# RETENTION AND EFFICACY OF METHYL IODIDE UNDER VIRTUALLY AND TOTALLY IMPERMEABLE FILMS

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Methyl iodide (MI) has been implemented in many production systems that utilize plasticulture and appears to be a successful methyl bromide alternative. A drawback to methyl iodide is the high cost. One method that could make the use of MI more cost effective and efficacious is the use of mulch film with greater fumigant retention to allow for lower fumigant use rates. Vaporsafe® Totally impermeable film (TIF) mulch has been shown to increase retention of dimethyl disulfide when compared with virtually impermeable film (VIF) mulch (Freeman et al., 2009). TIF utilizes a high barrier ethylene vinyl alcohol (EVAL) copolymer which is less permeable than nylon barrier layers common in VIF (Chow, 2009). It is unclear how MI will react with this film technology and if fumigant rates can in fact be lowered while maintaining efficacy. If 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. In fact, the US EPA has amended the re-registration eligibility decisions (REDs) to approve a 60% buffer zone reduction credit for MBr when applied under certain types of TIF (US EPA, 2009). A potential drawback of TIF is that the plant back period may be increased. A research program has been developed to look at multiple aspects of reduced use rates of MI under Vaporsafe ® TIF mulch.

## Materials and Methods

Methyl iodide fumigant trials were conducted at the Virginia Tech Eastern Shore Agricultural Research and Extension Center in Painter, VA during the spring and fall of 2010. A 50:50 formulation of MI: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 TIF, and reduced rates (4, 6, and 8 GPA) under TIF.

## Data Collection

Fumigant persistence, soil temperature, yellow nutsedge 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 taken using a HOBO data logger. Yellow nutsedge and disease incidence (dead/wilted plants) counts 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 methyl iodide under TIF showed a classical rate response (Fig. 1 and 2). The standard application rate (10 GPA) 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 similar levels as the 6 GPA rate under TIF. Therefore, 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 MI is 14 to 21 days when using highly retentive films. In our spring experiment the VOC readings for all fumigant treatments were within tolerable levels for planting at 14 days (below 135 ppm isobutylene) and at 21 days the fumigant was non-detectable. In the fall experiment all MI was non-detectable in all plots at 12 days after fumigation.

All MI fumigant treatments controlled yellow nutsedge, broadleaf weeds, grasses, and diseases better than the untreated control (Table 1). Although there was significant disease incidence, much of the disease did not result in plant mortality and plants subsequently produced fruit. There were no significant differences in medium fruit, extra large fruit, or total marketable yield between treatments (Table 2). The 10 GPA rate under TIF yielded more large sized fruits (13,177 lbs/A) than the 4 GPA rate (9,958 lbs/A). In addition, all the fumigant treatments except the 4 GPA rate under TIF, produced higher large fruit yields (11,120 to 13,177 lbs/A), than the untreated control (8,319 lbs/A). The fall efficacy and yield data will be presented in November. Data generated in the spring of 2010 indicates that it may be possible to significantly reduce fumigant use rates while maintaining efficacy, however, weed pressure was low in this trial. Fumigant reduction capacity under TIF will remain unclear until more trial data is accumulated when pressure from yield limiting factors is high.

**Literature Cited**

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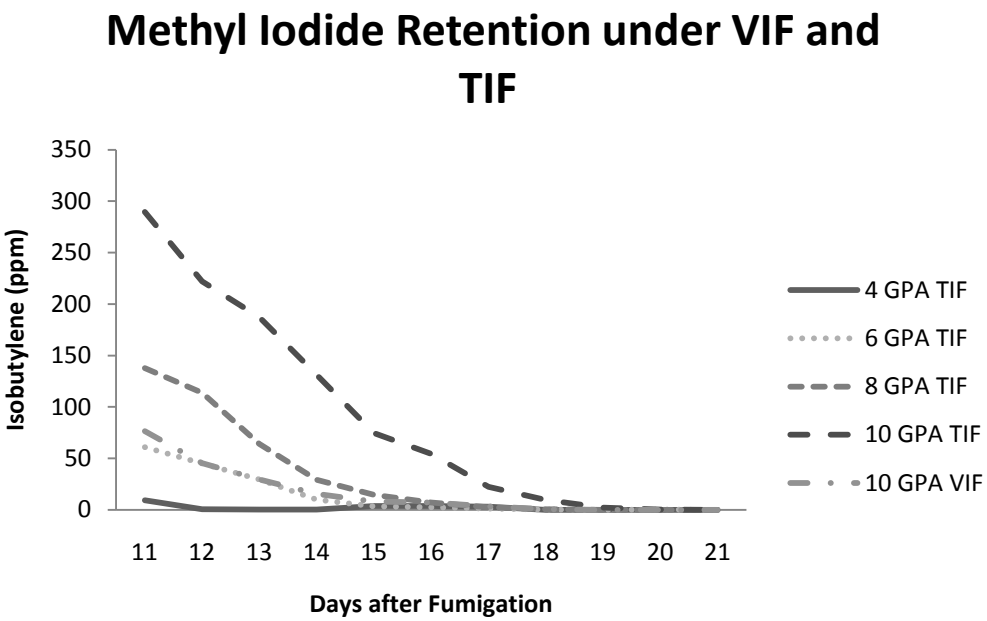


Fig 1. Methyl Iodide Retention under VIF and TIF mulches. Experiments were performed during the spring of 2010 at the Eastern Shore Agricultural Research and Extension Center in Painter, VA.

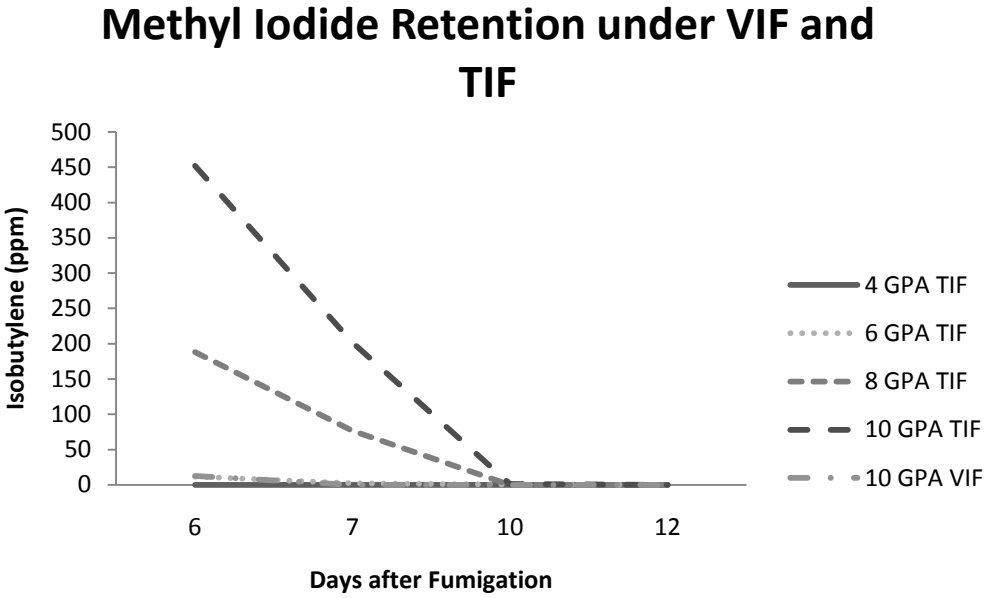


Fig 2. Methyl Iodide Retention under VIF and TIF. Experiments were performed during the fall of 2010 at the Eastern Shore Agricultural Research and Extension Center in Painter, VA

Table 1. Weed and disease incidence data from methyl iodide fumigant trials conducted in Painter, VA during the spring of 2010. Weeds are categorized as yellow nutsedge, broadleaves (common lambsquarters and carpetweed) and grasses (crabgrass, goosegrass and johnsongrass). Diseases include fusarium crown rot and southern blight.

| | Weeds/ft$^2$ | | | % Disease Incidence |
|---|---|---|---|---|
| Treatment | Nutsedge | Broadleaves | Grasses | |
| Untreated | 0.178 a[z] | 0.05 a | 0.04 a | 36 a |
| 4 GPA TIF | 0.005 b | 0 b | 0.01 b | 6 b |
| 6 GPA TIF | 0 b | 0 b | 0 b | 3 b |
| 8 GPA TIF | 0 b | 0.003 b | 0 b | 2 b |
| 10 GPA TIF | 0 b | 0.003 b | 0.008 b | 5 b |
| 10 GPA VIF | 0.003 b | 0.003 b | 0 b | 3 b |

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

Table 2. Tomato yield data from methyl iodide fumigant trials conducted at the Eastern Shore Agricultural Research and Extension Center in Painter, VA during the spring of 2010.

| | Yield (lbs/A) | | | |
|---|---|---|---|---|
| Treatment | Medium | Large | X-large | Total Marketable |
| Untreated | 5161 ns | 8319 c [z] | 18997 ns | 32476 ns |
| 4 GPA TIF | 3854 | 9958 bc | 20376 | 34189 |
| 6 GPA TIF | 4338 | 11120 ab | 20141 | 35598 |
| 8 GPA TIF | 5246 | 11804 ab | 20915 | 37964 |
| 10 GPA TIF | 5965 | 13177 a | 21992 | 41134 |
| 10 GPA VIF | 5233 | 12518 ab | 26149 | 43900 |

[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.