Table 1. The effect of carrot variety on root size, marketable yield, and sugar level when grown in a sandy soil using reclaimed water in a drip irrigation system.

Variety	Marketable root size			No. 48-lb units/A	Sugar conc.[y] (°brix)
	Width[z] (inch)	Avg. length[y] (inch)	Wt. (oz.)		
Caro-Choice	1.17 a[x]	7.16 bc	2.31 a	365 a	8.75 a
Apache	1.04 ab	6.47 c	1.79 a	320 a	8.70 a
Six Pence	1.06 ab	7.49 ab	2.44 a	303 a	8.23 a
Caro-Best	0.96 b	7.43 ab	1.87 a	275 a	8.53 a
Caro-Pride	1.17 a	8.06 a	2.57 a	232 a	8.70 a

[z]Average width or diameter taken 2.5 inches from the crown.
[y]Sap reading taken from a section 2.5 inches from crown using a refractometer to measure brix.
[x]Mean separation in columns by Duncan's multiple range test, 5% level.

Choice', but was not found to be significantly different (Table 1). This compared favorably with the overall state yield of 302 48-lb units/acre. Variations occurred among replications due to irrigation problems and root-knot nematode injury. Nematode control achieved would not meet commercial standards required for fresh market.

Brix sugar refractometer readings were taken (Table 1) to determine if there was a variety difference. The readings ranged from 8.23 to 8.75 and were not statistically different.

These studies indicate that marketable yields of 5 varieties were similar and that yields were similar to those produced on organic soil. In conclusion, carrots can be grown on deep sandy soils, but nematodes will need to be controlled (Anonymous, 1992). An adequate irrigation system which can also be used to supply nutrients is necessary. This study used 7975 gal/acre/day of water which included line flush water and water lost due to two line breaks. The deep sandy field was never too wet for carrot production. Irrigation frequency and duration had to be increased as carrots grew and matured. The total amount of fertilizer used was 149N-58P-128K lb per acre. The total N was about 40 lb higher than recommended, but was added due to the water requirement and leaching. If drip irrigation is used, a filtering system is required. There were less differences in average root weight, yield, and brix sugar readings among the 5 varieties than expected. This indicates a quality carrot can be produced on sandy soils in central Florida using the correct cultural practices and current varieties. It should be noted that under Florida DER rules for reuse of reclaimed water, "irrigation of edible crops that will not be peeled, skinned, cooked or thermally processed before consumption using an application method that allows for direct contact of the reclaimed water on the crop is prohibited" (Anonymous, 1990). Therefore, reclaimed water may not be used on fresh market carrots at the current time.

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POLE BEAN YIELD AS INFLUENCED BY COMPOSTED YARD WASTE SOIL AMENDMENTS

S. R. Kostewicz
Horticultural Sciences Dept.
IFAS, University of Florida
Gainesville, FL 32611-0690

Additional index words. Phaseolus vulgaris, compost, organic matter.

Abstract. **Composted Yard Waste (CYW) at rates of 0, 25, 50 and 100 tons/acre were applied and incorporated into a sandy soil in the spring of 1993. These plots were superimposed on plots previously treated with identical CYW rates in 1991. The plots were split into subplots that either received a second application or did not and into fertilized and unfertilized areas. The pole bean *Phaseolus vulgaris* L. cultivar 'Dade' was planted. Pole beans grown with fertilizer significantly outyielded pole beans grown with no fertilizer regardless of compost application rate. Yields were 439 and 201 bu/acre, respectively. With the single CYW applications made in 1991, the highest yield of pole beans was with the 100 ton/acre rate (403 bu/acre). The second application of 100 ton/acre rate made in 1993, reduced the yield of beans by 14% (42 bu) as compared to the yield with the 50 ton rate. This was attributed to N tie-up from the more immature compost used in the 1993 application.**

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The composting of waste materials from urban settings has become of great interest in recent years as a means of reducing landfill volume required and in general to promote recycling and environmental awareness. A variety of materials and mixture of feedstocks for the composting processes have resulted in a wide range of materials available. Initially one material, yard waste, was of interest and was chosen because of its close approximation to traditional products having "horticulturally" useful properties including organic matter and some nutritive value when used as a soil amendment. Organic matter has been recognized as an important component useful in gardening and farming as early as 1100 B.C. (Korcak, 1992). Many texts list and discuss the benefits that may be associated with organic matter in the soil and urge good soil husbandry to maintain these levels (Pierce, 1987; Coleman, 1989). Most of the sandy soils in Florida are quite low in organic matter particularly after several years of cultivation. Applications of organic materials obtained from non-farm locations to production fields are not made because of limited availability and great expense. Recent legislative mandates have resulted in large quantities of potentially useful organic or mostly organic composted materials available on the local level. Work has been done at the home garden level with composted yard waste (CYW) as a soil amendment (Stephens and Kostewicz, 1992) and commercial use as a mulch (Roe et al., 1992) This study was undertaken to investigate the usefulness and management parameters necessary for using composted yard waste (CYW) as a soil incorporated amendment in the production of vegetables. A portion of the results of the ongoing project are reported here.

Materials and Methods

Studies were conducted in Gainesville, FL on a Loamy, siliceous, hyperthermic, Grossarenic Paleudults soil (Arrendondo fine sand) to evaluate the effects of CYW rate and fertilizer rate on the growth and yield of pole beans. The study was started during Jan. of 1991 and involved 4 rates of CYW application (0, 25, 50 and 100 tons/acre), and fertilizer rates (with fertilizer or without). Treatments were replicated three times. CYW was obtained from Wood Resources Recovery in Gainesville, Florida. The compost was well aged (1+ years) but not screened. Various crops were grown during 1991 but the field was clean fallowed during 1992. During the spring of 1993 a second application of CYW was made to one-half of each of the plots at identical rates as used in 1991. Each subplot either received fertilizer or no fertilizer. This arrangement resulted in 4 subplots as follows: (1) residual CYW and fertilizer, (2) residual CYW with no fertilizer, (3) residual and current application of CYW with fertilizer, and (4) residual and current application of CYW with no fertilizer. The subplot size was 5 feet × 5 feet. The CYW was applied on 8 Mar. and rototilled to a depth of 8 inches on 15 Mar. Fertilizer was applied using 60N-35P-66K lb/acre supplied as a 6-3.5-6.6 material and was broadcast incorporated with a rototiller prior to planting. A single row of 'Dade' pole bean was planted with a mechanical seeder on 25 Mar. Skips in the row were replanted on 2 Apr. and eventually thinned to a 6 inch spacing in the row. The fertilized plots were sidedressed twice, once on 13 May with 20N-0P-15K lb/acre from a 15-0-11.5 material and similarly on 9 June. The plants were sprayed for insects and diseases as needed with recommended materials for the crop. Beans were harvested 10 times beginning on 20 May and concluded on 28 June. Marketable pods were picked, counted and weighed and data were recorded. Following conclusion of the harvesting, soil samples for chemical analysis were taken and submitted to the IFAS extension Soil Testing Laboratory, Gainesville, Florida. Data was statistically analyzed using SAS-PC ANOVA and Regression programs.

Results and Discussion

The spring 1993 season was warm with seasonal rainfall resulting in good growth of the beans. Insect and disease pressures were light and adequatly controlled. Unfertilized beans developed a pale green color early and remained physically smaller during most of the season. The total weight of marketable pods was greater where fertilizer was used regardless of other parameters (Table 1). The yield was more than double that with no fertilizer, 439 and 201 bu/acre respectively. The interesting aspect remains that no fertilizer still resulted in a yield of 201 bu/acre. This may have been due to fertilizer and or nutrient encroachment from adjacent plots or release from organic matter or numerous other possibilities.

The number of CYW applications and CYW application rate interacted in their affect on pole bean yield (Table 2). The marketable yield of pods with the single CYW application in 1991 was the highest yield with the 100 ton/acre rate. However, with the second application made in 1993, use of the 100 ton/A rate resulted in the lowest yield of 259 bu/acre. The CYW used in 1993 was less mature and still actively decomposing at time of application as contrasted to the use of a well aged material in 1991. The use of high rates of immature CYW may have resulted in N-tie up not encountered in the 1991 season. Additionally, the single application of CYW made in 1991 may have begun

Table 1. Total marketable yield of 'Dade' pole beans as affected by fertilizer: Summer 1993.

Fertilizer	Yield (bu/acre)
Fertilizer not added	201
Fertilizer used	439
F value[z]	**
Main Effects	
Fertilizer	**
CYW app. number	ns
CYW rate	ns
Interactions	
CYW app. × fert.	ns
CYW app. × CYW rate	**
Fert. × CYW rate	ns
CYW app. × fert × CYW rate	ns

[z]- F test values denoted as not significant (ns), significant at 5% level (*) or 1% level (**).

Table 2. Total marketable yield means of 'Dade' pole beans as affected by an interaction between application rate and application time of CYW.

CYW rate (tons/acre)	CYW applications (no.) 1	2
	bu/A	
0	309	315
25	281	337
50	351	302
100	403	259
F value[z]	+L*	−L*

[z]The responses were (L) Linear and significant at the 5% level. Slope of the response was (+) positive or (−) negative.

to provide a release of nutrients and or an increase in exchange capacity for use in retention of added nutrients in the profile.

The main effect of CYW rate on soil analysis data are listed in Table 3. The K, Ca, Mg, Zn, Mn and organic matter content increased linearly with increased rates of CYW application. The soil Cu linearly decreased with increased rate of CYW application indicating that the Cu was tied up by organic matter. Although the Mn and Zn concentration *increased, these value* appear to be in a safe range. These types of compost do not in general contain excessively high concentrations of heavy metals and probably should be of little concern. Soil pH and P levels were not affected by rate of CYW applicaion.

The use of as high as 100 tons/acre of CYW appears to be useful and reasonable for pole bean production as long as adequate fertilizer to grow the crop is present. Immature CYW can result in N tie-up and reduce yield if not accounted for in the fertility program as evidenced by the 1993 application. Application of CYW appears to have a residual benefical effect since yield increased with increasing rate of residual CYW. It is unclear, however, whether that effect is due to retention of added fertilizer or release of nutrients from breakdown of the CYW.

Table 3. Main effects of CYW rate on soil chemical analysis. July 1993.

Rate of CYW (ton/acre)	pH	Mineral concn. (ppm)							OM (%)
		P	K	Ca	Mg	Cu	Zn	Mn	
0	6.96	225	26	1045	47	1.4	4.6	10	0.9
25	6.95	216	30	1125	54	1.2	4.6	11	1.2
50	6.94	215	38	1224	62	1.0	5.1	12	1.2
100	6.91	218	52	1420	76	1.0	5.7	13	1.6
F test	ns[z]	ns	L**	L**	L**	–L**	L**	L**	L**

[z]Regression analysis indicated responses were not significant (ns) or (L) linear at the (**) 1% level.

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Municipal Solid Waste (MSW) Soil Amendments: Influence on Growth and Yield of Snap Beans

M. OZORES-HAMPTON[1] AND H. H. BRYAN[2]
Tropical Research and Education Center
IFAS, University of Florida, Homestead, FL 33031

Additional index words. Phaseolus vulgaris, compost, garbage, recycling.

Abstract. **The effects of compost derived from Municipal Solid Waste (MSW) on crop growth has only been recently investigated due to current availability of these materials in large quantities. The purpose of this study was to determine the effects of MSW (Reuter compost) on plant stands, growth, and yields of snap beans (*Phaseolus vulgaris* L). MSW was incorporated into calcareous limestone soil at 0, 90, 134 t·ha⁻¹ in the fall of 1992. Plant stands and bean yields were not different among treatments. However, fresh shoot weight increased quadratically as rates of compost increased. In a second Experiment, fertilizer applications at planting were compared with a control (no fertilizer). No additional compost was applied in Experiment 2. Plant stands were the highest when no fertilizer and 90 t·ha⁻¹ of MSW were used. Total snap bean yields were higher with fertilizer at planting than with no fertilizer. Total snap bean yields increased quadratically as rates of compost increased.**

[1]Graduate Research Assistant and [2]Professor.

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Municipal solid waste (MSW) includes paper, cardboard, glass, metals, plastics, rubber, leather, textiles, wood, food waste, and yard waste. The Environmental Protection Agency (EPA) has estimated that approximately 65 percent of the MSW produced in the U.S. is reusable organic material. MSW has recently become of greater interest in the United States, since landfills across the country are near capacity, and few additional facilities have been approved for construction (Rathje, 1991). In 1992, there were 19 operating MSW composting facilities in the United States with 7 under construction and over 150 in various stages of planning (Hyatt et al., 1992). Nationally, the number of private and MSW composting ventures has more than doubled since 1989 (Gillis, 1992). The largest potential user of MSW compost is the agricultural industry (Parr and Hornick, 1992). Vegetable crops are grown on about 21,000 ha in southern Florida with the majority located near a large and growing urban population, so it presents an important potential market for compost (Ozores-Hampton, 1993).

Most benefits from MSW compost applications to soil have been attributed to improved physical properties of the soil due to increased organic matter content rather than their value as a nutrient source (Gallardo-Lora and Nogales, 1987; Hernando et al., 1986). Soils with MSW amendment has increased yields of tomatoes (*Lycopersicon esculentum* Mill.) (Maynard, 1993), tomatoes and squash (*Cucurbita maxima* Duch. Ex Lam.) (Ozores-Hampton, 1993),