Crushed Fruit Shells of West Indian Mahogany (*Swietenia mahagoni* Jacq.) as a Potential Potting Media Constituent[1]

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ABSTRACT

Crushed fruit shells of West Indian Mahogany were evaluated as a potting soil medium constituent with Croton (*Codiaeum* sp. var Mortii) as a test plant. Crushed fruit shells, both pure and mixed in a 1:1 ratio by volume with sand was compared to a local commercial potting mix consisting of peat, sand, perlite and soil. Results showed that the fruit shell/sand mixture was just as good as the commercial mix for production of healthy attractive croton plants. Application of a soluble and a slow release fertilizer incorporated with soil mix gave better results than slow release fertilizer used alone.

INTRODUCTION

The West Indian Mahogany (*Swietenia mahagoni* Jacq.) grows throughout the island of St. Croix, USVI where it is used as a major part of the road landscape, a good storm resistant shade tree and as a valuable source of lumber (5). This tree grows 1–2 feet in height per year and flowers and fruits abundantly. The fruit, a woody pear shaped capsule 2–4", is shed during the dry months of the year. Fruits are collected and sometimes harvested by the Forestry Division of the Virgin Islands, Dept. of Agriculture, for seed extraction. Fruit shells are then heaped and abandoned. Several crop residue materials have been tested with varying results as growth media for potted plants (1, 4, 6). At present the increasing costs of imported soil media constituents limit 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 potting media constituents.

MATERIALS AND METHODS

Plants of croton var. Mortii were obtained from the Virgin Islands Dept. of Agriculture. These had recently been air layered and potted in ½-gallon tin containers of soil. Six-month-old aged mahogany fruit shells were shredded in a 3-hp Gibson Compost Shredder-Grinder[3] with a sieve

[1] Manuscript submitted to Editorial Board April 23, 1980.

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[3] Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

plate modified to ¼ in. Particle size of the end product ranged from a fine dust to thin fragments ¼ in long. A sharp sand obtained from local streams (guts) was mixed in a 1:1 ratio by volume with crushed mahogany shells. Commercial mix consisting of imported peat, 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 oz/ft^3 and Peter's soluble trace element at 1 oz/ft^3. Mixtures were made on July 13, 1979 and rooted croton plants were potted on July 17, 1979 in ½-gal 6-in plastic containers.

Experimental design was a 2 × 3 factorial consisting of 2 levels of fertilizer and 3 soil media mixes. Fertilizer treatments were F_1, osmocote alone; and F_2, osmocote plus Peters soluble 20-20-20 mix applied as a soil drench at 1½ pints/pot of a solution containing 1 tbsp/gal. Soil media treatments were M_1, pure crushed mahogany fruit shells; M_2 crushed shells plus gut sand 1:1 volume; and M_3, local commercial mix. Each combined treatment was applied to 10 plants; thus there were a total of 60 plants. For the first week plants were kept under a 50% shade netting and then moved to full sunlight. Soluble fertilizer was applied biweekly, starting July 31. Pots were hand watered as needed with cistern rain water. Starting August 17, and continuing for 3 months, growth measurements were taken of the height of plants measured from the rim of the pot to the apical point and width of plant at widest point of foliage. A visual grading of 1 to 5, based on plant size, plant:pot ratio, and general attractiveness of foliage was taken at the termination of the experiment. Data was subjected to analysis of variance and treatment means compared with Duncan's New Multiple Range Test.

RESULTS AND DISCUSSIONS

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 in the mahogany shells and sand (M_2), grew as well as in the commercial mix (M_3), and better than in the pure mahogany shells (table 1, fig. 2). There were no differences among plants grown in pure shells with soluble fertilizer (F_2M_1) and 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 that of 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) did show yellowing of basal leaves, an indication of nitrogen deficiency. An application of ammonium sulphate (21-0-0) at 1 tbsp/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 due to the more luxuriant growth and almost complete absence of weeds in these treatments. Plants grown in

TABLE 1.—*Effects of media and fertilizer on growth and appearance of croton var mortii*

Media and fertilizer treatments[1]	Percentage increase in growth[2] $\frac{H + W}{2}$			Visual grade (1–5)[3]
	4 wks	8 wks	12 wks	12 wks
F_1M_1	7.2a[4]	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_2M_1	10.8a	40.4a	44.5ac	3.3a
F_2M_2	54.2b	55.7b	73.1e	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 $\frac{\text{Height + Width}}{2}$ used as growth measurement.

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

[4] Means with the same letter or set of letters do not differ significantly at the 5% probability level.

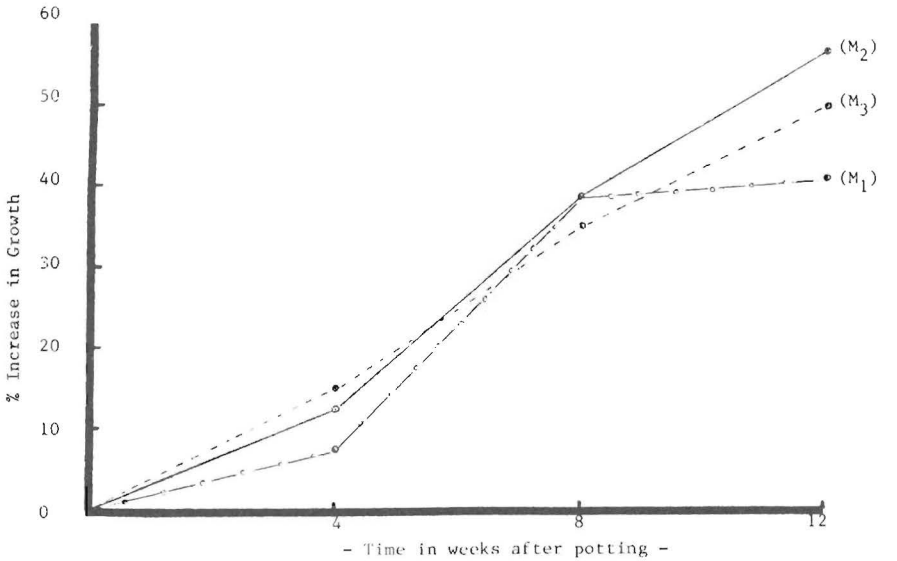

FIG. 1.—Effect of 3 soil media with slow release fertilizer (F_1) on growth of Croton Var. Mortii at 3 monthly intervals.

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 reason 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 potted plants (2); therefore, 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 medium (3). Pure shells held the plants fairly firm, 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 they are used. This is an important economic aspect in growing

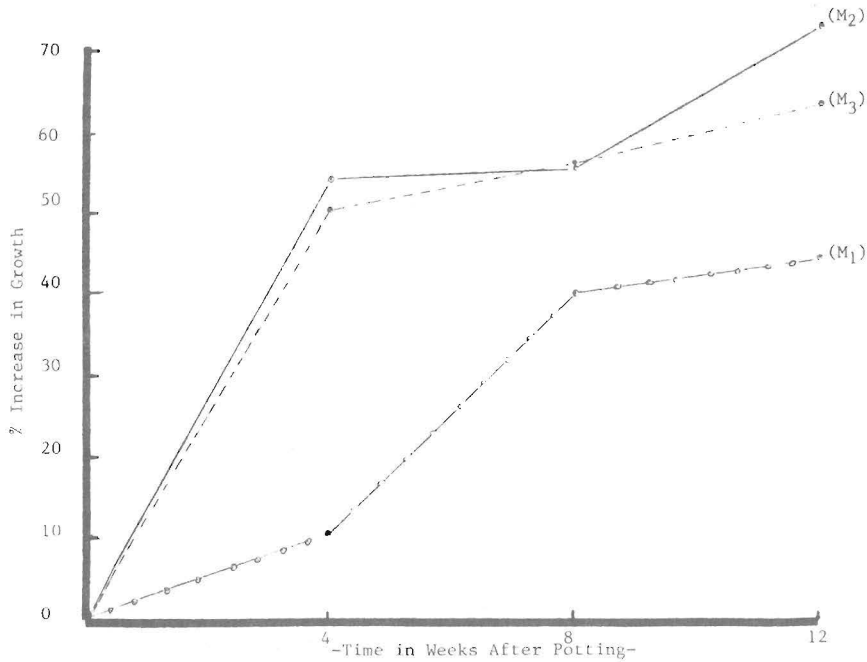

FIG. 2.—Effect of 3 soil media with slow release and soluble fertilizer, (F_2) on growth of Croton Var. Mortii at 3 monthly intervals.

TABLE 2.—*Chemical composition of 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 in solution (1.5)*									
0.24	13.0	496	242	53	20	66.3	34.9	22.8	17.4	0.9

[1] Chemical analysis from United States Testing Company, Inc. Memphis Laboratory, Memphis, Tennessee.

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 a good fibrous root development with little evidence of root-bound plants at the end of the experiment. Plants in the M_3 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 (3). Mahogany fruits are found for most of the year, and a good supply of cracked fruit shells is available at the Forestry Division of VIDA. This medium is therefore cheap, readily available and its usage would convert an unsightly by-product to 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, then there is no need for additional soluble fertilizer. If 6-mo-old fruit shells are used alone, plants must be treated with additional nitrogen fertilizer 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 need to be tested in such a potting medium. However, this initial investigation alone indicates that the fruit shells of West Indian mahogany is a suitable alternative for expensive imported peat used in the pot plant industry of St. Croix.

RESUMEN

Las cáscaras de frutas aplastadas del caobo dominicano se evaluaron como ingrediente en mezclas de tierra para plantas en tiestos. Para observar el efecto de las diversas mezclas se usó el crotón (*Codiaeum* sp. var. Mortii). Las cáscaras aplastadas de las frutas, puras y mezcladas con arena a razón de 1:1 por volumen, se comparanon con una mezcla comercial de arena, turba, perlita, y tierra. Los resultados demostraron que la mezcla de la cáscara de la fruta y arena era tan buena como la comercial para la producción de plantas atractivas y saludables de crotón. La aplicación de un abono soluble y otro de acción retardada incorporados a la mezcla de tierra, dio mejores resultados que la aplicación del segundo solamente.

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