WEED RESPONSE TO CHLOROPICRIN AND INLINE™ DOSE UNDER VIF AND STANDARD FILM

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The use of virtually impermeable films (VIF) has been evaluated in California for several years. However, to the best of our knowledge, no systematic evaluation had previously been conducted in California to examine the weed and pest control benefits, fumigant emissions and production economics of VIF use in strawberry. We evaluated VIF at two commercial California strawberry field sites during the 2002-03 and 2003-04 productions seasons. This presentation will summarize the weed control results from this project. The objective was to evaluate the weed control efficacy of chloropicrin (Pic) and InLine (1,3-D + Pic) under VIF and standard film.

Methods. Chloropicrin (Pic) and InLine were applied at 50, 100, 200, 300 and 400 lbs per acre in water through the drip irrigation system Sept. 2002 and Aug. 2003 at Oxnard, CA, and Oct. 2002 and Sept. 2003 at Watsonville, CA. The commercial standard, methyl bromide/chloropicrin (MbPic) was applied at 350 lb/A. Two types of tarp were used: standard polyethylene and VIF. Each treatment was replicated 4 times. Weed seed bags containing chickweed (*Stellaria media*) and knotweed (*Polygonum arenastrum*) seeds plus other species, were buried at 2″ and 6″ depths at the center and side of the beds before fumigation and retrieved 2 to 3 weeks later. Strawberries were transplanted during Oct. 2002 and 2003 at both locations. Weed densities, weed biomass and weeding times were measured 4 to 6 times in all trials, on an as-needed basis that was defined by the grower. Data were subjected to ANOVA, and linear contrasts were used to compare weed biomass and weeding times with VIF and standard tarp. Regression analysis was used to: a) calculate the dose required to kill 50% of a weed seed sample (GR_{50}), and b) Inline or Pic dose hand weeding times equivalent to 350 lbs MbPic.

Results. Generally, weed biomass and hand weeding times were less with InLine than Pic. Weed control improved with higher concentrations of InLine and Pic (Tables 1 and 2). The Oxnard weed biomasses and hand weeding times were 32 to 41% less where Pic at 50 and 300 lb/A and Inline at 400 lb/A were applied under VIF than under standard tarp (Table 1). Weed biomasses at Watsonville were 52 to 70% less where Inline at 50 and 200 lb/A or Pic at 50 lb/A was applied under VIF compared to standard tarp. At Watsonville VIF tarp reduced weeding times in all Inline treatments by 40 to 52% and Pic treatments by 32 to 42% compared to the standard tarp (Table 2). Based on regression analysis, Inline at 257 and 350 lb/A applied under VIF at Oxnard and Watsonville, respectively, had

hand weeding times equivalent to MbPic at 350 lb/A applied under VIF, while the Inline rate under standard film equivalent to MbPic was 761 to 770 lb/A. At Oxnard, 360 lb/A Pic applied under VIF had weeding times similar to MbPic, while 556 lb/A Pic was necessary to realize weeding times equivalent to MbPic at Watsonville. More than 1000 lbs/A of Pic would be necessary to provide weed control equivalent to MBPic under standard tarp at both Oxnard and Watsonville. The InLine GR_{50} doses for chickweed seeds at 2″ deep in the center of the bed were 43 lb/A under VIF and 138 lb/A under standard tarp (Table 3). The GR_{50} for Pic on chickweed seed was 118 lb/A under VIF and 217 lb/A under standard tarp. The InLine doses required to kill half the knotweed seeds in 6″ depth at the side of the bed were 134 lb/A under VIF and 421 lb/A under standard tarp (Table 4). The GR_{50} for Pic on knotweed seed was 260 lb/A under VIF and 439 lb/A under standard tarp.

Results from these studies suggest considerable improvements in weed control for the use of drip-applied Inline in conjunction with VIF. Inline at rates of 257 to 350 lb/A applied under VIF had hand weeding times the same as MbPic at 350 lb/A. Results for Pic do not consistently indicate an improvement in weed control associated with VIF. Final conclusions must consider the cost of VIF in relation to the benefits achieved.

Table 1: Response of resident weed biomass and hand weeding time to Pic and InLine fumigant applied under VIF and standard films at Oxnard, CA 2003-04.

Fumigants	Dose	Weed Biomass			Hand Weeding Time		
	(lb/A)	VIF	Standard	VIF vs. std	VIF	Standard	VIF vs. std
		-------lb/A----------		P-values	--------hrs/A-------		P-values
Untreated	0	1172	2990	0.96	71.8	128.9	0.72
Chloropicrin	50	1154	2097	<0.01	64.0	94.5	<0.01
	100	873	1830	0.84	62.2	99.2	0.81
	200	928	1731	0.57	57.9	100.0	0.24
	300	912	1424	<0.01	53.1	87.3	<0.01
	400	828	1445	0.33	52.4	86.5	0.60
InLine	50	1001	2149	0.42	59.3	110.2	0.31
	100	806	1869	0.40	55.2	95.1	0.17
	200	1019	1801	0.77	58.5	92.0	0.95
	300	670	1692	0.95	51.5	92.8	0.95
	400	716	1465	<0.01	45.8	77.1	0.02
MbPic	350	796	1094	0.36	52.8	71.2	0.38
$LSD_{0.05}$		703			26.3		

Table 2: Effect of Pic and InLine fumigants applied under two tarps on the resident weed biomass and weeding time at Watsonville, CA 2003-04.

Fumigants	Dose	Weed Biomass			Hand Weeding Time		
	(lb/A)	VIF	Standard	VIF vs. std	VIF	Standard	VIF vs. std
		-------lb/A---------		P-values	--------hr/A-------		P-values
Untreated	0	1166	2464	<0.01	135.4	215.1	<0.01
Chloropicrin	50	583	1213	<0.01	111.3	168.0	<0.01
	100	496	840	0.15	105.6	154.6	<0.01
	200	325	652	0.17	85.1	126.9	<0.01
	300	252	493	0.30	71.8	124.3	<0.01
	400	142	451	0.19	63.4	96.9	0.01
InLine	50	489	1627	<0.01	111.5	199.1	<0.01
	100	243	680	0.07	82.1	146.9	<0.01
	200	159	637	0.04	65.5	128.1	<0.01
	300	79	447	0.12	62.1	130.7	<0.01
	400	109	477	0.12	52.5	87.4	<0.01
MbPic	350	173	190	0.94	54.2	66.2	0.36
$LSD_{0.05}$		197.8	638.0		21.6	30.1	

Table 3: Chloropicrin and InLine dose (lb/A) required to kill 50% of a chickweed seed sample (GR_{50}) buried at 2" depth in the center of the bed at Oxnard 2003-04.

	Fumigants	Film	Lower limit	GR_{50}	Upper limit
Chickweed seed viability (%)	InLine	Standard	121	138	156
		VIF	37	43	48
	Chloropicrin	Standard	196	217	239
		VIF	106	118	130

Table 4: Chloropicrin and InLine dose (lb/A) response to the growth reduction (GR_{50}) of knotweed seed buried in 6" depth of the side of the bed at Watsonville 2003-04.

	Fumigants	Tarp	Lower limit	GR_{50}	Upper limit
Knotweed seed viability (%)	InLine	Standard	389	421	469
		VIF	115	134	155
	Chloropicrin	Standard	388	439	527
		VIF	236	260	285