**Cooperative Extension Service**
C/T/A/H/R
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

***Horticulture Research Note***
**June 1997**
**HRN-10**

# Plant Growth in Potting Media Using Compost

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## Objective

To evaluate the potential of using composted waste materials with volcanite in a potting media misture, a follow-up experiment was conducted based on earlier results (Rauch 1996)

## Methods

A comprehensive media trial was conducted using compost from a composting experiment conducted jointly by CTAHR's Departments of Animal Sciences and Biosystems Engineering (UH compost). The compost consisted of equal parts animal waste and waste paper from the public school lunch program. This material was milled to pass through a 0.5-inch screen. The composted material was mixed with volcanite in various ratios (3:1, 2:1, 3:2, 1:1, and 2:3 volcanite:compost by volume) and volcanite mixed with wood shavings (1:1 and 2:3) was used as a control. A local commercial compost was included for the privet and chrysanthemum trial, and a commercial potting mix (Micapeat) was included for the chrysanthemum trial.

Each mix in these trials was amended with 4 oz Osmocote (18-6-12), 7 oz dolomitic lime, and 7 oz superphosphate per cubic foot. Medium samples were taken at the start and end of the trials for analysis by the CTAHR Agricultural Diagnostic Service Center.

Plants grown in this study were Japanese privet (*Ligustrum japonicum*), green ti (*Cordyline fruticosa*), Gold-dust croton (*Codiaeum variegatum* 'Gold-dust'), and White Spider chrysanthemum (*Chrysanthemum* 'White Spider').

**Gold-dust croton.** Six-inch long, well rooted cuttings of Gold-dust croton were potted singly in each of the seven mixes (Table 1). The pots were arranged in a randomized complete block design with 10 replications. The plants were established in the greenhouse and moved to outdoor growing benches after three weeks. They were maintained with a liquid fertilizer (20:20:20) at the rate of 4 oz/gal every two weeks. Height measurements were made at monthly intervals. Plants were cut at the soil surface after seven months and the fresh weight of tops was determined.

**Green ti.** Well rooted, terminal cuttings of green ti were potted in each of seven mixes (Table 3). They were arranged in a randomized complete block design with five replications. The plants were maintained in a glasshouse at the Magoon Research Facility with a 200 ppm constant-feed regime. Plant growth was determined by height measurements each month.

**Japanese privet.** Well rooted, 8-inch terminal cuttings of privet were potted in each of nine mixes (Table 5). Treatments were arranged in a randomized block design on outdoor benches after establishment in a glasshouse. The plants were maintained with liquid fertilizer (20:20:20) at the rate of 4 oz/gal every two weeks. Plant growth was determined by height measurements each month. The plants were cut at the soil surface after six months, and fresh weight was determined.

**White Spider chrysanthemum.** Rooted cuttings of white spider chrysanthemum were planted, three per pot, in each of 10 mixes (Table 7). The pots were maintained in a glasshouse and given 200 ppm of a complete fertilizer with each watering. They were arranged in a randomized block design with five replications. The plants were given a hard pinch after two weeks. Data collected at the conclusion of the study were increase in plant height, fresh weight of top growth, number of lateral breaks, foliage color rating, and percent open flowers.

## Results

**Gold dust croton** growth was excellent and uniform in all mixes tested, as indicated by plant height increase

**Table 1. The growth of Gold-dust croton in a volcanite potting mix with various organic amendments.**

| | | Plant height (cm) at wks after potting: | | | | | |
|---|---|---|---|---|---|---|---|
| Amendment | % | 10 | 14 | 20 | 24 | 29 | Fresh weight of tops (g) at 7 mo |
| UH compost | 25 | 24 | 27 | 33 | 38 | 52 | 166 |
| UH compost | 33 | 22 | 27 | 33 | 39 | 49 | 157 |
| UH compost | 40 | 21 | 24 | 30 | 36 | 47 | 131 |
| UH compost | 50 | 24 | 26 | 31 | 36 | 49 | 153 |
| UH compost | 60 | 24 | 28 | 33 | 38 | 50 | 166 |
| Wood shavings | 50 | 24 | 27 | 33 | 38 | 50 | 141 |
| Wood shavings | 60 | 25 | 28 | 34 | 39 | 50 | 150 |

and fresh weight of the tops after seven months (Table 1). There was little difference in the pH of the various mixes at planting time, with some change over time (Table 2). However, salinity varied significantly within the various mixes of the trial, increasing with compost content. These differences were not apparent when the mixes were tested after 20 and 30 weeks, because salinity decreased with time.

**Green ti** had excellent growth in each of the mixes, with no significant differences between the treatment means (Table 3). The soil test results showed a high initial salt content in the mixes containing compost, but the salinity levels were down to acceptable levels at the conclusion of the trial (data not shown).

**Japanese privet** growth was significantly influenced by the potting mix (Table 4). Height differences were apparent after two months and were most apparent in plant height and fresh weight of the tops after six months, when the trial was terminated. Growth in the UH compost mixes was slightly better than in the wood-shavings mixes (Fig. 1) and significantly better than in the commercial compost. There was a positive correlation between the amount of compost in the mix and plant growth, with the heaviest plants occurring in the 1:1 volcanite:UH-compost medium (Fig. 2). Again, there was a significant drop in both pH and salinity over time (Table 5).

**White spider chrysanthemum.** Shortly after potting, the cuttings in the UH compost mix developed chlorotic foliage. The chlorosis was rated after two weeks, with 1 = normal green color and 3 = severe chlorosis. The chlorosis was directly correlated with the percent of compost in the mix

**Table 2. Salinity (mmhos/cm) and pH of potting mixes containing volcanite and various organic amendments used to grow Gold-dust croton.**

| Organic Amendment | % | Planting time | | 20 weeks | | 30 weeks | |
|---|---|---|---|---|---|---|---|
| | | pH | Salinity | pH | Salinity | pH | Salinity |
| UH compost | 25 | 7.2 | 7.4 | 5.6 | 2.9 | 6.2 | 1.0 |
| UH compost | 33 | 7.2 | 8.4 | 5.6 | 3.4 | 6.4 | 1.2 |
| UH compost | 40 | 7.0 | 10.8 | 5.5 | 3.8 | 6.1 | 1.1 |
| UH compost | 50 | 7.4 | 18.0 | 5.6 | 3.3 | 6.5 | 1.0 |
| UH compost | 60 | 7.2 | 18.0 | 5.5 | 3.9 | 6.9 | 1.5 |
| Wood shavings | 50 | 7.4 | 1.9 | 5.4 | 3.6 | 5.9 | 1.1 |
| Wood shavings | 60 | 6.2 | 3.0 | 5.4 | 3.6 | 5.9 | 1.1 |

**Table 3. The growth of green ti in a volcanite potting mix with various organic amendments.**

| Amendment | % | Plant height (cm) at weeks after potting: | | | | |
|---|---|---|---|---|---|---|
| | | 9 | 14 | 18 | 23 | 28 |
| UH compost | 25 | 36 | 45 | 53 | 57 | 62 |
| UH compost | 33 | 32 | 41 | 48 | 55 | 64 |
| UH compost | 40 | 37 | 46 | 53 | 57 | 64 |
| UH compost | 50 | 33 | 41 | 46 | 51 | 56 |
| UH compost | 60 | 32 | 41 | 47 | 53 | 61 |
| Wood shavings | 50 | 32 | 50 | 49 | 54 | 61 |
| Wood shavings | 60 | 37 | 47 | 53 | 56 | 64 |

**Table 4. The growth of Japanese privet in a volcanite potting mix with various organic amendments.**

| Organic amendment | % | Plant height (cm) at months after potting: | | | | Fresh weight (g) of tops after 6 mo |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 5 | 6 | |
| UH compost | 25 | 4.0 a[z] | 9.8 ab | 19.3 cd | 24.2 cd | 128 de |
| UH compost | 33 | 5.8 a | 13.7 a | 31.2 ab | 83.4 a | 156 bcd |
| UH compost | 40 | 6.8 a | 14.8 a | 30.8 ab | 35.9 abc | 176 ab |
| UH compost | 50 | 4.5 a | 10.2 ab | 37.5 a | 42.4 a | 185 a |
| UH compost | 60 | 5.9 a | 12.0 ab | 36.2 a | 42.6 a | 165 abc |
| Wood shavings | 50 | 5.1 a | 5.6 b | 29.3 abc | 39.3 a | 150 bcd |
| Wood shavings | 60 | 4.7 a | 6.4 b | 27.9 abc | 37.0 ab | 142 cde |
| Com. compost | 50 | 6.7 a | 10.7 ab | 14.1 d | 21.7 d | 117 e |
| Com. compost | 60 | 3.2 a | 9.6 ab | 20.5 bcd | 25.5 bcd | 138 cde |

[z]Mean separation within columns by duncan's Multiple Range Test, 5% level.

**Figure 1. Comparison of growth of Japanese privet in potting mixtures of volcanite 1:1 (v:v) with each of three organic matter sources.**

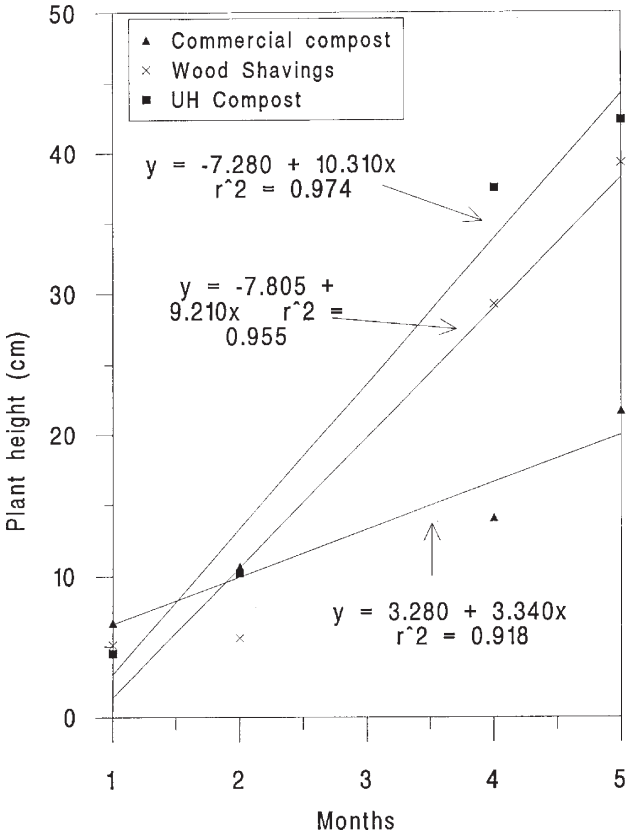


**Figure 2. Influence of compost content of potting mixtures with volcanite on growth of Japanese privet after six months.**

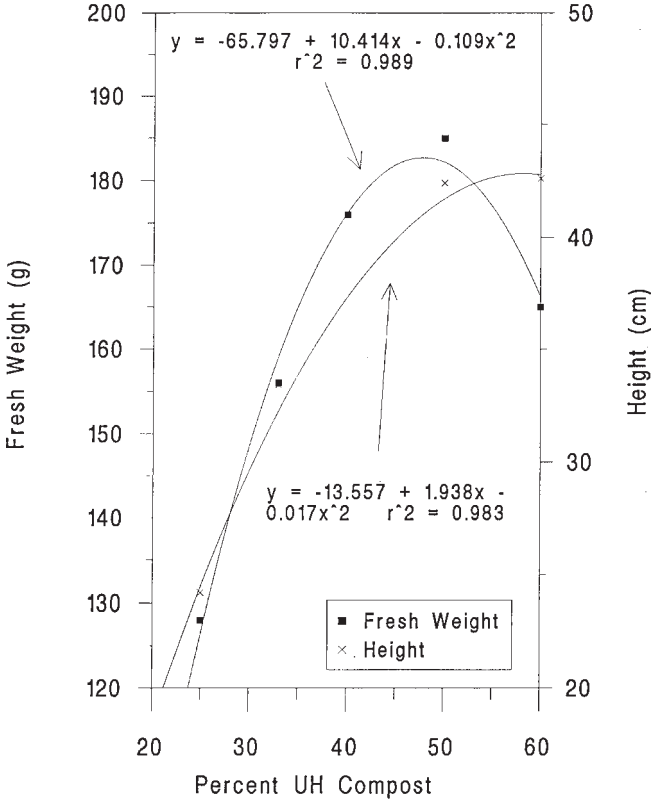


**Table 5. Salinity (mmhos/cm) and pH of potting mixes containing volcanite and various organic amendments used to grow Japanese privet.**

| Organic amendment | % | At planting time pH | At planting time Salinity | After 6 months pH | After 6 months Salinity |
|---|---|---|---|---|---|
| UH compost | 25 | 7.2 | 7.4 | 5.8 | 3.7 |
| UH compost | 33 | 7.2 | 8.4 | 5.8 | 2.6 |
| UH compost | 40 | 7.0 | 10.8 | 5.8 | 3.4 |
| UH compost | 50 | 7.4 | 18.0 | 5.9 | 4.0 |
| UH compost | 60 | 7.2 | 18.0 | 6.0 | 3.4 |
| Wood shavings | 50 | 7.4 | 1.9 | 5.8 | 3.5 |
| Wood shavings | 60 | 6.2 | 3.0 | 5.7 | 3.2 |
| Com. compost | 50 | 6.0 | 9.6 | 5.7 | 3.1 |
| Com. compost | 60 | 6.2 | 6.2 | 5.9 | 2.4 |

and the salinity of the original potting mix (Tables 6, 7).

The growth of chrysanthemum plants was similar in all of the volcanite mixes, with significantly taller and slightly heavier plants in those amended with wood shavings and generally shorter plants in those amended with the UH compost (Table 6).

There were differences found in the number of lateral breaks produced per plant and the percentage of flowers that were open after three months, but this did not seem to be correlated with the organic amendments.

Plants grown in Micapeat were severely reduced in their growth and development. This is probably due to the increased irrigation frequency to provide sufficient moisture for the well drained volcanite mixes, which resulted

in over-watering conditions with the high peat mix.

Very little difference was found in the cation exchange capacity, moisture holding properties, or the bulk density among any of the mixes tested (Table 8).

## Summary

This study demonstrates that a composted blend of animal manures and waste paper materials is a suitable organic component for combination with locally available cinder products for use in a potting mix for container-grown plants. The primary limitation would be with the production of salt-sensitive plants, due to the high soluble salt levels from the animal waste. However, it appears that this problem can be reduced by using the material in a well drained mix and leaching it prior to or at potting time.

## Literature cited

Rauch, F.D. 1996. Preliminary evaluation of compost for potting media mixtures. (This volume.)

**Table 6. The growth of White Spider chrysanthemum in a volcanite potting mix with various organic amendments.**

| Organic amendment | % | Plant height (cm) | Fresh weight (g) | Breaks (no.) | Color rating[y] | Open flowers (%) |
|---|---|---|---|---|---|---|
| UH compost | 25 | 58.4 c[z] | 13.8 b | 6.2 abc | 1.4 c | 42 cd |
| UH compost | 33 | 60.8 c | 14.8 ab | 6.9 a | 1.8 b | 37 d |
| UH compost | 40 | 61.6 bc | 12.8 b | 5.2 cde | 2.0 b | 60 abc |
| UH compost | 50 | 58.2 c | 13.2 b | 5.6 bcd | 3.0 c | 46 cd |
| UH compost | 60 | 52.6 d | 14.4 b | 6.5 ab | 3.0 c | 52 bcd |
| Wood shavings | 50 | 66.2 a | 14.2 b | 5.4 bcd | 1.0 d | 44 cd |
| Wood shavings | 60 | 66.8 a | 16.8 a | 5.9 abcd | 1.0 d | 57 abc |
| Com. compost | 50 | 65.6 ab | 14.6 b | 4.9 de | 1.0 d | 69 ab |
| Com. compost | 60 | 61.0 c | 14.6 b | 5.8 abcd | 1.0 d | 73 a |
| Micapeat | — | 48.6 d | 4.2 c | 4.2 e | 1.0 d | 16 e |

[y]1 = normal green color, 3 = severe chlorosis.
[z]Mean separation within columns by Duncan's Multiple Range Test, 5% level.

**Table 7. Salinity (mmhos/cm) and pH of potting mixes containing volcanite and various organic amendments used to produce White Spider chrysanthemus.**

| Organic amendment | % | Planting time | | After 3 wks | | After 12 wks | |
|---|---|---|---|---|---|---|---|
| | | pH | Salinity | pH | Salinity | pH | Salinity |
| UH compost | 25 | 7.2 | 7.4 | 6.7 | 3.0 | 7.2 | 1.9 |
| UH compost | 33 | 7.2 | 8.4 | 6.7 | 4.4 | 6.8 | 1.9 |
| UH compost | 40 | 7.0 | 10.8 | 6.7 | 3.7 | 6.9 | 2.2 |
| UH compost | 50 | 7.4 | 18.0 | 6.8 | 4.2 | 7.0 | 2.4 |
| UH compost | 60 | 7.2 | 18.0 | 6.8 | 2.7 | 6.8 | 2.6 |
| Wood shavings | 50 | 7.4 | 1.9 | 6.4 | 4.3 | 6.3 | 2.6 |
| Wood shavings | 60 | 6.2 | 3.0 | 6.4 | 4.8 | 6.9 | 1.6 |
| Com. compost | 50 | 6.0 | 9.6 | 6.3 | 6.4 | 6.7 | 2.1 |
| Com. compost | 60 | 6.2 | 6.2 | 6.5 | 3.8 | 7.1 | 1.8 |
| Micapeat | — | 5.2 | 1.7 | 7.1 | 0.6 | 7.6 | 1.4 |

**Table 8. The analysis of volcanite potting mixes with various organic amendments used to produce White Spider chrysanthemums.**

| Organic amendment | % | CEC (me/100 g) | Moisture holding capacity (%) | Moisture equivalent (%) | Bulk density (g/cc) |
|---|---|---|---|---|---|
| UH compost | 25 | 4.9 | 41.8 | 20.5 | 0.88 |
| UH compost | 33 | 4.6 | 46.3 | 20.3 | 0.85 |
| UH compost | 40 | 5.3 | 52.3 | 21.9 | 0.82 |
| UH compost | 50 | 6.8 | 66.7 | 27.0 | 0.69 |
| UH compost | 60 | 9.8 | 58.0 | 28.5 | 0.62 |
| Wood shavings | 50 | 7.3 | 71.9 | 30.3 | 0.56 |
| Wood shavings | 60 | 5.6 | 46.5 | 20.5 | 0.71 |
| Com. compost | 50 | 8.0 | 66.7 | 24.9 | 0.61 |
| Com. compost | 60 | 7.1 | 52.9 | 21.2 | 0.68 |