

Investigation of the Suitability of Compressed Coir Fiber Pith (Jiffy -7C Pellets) for Production of Rooted Canes of *Polyscias balfouriana* 'Marginata', *Codiaeum variegatum* 'Pictum' and *Cordyline fructicosa* 'Purple Compacta'.

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ABSTRACT

Polyscias balfouriana 'Marginata', *Codiaeum variegatum* 'Pictum' and *Cordyline fructicosa* 'Purple Compacta' are generally propagated by cane cuttings. They are highly demanded foliage plants in the export market. Use of an appropriate rooting medium for the exportation of these plants is of vital importance. "Jiffy -7C Pellets" are compressed blocks of coir pith manufactured by incorporating desirable properties for root growth.

An experiment was conducted to evaluate the suitability of Jiffy-7C Pellets for the production of rooted canes of above plants in comparison to the conventional media namely net pots containing coir dust, coir pots filled with coir dust and Oasis. Treated cane cuttings (rooting hormone and wax treated) of standard size were potted and maintained in a propagator. Treatments were arranged in a Completely Randomized Design with three replicates. Shoot growth (maximum shoot length, average shoot length, number of shoots and number of leaves) and root growth parameters (maximum root length, average root length, number of roots and root dry weight) were recorded at two weeks intervals up to 8 weeks of planting.

Growth parameters of the three plant varieties were significantly affected by the growing medium. Jiffy-7C Pellets and net pots with coir medium resulted the best performance in root growth and shoot growth of canes. However, based on the desirable properties possessed by Jiffy-7C Pellets such as being a purified substrate, easy transportability, easy handling and transplanting with minimal root damages, it can be recommended as a standard rooting medium for the production of rooted canes in above mentioned plants.

KEYWORDS: *Codiaeum variegatum* 'Pictum', Coir fiber pith, *Cordyline fructicosa* 'Purple Compacta', Jiffy -7C Pellets, *Polyscias balfouriana* 'Marginata'.

INTRODUCTION

The international market place for floricultural products is blooming with possibilities, for any supplier in any part of the world, to provide a reliable and regular supply of high quality products. This market is sophisticated and demanding due to severe competition among supplying countries. Sri Lanka has become a leading floriculture production centre in Asia. The growing of floricultural products for export in Sri Lanka is of recent origin (Silva, 1994). In 2002, the demand for live plants in world trade was 43% of the total demand of floricultural products. In 2003, total earnings by Sri Lanka from live plants exportation amounted Rs.625mn (Anon, 2002). It has made remarkable progress within a short period, in acquiring the technology of growing high quality plants that conform to international standards and also in creating a good image and demand for these products in Western Europe, Japan, Middle East and other markets.

Plants with attractive leaves grown indoors as well as outdoors are considered as foliage plants and are one of the most demanding floricultural products. Sri Lankan growers supply a wide range of foliage plant products such as rooted cuttings, unrooted cuttings, cut foliage and pot plants to the export market (Bandara, 1997). Products having a high demand in the European and Japanese markets include rooted cuttings, unrooted cuttings and cut foliage of plant species such as *Ficus*, *Schefflera*, *Codiaeum*, *Calathea*, *Polyscias*, etc. (Ilangasinghe, 1997).

Polyscias balfouriana 'Marginata' belongs to the family Araliaceae and it is a shrubby plant having quite large, glossy, green leaves with white margin

(Henny *et al.*, 2002b). *Codiaeum variegatum* 'Pictum' belongs to the family Euphobiaceae. It has an erect strong stem and the mature leaves have patterns in different colours (Henny *et al.*, 2002a). *Cordyline fructicosa* 'Purple Compacta' which has purple colour foliage belongs to family Agavaceae.

Cane cutting is an easy method of propagating some overgrown, leggy house plants such as *Codiaeum*, *Polyscias*, *Cordyline* and canes are a highly demanded, popular product category of these plants. However, rooting and growth of these cuttings consume a longer time than tip cuttings.

Selection of appropriate growing media is of crucial importance in the exportation of foliage plants. The selected propagation medium should be easily obtainable, uniform and available in abundance. A pH of 5.5-6.5 in the propagation medium will result in satisfactory rooting of most of the foliage plants while a water holding capacity of 50-75% by volume will be favourable (Jianjun and McConnell, 2002).

Jiffy-7C Pellets are compressed coir pith blocks enclosed in a minimal netting film of non woven material. The substrate used in Jiffy-7C is produced from carefully selected raw materials and designed to provide a stable and controlled environment for propagation of plants from seeds, cuttings or tissue culture (Anon, 2004).

However, sufficient research work has not been carried out to study its suitability for the production of rooted canes in given species. Therefore, this study was initiated to evaluate the growth performances of three selected foliage plants grown in Jiffy-7C Pellets

in comparison to their performance in other conventional growing media.

MATERIALS AND METHODS

The study was carried out at the OMEGA Green (Pvt.) Limited, Badalgama (Low Country Intermediate Zone; IL1) from February to May, 2005.

Canes of 10cm size were obtained from healthy mother plants. The upper end of the cane was waxed and the bottom end was treated with a rooting hormone (Secto).

Net pot filled with coir dust (T1-control), Coir pot filled with coir dust (T2), Oasis (T3) and Jiffy -7C Pellets (T4) were used as rooting media.

The canes were planted inserting at least one node into the medium. Pots were arranged in trays, at a spacing of 5 x 5cm and kept in a propagator covered with 600 gauge white polythene up to eight weeks. The propagators were located in a net house with 63 percent shade.

The experiment was arranged in a Completely Randomized Design with three replicates. Each treatment had 20 cuttings per replicate and altogether, 720 cuttings were taken from the three species per trial. Two plants were selected randomly from each species and used for data recording from two weeks after planting to eight weeks, with two weeks interval. Maximum root length (cm), maximum shoot length (cm), average root length (cm), average shoot length (cm), number of shoots, number of roots, number of leaves and root dry weight (g) (oven dried at 80°C for 24 hrs) were recorded.

Electrical Conductivity (EC) and pH of each medium were measured with portable conductivity meter (model TD Scan 4) and pH meter (model AGB-72) respectively. Other cultural practices of foliage plants were carried out according to the recommendations of the OMEGA Green (Pvt.) Ltd. (Anandatissa, 2005). The data generated from the experiment was statistically analyzed using General Linear Model (GLM) and Kruskal-Wallis method of Statistical Analysis System (SAS, 1991).

RESULTS

During the experimental period the average temperature and relative humidity inside the propagator were 33°C and 90% respectively.

Table 2. Growth of *Polyscias balfouriana* 'Marginata' canes in different rooting media at 8 weeks of planting.

Rooting Media	Root Growth (8WAP)				Shoot Growth (8WAP)			
	Max. Root length (cm)	Avg. root length (cm)	No. of roots	Root dry weight (g)	No. of shoots	Max. shoot length (cm)	Avg. shoot length (cm)	No. of leaves
T1	4.5 ^{ab}	4.30 ^a	11	0.14 ^{ab}	4	10.30 ^a	9.96 ^{ab}	6
T2	3.83 ^b	3.66 ^b	2	0.12 ^b	4	8.66 ^b	8.50 ^b	7
T3	4.40 ^{ab}	4.23 ^{ab}	6	0.13 ^b	4	9.43 ^{ab}	9.63 ^{ab}	6
T4	5.23 ^a	4.90 ^a	6	0.17 ^a	4	10.56 ^a	10.03 ^a	7
LSD	0.85	0.81	-	0.02	-	1.56	1.5	-
CV	10.12	10.17	-	10.18	-	8.55	8.35	-

In a column, treatment means having common letters are not significantly different by LSD 5% WAP = Weeks After Planting

Additionally, the pH and Electrical Conductivity (ms/cm) of the rooting medium were as follows.

Table 1. pH and Electrical Conductivity of different rooting media.

Media	pH		EC(ms/cm)	
	Initial	Final	Initial	Final
Coir fiber	5.45	5.65	0.60	0.10
Oasis	5.55	5.75	0.80	0.20
Pellets	4.90	5.65	0.50	0.20

1. Performance of *Polyscias balfouriana* 'Marginata'

1.1 Root Growth

According to the results, maximum and average root lengths were significantly influenced by the rooting media used (Table 2). Significantly higher maximum root length and average root length were observed in Jiffy-7C Pellets (5.23cm, 4.90cm), whereas the minimum values for same parameters were given by coir dust medium in coir pots (3.83cm, 3.66cm). Cuttings in net pots with coir fiber also resulted a higher average root length (4.30cm) which was not significantly different from Jiffy-7C Pellets.

According to the Table 2 there was a significant difference among rooting media in number of roots ($P < 0.05$). However, highest number of roots was observed in coir dust medium in net pots (11) and the least number of roots were presented in coir dust medium in coir pots (2) at eight weeks of planting.

Table 2 exhibits that a significantly higher root dry weight was observed in Jiffy-7C Pellets (0.17g). Coir fiber medium in coir pots (0.12g) and oasis medium (0.13g) showed the lower root dry weight.

1.2 Shoot Growth

The number of shoots was not remarkably influenced by the treatments (Table 2). However, the results indicate that maximum and average shoot lengths were significantly influenced by the treatments. The highest maximum shoot length (10.56cm) was observed in Jiffy-7C Pellets and coir dust containing net pots (10.30cm) while the lowest maximum shoot length (8.66cm) was observed in coir pots with coir dust (Table 2). Jiffy -7C Pellets also recorded a significantly higher average shoot length (10.03cm) over the other media (Table 2). It is shown in the Table 2 that there were no significant differences among treatments ($P > 0.05$) in relation to the number of leaves.

1.3 Export Quality

The quality parameters viz. appropriate size of cane (10cm), pest and disease-free condition and possession of minimum two sprouts per cutting were considered in evaluating the export quality of rooted canes.

The Percentage of exportable cuttings was higher in net pots filled with coir fiber (94%). The least value for this parameter was recorded in oasis (92%) (Figure 1). However, there was no significant difference in percentage exportable cuttings produced in different rooting media.

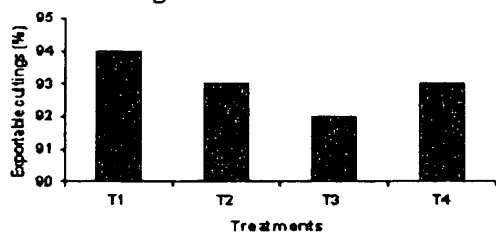


Figure 1. Percentage of exportable cuttings of *Polyscias balfouriana* 'Marginata' in different rooting media

2. Performance of *Cordyline fruticosa* 'Purple Compacta'

2.1 Root Growth

The maximum and average root lengths were significantly higher in Jiffy-7C Pellets (11.30cm, 10.73cm respectively), while the lowest values were recorded in coir pots containing coir dust (8.70cm, 8.60cm respectively) (Table 3).

Significant differences were observed among treatments in relation to number of roots ($P < 0.05$). The highest number of roots was resulted in net pots with coir dust (11) whereas the lowest number was shown in coir pots with coir dust (2).

There were significant differences in root dry weight among treatments (Table 3). The highest root dry weight (0.35g) was shown by coir dust filled net pots, while the lowest (0.23g) was recorded in coir pots with coir dust

2.2 Shoot Growth

Results indicate that the maximum and average shoot lengths were significantly influenced by the

treatments (Table 3). Highest maximum shoot length and average shoot length were observed in net pots with coir dust (8.10cm and 7.93cm respectively) and jiffy-7C pellets (7.70cm and 7.63cm respectively) which were significantly different from the lowest values observed in oasis medium (5.23cm and 5.06cm respectively). Though the highest number of shoots were observed in coir dust filled net pots (8) there were no significant differences ($P > 0.05$) among treatments in relation to the number of shoots (Table 3).

Cane cuttings in Jiffy-7C pellets produced a significantly higher number of leaves (9), while the least number of leaves was resulted in Oasis medium (4).

2.3 Export quality

The highest percentage of exportable cuttings (97%) was observed in net pots with coir dust (T1), while the lowest (92%) was recorded in Oasis medium. However, there was no significant difference in percentage of exportable cuttings produced in different rooting media.

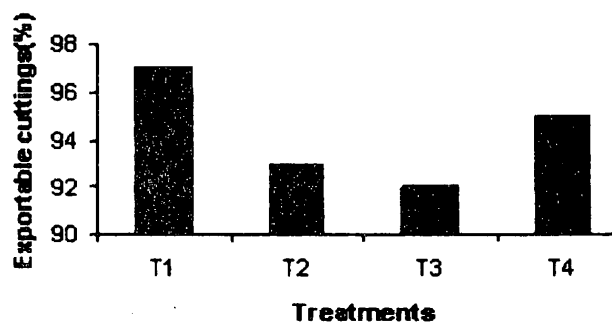


Figure 2. Percentage of exportable cuttings of *Cordyline fruticosa* 'Purple Compacta' in different rooting media

3. Performance of *Codiaeum variegatum* 'Pictum'

3.1 Root Growth

According to the Table 4, cane cuttings in net pots with coir dust (T1) and Jiffy-7C Pellets (T4) showed significantly higher maximum root lengths (9.10cm and 8.43cm respectively) over T2 and T3.

Table 3. Growth of *Cordyline fruticosa* 'Purple Compacta' canes in different rooting media at 8 weeks of planting

Rooting Media	Root Growth (8WAP)				Shoot Growth (8WAP)			
	Max. Root length (cm)	Avg. root length (cm)	No. of roots	Root dry weight (g)	No. of shoots	Max. shoot length (cm)	Avg. shoot length (cm)	No. of leaves
T1	10.50 ^{ab}	10.33 ^{ab}	11	0.35 ^a	8	8.10 ^a	7.93 ^a	6
T2	8.70 ^b	8.60 ^b	2	0.23 ^b	6	6.83 ^{ab}	6.73 ^{ab}	7
T3	9.16 ^b	9.00 ^{ab}	6	0.27 ^b	6	5.23 ^b	5.06 ^b	4
T4	11.30 ^a	10.73 ^a	6	0.34 ^a	6	7.70 ^a	7.63 ^a	9
LSD	1.89	1.86	-	0.06	-	2.04	2.06	-
CV	10.12	10.26	-	11.09	-	15.55	16.03	-

In a column, treatment means having common letters are not significantly different by LSD 5%. WAP = Weeks After Planting

There was a significant difference in average root length among different media (Table 4). Both Jiffy-7C Pellets (3.70cm) and net pots with coir dust (3.53cm) resulted significantly higher average root length than in coir pot (2.73cm) and Oasis (2.83cm).

The results indicate that there were no significant differences among treatments in relation to the number of roots ($P>0.05$). Highest number of roots was observed in T1 (10), while the lowest was observed in T2 (3).

According to the Table 4, T1 and T4 exhibited the highest root dry weight (0.08g) followed by T2 and T3 of 0.06g.

3.2 Shoot Growth

There was no significant difference in number of shoots ($P>0.05$) among treatments. T1 showed a higher number of shoots (8) over the other media.

Results indicate that maximum shoot length was significantly influenced by the rooting medium. The highest maximum shoot length was observed in T1 (12.33cm), followed by T4 (10.40cm) while the lowest was observed in T3 (9.13cm), which is not significantly different from T2 (9.93cm) (Table 4).

There was a significant difference in average shoot length among different media (Table 4). Highest average shoot length was shown by coir fiber filled net pot (12.06cm), while lower figures were given by oasis medium (8.96cm) and coir pots (9.73cm).

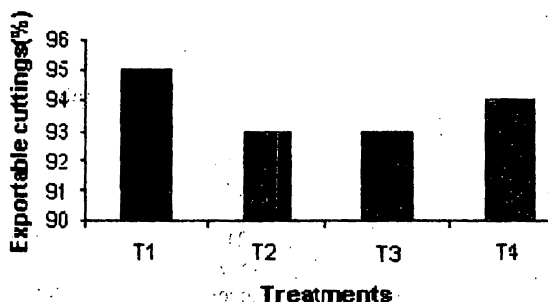


Figure 3. Percentage of exportable cuttings of *Codiaeum variegatum* 'Pictum' in different rooting media

Croton cuttings in T1 showed higher number of leaves (10) followed by Jiffy-7 Pellets, coir pot with coir dust and oasis medium (Table 4). However, a significant difference could not be observed in number of leaves in different treatments ($P>0.05$).

3.3 Export Quality

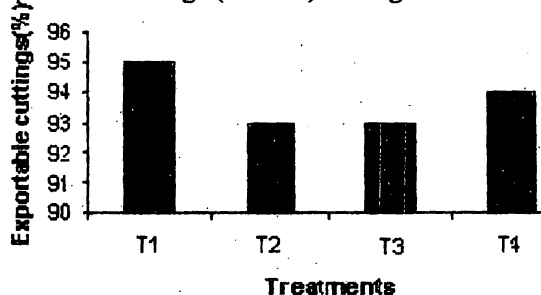
Table 4. Growth of *Codiaeum variegatum* 'Pictum' canes in different rooting media at 8 weeks of planting

Rooting Media	Root Growth (8WAP)				Shoot Growth (8WAP)			
	Max. Root length (cm)	Avg. root length (cm)	No. of roots	Root dry weight (g)	No. of shoots	Max. shoot length (cm)	Avg. shoot length (cm)	No. of leaves
T1	9.10 ^a	3.53 ^a	10	0.08 ^{ab}	8	12.33 ^a	12.06 ^a	10
T2	7.63 ^{ab}	2.73 ^b	3	0.06 ^{bc}	6	9.93 ^b	9.73 ^b	6
T3	6.56 ^b	2.83 ^b	4	0.06 ^c	6	9.13 ^b	8.96 ^b	3
T4	8.43 ^a	3.70 ^a	8	0.08 ^a	6	10.40 ^{ab}	10.23 ^{ab}	8
LSD	1.52	0.66	-	0.01	-	2.05	2.08	-
CV	10.48	11.04	-	11.66	-	10.46	10.79	-

In a column, treatment means having common letters are not significantly different by LSD 5%.

WAP=Weeks After Planting.

According to the figure 3, T1 exhibited the highest percentage of exportable cuttings (95%) followed by Jiffy-7C Pellets (94%). Both T2 and T3 recorded 93%. There was no significant difference in exportable cuttings ($P>0.05$) among the treatments.



DISCUSSION

The foliage plant industry has undergone dramatic expansion during the last two decades. This has resulted an increasing need of regular supply of a uniform rooting medium that is capable of supporting vigorous plant growth. Most of the foliage plant nurseries utilize soilless potting substrates owing to the problems associated with soil-based media (Benedetto *et al.*, 2004).

This experiment revealed that growth parameters of cane cuttings were significantly influenced by the rooting media. When root growth parameters are considered, higher root length and heavy root mass could be observed in canes planted in Jiffy-7C Pellets and net pots with coir substrate. The superior root growth under these two media could be due to some of their desirable properties, such as high water holding capacity, adequate drainage properties and permission for free root penetration.

Even though the growing medium is the same, the canes grown in coir pots with coir dust exhibited the poorest root growth parameters as a result of the physical barrier created by coir pot, hindering the free root growth. Furthermore, coir pots may not provide satisfactory drainage owing to the same physical barrier.

When Jiffy 7C Pellets are manufactured special fertilizer with low ammonium content is added. Coir Pellets are enclosed in a minimal netting film of non woven material, serving as an envelope for the substrate. The net is made to allow optimal root development of the plant by allowing roots to penetrate and expand freely, while providing adequate strength for the root ball during handling, shipping and transplantation (Anon, 2004).

Though cuttings could be easily kept in oasis (T3), it may dry up quickly compared to other rooting media. Unavailability and higher cost are some of the disadvantages of oasis as a rooting medium. pH and EC of the oasis was recorded as 5.55 and 0.80ms respectively. Conover and Poole (1991) have described when salts levels increase, roots are unable to extract water from the solution. Root systems of such plants will be smaller than root systems of plants grown in media with lower soluble salt levels. This may be the reason for low root growth in oasis. Out of the shoot growth parameters tested, the number of shoots and number of leaves formed in canes were not affected by the rooting media. However, Jiffy-7C Pellets and net pots with coir dust medium showed the highest shoot length, which could be a result of better root growth in these two media.

CONCLUSIONS

Out of the four rooting media tested, Jiffy-7C Pellets and net pots with coir substrate proved to be the best media for production of rooted canes of *Polyscias balfouriana* 'Marginata', *Codiaeum variegatum* 'Pictum' and *Cordyline fruticosa* 'Purple Compacta'.

Taking in to account some improved properties of Jiffy-7C Pellets such as being a purified and stable substrate, easy transportability of medium (as pellets), trouble free irrigation, easy handling and transplanting with minimal root damages encourage its use as a standard rooting medium for production of rooted canes of above plants.

It could be suggested that further studies are needed to ascertain the suitability of Jiffy-7C Pellets for rooting of other economically important foliage plant species as well.

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