REDUCED RATES OF IODOMETHANE IN COMBINATION WITH TOTALLY IMPERMEABLE FILM MULCH

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Iodomethane plus chloropicrin (IM) has been implemented in many plasticulture production systems as a methyl bromide replacement. The efficacy of this chemistry has been demonstrated on many soilborne pests. However, iodide is an expensive material and IM has been cost prohibitive in some situations. The use of IM in combination with highly retentive mulch may provide pest control efficacy at lower use rates that may be more economical. Totally Impermeable Film (TIF) is a new mulch technology that utilizes a high barrier ethylene vinyl alcohol (EVAL) copolymer which is less permeable than nylon barrier layers common in Virtually Impermeable Film (VIF) mulches. Vaporsafe® TIF mulch has been shown to increase retention of dimethyl disulfide and IM when compared with VIF mulch. Soilborne pest control equivalent to standard application rates under VIF has been demonstrated with reduced rates of these compounds under TIF (Freeman and McAvoy, 2010; McAvoy and Freeman, 2010). If results remain consistent and fumigant rates can be lowered, it will likely have multiple benefits such as reduced buffer zones as well as decreasing input costs incurred by growers. A potential drawback of TIF is that the plant back period may be increased. A research program has been developed to evaluate reduced use rates of IM under Vaporsafe ® TIF mulch.

Materials and Methods

IM fumigant trials were conducted at the Virginia Tech Eastern Shore Agricultural Research and Extension Center in Painter, VA during the fall of 2010 and the spring of 2011. A 50:50 formulation of IM:chloropicrin fumigant was shank applied using a single row bed press 30 inches wide with three shanks. The treatments consisted of an untreated control under TIF, a standard rate (10 GPA) under Blockade® VIF and Vaporsafe ® TIF, and reduced rates (4, 6, and 8 GPA) under TIF.

Data Collection

Fumigant persistence, soil temperature, weed control, disease incidence, and tomato yield data were collected. Fumigant persistence data was measured using a MiniRAE3000 volatile organic compound (VOC) meter. Soil temperature under the plastic was recorded using a HOBO data logger. Weed emergence and disease incidence (dead/wilted plants) data were taken from each plot at the end of the growing season. Tomatoes were harvested and graded at maturity.

Results and Discussion

The retention of IM under TIF showed a classical rate response during both seasons (Figs. 1 & 2). The standard application rate (10 GPA) under TIF was retained at the highest level for the longest period of time, while the reduced application rates(8, 6, 4 GPA) showed a stepwise decrease in retention levels and periods. The standard rate under VIF was retained at levels similar to the 4 and 6 GPA rate under TIF during the fall of 2010. Fumigant was no longer detectable at 12 days after treatment. During the spring of 2011, the standard rate under VIF was generally maintained at levels similar to the 6, 8, and 10 GPA rates under TIF. Fumigant was no longer detectable at 19 days after treatment. VOC readings were very tightly clustered during the spring of 2011. These results suggest that it may be possible to reduce application rates by 40% under TIF, compared to VIF, while maintaining similar fumigant retention levels. The plant back period was longer in the spring compared to the fall due to lower soil temperatures. According to the label, the plant back period for IM is 14 to 21 days when using highly retentive films. It appears that standard rate under TIF may be too close to the labeled plant back period for crop safety under all environmental conditions.

During both seasons all IM fumigant treatments controlled yellow nutsedge better than the untreated control (Tables 1 & 2). There was minimal incidence of other weeds and soilborne diseases. During the fall of 2010, there were no significant differences between treatments in medium and large tomato fruit yield. All IM treatments produced significantly greater extra large and total marketable fruit yield compared to the untreated control (Table 1). During the spring of 2011, fumigant treatment did not significantly affect tomato yield in any size category (Table 2). Although there was significantly greater nutsedge incidence in the untreated control, the population was not high enough to reduce tomato fruit yield. Data generated in the fall of 2010 indicates that it may be possible to significantly reduce fumigant use rates while maintaining nutsedge control. Fumigant reduction capacity under TIF will remain unclear until more trial data is accumulated when pressure from other yield limiting factors such as fungal pathogens is high.

Literature Cited

Freeman, J and T. McAvoy. 2010. Retention and efficacy of dimethyl disulfide under virtually and totally impermeable film. Proc. 2010 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions. http://mbao.org/2010/Proceedings/006FreemanJDMDS.pdf

McAvoy, T and J. Freeman. 2010. Retention and efficacy of methyl iodide under virtually and totally impermeable film. Proc. 2010 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions. http://mbao.org/2010/Proceedings/009McAvoyTMidas.pdf

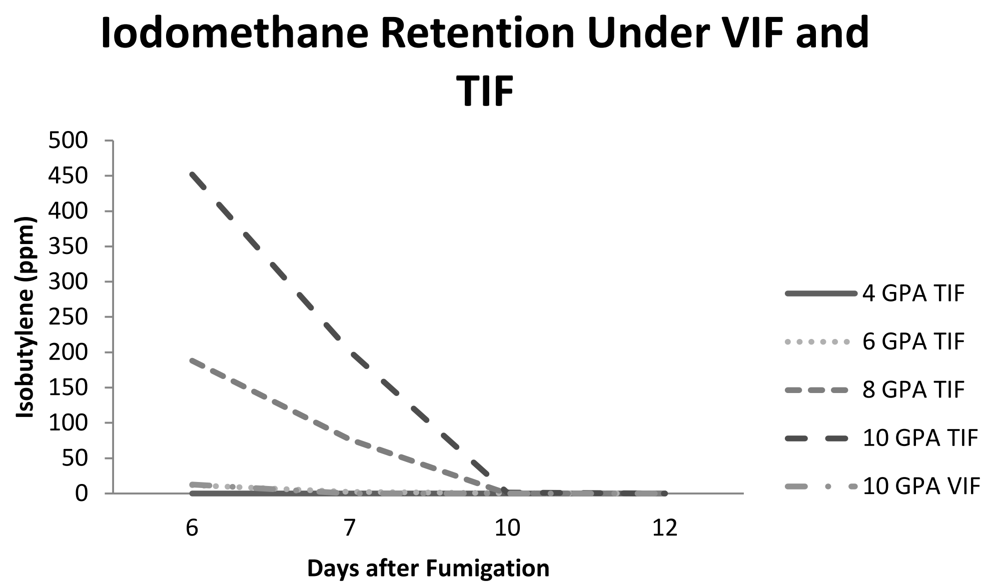

Fig 1. Iodomethane retention under VIF and TIF. Experiments were performed during the fall of 2010 at the Eastern Shore Agricultural Research and Extension Center in Painter, VA

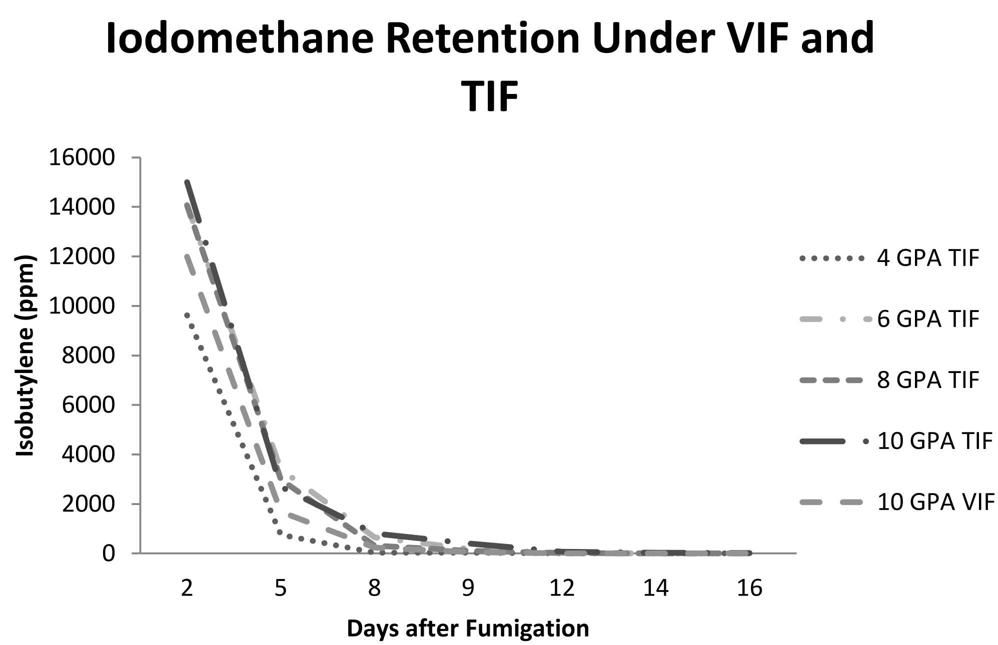

Fig 2. Iodomethane retention under VIF and TIF. Experiments were performed during the spring of 2011 at the Eastern Shore Agricultural Research and Extension Center in Painter, VA

Table 1. Tomato yield and nutsedge incidence data from Iodomethane (Midas®) fumigant trials conducted at the Eastern Shore Agricultural Research and Extension Center in Painter, VA during the fall of 2010.

Treatment	Emerged nutsedge/ft^2	Yield (lbs/A)			
		Medium	Large	Ex-Large	Total marketable
Untreated TIF	12.1 a	5644 ns	6286 ns	12052 b [z]	23982 b
4 GPA Midas 50:50 TIF	0.39 b	7641	9317	22942 a	39900 a
6 GPA Midas 50:50 TIF	0.09 b	6854	8809	20709 a	36373 a
8 GPA Midas 50:50 TIF	0.11 b	6667	9087	20413 a	36167 a
10 GPA Midas 50:50 TIF	0.02 b	7223	9638	20618 a	37480 a
10 GPA Midas 50:50 VIF	0.82 b	7574	11168	26088 a	44831 a

[z] Means not followed by the same letter are not significantly different at $P \leq 0.05$ by Duncan's multiple range test. ns = not significant.

Table 2. Tomato yield and nutsedge incidence data from Iodomethane (Midas®) fumigant trials conducted at the Eastern Shore Agricultural Research and Extension Center in Painter, VA during the spring of 2011.

Treatment	Emerged nutsedge/ft^2	Yield (lbs/A)			
		Medium	Large	Ex-Large	Total marketable
Untreated TIF	0.35 a [z]	5518 ns	16952 ns	33596 ns	56065 ns
4 GPA Midas 50:50 TIF	0.00 b	6032	15918	33425	55376
6 GPA Midas 50:50 TIF	0.00 b	6540	20945	33608	61096
8 GPA Midas 50:50 TIF	0.00 b	6837	20987	34515	62339
10 GPA Midas 50:50 TIF	0.01 b	5914	21223	31545	58683
10 GPA Midas 50:50 VIF	0.00 b	6588	19160	35296	61045

[z] Means not followed by the same letter are not significantly different at $P \leq 0.05$ by Duncan's multiple range test. ns = not significant.