EFFICACY OF FALL AND SPRING APPLIED METHYL BROMIDE ALTERNATIVES IN TOMATOES

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Introduction: Tomato growers in Western NC (WNC) and surrounding states face a challenge with alternative fumigants due to plant-back constraints. Historically in WNC, early harvested tomatoes command the highest prices in the market, requiring early season transplanting. If the region experiences a cool, wet spring, preparing the field for fumigation and waiting for the soil to reach an acceptable fumigation temperature can significantly delay fumigation. In addition, many of the alternatives growers may consider require 21 days between fumigation and transplanting, adding a full week to the required 14 day waiting period for methyl bromide/chloropicrin mixtures (67:33).

Fumigation in this production region is standard practice in order to suppress Verticillium wilt (race 2; VW) and weed pressure. Verticillium race 2 has been prevalent throughout the WNC production region and no commercial sources of resistance have been identified. Fumigation kills inoculum to a depth sufficient to produce an economical harvest, although the disease invariably affects tomatoes toward the end of harvest, even in fumigated plots. Previous research in WNC has demonstrated fumigants with sufficient chloropicrin content offer superior suppression of VW (Louws et al 2002, 2004) and addition of selective fumigants or herbicides provide promising weed management alternatives (Louws et al. 2004). The challenge remains to maximize advantages and mitigate disadvantages in order to maximize efficacy and grower returns using alternative disease and weed management systems.

The objective of this study was to evaluate pre-plant fumigant treatments as alternatives to methyl bromide as well as the timing of those treatments.

Materials and Methods: The study was conducted at the Horticultural Crops Research Station in Fletcher, NC using the tomato variety *Amelia*, a line that offers Tomato Spotted Wilt Virus resistance. Fumigant treatments were either in the fall 2004 or spring 2005 and tomatoes were transplanted at two dates in the spring of 2005. The first planting (early) corresponded with the average last frost date and the second planting (late) was one week later as described below. Four treatments were initiated in the Fall on October 27, 2004. Two untreated beds were formed, one to remain as an untreated control and a second, with two drip tapes, destined for InLine application in the spring. Telone C-35 and methyl bromide were shank applied and comprised the remaining two treatments. Winter wheat was seeded between the beds of the fall treatments and killed with herbicide in the early spring, prior to transplanting tomatoes. The wheat provided a superior cover between the fall-treated beds to limit soil erosion and enable worker and tractor traffic, even when the remaining field was still too wet. The InLine treatments were drip applied April 27, 2005 into the fall-formed beds. Shank application of methyl bromide, Telone C-35, and MIDAS (50% methyl iodide:50% chloropicrin), and the installation of a second non fumigated treatment was done on May 4, 2005. Transplants for the "First planting" were set into the field on May 18, 2005, corresponding with 14 days after the Spring fumigation treatments, and 21 days after the InLine injection. The late transplants ("Second planting") were set into untreated beds, methyl bromide and Telone C-35 treated beds on May 25, 2005. This was done to match the 21 day interval after the spring treatment of Telone C-35. Standard management practices were used in the trial including foliar disease and insect management, fertilizer recommendations and staking and stringing of plots. Tomatoes were harvested weekly for a total of eight harvests (Jul 21 to Sep 8). Harvest data were sorted into marketable categories: jumbo, extra large, large, medium, small and into cull fruit which included damaged, misshapen or diseased fruit. Total marketable yields (Table 1) and VW incidence were assessed weekly. The experiment was designed as a randomized complete block design with 4 replications per treatment. The internal section of each treated plot (50 ft) was planted to 14 plants spaced 18 in between plants and the 8 in raised beds were 24 in wide with the center spaced at 5 ft intervals. Plots experienced a high incidence of bacterial spot resulting in modest defoliation of lower leaves but a negligible incidence of fruit spots.

Results: The experiment was designed to ask specific questions and those will be highlighted here. To date, a complete analysis of the data has not been conducted. The results have been sorted by Marketable yield (ton/acre) in Table 1. With regard to yields from the First planting, InLine (treatment # 10) injected in the spring into beds formed the previous fall resulted in marketable yields equivalent to spring fumigation with MB (11) and was superior to yields obtained from plots fumigated with MB in the fall (5). Telone-C35 applied in the spring (9) resulted in superior yield compared to fall fumigation with MB (5) and was similar to fall fumigation with Telone-C35 (7) and spring fumigation with MB (11). Beds formed in the fall and not fumigated (1) had the lowest yield. Spring application with Midas (8) was statistically similar to spring application with MB (11). Plots formed in the spring and not fumigated but planted early (First planting; 6) resulted in marketable yields similar to fall applied MB (5) and Telone-C35 (7) and spring applied Midas (8).

With regard to the Second planting, MB (3) and Telone-C35 (4) generated similar yields and offered superior yield compared to the non-fumigated plots (2).

Summary: Application of InLine in the spring resulted in superior yields compared to MB applied in the fall and similar to MB in the spring. Likewise, Telone-C25 generated yields comparable to the respective MB treatments. Phytotoxicity was not consistently noted for any fumigant treatment (a few plots had slight phytotoxicity soon after planting but this was associated with a non-treatment-based abiotic disorder). In this trial, a 14 day plant-back waiting period was adequate to avoid Telone-generated phytotoxicity. This has not been our consistent experience. This study highlights fall application of fumigants, or drip application in the spring into preformed beds, offers a viable mechanism to reduce risk of phytotoxicity. The preformed bed covered with black plastic increased the soil temperature compared to bare soil and this should contribute to InLine efficacy and dissipation. Of particular interest was the yield generated from the non fumigated plots planted early. Additional work will be important to determine if this will be a consistent observation.

Table 1: Marketable yield as impacted by fumigants, time of application and time of tomato transplanting.

Treatment		Rate	Time of Application	Time of Planting	Marketable Yield (ton/A)
1	No Fumigation	--------	Fall	First	26.5 a
2	No Fumigation	--------	Spring	Second	28.8 a
3	Methyl Bromide:Pic (67:33)	400 lbs/A	Spring	Second	33.0 b
4	Telone C35	35 gal/A	Spring	Second	34.1 b
5	Methyl Bromide:Pic (67:33)	400 lbs/A	Fall	First	34.3 bc
6	No Fumigation	--------	Spring	First	34.4 bc
7	Telone C35	35 gal/A	Fall	First	36.4 bcd
8	Midas:Pic (50:50)	240 lb/A	Spring	First	37.9 cd
9	Telone C35	35 gal/A	Spring	First	38.6 d
10	InLine	26 gal/A	Fall bedding; Spring injection	First	38.9 d
11	Methyl Bromide:Pic (67:33)	400 lbs/A	Spring	First	38.9 d
					P = 0.05

References:

Louws, F. J., L.M. Ferguson, K. Ivors, J. Driver, K. Jennings, D. Milks, P.B. Shoemaker, and D.W. Monks. 2004. Efficacy of methyl bromide alternatives for Verticillium and weed management in tomatoes. Proc. of the Int. Res. Conf. on Methyl Bromide Alternatives and Emissions Reduction. 43/1-43/3.

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