USDA ARS AREAWIDE PROJECT: LARGE SCALE FIELD DEMONSTRATION TRIALING OF METHYL BROMIDE ALTERNATIVES IN FLORIDA STRAWBERRY 2010-11

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This USDA CSREES project was funded during 2010-11 to demonstrate and improve the performance and consistency of next-best chemical alternatives to methyl bromide in large scale, grower field demonstration trials in Florida strawberry. 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 as a potential risk mitigation tactic to reduce buffer zone distances and overall personal protective equipment requirements which were being proposed by EPA. Secondary objectives were to evaluate the feasibility of using two drip tapes per bed rather than one to evaluate efficacy and yield of methyl bromide chloropicrin and of other different drip applied fumigants; and use of a high barrier, semi-impermeable mulch film to reduce emissions and soil fumigant field application rates and to compare crop yield and pest control efficacy of methyl bromide alternatives.

Methods: Four 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%) (320lb/ta) ± VIF mulch, Telone C35 (30-35 gpta) ± VIF mulch, Pic Clor 60 (250-300 lb/ta) ± VIF mulch. A variety of drip applied fumigants were also evaluated including Telone Inline (35-42 gpta), Pic Clor 60EC (300 lb/ta), Vapam (75 gpta), and KPam (60 gpta) evaluated with either one or two drip tapes per bed at the Florida Strawberry Growers Association (FSGA) research 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 reduced rate applications of Telone C35 and Pic Clor 60. All fumigants were applied with commercial grower equipment. Calibration procedures were followed at each experiment location. Certified applicators and pesticide label requirements for buffers, posting, rates of use, and personal protective equipment requirements were closely followed.

At all 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.

At FSGA and Ferris, bare root 'Festival' transplants from Canadian nurseries were planted between 4 to 5 weeks following fumigant treatment. Water and nutrients were supplied to each plant row with Netafim or TTape (0.22 gpm/100 ft or 0.45 gpm/ 100 ft row; or 0.40 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 generally based on a near 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 (lb/plot or lb/row) and numbers of individual flats (8 lb/flat and 10,890 ft/a) were determined on a 2 to 3 day basis from early December generally through March or April. Following fumigant treatment, weed densities were monitored and recorded on a periodic basis to determine any differences in weed control between fumigant treatments. An untreated control was not included as a replicated treatment for comparison at Ferris Farms. All treatments were arranged within their respective experimental areas as a completely randomized block design with 4 replications per treatment. Plot sizes varied from 2 to 12 rows or 0.06 to 0.4 acres among the different grower field locations.

Results and Discussion:

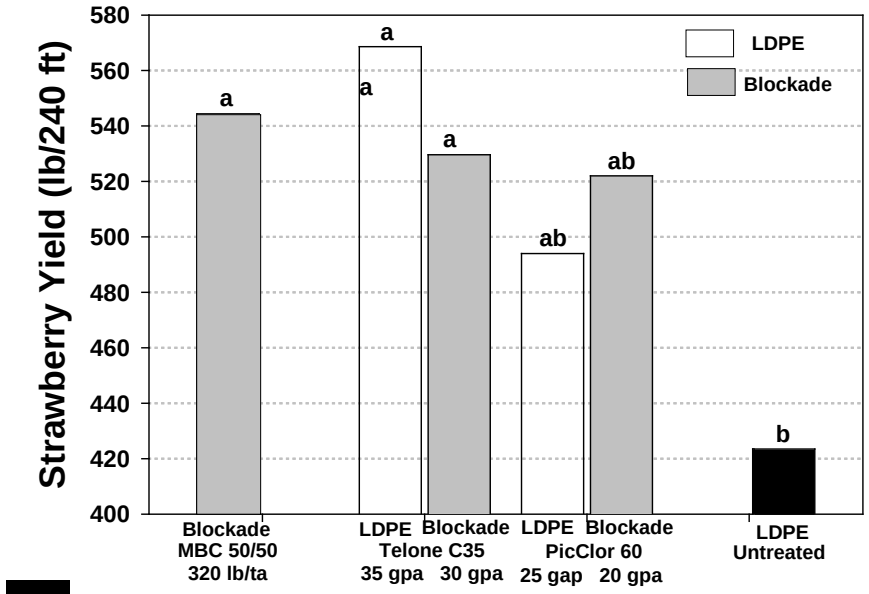
At FSGA, treatment comparisons consisted of shank and drip applied fumigants during fall 2010-11. Shank applied fumigants consisted of methyl bromide chloropicrin 50/50 (320 lb/ta), Pic Clor 60 (250 and 300 lb/ta) and two rates of Telone C35 (30 and 35 gpta). Telone InLine (42 gpta), Pic Clor 60EC (300 lb/ta), Vapam (75 gpta) and KPam (60 gpta) were drip applied into strawberry beds with one (0.45 g/min/100 ft) or two (each 0.225 g/min/100 ft) drip tapes per bed. Compared to the untreated control, highest (P=0.05) strawberry yields for the shank applied fumigants was observed with methyl bromide chloropicrin 50/50 (320 lb/ta) and both Telone C35 (30 and 35 gpta) treatments (Fig.1). The lower intermediate yields, which could not be differentiated from the untreated control, were the two Pic Clor 60 treatments. In this trial, Sting nematode was observed to reduce strawberry yields on average by 23 percent. During the 2010-2011 season, a significant (P<0.384) fumigant or horticultural benefit of a 2nd drip tape per bed was not observed in strawberry yields at FSGA among the methyl bromide chloropicrin and drip applied treatments at FSGA (Fig.2.). Lowest yields (P<0.05) were observed with within the untreated control irrigated with a single drip tape per bed. Compared to the untreated controls, highest (P,0.05) were obtained with both 1 and 2 drip tapes per bed with methyl bromide chloropicrin 50/50 and with 2 tapes per bed with both Telone Inline and KPam. At Ferris Farms, highest (P<0.05) yields of the shank applied fumigants was achieved with Telone C35 (35 gpta) (Fig. 3.).

At Ferris Farms, a significant ($P<0.001$) reduction in strawberry yield was observed between methyl bromide chloropicrin 50/50 (320 lb/ta) under new plastic compared to double cropped strawberry (strawberry followed by strawberry using the same, holey plastic and drip tape for 2 years) and Telone Inline applied as the drip fumigant. As in other studies, a significant ($P<0.05$) fumigant or horticultural benefit was not observed with the addition of a 2nd drip tape per bed.

KEY POINTS:

- Among the coformulated chloropicrin and 1,3-dichloropropene fumigant products, the higher proportion and thus rates of 1,3 D applications within the Telone C35 fumigant treatment again produced higher levels of nematode control efficacy and of strawberry yield compared to that of Pic Clor 60.
- Unlike previous years, a significant drip fumigation or horticultural benefit was not observed at any experimental site with the addition of a second drip tape per bed.
- In these trials, most alternative fumigants evaluated produced yields which were statistically equivalent to that of methyl bromide chloropicrin 50/50 (320 lb/ta). Coformulated fumigants such as Telone C35, generally performed better than that of PicClor 60 for maintaining strawberry crop productivity.

Fig. 1. Comparison of Telone C35 and Pic Clor 60 shank applied with low density polyethylene mulch and VIF Pliant Blockade mulch at reduced rates of application and compared with Methyl bromide chloropicrin 50/50 (320 lb/a) and an untreated control on strawberry yields at the Florida Strawberry Growers Association Farm, Dover, Fl, 2010-11.



[redacted] of drip applied fumigant treatments with Methyl bromide [redacted] lb/a) and an untreated control on strawberry yields at the Florida Strawberry Growers Association Farm, Dover, Fl, 2009-10. All treatments were evaulated with either one (0.45 g/min/100 ft) or two (each 0.225 [redacted]ed.

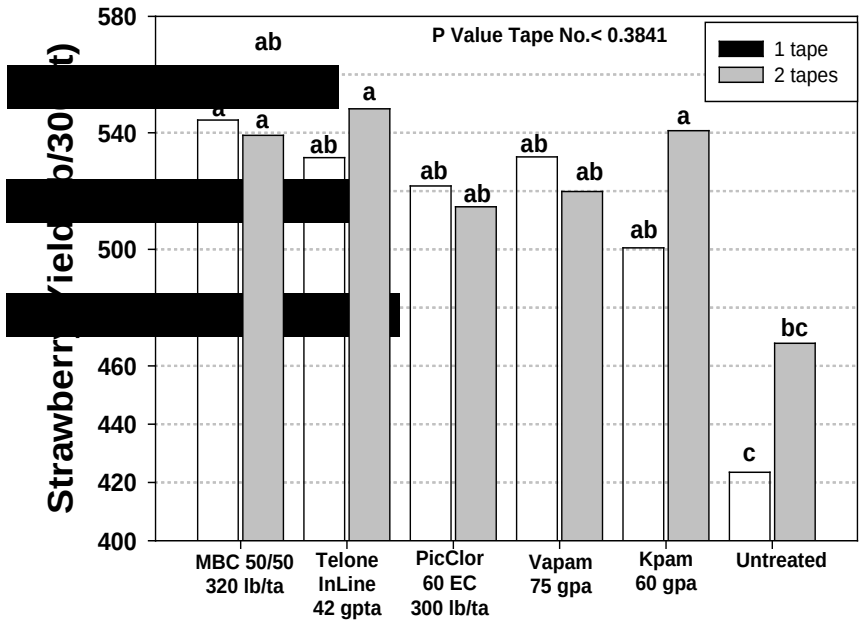


Figure 3. Comparison of three shank applied fumigant treatments including methyl bromide chloropicrin 50/50 (320 lb/ta), Telone C35 (35 gpta), and 2 rates of Pic Clor 60 (300 lb/ta; 250 lb/ta) on strawberry yields at the Ferris Farms, Floral City, FL 2010-11

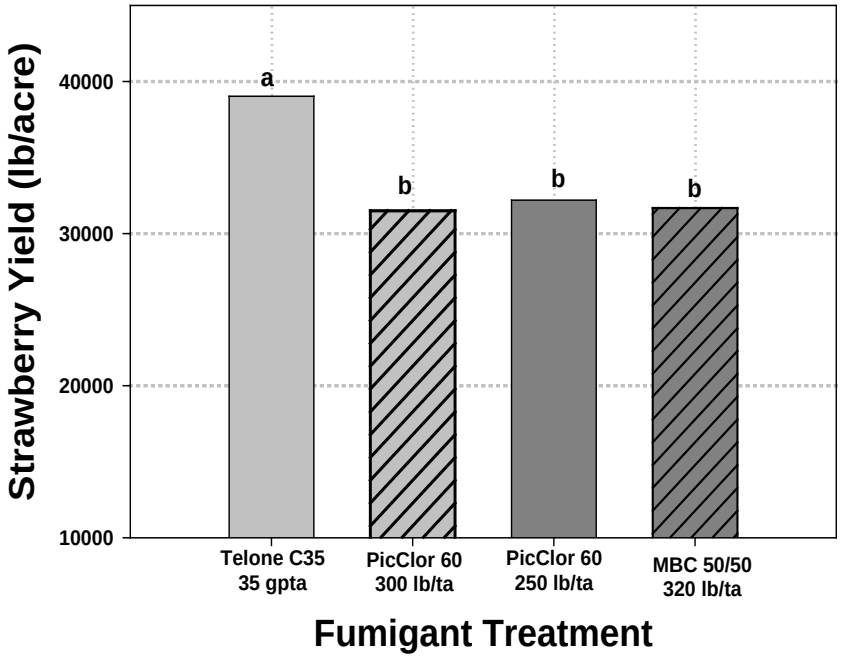


Figure 4. Comparison of shank (methyl bromide chloropicrin 50/50 (320 lb/ta) and drip applied Telone InLine (35 gpta) fumigant treatments on strawberry yields at the Ferris Farms, Floral City, FL 2010-11 using one (0.45 g/min/100 ft) or two (each 0.225 g/min/100 ft) drip tapes per bed to characterize fumigant and horticultural benefits of a 2nd tape. Methyll bromide chloropicrin was applied using new Pliant Blockade mulch while Telone Inline was drip applied to existing, double cropped bed.