Effects of Various Chemicals on Dormancy, Maturity and Thinning of Peaches

Esmaeil Fallahi, Michael Kilby and John W. Moon

Abstract

Effects of 5 chemicals on the reduction of dormancy and early maturity of peaches were studied for 3 years under the desert climatic condition of Southwest Arizona. CuSO4, urea and particularly hydrogen cyanamide reduced the dormancy and enhanced blooming. Application of hydrogen cyanamide in October induced full bloom in November (1 month after application) and produced fruit. Late November was the most appropriate time for application of hydrogen cyanamide, and fruit were harvested 10 days before normal time in April. No difference was found between 5% and 3% (V/V) of hydrogen cyanamide in the time of blooming; however, rate at 5% always caused some phytotoxicity. Application of hydrogen cyanamide at 1% before bloom and at full bloom produced the same size of commercially packed fruit as hand-thinned ones.

Introduction

Because of fluctuating market of some southwest traditional crops and the needs for an alternative crop with a better cash value, production of deciduous fruit, particularly peaches in the desert has become popular. Among all deciduous fruit, peaches have a better potential for commercial production. Flordaprince and EarliGrande peaches are planted commercially in Southwestern Arizona and Southern California. These 2 cultivars were found to be suitable for planting in the areas with low chilling hours in Florida, Texas and Arizona. Our goal was to reduce the dormancy and enhance maturity of Flordaprince and EarliGrande peaches with different chemicals. Also, our objective was to use hydrogen cyanamide for thinning peaches.

Materials and Methods

Flordaprince and EarliGrande peach trees on Nemaguard rootstock were planted at the University of Arizona Yuma Agricultural Center in February 1987. Tree spacing was 7.0 x 5.1 m, and the soil was sandy with the top 20 cm mixed with loam and pH was 8.0. Trees were pruned as vase shape (open center). Trees were pruned about 10 days before harvest (summer pruning). In this pruning, only large suckers were removed for better light penetration. Trees were flood irrigated every month between November and February and every 10 days between March and October. In general, all cultural practices in this experimental block were the same as those in commercial orchards. Zinc sulfate (5%), CuSO4 (10%), and urea (10%) were sprayed in late September, October, November, December and January in 1987, and tidiazuran (100 ppm and 300 ppm) in December 1987. Hydrogen cyanamide was sprayed at the rates of 3% and 5% in late September, October, November, December and January in 1987, 1988 and 1990. The experimental design was a completely randomized design with three trees (replications) per cultivars per application. Trees were sprayed with a backpack sprayer to the dripping point.

Physiological changes in the leaf and flower buds were recorded daily after spray. Dates of first bloom, full bloom and maturity were recorded. Bloom density, fruit set, and fruit color and size were measured.

In a separate experiment, hydrogen cyanamide was sprayed on Flordaprince at the rate of 0.5%, 1%, 2% and 3% before bloom and at full bloom, and the effects on fruit thinning were studied. Bloom density, fruit set and number of commercially packed fruit were recorded.

Results and Discussion

All of the tested chemicals, other than tidiazuran, defoliated the trees. CuSO4 defoliated the trees with 2-3 days by shedding leaves, while hydrogen cyanamide caused complete leaf burning within 24 hours. Effects of 5% hydrogen cyanamide were more severe than that of 3%. Defoliating effects of urea and ZnSO4 were less severe than other chemicals. September spray of hydrogen cyanamide induced bloom in October, but they did not set quality fruit. October spray of hydrogen cyanamide at both 5% and 3% rates induced full bloom in November, and fruit set was moderate (Table 1). These fruit, however, were lost due to frost in December. Late November application of hydrogen cyanamide induced full bloom about 10 days - 2 weeks earlier than other treatments (Table 1). December application of hydrogen cyanamide was ineffective. Urea, tidiazuran and CuSO4 application in November advanced blooming only by 2-3 days (not significant).

Late November application of 3% hydrogen cyanamide found to be desirable for inducing early blooming and fruit production (Table 2). Although the results varied from year to year, late November was always a desirable time for hydrogen cyanamide application, as fruit maturity in both Flordaprince and EarliGrande was advanced by 10 days - 2 weeks. Under the desert condition, fruit of EarliGrande peach are pointed "bullet" shape. Hydrogen cyanamide eliminated this sharp point from the EarliGrande in 1987 spray (1988 harvested fruit). However, this phenomenon was not observed in 1988 spray (1989 harvested fruit). Some variation in the time of fruit maturity was observed in 1988 spray, due to different stages (ages) of buds. Fruit buds were normally initiated in late June. However, secondary fruit buds were also developed in late August, after a sharp period of growth, producing buds with at least 2 ages with 2 different stages of maturity.

In a separate experiment, hydrogen cyanamide was used as thinning agent for Flordaprince peaches. Three percent and 2% application rates before bloom and during full bloom caused phytotoxicity and burned 95% - 100% flowers (Tables 3-6). One percent hydrogen cyanamide, however, before bloom and after bloom produced the same result as hand thinning (Tables 5 and 6). Numbers of large fruits (36 packs) in the hand-thinned and 1% hydrogen cyanamide trees were almost similar (Tables 5 and 6). This suggests that hydrogen cyanamide could be used as a dormancy-reducing chemical as well as thinning agent, when it gets the registration approval.

Acknowledgment

Authors would like to express their deep appreciation to SKW and Seimer, Inc. for their financial support of this study.

Table 1. Effects of Various Chemicals on Days to Full Bloom and Relative Bloom Density of 'Florda Prince' Peach.

	October Spray		November Spray		December Spray	
	Days to Full Bloom	Bloom Density	Days to Full Bloom	Bloom Density	Days to Full Bloom	Bloom Density
Control	110	Heavy	76	Heavy	46	Heavy
Urea	60	Medium	76	Heavy	46	Heavy
Hyd.Cy.	31	Light	66	Light	46	Light
$ZnSO_4$	110	Heavy	76	Heavy	46	Heavy
$CuSO_4$	42	Medium	76	Heavy	46	Heavy

Table 2. Effects of November Application of Hydrogen Cyanimide on Bloom and Fruit Set of 'Florda Prince' and 'Earli Grande' Peaches.

	'Florda Prince'			'Earli Grande'		
	Bud & Bloom	Number of Single Fruit	% Single Fruit Set	Bud & Bloom	Number of Single Fruit	% Single Fruit Set
Control	88	67	76	17	11	65
Urea	45	28	62	10	8	80
Hyd.Cy	18	13	72	6	3	50
$ZnSO_4$	36	24	67	7	4	57
$CuSO_4$	31	22	71	19	15	79

Table 3. Effect of Prebloom Application of Hydrogen Cyanimide on 'Florda Prince' Peach Fruit Set.

	Number of Blooms	Number of Single Fruit	% Single Fruit Set	Number of Doubles
Control	142	117	82	19
1% Hyd.Cy.	150	41	27	8
2% Hyd.Cy.	147	4	3	0
3% Hyd.Cy.	152	0	0	0

Control is commercially thinned.

Table 4. Effect of Full Bloom Application of Hydrogen Cyanimide on 'Florda Prince' Peach Fruit Set.

	Number of Blooms	Number of Single Fruit	% Single Fruit Set	Number of Doubles
Control	142	117	82	19
Surfactant	161	134	83	10
.5% Hyd.Cy.	225	151	67	6
1% Hyd.Cy.	138	68	49	8
2% Hyd.Cy.	142	7	5	0
3% Hyd.Cy.	138	0	0	0

Control is commercially thinned.

Table 5. Effect of Hydrogen Cyanimide at Prebloom on 'Florda Prince' Peach Pack Out.

	70 pk	54 pk	36 pk	32 pk
Control	0	9	54	5
1% Hyd.Cy.	1	29	45	6
2% Hyd.Cy.	1	4	2	0
3% Hyd.Cy.	2	0	2	0

Control is commercially thinned.

Table 6. Effect of Hydrogen Cyanimide at Full Bloom on Peach Pack out.

	70 pk	54 pk	36 pk	32 pk
Control	0	9	54	0
Surfactant	401	0	0	0
.5% Hyd.Cy.	469	129	0	0
1% Hyd.Cy.	0	20	64	3
2% Hyd.Cy.	0	5	3	3
3% Hyd.Cy.	0	1	1	0

Control is commercially thinned.