EVALUATION OF ACROLEIN FOR STRAWBERRY PRODUCTION

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Acrolein (acrylaldehyde 2propenal) is an effective aquatic herbicide that has been used to control weeds in irrigation channels for over 40 years. This study evaluated Acrolein as an alternative to methyl bromide for California strawberry production.

Methods

Experiments were conducted near Salinas and Watsonville, California to evaluate Acrolein for strawberry production. Acrolein was applied at 0, 100, 200 and 400 lb/ acre. The plant-back interval was determined by germinating lettuce seeds in soil collected 1, 7 and 14 days after the application. Soil was collected from a depth of 10" and kept on ice over night or frozen until ready for seed incubation. Lettuce seeds were placed on the treated soil and sealed in glass jars. Seed germination was checked daily and the vigor of the emerged seedling was evaluated (after 10-14 days of incubation.) Emerged seedling vigor was ranked from 1 to 10, with 1 indicating a dead plant and 10 a healthy seedling. The plant-back index was calculated as follows:
(% Seed germination * seedling vigor rank)/10.

Weed evaluation: Weed counts and fresh weed biomass were evaluated in Watsonville and Salinas, from 20 and 10 foot-long sections of the 24" bed-top. Weeds were counted by species and total weed fresh mass was recorded.

Yield evaluation: Strawberries (Albion) were transplanted on November 20, 2006, at the Watsonville site with 12" spacing, and on November 21, at the Salinas site with 10" spacing. The yield was evaluated once or twice a week as needed from 37 plants (19-foot section) in Watsonville and from 76 plants (30-foot section) in Salinas. Berries were harvested once or twice a week and reported as marketable and total yields.

Results

Plant-back studies indicated that under the highest Acrolein application rate of 400 lb/ac, a plant-back period ranges from 7- 14 days (Figure 1). Although Acrolein was found to be very effective in controlling emerged weeds, it did not control weed seeds in the soil seed bank (Tables 1 and 2). None of the Acrolein treatments provided comparable weed control to MbPic. In Watsonville, application of Acrolein at 400 lb/ac provided 75% in-season weed control while the application of MbPic controlled about 90% of the weeds.

Strawberry marketable and total yields in Watsonville were similar during the first 4 weeks of harvest and did not differ from the untreated control plots. However, as the season progressed, marketable and total strawberry yields were significantly higher in the

fumigated plots compared to the untreated control. Marketable berry yields in plots treated with Acrolien at 400 lb/ac were comparable to yields in plots treated with MbPic. Total berry yields increased with increasing rates of Acrolein and berry yields in plots treated with Acrolein at rates of 200 lb/ac or higher were not statistically different than MbPic (Table 3). Strawberry marketable and total yields were similar for all fumigation treatments in Salinas, indicating low disease pressure (Table 4).

Figure 1: Plant-back index for Watsonville and Salinas.

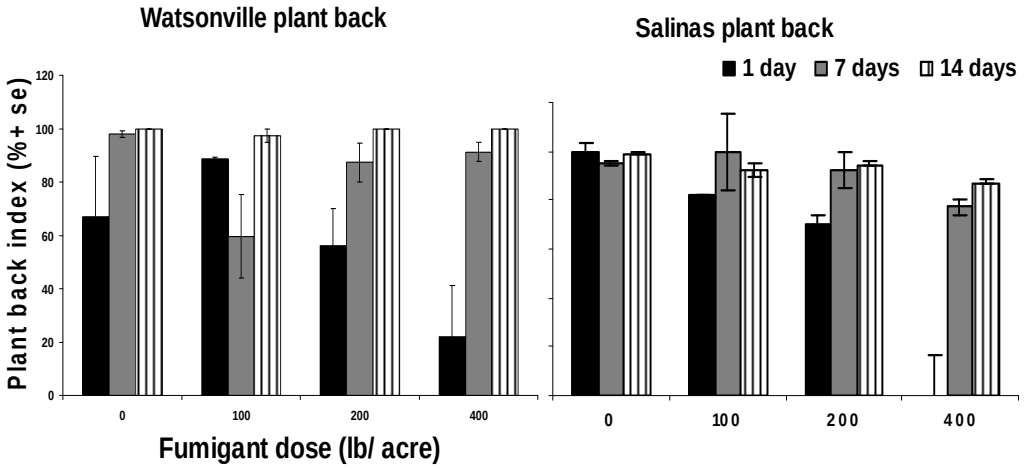

Table 1: Cumulative weed densities and fresh weed mass in Salinas

Fumigant treatment	Rate	Annual bluegrass	Prostrate knotweed	Common chickweed	Total weed
	lb/acre	Density (thousands weeds/ acre)			
Untreated Control	----	57.8	40.1 a	26.7 a	230.3 a
Acrolein	100	16.1	25.8 ab	8.7 a	87.6 ab
Acrolein	200	18.3	26.9 ab	8.7 a	93.4 ab
Acrolein	400	3.5	19.2 ab	4.1 a	57.6 b
MbPic (50:50)	350	4.1	5.8 b	1.6 b	19.5 c
ANOVA					
P value		ns	0.05	0.03	0.009

Table 2: Accumulated weed densities of annual bluegrass, prostrate knotweed, common chickweed and the total weed density through 3/2/2007 in Salinas.

Fumigant treatment[a]	Clover species	Oat	Total weed	Fresh weed mass
	Density (thousands weeds/ acre)			lb/ acre
Untreated Control	13.79 a	2.18 a	25.65 a	1287 a
Acrolein 100 lb/ac	11.62 a	2.42 a	17.42 a	722 a
Acrolein 200 lb/ac	14.52 a	1.21 a	23.23 a	786 a
Acrolein 400 lb/ac	15.97 a	0 b	20.33 a	1049 a
MbPic (50:50) 350 lb/ac	2.26 b	0 b	9.68 b	77 b
ANOVA				
P value	0.044	<0.0001	0.03	<0.0001

[a] Treatments followed by the same letter indicate no significant differences at P<0.05 level.

Table 3: Total and marketable strawberry yields in Watsonville (through July 23).

Fumigant	Rate lb/acre	4 weeks		Yield to date	
		Marketable	Total	Marketable	Total
		lb/ acre			
Untreated Control	----	774	928	9786 c	12943 d
Acrolein	100	795	1018	15077 b	18955 c
Acrolein	200	935	1165	15480 b	19853 bc
Acrolein	400	1249	1501	17839 ab	22372 ab
MbPic (50:50)	350	790	967	20258 a	24416 ab
ANOVA					
P value		ns	ns	0.003	<0.0001

Table 4: Total and marketable strawberry yields in Salinas (through July 31).

Fumigant	Rate lb/acre	4 weeks		Yield to date	
		Marketable	Total	Marketable	Total
		lb/ acre			
Untreated Control	----	1401	1883	21912	30660
Acrolein	100	1503	1953	28198	36491
Acrolein	200	1904	2408	24863	33282
Acrolein	400	1875	2506	23912	32907
MbPic (50:50)	350	1767	2769	21282	29424
ANOVA					
P value		ns	ns	ns	ns