ALTERNATIVE SOIL TREATMENTS FOR STRAWBERRY IN THE SOUTHEASTERN UNITED STATES

L. M. Ferguson[*1], G. E. Fernandez[2], P. M. Brannen[4], F. J. Louws[1], E. B. Poling[2], O. B. Sydorovych[3], C. D. Safley[3], D. W. Monks[2], Z. Pesic-Van Esbroeck[1], D. C. Sanders[2] and J. P. Smith[5]. Departments of Plant Pathology[1], Horticulture[2] and Agricultural and Resource Economics[3] at North Carolina State University, Raleigh, NC, Plant Pathology[4] at University of Georgia, Athens, GA, and Clemson Extension Service[5], Lexington, SC.

Most strawberry producers in the Southeastern United States (SEUS) rely on an annual plasticulture production system, which includes pre-plant fumigation with methyl bromide (MB). Soil fumigation contributes to the control of soilborne pathogens, weeds and nematodes. Collaborative experiments were begun to evaluate alternative products, application methods and alternative farming systems to maximize productivity of the crop and minimize persistent soilborne pest problems. Cost analyses of alternative chemical and compost applications will contribute to the decision-making process of growers faced with the loss of MB. We intend to give an overview of the current projects evaluating the costs and utility of alternative chemicals, application methods and compost-based farming systems for commercial strawberry production.

Research and extension specialists at North Carolina State University, University of Georgia and Clemson University, in cooperation with growers and industry participants have conducted research trials over the past 4 years to address the loss of MB to farmers in the region. Funding from the USDA and NC-Strawberry Growers Association has been allocated to develop strategies to adopt alternatives without sacrificing profits. The problem has been approached in two stages. Phase I emphasized new products, application methods (drip) and biologically-based management systems. Successful approaches identified in Phase I are now being tested in Phase II. Shank, drip applications and/or combinations of effective products are currently under study in our program. Of the biologically-based approaches, production systems incorporating compost showed the most promise. We have continued to characterize soilborne pathogens associated with strawberry root diseases (Fernandez et al. 2000). To complement the strawberry research, we are evaluating nursery and plug plant production systems to minimize the risk of pest introduction post-fumigation.

Methyl bromide alternatives for strawberry production: Regional trials were conducted throughout NC (Coastal, Piedmont, Mountains). On-farm trials and demonstrations also were a vital part of the testing of alternatives and outreach to growers in the SEUS. Additional experiments were conducted in Lexington, SC and at the Vidalia Onion and Vegetable Research Station in Vidalia, GA. In early trials the most viable replacements for MB were: Telone-C35, metam sodium, and dazomet. Biologically-based treatments included solarization, cabbage amendment + solarization, or mixed grass/legume cover crops followed by compost addition. Of these alternatives, cover crops and compost produced marketable yields equivalent to MB in 2 years of the study at Plymouth, NC and yields 93%, 103% and 90% (statistically similar) relative to yields in MB plots at the Vollmer Farm (Louws et al. 2000). Whole plant samples were collected at full-bloom, peak fruit production and final harvest for assessment of plant growth (crown number, leaf area, plant dry weights) and root rot severity.

In research trials conducted during 2000-2001 strawberry season in Plymouth, NC, Clayton, NC and Vidalia, GA, several alternative soil treatments were tested. Yield and fruit quality data were collected for the comparison of soil treatments. The following treatments were tested at Plymouth in 2000-2001 prior to planting Camarosa: Chloropicrin [6 gal/A in-row], compost [30 yd^3/A broadcast], nonfumigated control, MB 67:33 [200 lbs/A in-row], Telone-C35 [17.5 gal/A in-row], Inline [17.5 gal/A in-row], Telone II [11 gal/A in-row], Metam sodium [37.5 gal/A in-row], metam sodium (drip) [37.5 gal/A in-row]. At Clayton the fumigant treatments consisted of: MB 67:33 [250 lbs/A], Iodomethane (IM) (100%) [250 lbs/A], Iodomethane (IM): Chloropicrin (60:40) [300 lbs/A], Telone C35 [28 gal/A], Inline [28 gal/A] (all at broadcast rates) and nonfumigated control for Chandler production. In these trials marketable yields comparable (not statistically different) to MB were obtained in the Telone-C35, Inline, metam sodium, metam sodium (drip), chloropicrin, IM (100%) and IM:Chloropicrin (60:40) treatments. Treatments that produced lower numbers and weights of marketable fruit were: nonfumigated controls, compost and Telone II.

In Vidalia, GA several combination treatments and rates of chemicals were tested. Treatments included at broadcast rates were: untreated control, MB (67:33) [350 lb/A], Inline [32 gal/A] + Metam sodium [37.5 gal/A], Telone C35 [35 gal/A] + metam sodium [37.5 gal/A], Telone II [15 gal/a] + metam sodium [75 gal/A], Telone C17 [17.5 gal/A] + Chloropicrin [75 lb/A] + Devrinol [4 lb AI/A], Telone C35 [35 gal/A] + metam sodium [37.5 gal/A] + 7.2 e11 CFU *Bacillus subtilis* / 1000 bed feet, and Telone II [15 gal/A] + Chloropicrin [75 lbs/A] + Devrinol [4 lb AI/A]. Treatments which produced yields of Camarosa equivalent to MB (67:33) in Georgia studies were Inline + metam sodium, TC35+metam sodium, telone II+ metam sodium, and TC35 + metam sodium+*B. subtillis*. Untreated control plots and treatments incorporating the herbicide Devrinol with soil fumigants produced yields significantly lower than MB (67:33).

References Cited

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Table 1: Total, marketable, and cull yields of Camarosa from harvests 2000-2001 at Plymouth, NC contributed by G. E. Fernandez NCSU.

Treatment	Total yield lbs/A	Marketable lbs/a	Cull lbs/A	Fruit weight (g)
Chloropicrin	31006 c	27288 d	3679 ab	19.7
Compost	21654 ab	17898 ab	3756 ab	17.8
Control	19278 a	16595 a	2683 a	19.3
MB 67:33	28630 bc	24452 cd	4139 abc	19.5
Telone C35	31159 c	25717 cd	5442 c	19.5
Inline	30776 c	26752 cd	4024 abc	20.7
Telone II	22459 ab	18818 ab	3603 a	19.2
Vapam	30124 c	24912 cd	5212 bc	20.1
Vapam (drip)	27020 bc	22229 bc	3833 ab	19.7 NS all

Table 2: Total yields, root disease ratings, and plant growth parameters for Camarosa from 2000-2001 at Vidalia, GA contributed by P. M. Brannen UGA.							
Treatments	Total yield lbs/A	Root rot (Feb 15)	Leaf dry weight (g) Feb	Root dry weight (g) Feb	Root rot (May 16)	Leaf dry weight (g) May	Root dry weight (g) May
Control	16330 d	3.4 a	21.8 d	16.8 b	3.9 abc	101.9 b	19.8 cd
MB 67:33	26421 a	2.9 b	33.7 a	21.7 a	3.7 abc	204.4 a	23.1 abcd
Inline + vapam	22772 abc	3.5 a	27.2 bc	17.5 b	4.2 a	183.9 ab	28.7 abc
TC35 + vapam	26041 a	3.0 b	33 a	17.8 b	4.1 ab	176.1 ab	21 bcd
Telone II + vapam	24016 abc	3.2 ab	31.6 ab	20.2 ab	4.1 ab	217.7 a	16.8 d
Telone C17 + chloropic + devrinol	21149 c	3.3 ab	21.8 d	17.8 ab	3.5 c	197.1 a	33.4 a
TC35 + vapam + *B. subtilis*	24924 ab	3.1 ab	27.8 bc	17.4 b	3.8 abc	205.9 a	26.6 abcd
Telone II + chloropic + devrinol	21312 bc	2.9 b	25.3 cd	20.3 ab	3.6 bc	192.1 a	32.3 ab
LSD (P=0.05)	3773.9	0.4	5.2	3.9	0.6	8.38	11.7