CHLOROPICRIN AND INLINE DOSE-RESPONSE UNDER VIF AND HDPE FILM: WEED CONTROL RESULTS

S. Fennimore*[1], Z. Kabir[1], H. Ajwa[1], O. Daugovish[2], K. Roth[1] and J. Valdez[1],
[1]University of California, Davis, Salinas, CA 93905
[2]University of California, Ventura, CA 93003

Virtually impermeable films (VIF) have been tested for several years. These films may reduce fumigant emissions and increase fumigant efficacy by retaining lethal fumigant concentrations for longer times. However, we know of no field dose response studies to evaluate whether VIF improves fumigant efficacy on weeds. The objective of this work was to determine if VIF improves the weed control efficacy of chloropicrin (Pic) and Inline™ under VIF and standard film.

Methods

Pic and Inline were applied at 50 100, 200, 300 and 400 lbs per acre in water through the drip irrigation system September 16, 2002 near Oxnard, CA and October 1, 2002 near Watsonville. CA. Methyl bromide/chloropicrin (MBPic) was shank-applied at 350 lb/A. Two types of film were used: standard high-density polyethylene (HDPE) and VIF (Bromostop™). Each treatment was replicated four times and arranged in a randomized complete block design. Gas permeable bags containing yellow nutsedge tubers were buried 6-in deep in the center of the beds prior to fumigation and then retrieved prior to strawberry transplanting. Similarly, bags containing burclover, common chickweed, common purslane, little mallow and knotweed seed were buried at 2 and 6 inches deep in the center and at the edge of the bed prior to fumigation. After retrieval, the nutsedge samples were germinated in greenhouse pots to test viability, and weed seed viability was determined with tetrazolium. Strawberry 'Camarosa' was planted on October 7, at Oxnard and October 25 at Watsonville. Weed counts, weed fresh weights and weeding times were measured within 100 ft long subplots on Nov 26, 2002, Jan 15, Feb 25, Mar 26, and May 8, 2003 at Oxnard and within 90 ft long subplots at Watsonville Dec 5, 2002, Feb 24, Apr 3, and May 1, 2003.

Results and Discussion

Tarp type did not affect native weed biomass and weeding times at Oxnard (Table 1). However, at Watsonville VIF reduced native weed biomass and weeding times (Table 2). Impermeable films appear to improve weed control with Inline more than Pic. At Watsonville, weeding times with Inline at 200 lb/A were 40 hours per acre under VIF and 91 hours per acre under HDPE (Table 2). Generally, Pic and Inline killed more chickweed, knotweed and purslane seed

under VIF than under HDPE (Tables 3 and 4). Based on 50% growth reduction (GR_{50}) the Inline doses at Oxnard required to kill half the nutsedge samples were 101 lbs/A (80, 122, lower and upper 95% confidence intervals, respectively) under VIF and >400 lbs/A under HDPE. Nutsedge $GR_{50's}$ at Watsonville for Inline were 147 (137, 156) under VIF and 262 (236, 295) under HDPE. The $GR_{50's}$ for Pic at Oxnard on nutsedge were 185 lb/A (156, 216) under VIF and 362 lb/A (288, 515) under HDPE. Nutsedge GR50's for Pic at Watsonville were 128 lb/A (121, 136) under VIF and 218 lb/A (194, 247) under HDPE.

Conclusion. These results suggest that Inline and Pic generally provide better weed control under VIF than HDPE. VIF improves control of difficult-to-control weeds such as yellow nutsedge compared to HDPE.

Table 1: Efficacy of chloropicrin and Inline fumigants applied under VIF and HDPE films on the native weed biomass, and weeding times at Oxnard, CA. [1]

Fumigants	Dose (lb/A)	Biomass (Kg/A)		Weed Time (hrs/A)	
		VIF	HDPE	VIF	HDPE
		---------- Kg/A ----------		---------- hrs./A ----------	
Control	0	546.4 a	581.0 a	109.8 a	114.8 a
Chloropicrin	50	242.8 bcdef	332.8 bcde	84.4 bc	94.3 b
	100	281.9 bcdef	266.5 bcdef	73.7 cdefg	73.7 cdefg
	200	387.6 b	198.5 cdef	76.5 cde	63.6 efgh
	300	161.2 ef	158.4 ef	60.4 efgh	57.4 gh
	400	149.3 ef	210.4 bcdef	51.8 h	58.7 fgh
Inline	50	336.9 bcde	360.7 bcd	74.0 cdefg	81.9 bcd
	100	217.4 bcdef	281.0 bcdef	69.3 cdefgh	76.1 cdef
	200	122.2 f	237.1 bcdef	57.1 gh	65.2 defgh
	300	129.2 f	228.7 bcdef	55.4 h	66.8 defgh
	400	135.2 f	172.7 ef	54.9 h	57.6 gh
MBPic	350	372.1 bc	178.0 def	68.5 cdefgh	54.5 h

[1] Means within the biomass columns or within the weed time columns followed by the same letter do not differ at 0.05 according to the Duncan's multiple range test.

Table 2: Efficacy of chloropicrin and Inline fumigants applied under VIF and HDPE films on the native weed biomass, and weeding times at Watsonville, CA. [1]

Fumigants	Dose (lb/A)	Biomass (Kg/A)		Weed Time (hrs/A)	
		VIF	HDPE	VIF	HDPE
		Kg/A		hrs./A	
Control	0	2014.5 a	2098.2 a	245.0 a	257.9 a
Chloropicrin	50	1069.9 bc	1322.3 b	150.4 bcd	187.2 b
	100	601.8 def	1059.3 bc	132.2 cde	170.7 bc
	200	463.4 defg	678.1 cde	102.4 efgh	117.4 def
	300	352.0 efg	494.1 defg	62.4 hijk	84.5 fghij
	400	271.3 efg	413.4 efg	48.8 ijk	82.5 fghij
Inline	50	647.5 de	1334.0 b	112.5 defg	169.4 bc
	100	265.2 efg	873.3 cd	62.6 hijk	117.5 def
	200	185.5 fg	471.6 defg	40.2 jk	91.4 efghi
	300	110.2 g	393.2 efg	42.2 jk	70.7 ghijk
	400	112.1 g	317.9 efg	35.7 k	71.4 ghijk
MBPic	350	300.0 efg	340.3 efg	56.4 hijk	60.6 hijk

[1] Means within the biomass columns or within the weed time columns followed by the same letter do not differ at 0.05 according to the Duncan's multiple range test.

Table 3: Efficacy of chloropicrin and Inline fumigants applied under VIF and HDPE films on weed seed viability at Oxnard, CA

Fumigants	Dose (lb/A)	Chickweed		Knotweed		Purslane	
		VIF	HDPE	VIF	HDPE	VIF	HDPE
		Viability (%)					
Control	0	97 a	96 a	97 a	95 ab	100 a	99 a
Chloropicrin	50	88 ab	92 a	96 ab	97 ab	93 a	99 a
	100	78 abc	81 abc	95 ab	94 ab	79 ab	86 ab
	200	15 hij	48 defg	63 gf	80 bcde	15 ef	42 cd
	300	21 hij	35 gh	58 g	76 cdef	21 def	38 cd
	400	0 j	45 fg	33 h	79 bcdef	0 f	38 cd
Inline	50	68 bcd	97 a	89 abcd	97 a	91 a	99 a
	100	47 efg	83 abc	74 defg	97 a	66 b	98 a
	200	19 hij	66 cde	25 hi	90 abcd	31 cde	80 ab
	300	0 j	63 cdef	13 ij	92 abc	12 ef	80 ab
	400	0 j	32 ghi	3 j	69 efg	0 f	44 c
MBPic	350	0 j	13 ij	0 j	25 hi	0 f	29 cde

[1] Means within weed species columns followed by the same letter do not differ at 0.05 according to the Duncan's multiple range test.

Table 4: Efficacy of chloropicrin and Inline fumigants applied under VIF and HDPE films on weed seed viability at Watsonville, CA. [1]

Fumigants	Dose (lb/A)	Chickweed		Knotweed		Purslane	
		VIF	HDPE	VIF	HDPE	VIF	HDPE
		Viability (%)					
Control	0	76 a	83 a	50 ab	58 a	97 a	95 a
Chloropicrin	50	37 b	31 bc	39 c	47 bc	41 cd	40 cd
	100	22 bcd	27 bc	44 bc	46 bc	34 de	31 de
	200	6 e	11 de	16 def	27 d	0 f	12 f
	300	0 e	8 de	6 fg	21 d	1 f	9 f
	400	0 e	0 e	0 g	8 efg	0 f	0 f
Inline	50	9 e	35 b	19 d	47 bc	52 bc	66 b
	100	1 e	16 cde	5 fg	18 de	9 f	36 cd
	200	2 e	0 e	1 g	8 efg	5 f	13 f
	300	0 e	11 de	1 g	16 def	5 f	19 ef
	400	0 e	0 e	0 g	5 fg	1 f	10 f
MBPic	350	0 e	0 e	0 g	1 g	0 f	0 f

[1] Means within weed species columns followed by the same letter do not differ at 0.05 according to the Duncan's multiple range test.