INFLUENCE OF GLYPHOSATE OR PROPANIL DRIFT ON DRIED PLUM YIELD

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INTRODUCTION

Dried plum growers have occasionally seen leaf spotting or mottling, poor tree growth and poor flower set. It has been observed that these symptoms have been increasing over the past several years. In previous work conducted by the California Dried Plum Board, glyphosate and propanil were found in measurable amounts in dried plum leaf tissue. The source of the propanil is rice fields, but the source of the glyphosate is not clear. Glyphosate may be coming from outside sources, but also may be from applications made to the orchard. What is also not clear is what effects these sub-lethal rates are having on dried plum production. If one or both of these herbicides are impacting dried plum productivity, it may be necessary to modify the way they are applied or the timing of the application.

OBJECTIVES

1. Evaluate the effects of propanil and glyphosate on dried plum production
2. Determine the symptoms associated with these herbicides.

PROCEDURES

A field study was established at the Wolfskill Farm, near Winters, CA, to evaluate the effects of various rates and application timing of propanil and glyphosate on dried plums. The application dates were May 22, July 23, or August 20, 2009. Initially, the herbicide rates we planned on using were 1/2X, 1/10X, 1/100X, and an untreated control (1X rate = 1.5 lbs/a for glyphosate, and 4 lbs/a for propanil), with individual plots being a single-tree. However, the number of prune trees in the orchard (90 trees) was not sufficient for the planned number of rates, application timings, and replicates. Thus, at the first application timing, only three replicates were used and the 1/2X rate was not applied. The leaf symptoms from the 0.4 lb/a rate ($1/10^{th}$ rate) of propanil were severe enough that it was decided that the rates for subsequent applications be scaled back to $1/10^{th}$, $1/100^{th}$, and $1/500^{th}$ rates. Applications made in July and August included all three rates and was replicated four times. Treatments were applied using a CO_2-powered backpack sprayer, with 8001 nozzles, delivering 10 gal/ac total spray volume. A crop oil concentrate was added to all propanil treatments at 1% v/v. Treatments were applied on three sides of each tree, with a 4-nozzle spray boom, treating a 6-foot wide swath, going from near the top of the tree to the bottom of the canopy.

Prune trees were visually evaluated at regular intervals for injury, and photographs taken to document injury symptoms. On July 18-20^{th}, the number of flower initials was counted on three representative branches from each tree. Branches were chosen in a sunny, shady, and in the top portion of the canopy. Branches were marked in order to

assess number of flowers and fruit set next year, relative to the number of flower initials. All fruit from each tree were hand-harvested and weighed. A 100 fruit random sample was weighed separately to assess fruit size.

RESULTS

Injury symptoms were seen within a week of propanil treatment at the 0.4 or 0.04 lb/a rate of application (Figure 1). Following propanil treatment, prune leaves became chlorotic, primarily in the interveinal areas. Injury symptoms were not observed following application of propanil at the 0.008 lb/a rate or with any rate of glyphosate.

Prune yields varied but were not significant different among treatments (Table 1). The outside border rows were used as the untreated trees, which may have yielded more fruit than the internal rows. The outside rows had been committed to an insecticide experiment, and thus we were not permitted to treat these trees, which meant the four internal rows contained all the treatments. Although we expected to see decreasing yield with increasing herbicide rates, no trends were evident.

Prune size (lbs/100 fruit) did not differ among treatments (Table 2). Similar to prune yield, prune size was variable with no trend toward increasing or decreasing size with increasing herbicide rate.

CONCLUSIONS

Although visible injury symptoms were seen with some propanil treatments, prune yield and prune size did not differ among treatments. Propanil inhibits photosynthesis, and thus would be expected to lower the overall productivity of prune trees. However, it was reported (Al Bonin, personal communication) that the fruit was thinned prior to the initiation of the experiment. Thus, with a lighter fruit load, the trees may have been able to compensate for less photosynthesis.

Glyphosate blocks amino acid biosynthesis. Symptoms following glyphosate exposure are generally chlorosis, followed by necrosis. Glyphosate symptoms are generally slow to appear. Glyphosate symptoms are often seen first on immature leaf tissue. We did not observe any glyphosate symptoms, possibly due to all the leaves being fully expanded at the time of application. Glyphosate is very slow to metabolize in plants and symptoms are often seen the next spring, following exposure the previous year. We expect to see glyphosate symptoms next year.

Table 1. Prune yields (lbs/tree) relative to herbicide, rate, and application date. Yield differences among treatments were not significant.

Glyphosate

Appl. Date	Application rate (lbs/a)			
	0	0.015	0.15	0.75
	----------(lbs fruit/tree)----------			
May 22	172	162	156	
July 23	185	150	137	183
August 20	180	137	191	157

Propanil

Appl. Date	Application rate (lbs/a)			
	0	0.008	0.04	0.40
	----------(lbs fruit/tree)----------			
May 22	226		163	96
July 23	215	171	160	184
August 20	248	143	120	169

Table 2. Prune yields (lbs/100 fruit) relative to herbicide, rate, and application date. Differences among treatments were not significant.

Glyphosate

Appl. Date	Application rate (lbs/a)			
	0	0.015	0.15	0.75
	----------(lbs/100fruit)----------			
May 22	4.8	5.3	4.7	
July 23	4.4	4.6	4.9	4.8
August 20	4.7	5.3	4.9	4.6

Propanil

Appl. Date	Application rate (lbs/a)			
	0	0.008	0.04	0.40
	----------(lbs/100fruit)----------			
May 22	4.4		4.7	4.2
July 23	4.8	4.5	5.0	4.6
August 20	4.4	4.9	4.5	4.8

Figure 1. Prune leaves with chlorosis following propanil simulated drift at 0.04 lb/ac.