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PRELIMINARY OBSERVATIONS ON USE OF ETHYLENE-RELEASING COMPOUNDS FOR CHEMICAL PEACH THINNING IN NORTH TEXAS

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INTRODUCTION

Chemical peach thinning research has been conducted in the U.S. for more than 45 years. Much effort has been expended in search of a chemical thinning agent, yet no compound has been or is currently labeled for use on peaches in Texas. Materials including dinitro compounds, auxins, and ethylene-releasing agents have been evaluated in other states.

Ethephon ([2-chloroethyl]phosphonic acid), an ethylene-generating material, has been tested, but inconsistant results have been obtained due to seasonal climatic variations and temperature-dependent ethylene release rates. Silaid ([2-chloroethyl]methylbis[phenylmethoxy] silane), a relatively new material which degrades to release ethylene with less temperature dependence, has been used successfully to thin peaches in the Southeastern U.S. In 1984, an Experimental Use Permit was obtained for silaid in Florida, Georgia, and South Carolina. This preliminary study was conducted to determine peach thinning effectiveness of ethephon and silaid under North Texas conditions.

MATERIALS AND METHODS

Ethephon and silaid were applied in separate studies to nonirrigated, 18-year-old 'Sentinel' peach trees at the Texas A&M Fruit Research Station, Montague, Texas. Concentrations of 0, 250, and 500 ppm of each material were applied at full bloom (March 22), 6-mm (May 2) and 12-mm (May 19) ovule length stages in 1983 in 3x3 factorial randomized complete blocks with 3 replications of single-tree plots. Average ovule length was determined by selecting 10 representative fruit from each tree and slicing longitudinally to expose the greatest ovule length.

Ethephon sprays containing 0.1% X-77 surfactant were applied to the point of drip using a hand sprayer. Silaid treatments were applied similarly except surfactant was omitted as recommended. Control trees were not sprayed or hand-thinned. Ambient temperatures ranged between 4°C at full bloom to 13 and 14°C at the 6- and 12-mm ovule length stages, respectively. Wind movement was minimal.

At harvest, fruit were sorted into two size categories: less than 2 1/4 in, and equal to or larger than 2 1/4 in. Fruit weights were recorded and samples consisting of 10 representative fruit from each tree in the large size category were collected and frozen for later soluble solid (sugar) and titratable acidity analysis.

RESULTS AND DISCUSSION

Ethephon reduced total fruit yield with each increase in concentration (Table 1). Most of the total yield reduction at the 250 ppm application rate was accountable to lowered yields of fruit in the small size category (less than 2 1/4 in diameter). Ethephon at 500 ppm severely reduced yields in both the small and large size categories as a result of overthinning. Soluble solids and titratable acidity were not affected by ethephon concentration. The 500-ppm ethephon concentration caused leaf yellowing and some defoliation, particularly when applied at the 6- and 12-mm ovule length stages. Ethephon did not appear to affect vegetative bud development when applied at full bloom.

Ethephon generally had more effect in reducing total yields when applied at the 6-mm ovule length stage by reducing yield of small fruit (Table 1). The least thinning activity occurred at the more mature 12-mm ovule length stage. Lower soluble solids and higher titratable acidity indicate a delay in fruit maturation associated with the 6-mm, and to a lesser extent, the 12-mm application times. The delayed fruit maturity could be partially due to foliar damage which occurred when ethephon was applied at the 6- and 12-mm stages.

Total yields were reduced by silaid application (Table 2), but not as severely as with ethephon. The lower total yields with 250-ppm silaid were due to reductions in small fruit yield with no detrimental effects on marketable yield. At the 500-ppm concentration, yields of not only small, but also marketable fruit were decreased as a result of overthinning. Increasing the silaid concentration tended to increase titratable acidity with no effect on soluble solids. No phytotoxic effects of silaid were noted at any concentration or time of application.

The main effects of silaid application time (Table 2) show little effect on yield parameters and only slight effects on fruit quality. However, the interactive effects of silaid concentration and application time (Figure 1) indicate that total yields were reduced only when applications were made at 6- and 12-mm ovule length stages. The full bloom stage was relatively insensitive to the concentrations used in the study. Silaid has not been cleared for use in commercial peach production.

SUMMARY

Both ethephon and silaid at 250 and 500 ppm reduced total fruit yield and both compounds at 500 ppm reduced marketable (2 1/4-in diameter and larger) fruit yield. Ethephon thinned fruit when applied at full bloom and the 6- and 12-mm ovule length stages, but the full bloom stage was relatively insensitive to the silaid concentrations used. Under the conditions of this study, none of the treatments significantly increased marketable fruit yields.

Table 1. Main effects of ethephon concentration and time of application on yield and quality of 'Sentinel' peaches, 1983.

Main effects	Yield (lbs/tree) Total	Yield (lbs/tree) <2 1/4 in	Yield (lbs/tree) ≥2 1/4 in	Soluble solids (%)	Tit. acidity (%)
Concentration (ppm)					
0	114.7a[z]	71.0c	43.7a	10.0a	0.64a
250	65.6b	31.1b	34.4a	10.6a	0.64a
500	29.2c	12.9a	16.3b	10.4a	0.63a
Application time					
full bloom	69.0ab	43.0b	26.0a	11.1b	0.56a
6-mm ovule	59.3b	26.1a	33.2a	9.6a	0.74b
12-mm ovule	81.1a	45.9b	35.2a	10.3ab	0.61ab

[z]Means separation within columns and main effects by Duncan's Multiple Range Test, 5%.

Table 2. Main effects of silaid concentration and time of application on yield and quality of 'Sentinel' peaches, 1983.

Main effects	Yield (lbs/tree)			Soluble solids (%)	Tit. acidity (%)
	Total	<2 1/4 in	≥2 1/4 in		
Concentration (ppm)					
0	114.7a[z]	71.0b	43.7a	10.0a	0.64a
250	93.6b	45.6a	48.0a	10.0a	0.70ab
500	60.8c	31.0a	29.8b	10.0a	0.78b
Application time					
Full bloom	93.4a	49.4a	44.0a	10.1a	0.65a
6-mm ovule	89.9a	55.4a	34.4a	10.1a	0.77b
12-mm ovule	85.7a	42.7a	43.0a	9.8a	0.70ab

[z]Means separation within columns and main effects by Duncan's Multiple Range Test, 5%.

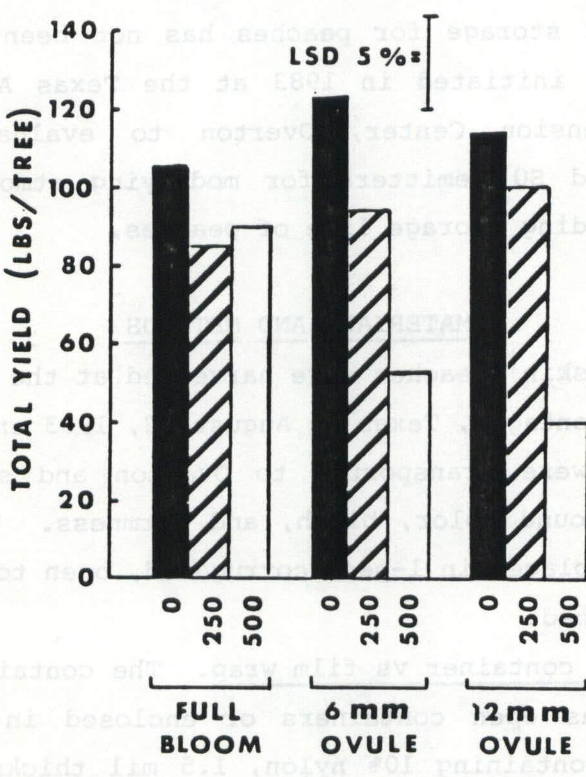

Figure 1. Interactive effects of silaid concentration and application time on total yield of 'Sentinel' peaches, 1983.