Effect of Halosulfuron on Prunes

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Halosulfuron is a unique herbicide, in that it can control sedges. It is currently registered for agricultural use in corn, sorghum, and several nut crops. There is great interest in expanding this registration into other crops, such as rice, due to halosulfuron's ability to control nutsedge (Cyperus spp.) and other sedges. However, prior to registering any new herbicide, the potential effects on non-target plants must be known. Thus, the objectives of this study were to test the effects of low-rate applications of halosulfuron on potential prune.

Methods: A field study was established in 2001 on the Pomology Crops Farm at Davis, California to evaluate the effects of a reduced rates of halosulfuron on prunes (Table 5). Halsulfuron rates represented a full label rate and several lower rates, down to 1/100th of the full rate. Individual plots were a single-tree, for three replications and individual limbs for a fourth replicate. Prune trees in the first three replications were 4-years old, while the trees in replicate four were 15 years old. The experimental design was a randomized complete block. Prune trees were treated on May 17 (~60F, no wind during the time herbicides were being applied; http://www.ipm.ucdavis.edu/), and at flowering on June 21, 2001 (~70F, 0 to 2 mph wind during the time herbicides were being applied). On May 17, 2001, prune tree leaves were still expanding and small fruit was visible, but less than 1 inch in diameter. On June 21, leaves were fully expanded and fruit was all greater than 1 inch in size. A nonionic surfactant (LI-700) was added to all treatments at 0.25% v/v. Treatments were applied directly to the prune trees, with a backpack sprayer using 800063 nozzles, with a final spray volume of 7 gal/a. Applications were made with a single nozzle, going from top to bottom on two sides of the tree for the young trees (reps 1-3), and with a one pass, on a single limb on the older trees, with the remainder of the tree untreated.

On May 26, June 4, 12, 29, July 10, and 27, 2001, prune trees and fruit were visually evaluated for injury. On August 23, 2001, all prune fruit from each tree was hand-harvested, separated and weighed.

At the time of herbicide application and at peak injury, tissue samples were taken for analysis of halosulfuron. Samples consisted of at least 10 leaves taken randomly from all reps of each treatment. Samples were immediately frozen, and sent in a frozen state (dry ice) to A.P.T. Labs, Inc. (Analytical Pesticide Technology Laboratories, Inc.) in Wyomissing, PA for analysis.

Results: A moderate amount of leaf yellowing was evident on prunes at all treatment rates at the first application time (Table 5). These leaf symptoms gradually disappeared at the $1/10^{th}$ and $1/100^{th}$ use rates of halosulfuron. When a full rate of halosulfuron was used a few branches lost their leaves and the tips appeared to die. Applications made later in the season appeared to be less injurious to the prunes. Another injury symptoms which appeared on the older trees was fruit abortion and drop prior to harvest. Since only a single limb was treated on the older trees, it was easy to see that fruit drop was associated with the treated limb and not the entire tree.

Prune yields were highly variable, particularly on the young prune trees (Table 6).

The halosulfuron applications at full rate and half rate at the early treatment timing appeared to lower fruit yields. Halosulfuron treatments made at the later timing also appeared to reduce yields, although this is probably an artifact of using young trees or a single limb, as we could find no evidence of fruit abortion or a decrease in fruit size on plots where halosulfuron was applied at $1/10^{th}$ or $1/100^{th}$ rates. Halosulfuron concentrations on prune leaves declined, but were still evident 26 days after the first treatment (Table 7). At 22 days after the second treatment timing, the two higher rate treatments still had detectable levels, but prune leaves from the lower rate plots had declined to non-detectable levels by 22 days after treatment.

Conclusions:Prunes are sensitive to halosulfuron at the two application timings made in this study. Young prune trees suffered some leaf discoloration, leading to loss of some leaves, and tip's of a few branches died. Older trees did not appear to be affected by the early treatments, but did have more fruit abscission when halosulfuron was applied closer to harvest.

Table 5. Prune injury (% -visual rating) following low-rate application of herbicides to simulate the effects of herbicide drift.

Treatment	Rate	Timing	Prune Injury (%)					
	(lbs. ai/a)		5/26	6/4	6/12	6/29	7/10	7/27
Halosulfuron	0.047	Small fruit	16.2	15.0	12.5	12.5	11.2	8.8
Halosulfuron	0.024	Small fruit	12.5	11.2	11.2	11.2	8.8	5.5
Halosulfuron	0.0047	Small fruit	17.5	11.2	7.5	9.2	5.0	1.0
Halosulfuron	0.00047	Small fruit	13.8	10.0	5.0	7.5	2.5	2.8
Untreated		Small fruit	0	0	0	0	0	0
Halosulfuron	0.047	Large fruit				2.8	6.2	3.2
Halosulfuron	0.024	Large fruit				0.5	3.8	4.0
Halosulfuron	0.0047	Large fruit				2.0	3.0	0.8
Halosulfuron	0.00047	Large fruit				0	0.5	0.0
Untreated		Large fruit				0	0	0
LSD .05			13.7	12.3	8.5	11.9	6.5	4.7

Table 6. Prune yield (grams fresh wt./ single limb) on Aug. 23, 2001, following low-rate application of herbicides to simulate the effects of herbicide drift.

Treatment	Rate	Timing	Prune Yield
	(lbs. ai/a)		grams fresh wt./ single limb

Halosulfuron	0.047	Small fruit	394.9
Halosulfuron	0.024	Small fruit	263.0
Halosulfuron	0.0047	Small fruit	2444.4
Halosulfuron	0.00047	Small fruit	2132.6
Untreated		Small fruit	2649.7
Halosulfuron	0.047	Large fruit	933.3
Halosulfuron	0.024	Large fruit	1473.0
Halosulfuron	0.0047	Large fruit	1715.8
Halosulfuron	0.00047	Large fruit	1632.2
Untreated		Large fruit	3015.0
LSD .05			1144.8

Table 7. Prune tissue concentrations of halosulfuron following low-rate application of herbicides to simulate the effects of herbicide drift.

Treatment	Rate	Timing	Halosulfuron Conc. (ppm)	
	(lbs. ai/a)		5/17/01	6/12/01
Halosulfuron	0.047	Small fruit	6.39	0.446
Halosulfuron	0.024	Small fruit	2.20	0.636
Halosulfuron	0.0047	Small fruit	0.261	0.0088
Halosulfuron	0.00047	Small fruit	0.902	0.090
Untreated		Small fruit		<0.0070
		Small fruit		
		Large fruit	6/21/01	7/13/01
Halosulfuron	0.047	Large fruit	2.01	0.580
Halosulfuron	0.024	Large fruit	0.88	0.544
Halosulfuron	0.0047	Large fruit	0.094	<0.0085
Halosulfuron	0.00047	Large fruit	0.031	<0.0085
Untreated		Large fruit	0.017	<0.0085