Evaluation of Composted Household Garbage as a Horticultural Substrate

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Significance to Industry: MSWFC can be used as a partial substitute for PB or PM in container grown weeping figs. New Guinea impatiens can grow in blends with 40% MSWFC as good as in the three commercial blends compared in this study. Some bedding plants, like petunias, may not have good growth in 100% MSWFC, but MSWFC can be used to replace at least one third of the pine bark or peat moss as a substrate component for both petunias and dusty miller. Our studies suggest that a ratio of about one third MSWFC replacement can be effectively used to grow a wide variety of container plants or flowers.

Nature of Work Selection of substrates for horticultural use is often based on cost, availability, ease of handling, and reproducibility. Peat and pine or other types of bark are common substrate components for nursery growers in the United States. Availability and cost of peat and pine bark is greatly affected by the timber industry, transportation, and/or environmental conditions such that the supply can be inconsistent or unpredictable (1,2). Future supply of pine bark is predicted to be further constricted as papermills relocate outside of the United States or to regions of the country where freight costs will prohibit nursery use of the material. Additionally, pinebark use as a biofuel is increasing as EPA regulations requiring reduction in fossil fuels hit full stride early next year.

The phrase “One man’s waste is another man’s treasure” certainly applies to materials we find useful for various horticultural applications. Alternative products as substrate blending components for horticultural use in propagation and container production of landscape plants are evermore urgent. Factors such as transportation costs, consistency of product, disease and insect infestation, and availability of the various alternative materials have been the primary concerns for growers.

The objective of this study was to evaluate various blends of municipal solid waste fluff compost (MSWFC) as a horticultural substrate in (a) container growth of weeping figs (*Ficus benjamina*), and (b) growth of three bedding plant selections. MSWFC was obtained from the WastAway Services, LLC, in McMinnville, Tennessee following indoor windrowing for composting at the WastAway Processing Center in January 2004.

On February 19, 2004, four substrates were blended: 100% pine bark (PB), 50%:50% (v:v) PB:MSWFC, 75%:25% (v:v) PB:MSWFC, and 75%:25% (v:v) PB:peat (PM). Substrates were amended with 7.8 $kg \cdot m^{-3}$ (13.2 lbs/yd^3) Osmocote 18-6-12 (The Scotts Company, Marysville, OH) and 0.9 kg m^{-3} (1.5 lbs/yd^3) Micromax (The Scotts Co.). Twelve weeping figs were transplanted from 3.8 L (#1) pots to 7.6 L (#2) pots in each substrate blend. Plants were grown in a double layer polyethylene-covered greenhouse at the Paterson Greenhouse Complex, Auburn University, AL for 12 weeks. Plants were arranged in a randomized complete block design with 4 treatments per block and four blocks.

Plant growth measurements were determined in terms of growth index (GI) (height + width at widest point + width perpendicular to width at widest point/3) measured initially and then 1, 6, 12 weeks after transplanting. At the end of the study on May 12, 2004, aboveground parts (shoots) of plants were harvested. Shoot fresh weights immediately after harvest and dry weights after drying at 70^{o}C for 72 hr were recorded.

On March 17, 2004, plugs of New Guinea impatiens (*Impatiens* 'New Guinea'), were transplanted into 8 18-hole trays using one blend containing MSWFC and three commercial growing blends (Fafard 3B, Fafard 52, and ProMix), with 2 trays for each blend. The blend containing MSWFC was 2:2:1 MSWC:PM:Perlite (PLR) and was amended with the same rates of fertilizers as in the weeping fig study. Growth of impatiens was visually evaluated.

On March 17, 2004, plugs of dusty miller (*Senecio cineraria*) and petunias (*Petunia X hybrida*), were transplanted into 9 36-hole trays of three substrates with 3 trays for each species and substrate combination. Three blends were used: 100% MSWFC; 2:1 MSWC:PLR; and 1:1:1 PB:MSWFC:PLR. Initial leachates and final leachates at the end of the study were taken for determination of pH and electrical conductivity (EC). Leachates were collected weekly using the Virginia Tech Extraction Method (VTEM) (3). Leachates were analyzed using a Model 63 pH and conductivity meter (YSI Incorporated, Yellow Springs, Ohio).

Survival and growth of dusty miller and petunia were visually evaluated. At the end of the study, the shoots of dusty miller were harvested for determination of fresh and dry weights with the same procedure for weeping figs. All bedding plants were randomly placed under mist irrigation in a greenhouse at the Paterson Greenhouse Complex, Auburn University, AL for 2 months.

Results and Discussion: In the weeping fig study, plants in the 1:1 PB:MSWFC had a greater initial growth index (GI) than plants in 3:1 PB:PT. One week after transplanting, the GI of plants in 3:1 PB:MSWFC was greater than plants in 100% PB and 3:1 PB:PT (Table 1). Six weeks after transplanting, the GI of plants in 3:1 PB:MSWFC was greater than plants in 3:1 PB:PT. However, there were no significant differences on the final GI (12 weeks after transplant). Analysis also indicated a greater increase over initial GI of plants in 3:1 PB:MSWFC than plants in 3:1 PB:PT one week after transplanting. There was no difference on the increases over initial GI 6 or 12 weeks after transplanting. Fresh weights of weeping figs grown in 3:1 MSWFC:PB were greater than plants in 3:1 PB:PT, but there was no difference on the dry weights of plants across all four blends.
The New Guinea impatiens grown in the blend containing MSWFC had the best growth and color development compared with the three commercial blends, which we attribute to the additional fertilizer included only in the MSWFC blends.

The survival of petunias in the 100% MSWFC was low (less than 20%), about 50% of the petunias survived and grew well in the 2:1 MSWC :PLR blend, almost all petunias on 1:1:1 PB : MSWFC : PLR survived and grew well. Dusty miller grew well in all three blends. Analysis of the harvest shoot weight indicated no significant differences in the fresh weights of dusty miller from different blends, but dusty miller in the 2:1 MSWFC:PB had a greater dry weight than those from 100% MSWFC. Leachate analysis of the blends indicated a very high initial EC reading in the 100% MSWFC (Table 2) which may have contributed greatly to the low survival of petunias in the 100% MSWFC.

Literature Cited:

1. Shumack, R.L., D.J. Eakes, C.H. Gilliam, and J.O. Donald. 1991. Using gin trash in composted soil ingredients. Proc. Natl. Cotton Council. 1:498-499.

2. Wang, Y. and T.M. Blessington. 1990. Growth and interior performance of poinsettia in media containing composted cotton burrs. HortScience 25:407-408.
3. Wright, R.D. 1994. The pour-through method: a quick and easy way to determine a medium's nutrient availability. Amer. Nurseryman. 160(3):109-111.

Table 1. Effect of substrate blends on weeping fig growth index (GI) and shoot weight.

Treatment[z]	GI				Increases over initial GI			Fresh weight	Dry weight
	Initial[x]	1 WAP[y]	6 WAP	12 WAP	1 WAP	6 WAP	12 WAP		
100% PB	26.53ab	27.47bc	35.47ab	58.86a	0.95b	8.94a	32.33a	163.63ab[y]	43.38a
3:1 PB:MSWFC	26.72ab	30.53a	36.55a	60.11a	3.81a	9.83a	33.39a	181.26a	47.52a
1:1 PB:MSWFC	27.42a	29.61ab	35.94ab	60.86a	2.19ab	8.53a	33.44a	163.77ab	42.75a
3:1 PB:PM	24.75b	25.78c	33.08b	57.22a	1.03b	8.34a	32.47a	143.94b	39.46a

[z] PB = pine bark, PM = peat moss, MSWFC = municipal solid waste fluff compost from household garbage.
[x] Means within columns followed by a different letter are different according to Duncan's Multiple Range Test ($p = 0.05$)
[y] WAP: weeks after planting.

Table 2. Leachate analysis and effect of substrate blends on growth of dusty miller.

Treatment[z]	Fresh weight[y]	Dry weight	Initial pH	Final pH	Initial EC[x]	Final EC[x]
100% MSWFC	12.29[w]	1.81b	7.06	6.85	14.08	0.31
1:1:1 PB:MSWFC:PLR	15.49	2.49ab	7.02	6.88	9.32	0.23
2:1 MSWC:PLR	15.24	2.68a	6.34	6.86	8.42	0.37

[z] PB = pine bark, MSWFC = municipal solid waste fluff compost from household garbage, and PLR = perlite.
[y] Fresh and dry weight measured in grams.
[x] Initial and final electrical conductivity measured in millisiemens per centimeter.
[w] Means within columns followed by a different letter are different according to Duncan's Multiple Range Test ($p = 0.05$).