

**USDA ARS AREAWIDE PROJECTS LARGE SCALE DEMONSTRATION  
TRIALING OF METHYL BROMIDE ALTERNATIVES IN FLORIDA  
STRAWBERRY**

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This USDA ARS South Atlantic Areawide project was funded to demonstrate and improve the performance and consistency of next-best chemical alternatives to methyl bromide in large scale, grower field demonstration trials. Alternative chemicals evaluated within these trials include individual and or combined uses of chloropicrin, and 1, 3-dichloropropene with use of appropriate herbicide(s). A diversity of drip fumigants were also evaluated for pest control efficacy, strawberry yield enhancement, and a

Secondary objectives were to

**Methods:** Two grower field studies focused on a co-application approach of different fumigants, herbicides, and other alternative tactics to achieve pest control efficacy and crop growth response similar to that of methyl bromide. Among the sites, chisel applied soil treatments included broadcast equivalent methyl bromide (50%) chloropicrin (50%) (200lb/ta), methyl bromide (67%) chloropicrin (33%) 200 lb/ta, dimethyl disulfide (DMDS) (79%) chloropicrin (21%) (60 gpta), Pic Clor 60 (250-300 lb/a), and Telone C35 (33-35 gpta) plus Goal herbicide. In addition to the chisel applied fumigant applications, two drip applied fumigants including Pic Clor 60 EC ( 250-300 lb/ta) and Telone Inline (35 gpta) were evaluated with either one or two drip tapes per bed at the Florida Strawberry Growers Association (FSGA) Research and Education farm in Dover, FL and at Ferris Farms, Floral City, FL. At all field locations, the highly gas retentive Pliant Blockade was installed immediately after methyl bromide chloropicrin application and with specific Telone C35 and Pic Clor 60 fumigant applications to ascertain need for added expense of the higher cost plastic. All fumigants were applied with commercial grower equipment. Certified applicators and pesticide label requirements for posting, rates of use, personal protective equipment requirements, etc., were closely

followed.

At both farm locations, beds measured 30 inches wide, 10 inches in height, with rows spaced on 4 foot centers. Actual per acre fumigant use rates represent 62.5% of the broadcast or reported per treated acre (ta) rates expressed above. Bare root 'Festival' transplants from Canadian nurseries planted within rows 7 weeks following fumigant treatment. Water and nutrients were supplied to each plant row with TTape (0.22 gpm/100 ft or 0.45 gpm/ 100 ft row) on at least a daily/ twice daily basis (unless sufficient rainfall occurs) for much of the season. Fertigation rates were seasonally defined based on crop growth stage. Fertilization rates were based on a field equivalent of 225 lbs NPK per acre per season. Other pest and disease control measures were maintained primarily on both a prophylactic and as needed basis.

Assessments of plant growth were made as appropriate during the course of the season to characterize differences in plant size, health, and vigor. Strawberry fruit were harvested and numbers of individual flats (8 lb/flat) were determined on a 2 to 3 day basis from early December 2008 through April 2009. Following chemical treatment, weed densities were monitored and recorded on a periodic basis to determine any differences in weed control. An untreated control was not included as a replicated treatment for comparison at Ferris Farms. With the exception of DMDS+PIC, all treatments were arranged within their respective experimental areas as a completely randomized block design with 3 or 4 replications per treatment. Plot sizes varied from 8 to 10 rows or 0.2 to 0.4 acres among the different grower farm locations.

### **Results and Discussion:**

At FSGA, a high barrier mulch did not contribute significantly ( $P \leq 0.05$ ) to improved strawberry plant growth or yield (**Figure 1**). Sting nematode control and improved strawberry yield were observed to increase with rates of 1,3-D application. It would appear the levels of 1,3-D were insufficient for sting nematode control with Pic Clor 60, which then contributed to reduced strawberry yield. A significant ( $P \leq 0.0001$ ) drip tape effect (1 vs. 2) was observed with methyl bromide chloropicrin, Telone InLine, and Pic Clor 60EC. Strawberry yields increased presumably as a horticultural effect (improved water and nutrition) and also as a fumigation effect (improved bed distribution of the fumigant and correspondingly nematode control) with Telone InLine and Pic Clor 60EC.

At Ferris Farms, no significant differences in strawberry yield were observed between most fumigant treatments (**Figure 2**). At Ferris Farms, strawberry yields were increased with Telone InLine (2 tapes) and with DMDS + PIC.

Compared to methyl bromide chloropicrin, neither water or gas phase concentrations of the drip applied Pic Clor 60EC or Telone InLine were sufficient to provide effective nutesedge control, even with 2 drip tapes per bed to deliver the fumigants. Regardless of tape number or drip fumigant used, increased nutesedge survivorship with distance from the bed center to bed shoulder, particularly with Pic Clor 60EC (**Figure 3**).

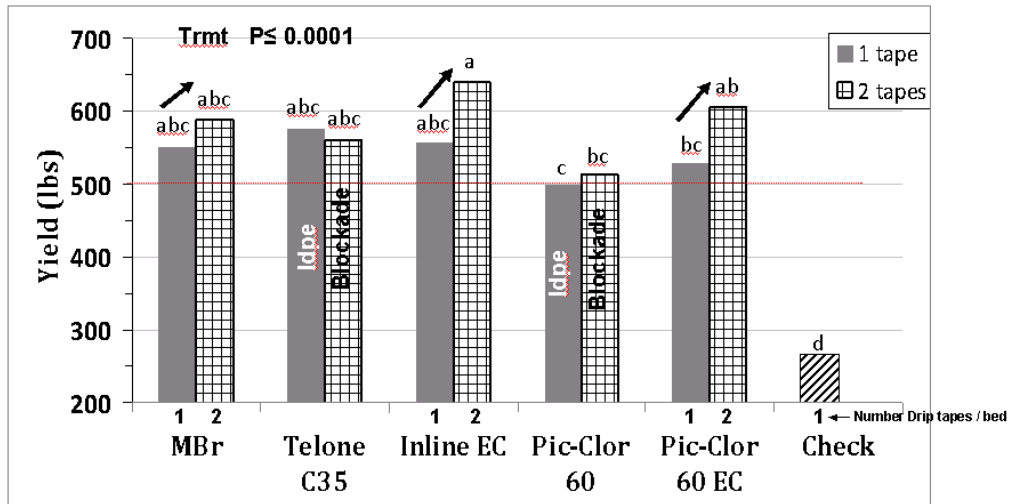
In general no significant ( $P \leq 0.05$ ) differences in numbers of dead or decline strawberry plants were observed among treatments season long at either of the grower demonstration sites.

**GENERAL SUMMARY:**

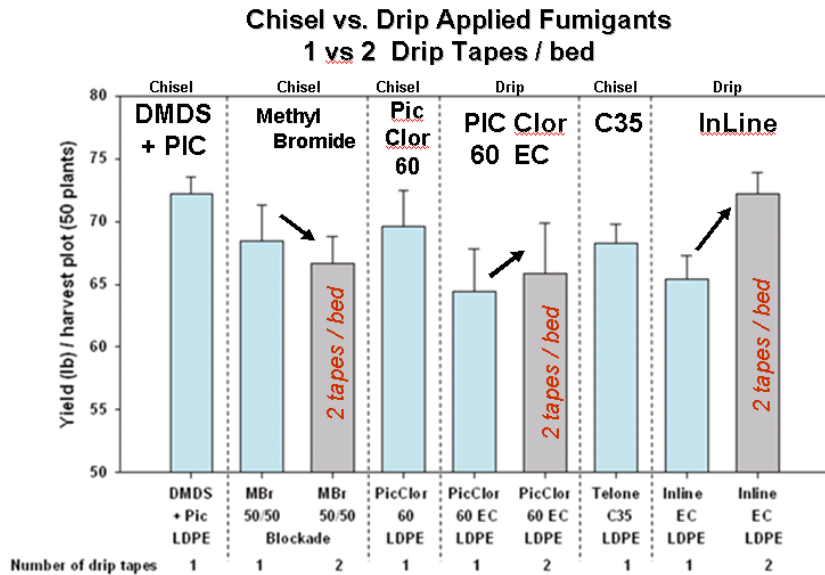
- § In these trials, most alternative fumigants evaluated produced yields which were statistically equivalent to that of methyl bromide chloropicrin.
- §
- § Minimum use levels for 1,3-D (220 lb/ta) are currently thought to be required for satisfactory control of Sting nematode in strawberry.
- § Strawberry yields increased presumably as a horticultural effect (improved water and nutrition) and also as a fumigation effect (improved bed distribution of the fumigant and correspondingly nematode control) with Telone InLine and Pic Clor 60EC.
- § Neither water or gas phase concentrations of drip applied Pic Clor 60EC or Telone InLine were sufficient to provide effective nutesedge control, even with 2 drip tapes per bed to deliver the fumigants.

Figure 1. Strawberry seasonal yields (lb/250 ft linear feet of row) from various chisel and drip applied fumigant alternatives to methyl bromide, methyl bromide chloropicrin (MBr)(50/50)(240 lb/a), PicClor 60 (300 lb/a), PicClor 60EC (300 lb/a), Telone C35 (33 gpa), and Telone InLine (33 gpa). Difference in numbers of drip tapes per bed (1 vs. 2 with equivalent total water flow) and use of either Pliant Blockade or LDPE plastic mulch are indicated as appropriate for the different treatments. FSGA / Pacific Ag Research Farm, Dover, FL. Fall 2008-09

**Chisel vs. Drip Applied Fumigants  
1 vs 2 Drip Tapes / bed**



**Figure 2.** Strawberry seasonal yields obtained from various chisel and drip applied fumigant alternatives to methyl bromide, including DMDS +PIC (60 gpa), methyl bromide chloropicrin (50/50)(240 lb/a), Pic Clor 60 (250 lb/a), Pic Clor 60EC (250 lb/a), Telone C35 (33 gpa), and Telone InLine (33 gpa). Difference in numbers of drip tapes per bed (1 vs. 2 with equivalent total water flow) and use of either Pliant Blockade or LDPE plastic mulch are indicated as appropriate for the different treatments. Ferris Farms, Floral City, FL. Fall 2008-09



**Figure 3.** Numbers of nutsedge plants emerged through the plastic mulch per 48 linear feet of row (individual sprinkler sections (SS)). Locations of nutsedge emergence were measured as distance from the center of the bed. Ferris Farms, Floral City, FL 10/7/08.

