

# WEED CONTROL IN STRAWBERRY WITH ALTERNATIVE FUMIGANTS

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## Introduction

Strawberry producers will require fumigant systems to manage weeds. For the past two seasons we have evaluated the weed control efficacy of currently registered alternative fumigants, chloropicrin (Pic) and Inline, as well as promising unregistered products, iodomethane (IM) and propargyl bromide. Fumigants have been applied using conventional shank injection or through the drip irrigation system. Previous results have shown that in general drip-application of these fumigants provided better weed control than shank application. Our objective has been to characterize the weed control efficacy and provide recommendations for the use of these alternative fumigants applied through a drip irrigation system in strawberry fruiting fields.

## Methods

Evaluation of emulsified fumigants was conducted in commercial strawberry fields near Oxnard and Watsonville, CA. At Oxnard, beds were 68 inches wide and at Watsonville 56 inches wide. Two drip irrigation lines were buried in each bed and fumigants were applied with water through the drip lines. Treatments included 1) Pic at 300 lb/A, 2) Inline at 400 lb/A, 3) a 50:50 mixture of IM and Pic (IM:Pic) at 400 lb/A and 4) propargyl bromide at 180 lb/A. The standard mixture of methyl bromide and chloropicrin in a 67:33 ratio (MB:Pic) was applied by shank injection at 375 lb/A in Oxnard and at 275 lb/A in Watsonville. Fumigants were evaluated by measuring their effects on the native weed population and buried samples of weed seed. Packets containing little mallow (*Malva parviflora*), redstem filaree (*Erodium cicutarium*), prostrate knotweed (*Polygonum aviculare*), common purslane (*Portulaca oleracea*), common chickweed (*Stellaria media*) and strawberry seed were buried in the plots before fumigation. Samples were buried in the bed centers and 4 inches from the edge of the bed at depths of 2 and 6 inches. After fumigation samples were retrieved and the percentage of viable seed determined. Each treatment was replicated four times and plots were three beds wide by 50 ft. long. At Oxnard, 'Camarosa' was planted Oct. 27, 2001, and weed counts were taken on Dec. 4, 2001, and Feb. 4, March 11, and May 20, 2002. The species and number of weeds was recorded for each plot. In Watsonville "Camarosa" was planted Oct. 25, 2001. Counts of

native weeds in Watsonville were taken on November 19, 2001, January 4, February 20, March 19, and April 19, 2002.

## **Results and discussion**

Seed viability. None of the fumigants provided acceptable control of redstem filaree or little mallow seed (data not shown). Seed viability results indicated that all of the fumigants reduced the efficacy of prostrate knotweed, common purslane, common chickweed and strawberry seed compared to the untreated (Tables 1 and 2). Inline, IM:Pic and propargyl bromide provided control that did not differ from MB:Pic. Pic at 300 lb/A was less active on weed seed than MB:Pic or the other treatments.

Results suggest that for chloropicrin there is a zone of effective weed control within 8 to 10 inches of the drip tape. Seed buried on the edge of the bed were more than 8 inches from the drip tapes and tended to have a higher percentage of viable seed compared to seed buried in the bed center that were less than 8 inches from either drip tape. In Oxnard, control of strawberry seed with Pic in the center of the bed was 39% and at the edge of the bed was 13% ( $P = 0.03$ ). If the drip tape is closer to the edge of the bed, as it was in Oxnard, then weed control in the bed center will be more difficult to achieve. Similarly, if the drip tapes are closer to the center of the bed than to the edge of the bed, as was the case in Watsonville, then weed control will be more difficult to achieve at the edge of the bed.

Control of native weeds. The most common native weeds at Oxnard were annual bluegrass (*Poa annua*) and little mallow (Table 4). At Watsonville the most common weeds were annual bluegrass, common groundsel (*Senecio vulgaris*), little mallow and volunteer strawberry (Table 5). At both sites all fumigants provided effective control of annual bluegrass with the exception of Pic, which provided poor control of this weed. Inline, IM:Pic (Oxnard only) and propargyl bromide provided better control of little mallow than MB:Pic. All fumigants provided effective control of common groundsel and volunteer strawberry that did not differ from methyl bromide.

Recommendations. Results of this and other studies have shown that Pic provides marginal weed control. For more consistent weed control we recommend that drip-applied Pic be followed with a sequential application of metam sodium 5 to 7 days after the Pic application. Inline, IM:Pic and propargyl bromide consistently provide effective control of most weed species with the exception of little mallow and redstem filaree

**Table 1.** Viability of weed and strawberry seed exposed to five soil fumigants at Oxnard CA.

Fumigant	Rate lb/A	Knotweed	Purslane	Chickweed	Strawberry
----- % viable seed -----					
MB:Pic	375	0 c	12 c	0 c	0 c
Chloropicrin	300	75 b	42 b	23 b	26 b
Inline	400	1 c	4 c	0 c	1 c
IM:Pic	400	5 c	3 c	0 c	1 c
Propargyl Br.	180	0 c	1 c	6 c	0 c
Untreated	--	90 a	98 a	84 a	78 a

**Table 2.** Viability of weed and strawberry seed exposed to five soil fumigants at Watsonville, CA.

Fumigant	Rate lb/A	Knotweed	Purslane	Chickweed	Strawberry
----- % viable seed -----					
MB:Pic	275	0 d	0 c	0 c	0 c
Chloropicrin	300	44 b	21 b	19 b	25 b
Inline	400	0 d	6 c	0 c	0 c
IM:Pic	400	13 c	0 c	0 c	3 c
Propargyl Br.	180	6 cd	0 c	0 c	1 c
Untreated	--	100 a	100 a	95 a	89 a

**Table 3.** Viability of seed buried in the bed center compared to seed buried on the side of the bed at Watsonville, CA.

Fumigant	Rate lb/A	Species	Center	Side	P value
---- % viable seed ----					
Pic	300	Knotweed	22	66	0.03
Pic	300	Chickweed	0	39	0.02
Pic	300	Strawberry	3	46	0.01
MB:Pic	275	Knotweed	0	0	1.0
Untreated	--	Knotweed	100	100	1.0

**Table 4.** Efficacy of five soil fumigants on native weeds at Oxnard CA.

Fumigant	Rate lb/A	Annual bluegrass	Little mallow
----- No. /200 ft <sup>2</sup> -----			
MB:Pic	375	46 b	192 a
Chloropicrin	300	2103 a	103 bc
Inline	400	59 b	52 c
IM:Pic	400	219 b	71 c
Propargyl Br.	180	32 b	64 c
Untreated	--	2604 a	140 ab

**Table 5.** Efficacy of five soil fumigants on native weeds at Watsonville, CA.

Fumigant	Rate lb/A	Bluegrass	Groundsel	Little mallow	Strawberry
		----- No. /125 ft <sup>2</sup> -----			
MB:Pic	275	5 bc	0 b	4 ab	0 b
Chloropicrin	300	23 b	1 b	3 bc	8 b
Inline	400	0 c	0 b	2 c	0 b
IM:Pic	400	0 c	0 b	3 bc	0 b
Propargyl Br.	180	0 c	0 b	1 c	0 b
Untreated	--	42 a	8 a	6 a	107 a