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Coir (Coconut Mesocarp Pith) as a Peat Substitute

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Peat used in soilless container media for commercial plant production is harvested from wetland ecosystems at rates considered non-sustainable 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 in order to meet environmental concerns of consumers and contend with increased regulation of peatland exploitation (Bragg, 1990; Robertson, 1993).

Previously (TropicLine 6(2): 1-4), I reported on the potential of coir dust (the short fibers and dust left behind after the industrially valuable long fibers of coir are extracted from the coconut husk) as a peat substitute. Here, I report on tests of coir dust as a 40% constituent in media for four oramental crops: ixora, pentas, majesty palm, and anthurium.

Materials and Methods

In the first experiment, 30 liners of *Ixora coccinea* 'Maui' and *Pentas lanceolata* 'Starburst Pink,' and 20 liners of *Anthurium* 'Lady Jane' were potted into 3.7 liter containers of 5:4:1 (v:v) non-composted pine bark, either sedge peat or coir pith and sand on 13 Apr 1993.

Twenty-five liners of *Ravenea rivularis* (Majesty palm) were potted into 7.4 l containers of the same medium. In the second experiment, 15 liners of the same species were potted into 3.7 liter containers of 5:4:1 (v:v) non-composted pine bark, either sphagnum peat or coir pith and sand on 8 Aug 1993. All media were amended with 9.5 kg.m-3 Osmocote 17N-2.3P-10K, 4.16 kg.m-3 dolomite, and 1.2 kg.m-3 Micromax. Fifteen to thirty replicate plants, respectively for the two experiments, of each treatment were arranged in a completely randomized design in full sun (max PPF=2100 umol.m-2.sec-1; ixora and pentas), 50% shade (majesty palm) or 63% shade (anthurium) and irrigated as necessary. Height and width measurements were taken at inception and again at termination from which a growth index was calculated (net change in height + net change in width). At termination, tops and roots were harvested, dried, and weighed. For the ixora and pentas, the first trials were terminated on 27 Jul 1993 (*Pentas*) and 7 Sep 1993 (*Ixora*); the second

on 8 Nov 1993 (*Pentas*) and 4 Jan 1994 (*Ixora*). The anthuriums and majesty palms were harvested on 15 Dec 1993 (coir/sedge trials) and 4 Apr 1994 (coir/sphagnum trials).

Data were analyzed using ANOVA and Tukey's Studentized Range test. Physical parameters, pH and conductivity (eC) of the media were determined at inception and again at termination for three replicate samples of each medium exposed to the same conditions as the plants, but in which no plant was grown. Measurement of pH and eC used the saturated paste extract method (Bunt, 1988).

Results

Pentas, ixora and majesty palm grown in coir-based media were superior in all growth parameters measured to those grown in sedge peat-based media (Table 1). The ixora in particular averaged nearly a fourfold, sixfold, and fivefold increase in growth index, top dry wt and root dry wt, respectively, in the coir-based medium as compared to sedge peat. The anthurium had significantly better top weight and growth index in the coir-based medium, but root dry weight equal in both sedge and coir-based medium. However, the differences in growth between sedge-grown anthurium and coir-grown anthurium were not as significant as with the other crops.

The sedge peat-based medium had the greatest per cent 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 3). The coir-based medium showed the least change in these parameters over time.

There were no significant differences between growth, top or root dry weight of anthurium or majesty palm in coir-based vs. sphagnum peat-based media. Growth and top dry weights were similar for coir- and peat-grown pentas, but root dry weight was greater for coir-grown pentas plants (Table 2). The ixora had significantly greater growth and top dry weight in the sphagnum peat-based medium versus coir, but no difference in root dry weight (Table 2). These differences were not as large as observed between coir and sedge peat.

The better growth of ixora in sphagnum-based medium as compared to coir-based medium could have been due to nitrogen drawdown in the coir-based medium.

Conclusions

On the basis of plant growth parameters, coir pith was superior to sedge peat as a medium component (though only marginally for the anthurium) and at least equal to sphagnum peat for all crops tested except ixora. In this latter case, higher rates of nitrogen fertilization might have overcome the difference. The physical characteristics of coir pith appear more stable over time than either sedge peat or sphagnum peat.

For most plant producers in the United States, the primary decision on whether to use this

material as a substitute for peat will likely be economic, and secondarily environmental. Sedge peat, despite its disadvantages, is very inexpensive relative to sphagnum. If high quality coir dust can be brought into the United States at a price competitive with sphagnum peat, it should find a ready market among users of the latter.

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Table 1. Growth of *Pentas lanceolata* 'Starburst Pink,' *Ixora coccinea* 'Maui,' *Anthurium* 'Lady Jane,' and *Ravenea rivularis* in coir- and sedge peat-based media.

Species	Medium	Growth Index[z]	Top dry wt.	Root dry wt.
		(cm)	(g)	(g)
Pentas lanceolata 'Starburst Pink'	Coir	72.89[ay]	51.18[a]	10.39[a]
	Sedge	61.01[b]	28.19[b]	5.07[b]
Ixora coccinea 'Maui'	Coir	62.53[a]	44.22[a]	11.10[a]
	Sedge	17.93[b]	7.63[b]	2.50[b]
Anthurium 'Lady Jane'	Coir	58.30[a]	18.49[a]	10.61[a]
	Sedge	53.35[b]	14.88[b]	12.33[a]
Ravenea rivularis	Coir	9.16[az]	120.83[a]	53.35[a]
	Sedge	8.36[b]	83.74[b]	35.99[b]

[z]Net increase in leaf number was used as the growth index for *Ravenea rivularis*

[y]Mean separation by Tukey's Studentized Range Test. Means within each comparison with the same letter are not significantly different

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Table 2. Growth of *Pentas lanceolata* 'Starburst Pink,' *Ixora coccinea* 'Maui,' *Anthurium* 'Lady Jane,' and *Ravenea rivularis* in coir- and sphagnum peat-based media.

Species	Medium	Growth Index[z]	Top dry wt.	Root dry wt.
		(cm)	(g)	(g)
Pentas lanceolata 'Starburst Pink'	Coir	59.40[ay]	46.13[a]	7.00[a]
	Sphagnum	55.66[a]	43.83[a]	6.16[b]
Ixora coccinea 'Maui'	Coir	40.37[b]	24.86[b]	7.04[a]
	Sphagnum	54.91[a]	31.88[a]	7.01[a]
Anthurium 'Lady Jane'	Coir	52.73[a]	22.62[a]	12.93[a]
	Sphagnum	57.06[a]	24.03[a]	12.12[a]
Ravenea rivularis	Coir	7.67[az]	69.93[a]	21.40[a]
	Sphagnum	7.53[a]	75.71[a]	22.81[a]

[z]Net increase in leaf number was used as the growth index for *Ravenea rivularis*

[y]Mean separation by Tukey's Studentized Range Test. Means within each comparison with the same letter are not significantly different

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Table 3. Physical characteristics of coir-, sedge peat- and sphagnum peat-based media. Mean of three samples (std dev).

Medium		**% Air space %**			**Water-holding capacity**	
	Initial	**After 5 mos.**	**After 8 mos.**	**Initial**	**After 5 mos.**	**After 8 mos.**
Coir	**13.7 (0.7)**	**11.0 (0.2)**	**9.7 (0.5)**	**35.7 (1.2)**	**39.2 (1.0)**	**39.8 (1.2)**
Sedge	**23.1 (2.7)**	**9.7 (1.0)**	**8.5 (0.8)**	**29.8 (1.4)**	**45.4 (2.0)**	**46.7 (0.6)**
Sphag.	**14.5 (1.5)**	**8.5 (0.8)**	**8.1 (1.1)**	**36.9 (1.1)**	**43.4 (0.6)**	**45.3 (0.5)**

Table 4. pH and eC of coir-, sedge peat- and sphagnum peat-based media. Mean of three samples (std dev).

Medium		pH				eC (dS/m)	
	Initial	After 5 mos.	After 8 mos.		Initial	After 5 mos.	After 8 mos.
Coir	5.6 (0.1)	6.3 (0.1)	6.3 (0.1)		3.1 (1.3))	1.6 (0.6)	0.31 (0.13)
Sedge	5.6 (0.2)	6.6 (0.3)	6.7 (0.2)		2.4 (1.5)	1.7 (1.2)	0.40 (0.07)
Sphag.	4.9 (0.1)	6.1 (0.0)	6.3 (0.2)		2.6 (0.9)	1.4 (0.9)	0.36 (0.20)