Chemical Blossom Thinning of Stone Fruits
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Introduction

The economic benefit of chemical bloom thinning to a stone fruit grower may be influenced by several factors, including price structure for larger fruit size, yield per acre, chance of spring frost, hand thinning costs, and labor supply.

Hand thinning costs for an early-maturing cultivar can run as high as $800 per acre. Because labor costs will continue to escalate, interests in chemical blossom thinning has been rekindled.

Considering the potential for greatly reducing hand thinning costs and increasing the value of the crop by enhancing fruit size, the economic benefits of chemical bloom thinning in regions of minimal spring frost may outweigh the risk of subsequent crop loss from this practice.

Research on chemical thinning in the past had included plant growth regulators, insecticides, etc., but the results were too inconsistent. Today there *is* still a keen interest in chemical thinning but registering new compounds has become difficult due to the recent political situation.

Researchers in other states and other areas of the world have worked with surfactants and fertilizers as blossom thinners. These compounds at high rates have caustic action on flowers, but some of the materials showed commercial potential. These compounds are exempt from federal registration and therefore do not have the problems attending registration.

The purpose of this trial was to initiate a bloom thinning chemical screening program and to study the caustic action of a variety of surfactants and fertilizers on flowers. The ultimate goal *is* to reduce the overall fruit load, which in turn would decrease the fruit thinning costs.

Procedure

The trial was conducted in 1991 in mature 'Friar' plum and 'Firebrite' nectarine orchards located in Fresno County. In the 'Friar' plum orchard, 400-500 flowers were selected in a section of a scaffold for each treatment. In the 'Firebrite' nectarine orchard, 10 fruit shoots on a scaffold were used for each treatment. The test materials were applied on the trees at full bloom with a hand pump sprayer to the point of drip. There were 17 treatments (Table 1) replicated four times.

The following measurements were made; fruit stem condition, leaf health, and % fruit set.

Results and Discussion

'FRIAR' PLUM.

Fruit stems and leaves. Fruit stem and leaf condition were examined three and six weeks after treatment. Three weeks after application, in the various treatments, fruit stems showed slight to severe browning (data not shown). The treatment Triton B-1956 (5%) was normal and similar to the control. The treatment $ZnSO_4$ (10 lbs) caused slightly more yellowing than the control. The rest of the treatments resulted in much fruit stem yellowing to severe burning.

There was slight to severe leaf burning, depending on treatment, three weeks after application (data not shown). The treatments Triton B-1956 (5%) and $ZnSO_4$ (10 lbs. and 20 lbs.) resulted in the least amount of foliage phytotoxicity and statistically were the same as the control. The rest of the treatments resulted in substantial delay in foliage emergence to severe leaf burn.

At six weeks after application, the fruit stem condition of the treatments $ZnSO_4$ (10 lbs. and 20 lbs.), was as normal as the control. The Triton B-1956 (5 & 10%) showed fruit stem spotting which eventually abscised. In the rest of the treatments the fruit stems had either abscised or were burnt. Regarding foliage growth, the treatments Triton B-1956 (5%} and $ZnSO_4$ {10 & 20 lb} were as normal as the control. The rest of the treatments ranged from delay in foliage growth to leaf burn. The treatments

that showed severe leaf burn three weeks prior had developed new regrowth with the exception of Sharpshooter (l0%) and SilWet-L77 (l0%) which showed no recovery.

Fruit set. Fruit counts were made a day before commercial thinning. All treatments set significantly less fruit than the control (Table 2). The Triton B-1956 (5%) and $ZnSO_4$ (10 lbs.) produced fruit sets of 6.5 and 7.2% respectively, while the control produced 11.2%. All other treatments produced 0-3% fruit set.

Assuming that the control's fruit set was normal, then the treatments Triton B-1956 (5%) and $ZnSO_4$ (10 lbs.) produced fruit sets of 58 and 64% of normal, respectively.

In the 1991 season this orchard was commercially hand thinned to a 0.5% fruit set. The two treatments mentioned above Triton B-1956 (5%) and $ZnSO_4$ (10 lbs.) may have produced the most commercially desirable level of chemical thinning because they significantly reduced the fruit set and produced a fruit set that was still manageable. This would allow the grower to conduct his own touch-up thinning to his desired level, with a savings of 36-42% in hand thinning costs.

'FIREBRITE' NECTARINE.

Fruit stems and leaves. Fruit stem and leaf condition were examined two and four weeks after treatment. Unlike the 'Friar' plums, fruit stem spotting was not found. The fruit stems were either normal or had abscised. The 1991 mild spring season created an extremely prolonged bloom period (40 days). Therefore all stages of development were present on the nectarine trees. At the time of spray application there was mostly full bloom, with a few popcorn stage flowers, some falling petals, and a few emerging leaves.

Materials such as UN32, Sharpshooter, and SilWetL77 had caused severe leaf burn after two weeks (data not shown). Interestingly, the $ZnSO_4$ (36%) did not cause any noticeable foliar phytotoxicity. After four weeks the SilWetL77 and the UN32 (ll%) showed recovery, but the UN32 (22%) and Sharpshooter (5 & l0%) did not. The rest of the treatments ranged from slight delay to normal leaf growth as compared to the control.

Fruit set. Fruit counts were made a day before commercial thinning. All treatments set significantly less fruit than the control (Table 3). The $ZnS0_4$ (10 lbs.) and Triton 8-1956 (5%) produced 55 and 66% fruit set respectively, while the control produced 82%. All of the other treatments produced 0-40%.

Treatments Triton B-1956 and $ZnSO_4$ produced fruit sets of 67 and 74% of normal, respectively, as compared to the control.

In the 1991 season, this orchard was commercially hand thinned to a 1St fruit set. The Triton and $ZnS0_4$ treatments may have produced the most desirable level of chemical thinning because they significantly reduced the fruit set, but still would have allowed the grower to touch-up thin to his own desirable fruit load level, saving 26-33% in his hand thinning costs.

Summary

Various surfactants and fertilizers were tested to study their activity on blossom thinning of 'Friar' plums and 'Firebrite' nectarines. The materials were applied at various concentrations at full bloom.

The surfactant "Triton B-1956 at the 5% (5 gal/100 gal H_2O)" rate and "$ZnSO_4$ at the 10 lbs/100 gallons H_2O" rate provided the most encouraging results. These materials at these rates significantly reduced the initial fruit sets to a more desirable and manageable level. The grower would have reduced his fruit thinning labor cost an average of 38% for his 'Friar' plums and 30% for his 'Firebrite' nectarines.

More years of testing and on more varieties are required, to gain more confidence in these materials. There is good potential to use them as blossom thinning aids. Since these compounds do not require registration, it makes them even more attractive.

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Table 1. Chemical Blossom Thinning Treatments

Treatment	Material	Conc (%)
1	TritonX-45	5
2	TritonX-45	10
3	TritonCS-7	5
4	TritonCS-7	10
5	MorAct	5
6	MorAct	10
7	Sharpshooter	5
8	Sharpshooter	10
9	SilWetL77	5
10	SilWetL77	10
11	TritonB1956	5
12	TritonB1956	10
13	$ZnSO_4$ (36%)	10-lbs/100 gal
14	$ZnSO_4$ (36%)	20-lbs/100 gal
15	UN32	11
16	UN32	22
17	Control	

Table 2. Chemical Blossom Thinning - Plums

Treatment	Material	Conc (%)	% fruit set	
2	TritonX-45	10	0.0	d*
4	TritonCS-7	10	0.0	d
5	MorAct	5	0.0	d
6	MorAct	10	0.1	d
7	Sharpshooter	5	0.0	d
8	Sharpshooter	10	0.0	d
9	SilWetL77	5	0.1	d
10	SilWetL77	10	0.0	d
15	UN32	11	0.0	d
16	UN32	22	0.0	d
1	TritonX-45	5	0.8	cd
14	$ZnSO_4$ (36%)	20-lbs/100 gal	2.0	cd
3	TritonCS-7	5	2.5	c
12	TritonB1956	10	2.7	c
11	TritonB1956	5	6.5	b
13	$ZnSO_4$ (36%)	10-lbs/100 gal	7.2	b
17	Control		11.2	a

* mean separation in columns using DMR test @ 5 % level

Table 3. Chemical Blossom Thinning - Nectarines

Treatment	Material	Conc (%)	% fruit set	
15	UN32	11	0.0	f*
7	Sharpshooter	5	0.3	f
10	SilWetL77	10	0.7	f
8	Sharpshooter	10	0.8	f
9	SilWetL77	5	1.2	f
16	UN32	22	5.4	f
6	MorAct	10	14.1	ef
2	TritonX-45	10	16.1	ef
1	TritonX-45	5	25.5	de
4	TritonCS-7	10	26.4	de
5	MorAct	5	33.0	d
12	TritonB1956	10	35.1	d
3	TritonCS-7	5	40.2	cd
14	$ZnSO_4$ (36%)	20-lbs/100 gal	53.7	bc
13	$ZnSO_4$ (36%)	10-lbs/100 gal	55.3	bc
11	TritonB1956	5	61.2	b
17	Control		81.7	a

* mean separation in columns using DMR test @ 5% level