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Potential Use of Crushed Fruit Shells of West Indian Mahogany as a Potting Media Ingredient

Christopher Ramcharan and John M. Gerber
Assistant Horticulturist and Horticulturist, Agriculture Experiment Station, College of the Virgin Islands, Kingshill, St. Croix

Crushed fruit shells of West Indian mahogany were evaluated as a potting soil media ingredient, both pure and mixed with sand in a 1:1 ratio by volume. Results indicated that the fruit shell/sand mixture was equal to a commercial growing medium for production of healthy, attractive croton plants.

West Indian mahogany *(Swietenia mahagoni* Jacq.) grows throughout the island of St. Croix, Virgin Islands, where it is used as a major part of the road landscape, a good storm-resistant shade tree, and a valuable source of lumber (*5*). This tree grows 1 to 2 feet in height per year and flowers and fruits abundantly. The fruit, a woody, pear-shaped capsule 2 to 4 inches long, is shed during the dry months of the year. Fruits are collected and sometimes harvested by the Forestry Division of the Virgin Islands, Department of Agriculture, for seed extraction. Fruit shells are then heaped and abandoned. Several crop residue materials have been tested as growth media for potted plants with varying degrees of success (*1, 3, 6*). At present, the increasing cost of imported soil media ingredients is a major limiting factor in the production of high-quality potted plants in St. Croix. This experiment explored the possibility of using a local crop residue (mahogany fruit shells) as a substitute for imported media ingredients.

Materials and Methods

Plants of croton *(Codiaeum sp.* var. *Mortii)* were obtained from the Virgin Islands Department of Agriculture. They had recently been air-layered and potted in 1/2-gallon tin containers using soil. Mahogany fruit shells that had been aged for 6 months were shredded using a 3-horsepower Gibson Compost Shredder-Grinder with a sieve plate modified to 1/4 inch. Particle size of the end product ranged from a fine dust to thin fragments 1/4 inch long. A sharp sand obtained from local streams (guts) was mixed with the crushed mahogany shells in a 1:1 ratio by volume. Commercial mix consisting of imported peat and perlite mixed in equal parts with gut sand and soil was bought from a local nursery. Osmocote 14-14-14 was incorporated in all mixes at 4 ounces per cubic foot and Peter's soluble trace element at 1 ounce per cubic foot. The mixtures were made on July 13,1979, and rooted croton plants were potted on July 17,1979, using 1/2-gallon plastic containers.

Experimental design was a completely randomized 2 by 3 factorial consisting of two levels of fertilizer and three soil media mixes. Fertilizer treatment solutions were F_1—Osmocote alone (1 tablespoon per gallon of water) and F_2—Osmocote plus Peter's soluble 20-20-20 mix (1 tablespoon of each per gallon) applied as a soil drench at 1-1/2 pints of solution per pot. Soil media treatments were Ml-pure crushed mahogany fruit shells, M_2—crushed shells plus gut sand in a 1:1 ratio by volume, and M_3—local commercial mix. Each combined treatment was applied to 10 plants so that there were a total of 60 plants. During the first week, plants were kept under a 50-percent shade netting and then moved to full sunlight. Soluble fertilizer treatments were made biweekly starting on July 31. Plants were hand watered, as needed, with cistern rainwater. For 3 months starting August 17, growth measurements were taken of plant height measured .from the rim of the pot to the apical point and plant width at the widest point of the foliage.

Visual grading on a scale of 1 to 5, based on plant size, plant to pot ratio, and general attractiveness of foliage, was done at the termination of the experiment. Data were analyzed by analysis of variance method and treatment means separated by Duncan's new multiple range test.

Results and Discussion

Without additional soluble fertilizer (F_1), growth increases were not significantly different among the three soil mixes except at 12 weeks (table 1, fig. 1). Plants receiving the additional soluble fertilizer (F_2) grew as well in the mahogany shells and sand (M_2) as in the commercial mix (M_3), but better than in the pure mahogany shell media (table 1, fig. 2). There were no differences between plants grown in pure shells with soluble fertilizer (F_2M_1) and

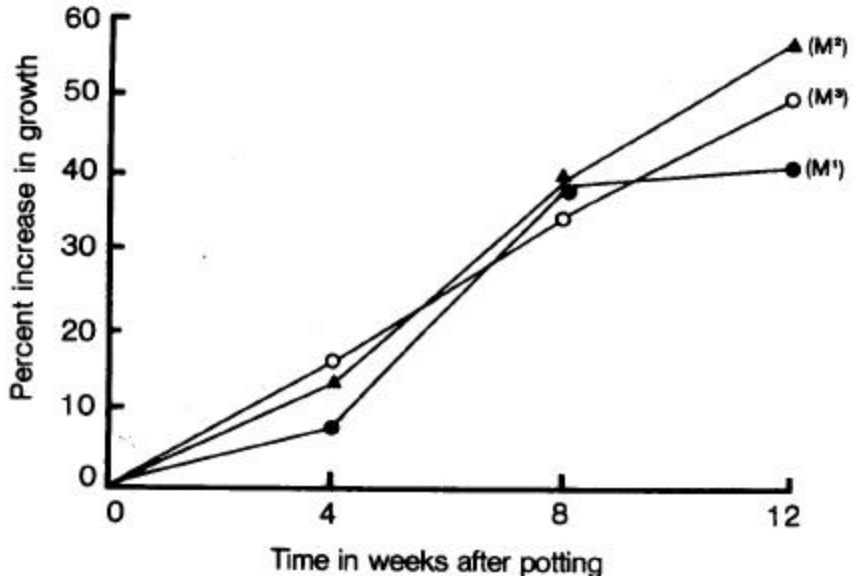

Figure 1.—*Effects* of *three soil media with slow-release fertilizer (F1) on growth* of *croton var.* Mortii *at three monthly intervals.*

Table 1.—*Effects of media and fertilizer on growth and appearance of croton var.* Mortii

Media and fertilizer Treatments[1]	Percent increase In growth[2]			Visual grade (1-5)[3]
	4 weeks	8 weeks	12 weeks	12 weeks
F_1M_1	7.2a*	38.1a	40.8a	3.0a
F_1M_2	12.1a	38.3a	56.2bcd	4.3b
F_1M_3	14.8a	34.5a	49.6ad	3.0a
F_2M1	10.8a	40.4a	44.5ac	3.3a
F_2M_2	54.2b	55.7b	73.1 a	4.7b
FM_3	50.5b	56.3b	63.4eb	3.4a

[1]F_1 = Slow-release fertilizer, F_2 = Slow-release and soluble fertilizer, M_1 = Pure mahogany shells, M_2 = Mahogany shells and gut sand, M_3 = Commercial media.

[2]Index $\left(\frac{\text{height and width}}{2}\right)$ used as growth measurement.

[3]1 = Plants with noncompact unhealthy appearance. 5 = Plants with compact, attractive foliage.

*Means followed by one or more of the same letters do not differ significantly at the 5-percent probability level.

any of the three soil mixes without soluble fertilizer (F_1M_1, F_1M_2, F_1M_3) (table 1). However, at the final growth measurement (12 weeks), the F_1M_2-treated plants had a growth increase similar to the F_2M_1 and F_2M_3 plants (table 1). Two weeks after potting, plants in pure shells without soluble fertilizer (F_1M_1) showed yellowing of basal leaves, an indication of nitrogen deficiency. An application of ammonium sulphate (21-0-0) at 1 tablespoon per pot was sufficient to clear up chlorosis.

In the visual grading, F_1M_2 and F_2M_2 treatments were superior to all others (table 1). This was mainly because of the more luxuriant growth and almost complete absence of weeds in these treatments. Plants grown in the local commercial mix (M_3) grew well, particularly with added soluble fertilizer (F_2M_3); but because of the inclusion of soil in this mix, there were many weeds. Weed species identified were wild or Creole senna *(Phyllanthus niruri* L.), tan tan (Leucaena leucocephala), paletaria (Peperomia pellucida), Pilea sp., and milkweed *(Euphorbia hirta* L.).

A chemical analysis of crushed mahogany fruit shells (table 2) showed the material to be quite high in nutrients except for nitrogen. This would indicate a high C:N ratio and hence the reasons for the chlorosis of plants in the pure mahogany mix (M_1) and the need for added nitrogen in the form of ammonium sulphate. The more aged the crop residue material, the better it is for

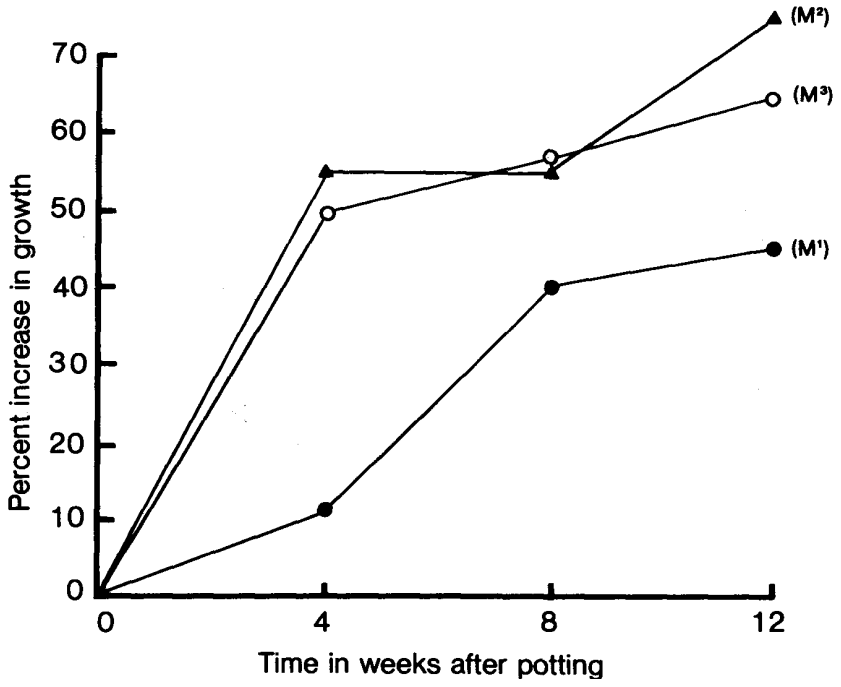

Figure 2.—*Effects of three soil media with slow-release and soluble fertilizer (FZ) on growth of croton var.* Mortii *at three monthly intervals.*

Table 2.—Chemical composition of a dried, crushed sample of fruit shells of West Indian mahogany (Swietenia mahagoni *Jacq.)* [1]

N	P	K	Ca	Mg	NO_3	Zn	Mn	Cu	Fe	B
%					P/m					
0.24	13.0	496	242	53	20	66.3	34.9	22.8	17.4	0.9

[1]The chemical analysis Is from the United States Testing Company, Inc., Memphis Laboratory, Memphis, Tenn.

potted plants (*2*), so mahogany shells older than 6 months may be even more suitable. Shells also had a good pH, a high cation exchange capacity, and low soluble salts indicative of a good media (*4*). Pure shells held the plants fairly firmly, but the mixture of shells and sand (M_2) held the plants better. Also, the crushed shells were fairly clean, as evidenced by the almost total absence of weeds from pots in which the shells were used. This is an important economical aspect of growing potted plants. The mixture of sand and shells showed no apparent shrinkage, while the pure shells did. The M_1 and M_2 treatments also allowed for good fibrous root development with little evidence of rootbound plants at the end of the experiment. Plants in the M3 mix did not have as good a root structure and many of the roots grew out of the pots at the end of the experimental period.

Availability and costs are other important aspects of a potting medium (4). Mahogany fruits are available for most of the year, and a good supply of cracked fruit shells is available at the Forestry Division, Virgin Islands Department of Agriculture. This medium is therefore cheap and readily available, and its use would convert a by-product into a valuable resource.

The overall results showed that croton plants grew just as well or even better in a mixture of crushed mahogany fruit shells and sand than in a commercially prepared mix containing peat and perlite. For faster, more luxuriant growth, a water-soluble fertilizer should be used in addition to a slow-release fertilizer. However, if plants are to be kept in pots for more than 3 months, there is no need for additional soluble fertilizer. If 6-month-old fruit shells are used alone, plants must be treated with additional nitrogen such as ammonium sulphate. Best weed-free growth and most attractive foliage occurred with a mixture of crushed shells and gut sand.

A wider variety of foliage and floral plants needs to be tested in such a potting medium. However, this initial investigation does indicate that the fruit shells of the West Indies mahogany can be a suitable alternative for expensive imported peat used in the pot plant industry of St. Croix.

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