Evaluation of Composted Municipal Waste as an amendment to Pine Bark for use in Container Ornamental Production

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NATURE OF WORK: For successful container nursery crop production, growers require substrates that are readily available, easy to mix and handle, economical, and have consistent and appropriate physical and chemical properties. Traditionally, pine bark has been the primary component for landscape plant production in the southeastern United States. However, concerns over erratic and highly variable supplies of pine bark have produced a need to evaluate alternative materials for use in organic container substrates. The objective of the research presented was to evaluate composted household garbage (municipal solid waste compost (MSWC)) as an amendment to composted pine bark for use as a growing substrate in container plant production.

The most promising work with MSWC is underway in McMinnville, TN, where Floyd Bouldin's WastAway Sciences has developed sophisticated municipal solid waste handling equipment and procedures to produce a composted material referred to as "Fluff". All MSWC was obtained from the WastAway Sciences Co., in McMinnville, TN following indoor composting at WastAway.

MSWC research was conducted in multiple locations with a wide range of nursery crops in 2003 and 2004 (see Table 1 for blend ratios and other details). Studies at Auburn University and CANR evaluated 5 MSWC and PB blends in 6 species (Table 1). No attempt was made to standardize the species, irrigation, fertilizer, or other cultural practices. Plant growth measurements were determined by a growth index (GI) ((height + width at widest point + width perpendicular to width at widest point)/3) measured initially through the end of the growing season. Leachates were collected by the Virginia Tech Extraction Method (Wright, 1994) for analysis. Results from one additional field trial at Greene Hill Nursery in Waverly, Ala. are also presented in Table 1.

RESULTS and SIGNIFICANCE to the INDUSTRY: Understandably, everything that goes in the kitchen trash cannot be sorted and removed at garbage processing centers. When household garbage is processed with a hammer mill or similar equipment, composted, and flushed with abundant water, many of the potential hazards from handling these materials are minimized. Physical properties are comparable to pine bark and with the exception of 'initial' EC fall within the recommended desirable range for substrates (Tables 2 and 3). Since MSWC can differ batch by batch further research is needed to characterize the range of expected components in the final products.

However, our studies at this point suggest that replacing about one-third of pine bark with MSWC can be effectively used to grow a wide variety of container plants or flowers. Grower opinions of "Fluff" were generally positive at the rates used. Determinations of product safety, quality control, and transportation costs will likely dictate wholesale acceptance in the future. In current form, the volume of "Fluff" screened to a one-inch maximum particle size is reduced by about 15%. Most of what is screened out are large pieces of plastic or other non-organic material. A concern with the initial versions of MSWC were C:N ratios ranging from 16:1 to 57:1, a variable that has become more consistent and now ranges from 25:1 to 35:1. "Fluff" is a substrate component that is compatible with automated production systems and common methods of container plant production.

Table 1. Growth[z] of container plants in blends of Municipal Solid Waste Compost (MSWC) and pinebark (PB) in 2004 at three locations.

Location	Species	100% MSWC	75:25 MSWC:PB	50:50 MSWC:PB	25:75 MSWC:PB	100% PB
Auburn	'Renee Mitchell' Azalea	49.4 ab [y]	47.6 b	50.6 ab	50.1 ab	53.9 a
	'Compacta' Holly	61.4 b	63.9 b	65.9 ab	66.0 ab	68.9 a
	'Firepower' Dwarf Nandina	53.9 a	51.6 a	52.9 a	55.5 a	53.5 a
Center for Applied Nursery Research	'Pink Ruffle' Azalea	19.6 ab	20.9 a	17.9 b	21.1 a	21.4 a
	Dwarf Yaupon Holly	17.7 ab	19.5 a	14.8 b	17.7 ab	18.0 ab
	Ternstroemia gymnanthera	26.4 ab	30.2 a	24.1 b	30.2 a	31.0 a
Greene Hill Nursery	'Cameo' Quince	NA	NA	NA	63.3 a	57.6 b
	Common sweetshrub	NA	NA	NA	54.2 a	49.5 b
	'Snow White' Indian hawthorn	NA	NA	NA	39.5 a	40.4 a

[z] Growth index (GI) determined by (height + width at widest point + width perpendicular to width at widest point/3).

[y] Means within **rows** followed by a different letter are different according to Tukey's Studentized Range (HSD) Test ($p = 0.05$).

Table 2. Physical and chemical properties of various substrate blends.

Substrate [z]	Air space[y]	WHC[y]	TP[y]	BD[x]	pH	EC[w]
100% PB	41.0	35.9	79.6	0.12	3.88	0.96
100% MSWC "Fluff"	21.0	47.2	68.2	0.31	6.4	14.08
Desirable Range[v]	10-30	45-65	50-85	0.19-0.70	5.0-6.0	0.8-1.0

[z] PB = Pine bark; MSWC = Municipal Solid Waste Compost.

[y] Air space, WHC (water holding capacity), and TP (total porosity) are on a percent volume basis.

[x] BD (bulk density) was measured in grams per cubic centimeter.

[w] EC (electrical conductivity) was measured in milli-Siemens per centimeter. EC for leachates collected from plants grown in 100% MSWC fell to 0.8 within 1 month under conventional overhead irrigation.

[v] Recommended ranges for substrates used in general nursery production (Yeager et al., SNA BMP Manual, 2000).

Table 3. Element and soil analysis of municipal solid waste compost (MSWC) material passing through a one-inch screen.*

Ca	K	Ma	P	Al	B	Ba	Cd	Co	Cr	Cu	Fe	Mn
ppm												
88.9	580.9	18.4	9.2	7.5	3.8	0.1	<0.1	<0.1	0.6	20.9	15.4	0.8

Na	Ni	Pb	Zn	NO_3-N	SS	EC mmhos/cm	pH	C:N Ratio	% C	% N	% S
	ppm										
1154.3	0.7	0.9	4.1	38.7	6650	9.5	7.86	26:1	31.55	1.22	0.292

*Analysis was conducted by Auburn University Soil Testing Laboratory using saturated extract method, February 2004.