Compost as an alternative to Methyl Bromide in Plasticulture Strawberry Production

F.J. Louws[1], M.A. Grabowski[1], G.E. Fernandez[1], and J. & B. Vollmer[2].
[1]North Carolina State University, Raleigh, NC and [2]Vollmer Farm, Bunn, NC

The majority of growers in North Carolina use annual plasticulture production to produce strawberries, and are dependent upon fumigation with methyl bromide (MB) for control of soil borne pathogens, weeds, and nematodes. We have initiated a series of experiments to explore alternative products or alternative farming systems to minimize risk of decreased profits with the pending loss of methyl bromide as a soil fumigant. In his report, we highlight our objective to critically evaluate the potential of a well-managed compost-based farming system as compared to MB and TeloneC-35 based systems for commercial strawberry production.

The experiment was established on a commercial farm (Vollmer Farm). Large quantities of uniformly decomposed compost were prepared using the management intensive system known as the Controlled Microbial Compost (CMC) system. Under the CMC protocols, compost piles were monitored and adjusted daily for temperature, moisture and CO_2 content. A legume-grass cover crop mix grown in the field during the off-season (July to August) was flail mowed just prior to application of the compost. Compost was applied to the field at rates of 30 yd^3/acre in year 1, 20 yd^3/acre in year 2 and 20 yd^3/acre in year 3. Compost and cover crop residues were tilled to a depth of 12 in. early September. Beds were formed in the third or fourth week of September and transplants field set early October.

Four twin row beds forty feet long were fumigated with; 1) methyl bromide, 2) Telone C-35 (Years 2&3 only), 3) amended with the compost, or 4) left as untreated controls. Treatments were arranged in a Latin–square design and plots were maintained in the same position for three consecutive years (i.e. no crop rotation) to test the cumulative effects of treatments. Whole plant samples were collected monthly and leaf area, crown number, percent root lesion incidence, and plant dry weights (root, crown, leaf, flower and fruit) were measured. Two beds per plot were harvested twice weekly from April through June. Fruit quality and yield data were recorded.

Leaf area (LA), a good indicator of overall plant performance is reported here to represent vegetative growth. In Year 1 MB plants had higher LA greater than both compost and control plants (Figure 1). In Years 2 and 3, leaf area of plants in the compost, methyl bromide, and Telone C35 treatments were statistically similar to one another and greater than control plants throughout the season (Figure 1). Yield of compost plots were 93.4%, 103% and 90% (statistically similar) to those obtained in MB plots in years 1 to 3, respectively. Yield in control plots was 79.6%, 62% and 66% of those obtained in MB plots in years 1 to 3, respectively. Telone-C35 plots had similar yields to the MB plots. These data suggest that the control plots have become less conducive to optimum productivity and this decline is hypothesized to result from increases in the populations of soil borne pathogens. A dramatic decline was not consistently observed in the compost plots over time. Excess rain in year 3 due to two hurricanes affected all treatments by decreasing yield (Figure 2) compared to the previous two years. Based on farm-implement maneuverability in the field, the excess moisture was more of a problem in the compost-based plots than those not treated with compost. Excess moisture delayed planting

date due to delayed scheduling of fumigant products the time interval required for fumigant dissipation. Delayed planting date is known to decrease yield in NC and this would not be a concern in the compost-based system.

Overall the growers' impression of this system has been favorable. Mastering the preparation of compost was a challenge and may not be adaptable to all farm sites. Some growers may consider buying compost for field application. This approach introduces questions about compost quality issues. At Vollmer Farm, the compost-based system will be relied on for certified organic fields and further explored in standard production fields. In the near future, compost applications and cover crops are planned for all strawberry fields and fumigants will not be applied in portions of the standard production fields. In the long run, rotation management plans may be developed, requiring a larger land base, to further learn if the compost-based system will offer the long-term productivity at the whole-farm level.

This study site has been a focal point of numerous grower-oriented field days as well as Cooperative Extension Service agent training (train-the-trainer) programs. The field days and training programs have provided a mechanism with numerous stakeholders to dialogue about alternative farming systems and the impact of such systems on farm profitability and reduced reliance on methyl bromide.

Figure 1a: Leaf Area vs Time
Vollmer Farm 1997-1998

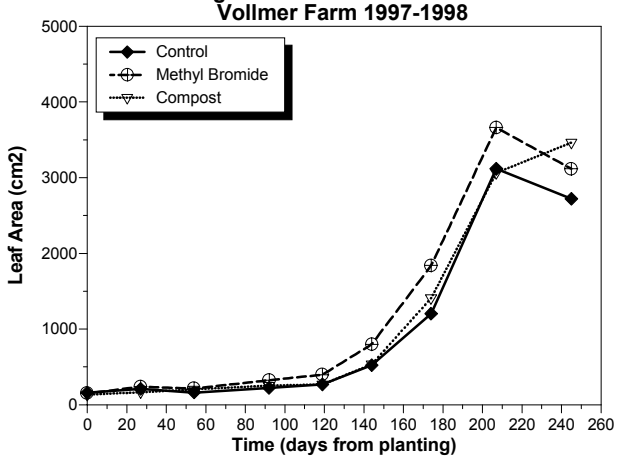

Figure 1b: Leaf Area vs Time
Vollmer Farm 1998-1999

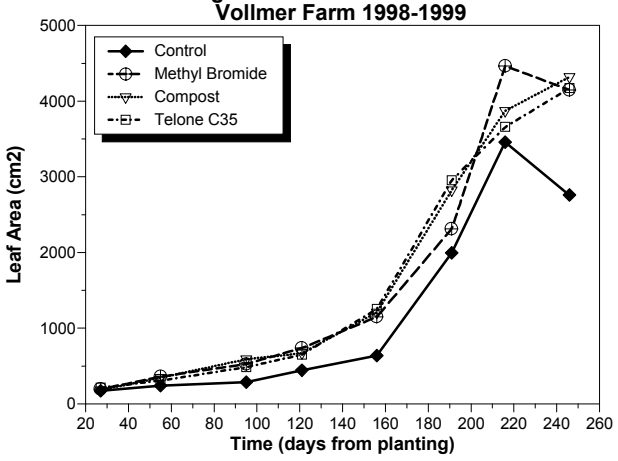

Figure 1c: Leaf Area vs Time
Vollmer Farm 1999-2000

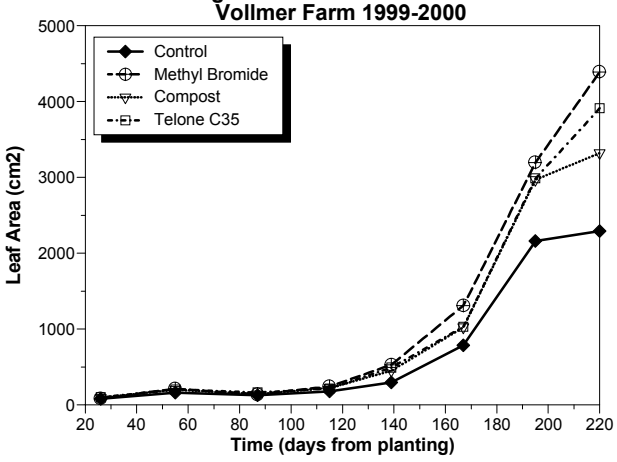

Figure 2: Total Fruit Weight vs. Time
Vollmer Farm 1997-2000