Evaluation of Four Composts on Strawberry Plant and Root Health

Field Trial, Watsonville 2012-2013

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OBJECTIVE

This study evaluates effects of four locally available commercial composts on strawberry production in non-fumigated soil. Composts differ in their nutritional contribution and microbial profile which affect the health and productivity of plants. Previous research has demonstrated that general and specific microbial activity can suppress soilborne diseases common in non-fumigated fields, such as *Verticillium dahliae*, *Pythium* spp., *Phytophthora* spp., and *Rhizoctonia* spp.. This work seeks to maximize the potential of compost as a tool for use in integrated pest management of strawberries.

COMPOST TREATMENTS

Origin of compost material	*Tons/Acre*
Control-Yard trimmings	10T/A Z-Best*
Steer manure	50T/A (+10T/A Z-Best*)
Yard trimmings	50T/A (+10T/A Z-Best*)
Spent mushroom compost	50T/A (+10T/A Z-Best*)
Vermicompost	2T/A (1 cup per planting hole) (+10T/A Z-Best*)

*All beds were amended with 10T/A of Z-best compost

50T/A adds ¼" or less of material when broadcast applied

RESULTS

The following results are from a current trial in a non-fumigated field in Watsonville, CA.

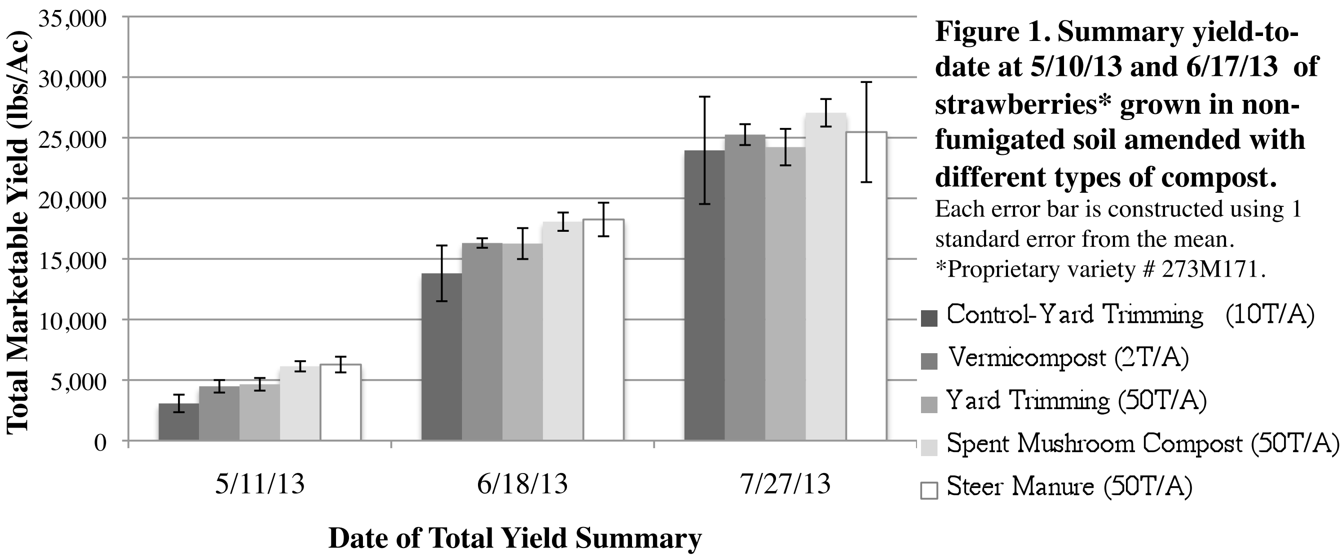

Figure 1. Summary yield-to-date at 5/10/13 and 6/17/13 of strawberries* grown in non-fumigated soil amended with different types of compost. Each error bar is constructed using 1 standard error from the mean. *Proprietary variety # 273M171.

Compost treatments significantly increased early fruit production. Differences between the control and compost treatments were much greater during the first 6-8 weeks of fruit production. Steer manure and spent mushroom compost mean berry yield produced approximately 100% increase over the control, and likewise mean yield of strawberries grown in vermicompost and yard trimming compost were about 50% greater than the control (Figure 1).

Strawberry yield differs significantly between compost type and rate. By 6/21/13, composted steer manure and spent mushroom compost provided the highest mean yield (>18,000lbs/A), roughly 30% increase over the standard control of 10T/A of yard trimming compost (13,807 lbs/A) (Figure 1). Vermicompost at 2T/A and yard trimming compost at 50T/A yielded approximately 17% more than the control. Compost rate effects yield, as demonstrated by the yield difference between 10T/A yard trimmings (control) and 60T/A yard trimmings, and compost type effects yield as seen by the significant yield difference between plots with different composts applied at the same rate.

RESULTS

Nitrate. Strawberry fruit yield and quality are strong influenced by nitrogen availability. Sufficient nitrogen during early vegetative growth is important for crown development and ensuing yield. Despite uniform management practices, nitrate levels in compost treatments differ. Compost from steer manure and spent mushroom compost are at least 20x higher in nitrate (Fig. 6) than compost from yard trimmings. Pure vermicompost is highest in nitrate, but is added at a much lower rate.
Once in the field, nitrate levels found in the control, yard trimming (50T/A) and vermicompost (2T/A), do not differ significantly, yet yield benefits are seen in the compost treatments.

Electrical conductivity (EC). Strawberries are very sensitive to salinity. Increased salinity is a concern when compost is applied at high rates, especially those originating from manure. Monthly EC measurements show that steer manure and spent mushroom compost have higher electrical conductivity values throughout the season. Considering that these two also have the highest yield, these levels do not appear to threaten strawberry productivity.

Plant Growth Rate. Plant diameter is recorded on a monthly basis to track plant growth rates. Initially, compost made from steer manure and yard trimmings (50T/A) had the highest growth rate. By March, vermicompost and the control treatment had the highest growth rates and by May, all treatments had similar rates of growth.

Root health. Early in the season, plant stunting was observed in a section of the field. Symptomatic and healthy plants from this area were uprooted and sampled for black root rot-associated pathogens, *Pythium* spp., *Phytophthora* spp. and *Rhizoctonia* spp..

Roots assayed from stunted plants for black root rot pathogens	<u>Result</u>
Phytophthora spp.	(-)
Rhizoctonia spp.	(-)
Pythium spp.	(+), from several plant roots

Fig. 2 NO3-N Levels from Field Soil Surrounding Strawberry Plant Roots Grown in Compost-Amended Soil

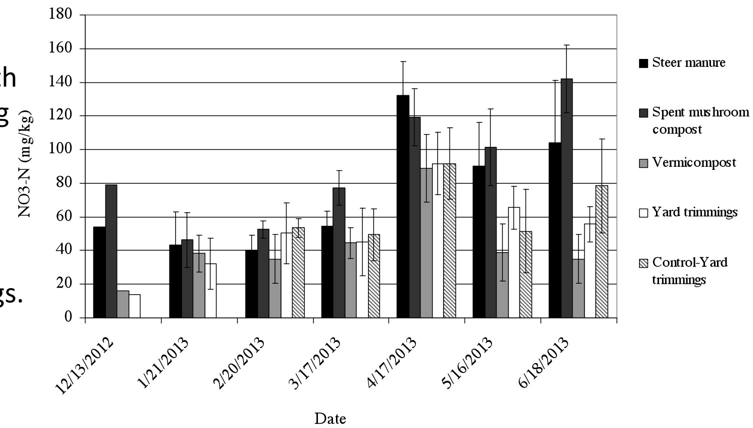

Fig. 3 Electrical Conductivity Levels from Field Soil Surrounding Strawberry Plant Roots Grown in Compost-Amended Soil

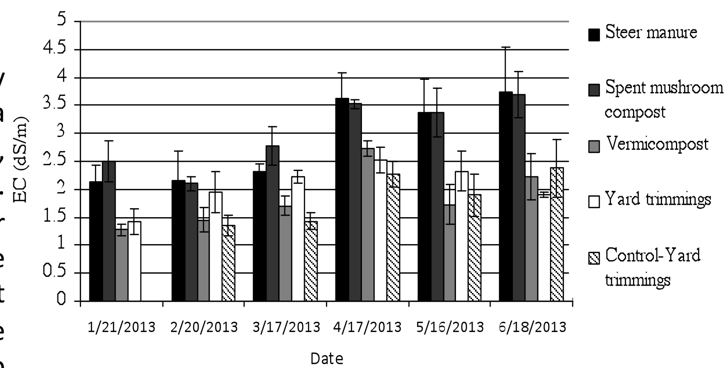

Fig. 4 Mean Relative Growth Rate of Strawberry Plants Grown in Compost-Amended Non-Fumigated Field

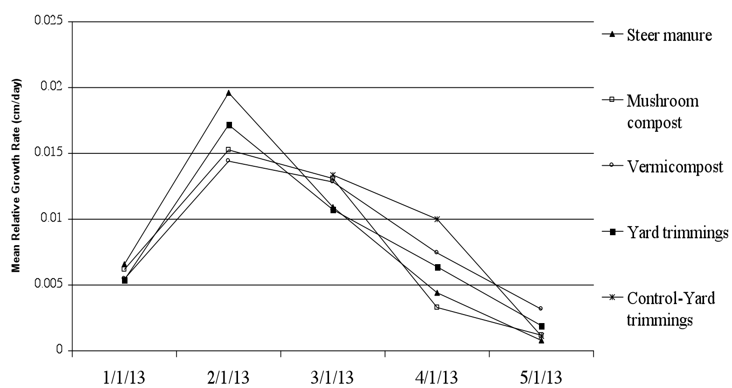

Fig. 5 Early evaluation of roots from both stunted and healthy plants

Stunted Healthy

Fig. 6 CHARACTERIZATION OF COMPOSTS

	Steer Manure Compost	Vermicompost	Spent Mushroom Compost	Yard Trimmings Compost
	 	 		
Source material	20% steer manure 30-40% green waste fines 35-45% mix of: Feed waste fr/ dairy cows Straw bedding fr/dairy stalls <5% vegetable waste	100% Composted dairy manure+ rice hull bedding fed to worms	Spent button mushroom medium. •Composted horse manure + straw •Amended with gypsum and peat post-decomposition	100% Yard Trimmings
Nitrate-N* (mg/kg)	234	380	120	6.6
pH*	8.1	7.0	7.3	7.6
EC* (dS/m)	28	7.1	4.8	4.5
C:N*	12:1	13:1	14:1	17:1
Cost	$5/T	$500/yd	$3-5/T	$21/T
Application method	Broadcast	Apply to rootzone •In planting hole •In trench	Broadcast	Broadcast
OMRI approved	OMRI Listed	OMRI Listed	OMRI Listed	OMRI Listed

*Averages based on soil tests from a minimum of two batches