EVALUATION OF ACROLEIN FOR WEED CONTROL IN TOMATO

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Summary. Acrolein was tested as a soil fumigant applied by drip injection at 100, 200, 400 and 800 lbs/A, and compared to methyl bromide/chloropicrin at 350 lb/A. Acrolein was safe to tomato transplanted as soon as 7 days after application. Acrolein did not control yellow nutsedge tubers, little mallow or burclover, but did control seed of common chickweed, common knotweed, and common purslane at 800 lbs/A.

Objective. The objective of this research was to evaluate the weed control efficacy of acrolein as well as crop safety in transplanted fresh market tomato.

Materials and methods. A field study was conducted on in the Spence USDA research farm near Salinas, CA during May to September, 2006 (in progress at submission time). Acrolein was applied at 100, 200, 400 and 800 lbs/A by drip injection on May 24, 2006. The commercial standard methyl bromide/chloropicrin (MBPic) 67:33 at 350 lb ai/A was applied by drip injection on May 23, 2006. An untreated control was also included. To estimate the safe plant back interval between application and planting, four tomato plants 'Shady Lady' were transplanted into the acrolein 800 lb/A and control plots at 7 and 14 days after application. Tomatoes were transplanted into the entire trial on June 13, 2006 at 20 days after application. Plants were watered by sprinkler irrigation for the first week after transplanting and then by drip irrigation for the remainder of the trial period. Evaluations were visual crop injury estimates, plant height, weed densities and weed seed viability assays. Tomato fruit harvest is planned for September 2006 at the time of this writing. All treatments were replicated 4 times and arranged in a randomized complete block design. Data were subjected to analysis of variance and mean separation was performed using LSD's at $P = 0.05$.

Results. The injury estimates and plant heights indicate that acrolein concentrations in the soil at 7, 14 and 20 DAA were below the level that would be injurious to tomato (Table 1). Resident weeds were primarily little mallow and California burclover, and acrolein at $\geq$200 lbs and MBPic provided suppression of those weeds (Table 2). None of the acrolein treatments controlled yellow nutsedge tubers at the level of MBPic. Acrolein at 800 lbs/A controlled common chickweed and common knotweed at a level that was approximately the same as MBPic (Tables 2 & 3). Acrolein at 800 lbs/A provided complete kill of common purslane at the 6 inch depth, but at the 2 inch depth 25 percent of the seed were still viable.

Discussion. The plant back analysis indicates that tomato can be transplanted within 7 days of an acrolein application up to 800 lbs/A. Acrolein did not control

yellow nutsedge at any rate, but effective control of the other weeds was achieved in the range of 400 to 800 lbs/A.

Table 1. Visual injury estimates and plant heights on 'Shady Lady' tomato that had been transplanted at 7, 14 and 20 days after application (DAA). Data were recorded on July 6, 2006.

Treatment	Rate	Visual injury estimates			Plant height		
	Lb/A	7 DAA	14 DAA	20 DAA	7 DAA	14 DAA	20 DAA
		0 = safe, 10 = dead			Height (inches)		
Acrolein	100	--	--	0	--	--	10.7
Acrolein	200	--	--	0	--	--	11.5
Acrolein	400	--	--	0	--	--	10.3
Acrolein	800	0	0	0.5	13.0	11.6 b	10.6
MBPic	350	--	--	0.3	--	--	11.4
Control	0	0	0	0	14.0	13.9 a	11.1
LSD 0.05		0	0	0.63	4.5	1.14	1.38

Table 2. Resident weed densities, yellow nutsedge tuber and common chickweed seed viability. The nutsedge tuber and weed seed samples were buried in the center of the beds at depths of 2 and 6 inches.

Treatment	Rate	Resident	Yellow nutsedge		Common chickweed	
	Lb/A	weeds	2-in	6-in	2-in	6-in
		1,000 / A	---------- viability (%) ----------			
Acrolein	100	14.4 ab	77.5 a	87.5 a	46.5 b	80.4 a
Acrolein	200	12.9 b	70.0 a	85.0 ab	37.8 bc	62.0 a
Acrolein	400	10.8 b	62.5 a	67.5 bc	24.1 bcd	49.0 a
Acrolein	800	8.5 b	45.0 ab	65.0 c	0.0 d	4.3 b
MBPic	350	13.1 b	10.0 b	0.0 d	6.0 cd	3.4 b
Control	0	21.2 a	80.0 a	82.5 abc	87.6 a	90.0 a
LSD 0.05		7.0	37.1	18.3	35.03	38.95

Table 3. Common knotweed and common purslane seed viability. The weed seed samples were buried in the center of the beds at depths of 2 and 6 inches.

Treatment	Rate	Common knotweed		Common purslane	
	Lb/A	2-in	6-in	2-in	6-in
		---------- viability (%) ----------			
Acrolein	100	88.0 a	96.0 a	85.5 a	81.6 a
Acrolein	200	84.0 a	96.0 a	58.0 ab	80.0 a
Acrolein	400	45.0 b	85.0 a	21.0 bc	82.6 a
Acrolein	800	1.0 c	10.0 b	25.0 bc	0.0 b
MBPic	350	0.0 c	2.0 b	0.0 c	1.0 b
Control	0	94.0 a	97.0 a	91.0 a	96.0 a
LSD 0.05		17.06	13.83	44.35	19.29