

Growth of Two Tropical Foliage Plants Using Coir Dust as a Container Medium Amendment

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Summary. Growth of *Ravenia rivularis* Jumelle and Perrier (majesty palm) and 'Lady Jane' *Anthurium* Schott was compared in container media, using as a primary organic component sphagnum peat, sedge peat, or coir dust. Growth index and shoot and root dry weights of majesty palm were significantly higher in the coir than the sedge peat medium. Growth index and shoot dry weight were only marginally higher for the *anthurium* in the coir vs. sedge peat medium, and root dry weights were comparable. Both crops grew equally well in the coir and the sphagnum peat medium. The sedge peat medium had the most air porosity and the least water-holding capacity of the three media at the initiation of the trials, but at termination showed a reversal of these parameters. The coir medium showed the least change in these parameters over 8 months. High-quality coir dust appears to be an acceptable substitute for sphagnum or sedge peat in soilless container media.

Sphagnum peat and sedge peat are the most common types of peat used in horticultural growing media, with sedge peat

regarded as the inferior material due to its lack of uniformity and tendency to lose volume when wet (Bunt, 1988; Cresswell, 1992). Both are harvested from wetland ecosystems at rates considered "nonsustainable" by wetland ecologists (Barber, 1993; Barkham, 1993; Buckland, 1993). While the peat industry argues that peatlands can be managed at sustainable levels (Robertson, 1993), it recognizes that alternatives to peat must be developed to meet environmental concerns of consumers and contend with increased regulation of peatland exploitation (Bragg, 1991; Robertson, 1993).

Coir pith or dust is the short fiber and dust left behind after the long fibers (coir) of the thick middle layer of the coconut fruit (*Cocos nucifera* L.) are extracted from husks and used in manufacturing. It is light to dark brown and consists primarily of 0.2- to 2.0-mm particles (75% to 90%). It is primarily lignin (about 70%) and cellulose (about 30%), with a C : N ratio of 80:1 (Meerow, 1994). Unlike sphagnum peat, it contains no sticks or other extraneous matter. Coir dust is hydrophilic relative to sphagnum peat and dehydrates readily (Cresswell, 1992).

The following qualities of coir dust recommend its use as an organic component in growing media (Cresswell, 1992): 1) high water-holding capacity equal or superior to sphagnum peat, 2) excellent drainage equal to sphagnum peat, 3) absence of weeds and pathogens, 4) greater physical resiliency (withstands compression of baling better) than sphagnum peat, 5) renewable resource—no ecological drawbacks to its use, 6) decomposes more slowly than sedge or sphagnum peat, 7) acceptable pH, cation-exchange capacity, and electrical conductivity, and 8) easier wetability than peat.

Excess Cl has been reported in coir dust from sources other than Sri Lanka (Cresswell, 1992; Handreck, 1993). Coir tends to be high in Na and K (Handreck, 1993) compared to the other peats, but Na is leached readily from the material under irrigation (Handreck, 1993). The most significant, but easily remedied, drawback to coir pith is variation in quality ii-em source to source (Handreck, 1993). So far, commercial operations in Sri Lanka (the world's leader in coir production) have established a high quality standard for use as a growing medium.

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Table 1. Growth of 'Lady Jane' Anthurium and Ravenia rivularis in coir-, sedge peat-, and sphagnum peat-based media.

Species	Medium	Growth* index (cm)	Dry wt (g)	
			Shoot	Root
Lady Jane <i>Anthurium</i> (n = 20)	Coir	58.30*	18.49*	10.61 ^{NS}
	Sedge	53.35	14.88	12.33
	Coir	52.73 ^{NS}	22.62 ^{NS}	12.93 ^{NS}
	Sphagnum	57.06	24.03	12.12
<i>Ravenia rivularis</i> (n = 25)	Coir	9.16**	120.83***	53.35**
	Sedge	8.36	83.74	35.99
	Coir	7.67 ^{NS}	69.93 ^{NS}	21.40 ^{NS}
	Sphagnum	7.53	75.71	22.81

*Net increase in leaf number was used as the growth index for *Ravenia rivularis*.

NS, *, **, ***Nonsignificant or significant at $P < 0.05$, 0.005, or 0.0005, respectively.

I previously reported on the growth-of two short-production-term (3 to 5 months) crops in a coir-based medium (Meerow, 1994). The objective of this study was to assess the performance of coir dust on two longer-term (8 months) tropical foliage crops.

Materials and methods

In the first experiment, 20 liners of 'Lady Jane' *Anthurium* and 25 liners of *Ravenia rivularis* (majesty palm) were potted into 1- and 2-gallon containers, respectively, of 5 aged but noncomposted pine bark : 4 sedge peat or coir pith : 1 coarse sand (by volume) on 13 Apr. 1993. In the second experiment; 15 liners of the same species were potted into 1-gallon containers of 5 aged but noncomposted pine bark : 4 sphagnum peat or coir pith : 1 coarse sand (by volume) on 8 Aug. 1993. All media were amended with 16 lb/yd³ (9.5 kg·m⁻³) Osmocote 17N-2.3P-10K (10 to 14 months, Grace-Sierra, Milpitas, Calif.), 7 lb/yd³ (4.16 kg·m⁻³) dolomite, and 2 lb/yd³ (1.2 kg·m⁻³) Micromax (Grace-Sierra). Replicate plants of each treatment were arranged in a completely randomized design under 63% shade [max photosynthetic photon flux (PPF) = 800 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, anthurium] or 50% shade (max PPF = 1100 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, majesty palm) with daily overhead irrigation or rainfall. Height (base to highest point in canopy) and width (distance between widest two points in canopy) for each replication of anthurium were measured at inception and again at termination, from which a growth index was calculated (net change in height plus net change in width). For majesty palm, the most

recently emerged leaf was tagged at inception, and number of leaves produced was used as the growth index. At termination, shoots and roots were harvested, dried, and weighed. The first experiment (coir vs. sedge peat) was terminated on 20 Dec 1993, and the second experiment (coir vs. sphagnum) was terminated on 20 Apr. 1994. Data were analyzed by analysis of variance. Physical parameters, pH, and conductivity (EC) of the media were determined at inception and again at termination for three replicate 1-gallon container samples of each medium exposed to the same growing conditions as the plants, but in which no plant was grown. The pH and EC were measured using the saturated paste extract method (Bunt, 1988). Physical parameters were determined in 1-gallon containers (column height = 12.5 cm) using protocols from Ingram et al. (1990). The coir dust used for this

study (EZ Peat; EZ Soil Co., Idabel, Okla.) originated in Sri Lanka and was received as highly compressed 20 × 10 × 5-cm bricks. These were dehydrated according to manufacturer's instructions before incorporation into media.

Results and discussion

A coir-based medium produced a marginally higher growth index and shoot dry weight in the anthurium than in the same plant grown in sedge peat-based medium (Table 1). Root dry weights were statistically comparable, however. For majesty palm, all three growth parameters were significantly higher for plants grown in the coir-based medium (Table 1). For both crops, there was no significant difference in growth between plants produced in coir-based vs. sphagnum-based media (Table 1).

The sedge peat-based medium had the greatest percentage air space and the lowest water-holding capacity of the three media at the initiation of the trials, but at termination showed considerable reversal of these parameters (Table 2). The coir-based medium showed the least change over the 8 months of this study. The higher initial air porosity of the sedge-based medium may have been conducive to better initial root growth of the anthurium, as this plant is epiphytic in nature.

No evidence of Cl or Na toxicity was observed on the plants in this study grown in the coir-based medium, and EC measurements (Table 3) indicated low levels of total dissolved salts. The high K concentrations appeared to have no demonstra-

Table 2. Physical characteristics of coir-, sedge peat-, and sphagnum peat-based media. Mean (SD) of three samples.

Medium	Air space (%)		Water-holding capacity (%)	
	Initial	8 months	Initial	8 months
Coir	13.7 (0.7)	9.7 (0.5)	35.7 (1.2)	39.8 (1.2)
Sedge	23.1 (2.7)	8.5 (0.8)	29.8 (1.4)	46.7 (0.6)
Sphagnum	14.5 (1.5)	8.1 (1.1)	36.9 (1.1)	45.3 (0.5)

Table 3. The pH and electrical conductivity (EC) of coir-, sedge peat-, and sphagnum peat-based media. Mean (SD) of three samples.

Medium	pH		EC (dS·m ⁻¹)	
	Initial	8 months	Initial	8 months
Coir	5.6 (0.1)	6.3 (0.1)	3.1 (1.3)	0.31 (0.13)
Sedge	5.6 (0.2)	6.7 (0.2)	2.4 (1.5)	0.40 (0.07)
Sphagnum	4.9 (0.1)	6.3 (0.2)	2.6 (0.9)	0.36 (0.20)

bly negative affects and maybe a positive feature of the material.

These data largely confirm previous results with 'Starburst Pink' *Pentas lanceolata* (Forssk.) Defiers after 3 months, and, in part, 'Maui' *Ixora coccinea* L. after 5 months (Meerow, 1994). Both crops grew better in coir vs. sedge medium. *Pentas* grew equally well in coir and sphagnum peat medium. Growth index and shoot dry weight of *Ixora* were moderately lower in the coir-based medium than the sphagnum peat-based medium, although root dry weights were equal. This difference may have been caused by nitrogen draw-down in the coir medium (Cresswell, 1992; Handreck, 1993).

Based on the results reported here and elsewhere (Cresswell, 1992; Handreck, 1993; Labey, 1991; Meerow, 1994; Pryce, 1991; Radjagukguk et al., 1983; L. Smith, unpublished data; R. Wehl, unpublished data), high-quality coir dust appears to be an acceptable substitute for sphagnum or sedge peat in soilless container media, although nutritional regimes may need to be adjusted on a crop-by-crop basis. Coir pith is higher in pH than sphagnum (Cresswell, 1992; Handreck, 1993) (Table 3) and may require less liming for use in media. Coir dust already is used widely in Europe and Australia (Coghlan, 1992; Labey, 1991). The key issues in developing widespread use of this material in American horticulture will be price (currently equal to sphagnum peat) and ensuring consistent quality of the coir dusts that enter the marketplace.

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