Using Soil Solarization and Compost to Increase Yields and Control Weeds

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With excellent cooperation from grower Steven Lee
August 2008

In July 2007 we started an experiment at Steven Lee's strawberry field on Grant Line Road in Elk Grove. The goal of this project was to see if we could improve plant health and increase yields by using soil solarization and compost. Soil solarization is using clear plastic on the soil surface to trap the sun's energy and heat the soil – up to 120°F. It can kill weeds, soilborne pathogens, nematodes and insect pests. It improves plant growth and yield without having to fumigate. Compost can be used to help with soil fertility and soil structure.

Steven fumigated with Vapam through the drip system just before planting, but we temporarily disconnected the drip lines in our experimental rows so these rows were not fumigated. We did the experiment in both Chandler and Seascape fields. Chandlers were planted in late August and Seascapes were planted in mid November.

The compost gets hot as it cures and ages it for several months. We applied compost at a rate of 5 tons per acre and incorporated into the soil with a rake on July 18, 2007. After the compost was added the drip irrigation lines were laid down and then the soil solarization plastic was placed on the beds using shovelfuls of soil to weigh it down every 3 feet.

We placed the soil solarization polyethylene plastic by hand on the beds on July 18, 2007. Irrigation water was turned on for approximately 24-48 hours, which watered to a depth of at least 12 inches. We left the plastic on the beds for 40 days on the Chandler beds and for 80 days on the Seascape beds. We monitored soil temperatures with Hobo data loggers. After solarizing, we removed the clear plastic mulch and laid black plastic mulch on the soil.

In 2006 we found that the plants in one of Steven's fields had potassium deficiency, so we also included treatments with 120 lbs. per acre of potassium sulfate.

We used four replications of each treatment.

Results

We found that soil solarization had the following effects: 1) Higher soil temperatures, 2) far fewer weeds, and 3) more marketable fruit and higher yields.

The compost treatment also significantly increased strawberry yields for Seascapes, but Chandler yields were not significantly increased with our compost application. This may be due to the fact that the Seascape plants were planted into soils that had strawberries previously, whereas the Chandlers were planted into new land that had previously been in pasture. Land new to strawberries may have had more nitrogen and fewer pathogens, nematodes or weed seeds. Land previously in strawberries may benefit more from the compost.

Solarization and compost also increased the number of crowns in the winter, but the differences were not significant.

Where to Buy Plastic and Compost

Soil solarization can be used as an alternative to fumigation with Vapam. UV-protected solarization plastic can be purchased from MIP-Co Ag Plastics in San Luis Obispo, CA, phone (805) 549-9540. A 5-foot wide, 3,000-foot long roll costs about $130, plus shipping.

The compost we used was bought from Lopez Agricultural Services, 11499 Florin Rd., west of Sunrise Blvd. (916) 682-5450. It costs $10 per yard, and a delivery charge would cost extra. The compost is made from cow and chicken manure, rice hull ash, and wood particles.

Table 1. Soil temperature summary, August 8 through September 18, 2007 (Seascape).

Treatment	Number of Hours Over 95ºF (41 days)	Maximum Temp. (ºF)	% of days with 1+ hours over 95ºF (41 days)
Solarization (18 cm deep)	1116	119ºF (Aug. 29)	78%
Bare Ground (18 cm deep)	650	111ºF (Aug. 29)	51%

Table 2. Total yields of Chandler (15 feet of row, picked 12 times, last pick June 2, 2008).

Treatment	Total Number of Marketable Berries per Plant	Total Weight of Marketable Berries per Plant (grams)
Solarization + Compost + Potassium Sulfate	46	605
Solarization Only	49	680
Compost Only	42	549
Potassium Sulfate Only	41	570
Compost + Potassium Sulfate	49	666
Untreated	**41**	**570**

Table 3. Total yields of Seascape (15 feet of row, picked 16 times, last pick July 10, 2008).

Treatment	Total Number of Marketable Berries per Plant	Total Weight of Marketable Berries per Plant (grams)
Solarization + Compost + Potassium Sulfate	28	435
Solarization Only	25	392
Compost Only	23	338
Potassium Sulfate Only	23	341
Compost + Potassium Sulfate	27	380
Untreated	**21**	**314**

Table 4. Number of crowns on Chandler plants in December 2007.

	Average Number of Crowns per Plant
Solarization + Compost + Potassium Sulfate	3.2
Solarization Only	3.5
Compost Only	3.1
Potassium Sulfate Only	2.9
Compost + Potassium Sulfate	3.3
Untreated	**2.8**

Table 5. Percent cover of weeds after 1-2 months of solarization, plus compost and potassium treatments, August – September 2007.

	Seascape Percent Cover of Weeds	Chandler Percent Cover of Weeds
Solarization + Compost + Potassium Sulfate	0%	0%
Solarization Only	0%	0%
Compost Only	18%	29%
Potassium Sulfate Only	17%	34%
Compost + Potassium Sulfate	9%	37%
Untreated	**8%**	**21%**

Experiment Shows that Soil Solarization and Compost Increased Yields and Reduced Weeds

(See the summary report in the following pages)

Adding compost, July 2007

Adding potassium sulfate, July 2007

Digging in the compost, July 2007.

Laying clear plastic for solarization, July 2007

Solarization and other treatments, July 2007

Solarization, early August 2007 (119°F)

Laying black plastic, late August 2007.

Laying clear plastic with a tractor (Fresno)