

## Simulated Drift of Transline (Clopyralid) on Tomatoes, Cotton, Safflower and Sunflower

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A field study was established in 1998 on the Vegetable Crops Farm at Davis California to evaluate the effects of simulated drift of clopyralid on processing tomatoes, cotton, sunflower, and safflower. Clopyralid was applied at 1X, 0.1X, 0.01X, and 0.001X the maximum use rate in California (0.25 lb/a). Crops were treated at the two leaf stage or at flowering. Clopyralid applications were made on June 3 and July 2, to tomato, safflower and sunflower, which were at the second true leaf stage and flowering, respectively (Table 1). Cotton treatments were made on July 2 and July 30, to the second true leaf stage and to the flowering stage, respectively.

At four weeks after the seedling treatment, tomatoes were stunted by the full label rate (0.25 lb/a) treatment. Tomatoes treated with 0.025 lb/a of clopyralid were stunted, but yield was not significantly affected by the 0.025 lb/a or lower rates (Table 2). Treatment timing did not statistically influence yield. However, the type of injury was different depending on the treatment timing. When 0.25 lb/a was applied to 2-leaf tomatoes, they were severely stunted with a low fruit yield, due to small plant size. When the same treatment was applied to flowering tomatoes, some flower abortion occurred. These plants recovered and flowering and fruit set occurred, but these plants were set back, resulting in lower red fruit yields and a much higher green fruit yield (Table 2).

Safflower yields were reduced by 95%, 87%, and 55% by clopyralid treatment at 0.25, 0.025 and 0.0025 lb/a rates, respectively (Table 3). Application timing did not influence safflower yield. The 0.25 lb/a clopyralid treatment killed most of the safflower, with the 0.025 lb/a rate also causing death or severe stunting. The 0.00025 lb/a clopyralid rate caused etiolation of safflower when applied to seedlings, but yields were not different from the untreated control.

Sunflower plants were completely killed by 0.25 lb/a rate of clopyralid when applied to seedlings and only a few plants survived this rate when applied at flowering (Table 4). The 0.025 lb/a rate of clopyralid also killed many sunflower plants when applied to seedlings, but was less injurious when applied at flowering. The number of sunflower seed heads at harvest was reduced more by seedling clopyralid treatments than when clopyralid was applied to flowering plants. Sunflower seed yield was reduced by 97% when clopyralid was applied at the 0.025 lb/a rate to seedlings, but only by 40% when this rate was applied to flowering plants.

The number of cotton plants was reduced by 13% by the 0.25 lb/a rate of clopyralid (Table 5). Other clopyralid rates did not affect plant population. The biggest loss in cotton plants came when clopyralid was applied to seedling cotton plants. The number of cotton bolls formed was reduced when either the 0.25 or 0.025 lb/a rate of clopyralid was applied, regardless of the time of application. Clopyralid did not influence maturity of cotton as the effect of reduced number of bolls was observed for both those that were fully open and those not quite fully open (closed) (Table 5). The reduction in number of cotton bolls formed resulted in yield reductions of over 90% when cotton was treated at the 0.25 lb/a rate of clopyralid and by over

60% when treated at 0.025 lb/a. There was a slight trend toward lower yields when cotton was treated at the flowering stage, even at the 0.0025 lb/a clopyralid rate.

Although full labeled rates of clopyralid were injurious to crops, in this study, it is unlikely that this rate would drift onto these crops. More likely drift rates would be between 0.025 lb/a and 0.0025 lb/a. At potential drift rates of clopyralid, safflower and sunflower would likely show some injury. Tomatoes could be injured by clopyralid at 0.025 lb/a, if the applications were made close to flowering. In most areas of California, tomato flowering would commonly occur after mid-May and thus drift problems could be avoided by treating before this time. The late planting of cotton in California makes drift from clopyralid onto cotton at the flowering stage unlikely, as most clopyralid applications would target yellow starthistle and thus be applied much earlier in the year.

**Table 1. Treatment information for the Transline (clopyralid) simulated drift study.**

Location: Vegetable Crops Farm, UC Davis  
 Plot size - 22 X 10ft (Tomatoes - 2 beds); 22 X 5ft. (Safflower, Sunflower, and Cotton - 2 beds)  
 4 Replications  
 1st Treatment Date: June 3, 1998 (1<sup>st</sup> Cotton treatment July 2, 1998)  
 Weather: 70°F – no wind  
 Treatment timing: 1<sup>st</sup> application - Second set of true leaves; 2<sup>nd</sup> application - Flowering  
 Spray Volume: 33 gal/a + 0.25% nonionic surfactant - CO<sub>2</sub> backpack sprayer  
 2nd Treatment Date: July 2, 1998 (2<sup>nd</sup> cotton treatment – July 30, 1998)  
 Weather: 86°F, wind 1 to 2 mph  
 Spray Volume: 20 gal/a + 0.25% nonionic surfactant - CO<sub>2</sub> backpack sprayer

**Table 2. Tomato yield (tons/a) in response to Clopyralid treatment**

Treatment	-----Yield-----		
	Reds	Greens	Rots
<u>2 true leaf</u>			
Clopyralid 0.25 lb/a	14.2	1.95	0.69
Clopyralid 0.025 lb/a	35.0	0.40	4.01
Clopyralid 0.0025 lb/a	37.5	1.02	6.15
Clopyralid 0.00025 lb/a	36.7	0.82	4.87
Untreated	28.8	0.71	4.76
Flowering			
Clopyralid 0.25 lb/a	5.8	10.53	1.46
Clopyralid 0.025 lb/a	22.2	2.67	4.05
Clopyralid 0.0025 lb/a	25.1	0.98	3.88
Clopyralid 0.00025 lb/a	26.8	0.71	4.09
Untreated	32.0	0.91	4.96
<b>Significance</b>			
Timing	NS	*	NS
Rate	***	***	***
Timing X Rate	NS	***	NS

**Table 3. Safflower yield (tons/a) in response to Clopyralid treatment**

Treatment	Yield (tons/a)
<u>2 true leaf</u>	
Clopyralid 0.25 lb/a	0.00
Clopyralid 0.025 lb/a	0.05
Clopyralid 0.0025 lb/a	0.46
Clopyralid 0.00025 lb/a	1.14
Untreated	1.06
<u>Flowering</u>	
Clopyralid 0.25 lb/a	0.11
Clopyralid 0.025 lb/a	0.23
Clopyralid 0.0025 lb/a	0.51
Clopyralid 0.00025 lb/a	0.89
Untreated	1.06
<b>Significance</b>	
Timing	NS
Rate	***
Timing X Rate	NS

**Table 4. Sunflower harvest data in response to Clopyralid treatment**

Treatment	Flower heads (#/30 ft.)	Seed Yield (tons/a)	Seed wt/head (g/head)
<u>2 true leaf</u>			
Clopyralid 0.25 lb/a	0.0	0.00	0.0
Clopyralid 0.025 lb/a	8.0	0.07	7.2
Clopyralid 0.0025 lb/a	27.5	1.83	104.8
Clopyralid 0.00025 lb/a	33.5	2.14	103.3
Untreated	40.2	2.65	102.7
<u>Flowering</u>			
Clopyralid 0.25 lb/a	1.0	0.01	2.2
Clopyralid 0.025 lb/a	28.5	1.32	70.6
Clopyralid 0.0025 lb/a	35.8	2.12	91.4
Clopyralid 0.00025 lb/a	28.2	2.17	120.1
Untreated	35.2	2.19	97.6
<b>Significance</b>			
Timing	NS	NS	NS
Rate	***	***	***
Timing X Rate	***	*	***

**Table 5. Cotton harvest data in response to Clopyralid treatment**

Treatment	Plants	Number of Bolls		
		Open ----- (#/30ft.)	Closed	Total
<u>2 true leaf</u>				
Clopyralid 0.25 lb/a	73.8	5.8	17.2	23.0
Clopyralid 0.025 lb/a	88.2	99.0	102.0	201.0
Clopyralid 0.0025 lb/a	93.5	227.5	131.0	358.5
Clopyralid 0.00025 lb/a	93.0	230.5	110.2	340.8
Untreated	93.8	253.5	128.8	382.2
<u>Flowering</u>				
Clopyralid 0.25 lb/a	90.8	58.5	15.8	74.2
Clopyralid 0.025 lb/a	92.2	68.8	65.8	134.5
Clopyralid 0.0025 lb/a	96.8	196.8	104.8	301.5
Clopyralid 0.00025 lb/a	87.5	229.5	105.8	335.2
Untreated	94.2	281.8	97.0	378.8
<b>Significance</b>				
Timing	NS	NS	NS	NS
Rate	*	***	***	***
Timing X Rate	NS	NS	NS	NS

**Table 6. Cotton yield data in response to Clopyralid treatment**

Treatment	Yield (lbs/a)	Yield (% of untreated)
<u>2 true leaf</u>		
Clopyralid 0.25 lb/a	138.2	4.2
Clopyralid 0.025 lb/a	1263.2	44.0
Clopyralid 0.0025 lb/a	2794.8	94.0
Clopyralid 0.00025 lb/a	2606.6	91.0
Untreated	2926.1	100.0
<u>Flowering</u>		
Clopyralid 0.25 lb/a	435.6	15.0
Clopyralid 0.025 lb/a	943.8	31.8
Clopyralid 0.0025 lb/a	2199.5	71.5
Clopyralid 0.00025 lb/a	2482.9	83.5
Untreated	3049.2	100.0
<b>Significance</b>		
Timing	NS	NS
Rate	***	***
Timing X Rate	NS	NS