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Performance of Woody Ornamentals in Municipal Compost Medium under Nine Fertilizer Regimes[1]

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Abstract. **Dry weight and total plant height of *Ilex cornuta* Lindl. cv. Burfordii and *Thuja occidentalis* L. were greater in municipal compost-amended medium than in sphagnum peat moss-amended medium. *Viburnum burkwoodii* Burkwood did not show any differences in the two media. Generally, constant and biweekly liquid fertilizer regimes produced more growth than other regimes.**

Peat moss, the main organic ingredient in most container plant media, is becoming increasingly unavailable, expensive, and variable. Concern for the environment has placed emphasis on material which usually is an ecological liability. Byproducts of rice (3), sugar (9), oil cake (8), and lumber (2, 4, 8, 11) have been used successfully in container plant production. Conover and Joiner (1) found that 3 week composted municipal refuse could substitute for peat moss in potted chrysanthemum production but high soluble salt-injury has been reported with cut chrysanthemums (5). Because composting time and methods vary with municipal compost to create differences in decomposition rates, fertility levels may be a problem.

Objectives of the present study were to determine the feasibility of using municipal compost as a soil amendment in the production of 3 woody ornamentals and to evaluate 9 fertilizer regimes.

Potted liners, 6-12 months old clones, of *Ilex cornuta, Thuja occidentalis,* and *Viburnum burkwoodii* were transplanted into 2.5 liter nursery cans containing either 1 soil:1 perlite:1 sphagnum peat moss or 1 soil:1 perlite:1 processed municipal compost (all v/v). The municipal compost was produced by the City of Mobile, Alabama by removing most of the metal, rags, and large items of refuse from garbage, grinding the remainder in a hammermill, spraying with raw sewage, and composting for 12-16 weeks in windrows. Spurway analysis (10) of dilute acetic acid extracts revealed NO_3 (0-5 ppm); P 0-1 ppm); K (20-40 ppm); and Ca (100-150 ppm). The compost had a pH of 8.4 and a soluble salts reading (1:5 dilution) of 30-86 mhos. Using ammonium acetate extraction for exchangeable bases, Hiltbolt (7) reported the following analyses for this compost: total N (0.9%); total P (0.2%); K (6.0 meq/100g); Ca (42.2 meq/100g); Mg (4.3 meq/100g); and Na (15.4 meq/100g). In addition, the compost had a C/N ratio of 38.5, exchange capacity of 13.7 meq/100g, 34.2% total carbon, and negative tests for NH_4, NO_3, Cl and SO_4 ions. X-ray spectographic analysis revealed the presence of Pb, Sn, Cu, Mn, Fe, and Zn. After mixing with soil and perlite, media pH was adjusted to 6.0 using either limestone or sulfur. Sypsum was added to the compost medium at the rate of 1.7 kg per m^3 to compensate for Ca added in the form of limestone to the peat moss medium. Preliminary investigations had shown municipal compost to be low in available Ca, Fe, and P. Sheldrake[2] has indicated that high aluminum content of municipal compost ties up phosphorous. Both media received 2.5 kg per m^3 $FeSO_4$ and 1.6 kg per m^3 superphosphate and were steam pasteurized after mixing and prior to initiating the fertilizer regimes shown in Table 1.

Table 1. Description, analysis, and application method of fertilizer regimes used on woody ornamentals grown in 2 media.

Fertilizer[z]	Description and analysis (N-P-K)	Application
1. Constant (liquid feed)	Water soluble inorganic, 150 ppm N, 26 ppm P and 50 ppm K from 25—4.4—8.4.	At each watering with a pressurized, stock solution, tank proportioner.
2. Biweekly (liquid feed)	Water soluble inorganic, 615 ppm N, 108 ppm P and 207 ppm K from 25—4.4—8.4.	At watering with a venturi, open stock solution, tank proportioner.
3. Agriform tablet	12 g compressed, organic and inorganic pill, 14—1.8—5.0 plus Ca, S and Fe, controlled-release N.	Pressed in media surface (4.8kg per m^3) at planting, 9 and 13 mo.
4. Eeesy-Grow packet	28 g perforated plastic envelope containing water soluble inorganic 16—3.5—13.3, controlled release.	Placed in root zone at potting (11.2 kg per m^3).
5. Mag-Amp	Dry, inorganic combination of $MgNHPO_4$, $6H_2O$ and $MgKPO_4 \cdot H_2O_3$ 7—19.5—5.0 plus 12% Mg, medium granule, controlled release.	1.5 kg per m^3 preplant and 6 g per container (2.4 kg per m^3 at 9 and 13 mo.
6. Osmocote 18-9-9	Plastic coated, water soluble, granular inorganic, 18.0—4.0—7.5, controlled release.	Same as 5.
7. Osmocote 14—14—14	Plastic coated, water soluble, granular inorganic, 14—6.2—11.6, controlled release.	Same as 5.
8. Dry inorganic	8.0—3.5—6.6.	Same as 5.
9. Sta-Green	Combination organic and inorganic, 12—2.6—5.0 plus micronutrients, controlled release.	Same as 5.

[z]Trademark name fertilizers used (with manufacturer) were: Agriform tablet (Agriform International, Newark, Calif.), Eeesy-Grow packet (Specialty Fertilizer Inc., Suffern, N.Y.), Osmocote (Sierra Chemical Co., Newark, Calif.), and Sta-Green (Sta-Green Plant Food, Sylacauga, Ala.).

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[2]Personal communication from Raymond Sheldrake, Jr., Dept. of Vegetable Crops, Cornell Univ., Ithaca, N.Y.

Table 2. Growth of 3 woody ornamentals grown in a municipal compost-amended medium and a sphagnum peat moss-amended medium (average of all fertilizer regimes).

Media	*Ilex cornuta* Dry wt (g) per plant	*Ilex cornuta* Height (cm)	*Thuja occidentalis* Dry wt (g) per plant	*Thuja occidentalis* Height (cm)	*Viburnum burkwoodii* Dry wt (g) per plant	*Viburnum burkwoodii* Height (cm)
Soil-perlite-compost	119.4a[z]	49.1a	152.1a	37.2a	58.1a	39.7a
Soil-perlite-peat	101.1b	42.7b	129.3b	34.3b	58.4a	39.1a

[z]Mean separation in columns by Duncan's multiple range test, 5% level.

Fertilizer regimes were selected on the basis of preliminary research, literature review, and manufacturers' recommendations. While differing in source, total amount, and rate of nutrients available, these regimes were supposed to produce satisfactory growth of container-grown plants. Treatments were started on May 13, 1969 and except for the Eeesy-Grow packet, all dry fertilizers were reapplied as indicated in Table 1.

Plants were grown outside in full sun under field conditions with 15 cm spacing between containers. A factorial design with 3 replications, 3 species and 4 plants per treatment was used. Data on size were recorded on all plants 17 months after initiation of treatments. Two plants of each species per treatment were selected at random for dry wt determinations.

Ilex and *Thuja* plants grown in the compost-amended medium were heavier and taller than plants grown in the peat-amended medium (Table 2). Visually, the foliage color and density of *Ilex* plants grown in compost-amended medium exceeded that of *Ilex* plants grown in compost-amended medium exceeded that of *Ilex* plants grown in peat-amended medium. Growth measurements of *Viburnum* plants did not show differences in the 2 media (Table 2).

Dry wt of *Ilex* plants fertilized biweekly with 615 ppm N, 108 ppm P, and 207 ppm K exceeded that of plants fertilized on all other regimes except constant feeding, 150 ppm N, 26 ppm P and 50 ppm K; Osmocote 18-9-9; and Osmocote 14-14-14. *Thuja* and *Viburnum* plants produced the greatest dry wt on constant feeding and biweekly regimes.

Ilex plants grown on constant or biweekly fertilization regimes had similar heights which exceeded plants grown on all other regimes except Agriform tablet and Osmocote 18–9–9 (Table 3). Heights of *Thuja* were similar on all fertilizer regimes except Mag-Amp which were shortest. *Viburnum* was tallest with constant, biweekly, Eeesy-Grow, and Osmocote 18–9–9 regimes; shortest under dry inorganic, and Sta-Green regimes.

The ultimate aim of any fertilizer program is to maintain a constant optimum level of nutrients in the medium (6). Our results suggest constant (150 ppm N, 26 ppm P, and 50 ppm K) and biweekly (615 ppm N, 108 ppm P and 207 ppm K) provided the best results. Mag-Amp, dry inorganic, and Sta-Green regimes provided the poorest results. Favorable growth results were obtained, in some instances, with controlled release fertilizer regimes involving Osmocote 18–9–9, Agriform tablets, and Eeesy-Grow packets.

The successful use of municipal compost as an organic component in a medium used for growing woody ornamentals is the significant finding of this research.

Table 3. Growth of 3 woody ornamentals grown under 9 fertilizer regimes irrespective of media.

Species / Fertilizer regime	Dry wt (g)	Height (cm)
Ilex cornuta Burfordii		
1	134.3ab[z]	52.5a
2	138.8a	52.6a
3	108.1bcd	49.1abc
4	94.4cd	44.1cd
5	92.3d	40.7de
6	114.7abcd	51.1ab
7	122.5abc	46.1bcd
8	94.2cd	37.1c
9	99.1cd	41.3de
Thuja occidentalis		
1	207.2a	37.2a
2	191.5a	37.4a
3	132.4bc	36.2a
4	148.3b	36.6a
5	100.8d	31.7b
6	140.9bc	37.0a
7	121.0bcd	36.1a
8	113.1cd	34.6ab
9	113.2cd	35.1a
Viburnum burkwoodii		
1	99.4a	45.0ab
2	99.4a	49.6a
3	50.3b	38.7bc
4	60.9b	45.1ab
5	28.3c	31.8c
6	54.4b	42.9ab
7	56.6b	39.1bc
8	28.0c	29.2c
9	42.4bc	31.9c

[z]Mean separation for species in columns by Duncan's multiple range test, 5% level.

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Anthocyanins of Cornaceae, *Cornus kousa* Hance and *Cornus florida* L.[1]

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Both *Cornus kousa* and *C. florida* are dogwood plants widely grown for ornamental purposes. The fruits of *C. kousa* are attractive and edible, and are