[y] Nonsignificant (NS), or linear (L) response at the 5% (*), 1% (**), or 0.1% (***) level. Control included in regression (n=9).
[x] No data was collected for pruned treatment for indicated response variable.
[w] Nonsignificant (NS), or significant at the 5% (*), 1% (**), or 0.1% (***) level (n=9).

of tagged shoots than other treatments. There were no phytotoxic effects from any treatment observed during these experiments.

These results indicate that applications of Pistill at full flower can be an effective tool to cause flower abortion resulting in reduced fruit set. Lateral branching can also be increased as a result of Pistill applications. This increase in lateral branching can increase the quality of plants as well as increase the number of cuttings that can be removed from plants without significantly reducing plant height. While not directly studied in these experiments, a potential benefit of Pistill reducing flowers and fruit is a reduction in plant breakage and blow-over during production. Likewise, a reduction in the labor requirements would reduce production cost of *Lagerstroemia*.

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