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Modified Coir Dust Media Elevate the Production of Superior Quality *Epipremnum aureum* .L Plantlets Derived from Stem Cuttings

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***Abstract*—**The experiment was conducted at Omega Green (Pvt) Limited, Godigamuvwa, to evaluate the effects of different potting media on the quality of Epipremnum aureum (N'joy) plants. Four different types of potting media including peat moss, oasis foam, coir dust, and peat moss + coir dust at 1:1 ratio were used for rooting. The treatments were arranged in Complete Randomized Design (CRD) with four replicates under 40% shade net house conditions. The study revealed that potting media significantly affected the number of shoots and roots produced in addition to their length. Stem cuttings grown in peat moss + coir dust (T4) denoted superior performance in producing higher number of shoots and roots, Conversely, the plants in oasis foam media (T2) expressed the lowest performances. Moreover, the export quality parameters were also superior in T4. The re-optimization of physical and chemical properties in the novel potting mixture which improves water holding capacity, root aeration, pH and EC values along with unknown exogenous factors might have favored the growth and development of stem cuttings. Therefore, it can be concluded that the peat moss + coir dust potting media (1:1) would be suitable for successful commercial production of *Epipremnum aureum* (N'joy).

***Keywords*—**Cuttings, Epipremnum aureum (N'joy), Oasis foam, Peat moss, Potting media

I. Introduction

Epipremnum aureum is among the popular tropical ornamental plants used as a hanging basket crop. It is known as golden pothos, devil's ivy, hunter's robe, ivy arum, money plant, silver vine, Solomon Islands ivy, and taro vine. This crop belongs to the family Araceae that consists of 110 genera and 2500 species distributed all over the world (Meshram Srivastava, 2015). Commercially, there are four different varieties namely E. *aureum* 'Neon' characterized with solid yellow-green leaves with no variegation, E. *aureum* 'Marble Queen' with fine variegation in white color, E. *aureum* 'Jade Pothos' with unvariegated, dark green color leaf and E. *aureum* 'N'Joy', characterized with variegation and bumpy leaf texture (Meshram Srivastava, 2014). Typically, these plants require medium indirect light, while the lengthy and direct sunlight will scorch the leaves (Bidarnamani Zarei, 2014). This species is popular in tropical and subtropical regions, however, it can become a highly invasive species when introduced into tropical countries where it is not native (Moodley *et al*., 2016).

Plant propagation is an important aspect in commercial horticulture where plants can be reproduced by two means sexually (by seed) or asexually (by vegetative methods) (Preece, 2003). Vegetative propagation is commonly used in the commercial production of variety of horticultural plants, particularly ornamental plants in which some do not produce any viable seeds in their natural state (Rout Jain, 2004). Even if the seeds are produced, the distinct ornamental feature of the plant may be altered by cross-pollination. Hence, stem cuttings are one of the simplest, cheapest, and least time-consuming vegetative techniques of plant multiplication which is commonly utilizing in the commercial production of E. *aureum* plantlets (Jaya, 2013).

In the present scenario, the world floriculture market denotes an approximately 44% demand for live plants including rooted cuttings (Beneragama Peiris, 2016). Therefore, many foliage companies try to produce a large number of rooted cuttings of ornamental plants including the N'Joy plants. The rooting ability of the plant stem cutting varies with the plant species while the function of endogenous physiological and morphological factors also affect root formation (Srivastava, 2002). Moreover, there is a huge demand for rooted cuttings of E. *aureum* in the floriculture sector. However, limited studies have been conducted to identify the proper media to facilitate rapid root and shoot induction of this relevant plant species. Therefore, the present study was conducted to identify a suitable potting media to promote rapid root and

shoot growth and hence to produce commercially acceptable plantlets to the foliage industry in Sri Lanka.

II. Material and Methods

The experiment was carried out at Omega Green, (Pvt) Limited, Godigamuvwa in Gampaha district which is one of the main commercial growers and exporters of floriculture products in Sri Lanka, during January to April 2021. This company is situated at low country wet zone, WL_3 agro-ecological region.

Stem cuttings of E. *aureum* (N'Joy) plants were collected from the mother plant section of the company. Healthy stems (runners) which were more than six months old and 40 – 60 cm in length were used to obtain the cuttings that were 1 to 1½-inch length with at least one leaf presented on the main stem to ensure sufficient food storage and the required shoot nodes for the experiment.

Table I: Composition of different propagation media used in this study

Treatment No	Media composition
T1	Only peat moss
T2	Only oasis foam
T3	Only coir dust
T4	Coir dust + peat moss (1:1)

In this study, four potting media were used as shown in Table 1. In the case of using the peat moss and oasis foams, they were preconditioned prior to planting by soaking in water. Further, oasis foams were cut into cubes with the dimensions of 3 cm3, and five stem cuttings were plugged in oasis cubes that were placed in sterilized trays. Then each type of media was filled in individual net pots (15 cm X 15 cm) where each consisted of five stem cuttings. This step was essential to fulfill the export market requirements, then the pots were placed in trays and transferred into plant propagators which were constructed under 40% shade net houses. Statistically, this experiment was laid out in a completely randomized design (CRD) with four treatments replicated four times. Each replicate was consisted of 100 pots with 500 stem cuttings and a total of 400 pots (2000 cuttings) were maintained in plant propagators.

The vegetative parameters including shoot number, shoot length (cm), root number and root length (cm), and percentage of success cuttings, and number of accepted pots for export were recorded in each treatment. All the parameters were evaluated at the end of six weeks after planting by randomly chosen 20 net pots per treatment (100 stem cuttings) whereby assessment of the last two parameters was done by the experienced staff members of the company. Subsequently, collected data were subjected to statistical analysis using SPSS software (version 25). The analysis of variance (ANOVA) was used for the statistical comparison of the treatments. Tukey's post-hoc test was done to identify the significant difference between treatment means at 0.05 probability levels.

III. Results and Discussion

Epipremnum aureum plants responded differently to varying conditions of treatments.

A. Number of shoots

The emergence of new shoots from the stem cuttings of E. *aureum* (N'joy) was significantly different among the treatments ($P<0.05$ at 95% level of confidence). At the 6th week after planting, the highest mean value for the number of shoots was observed in T4 (20) while the lowest value was denoted by T1 (14) (Figure 1) (Table 2). Conversely, the number of shoots in the treatments among the T2 and T3 denoted lower values than the T4 while did not possess a significant variation among the treatments.

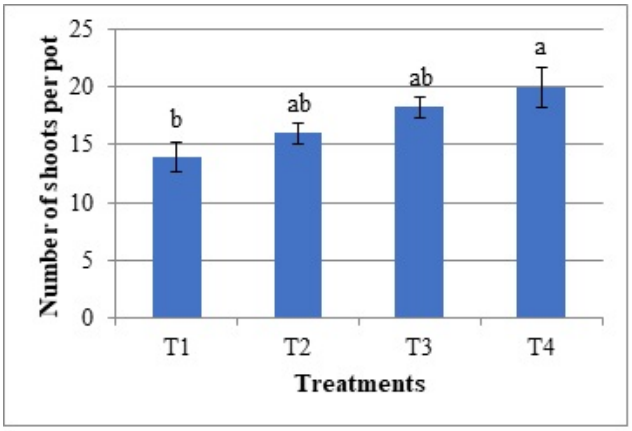

Figure 1: Number of shoots produced in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% level.

B. Number of roots

The type of growth media denoted a significant effect on the root production ($P<0.05$ at 95% level of confidence). The highest mean value for number of roots was observed in T4 (47), while the lowest value was from T2 (1) (Table 2) (Figure 2). However, there were no significant differences between the treatments T3 and T4.

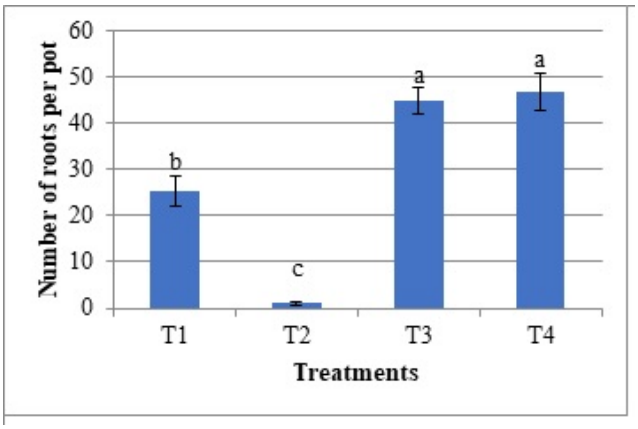

Figure 2: Number of roots produced in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% level.

Table II: Effects of different potting media on root and shoot growth to produce commercially acceptable plantlets of E. *aureum* (N'Joy).

Treatments	Average number of shoots/pot	Average number of roots/pot	Average shoot length(cm) /pot	Average root length (cm)/pot	Percent of success cuttings (%)	Number of accepted pots/20 pots
T1	14.0 ± 1.3^{b}	25.2 ± 3.2^{b}	1.2 ± 0.1^{cd}	3.8 ± 0.1^{b}	75.5 ± 3.6^{b}	12.5 ± 2.5^{ab}
T2	16.0 ± 0.9^{ab}	1.0 ± 0.4^{c}	0.9 ± 0.1^{d}	0.8 ± 0.1^{c}	73.7 ± 5.5^{b}	10.0 ± 2.0^{b}
T3	18.2 ± 0.8^{ab}	45.0 ± 2.9^{a}	1.5 ± 0.1^{ab}	4.9 ± 0.2^{a}	80.7 ± 2.5^{ab}	17.5 ± 1.4^{a}
T4	20.0 ± 1.7^{a}	47.0 ± 4.0^{a}	1.3 ± 0.0^{bc}	5.1 ± 0.1^{a}	91.7 ± 1.0^{a}	18.7 ± 1.2^{a}

*Values shown are mean ± S.E. Means with different letters represent significant differences at $p < 0.05$ using Tukey HSD.

C. Average shoot length

According to the recorded data, the average shoot length substantially varied according to the growth media. The highest mean value for shoot length was denoted in T3 (1.5 cm), while the lowest length was denoted in T2 (0.9 cm) (Figure 3). The results indicated a significant effect of treatments on shoot length (Table 2).

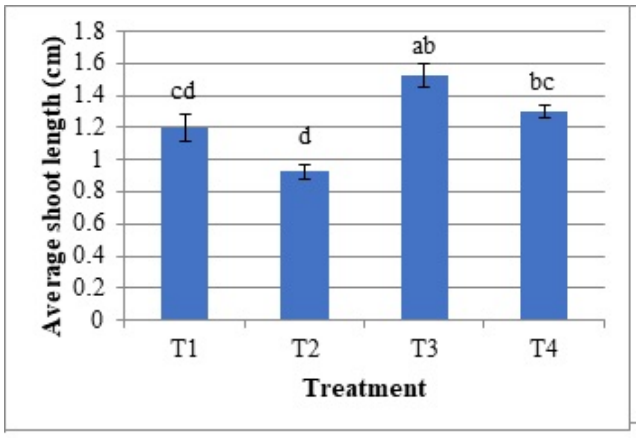

Figure 3: Averages shoot length in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% levels.

D. Average root length

Plant root length was significantly affected by the rooting media ($P<0.05$ at 95% level of confidence). The highest mean value for root length was observed in T3 and T4 (5 cm) while the lowest length was denoted in T2 (0.8 cm) (Figure 4) (Table 2). This observation suggests that the rooting media oasis did not favor the induction and elongation of roots in E. *aureum* (N'joy) plants. Conversely, the coir dust-based media promotes the rooting, though the production rates differ.

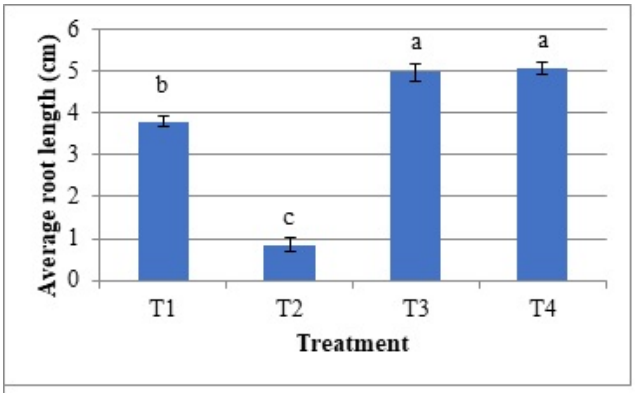

Figure 4: Average root length in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% levels.

E. Percent of success in cutting

The percent of success in cutting was assessed based on observing whether the sufficient number of roots and the shoots per individual cuttings produced within six weeks. According to the analysis, a significant variation in success percent was denoted by the treatments. The highest percentage of success was observed in T4 media (91.75%) while the lowest was recorded in T2 media (73.75%) (Figure 5) (Table 2). The response between T1 and T2 was not significantly different from each other. This emphasizes the media with coir dust + peat moss (T4) promote better production of adventitious roots with the required number of shoots of *E. aureum* (N'joy) plants. However, the usage of 100% coir dust (T3) media did not yield the number of shoots and roots within six weeks.

F. Number of commercially accepted pots

To be acceptable at the export level, each pot should contain healthy five stem cuttings with acceptable number

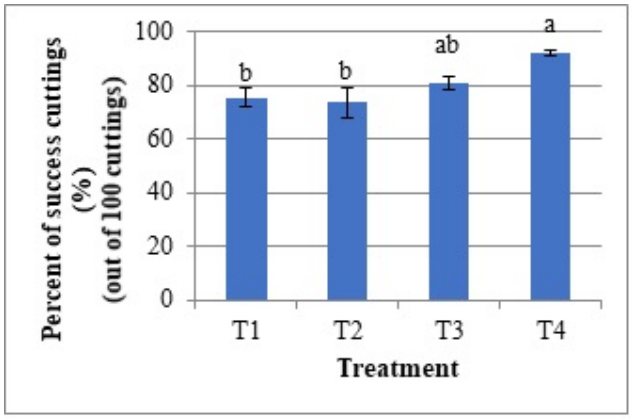

Figure 5: Percent of success cuttings in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% level.

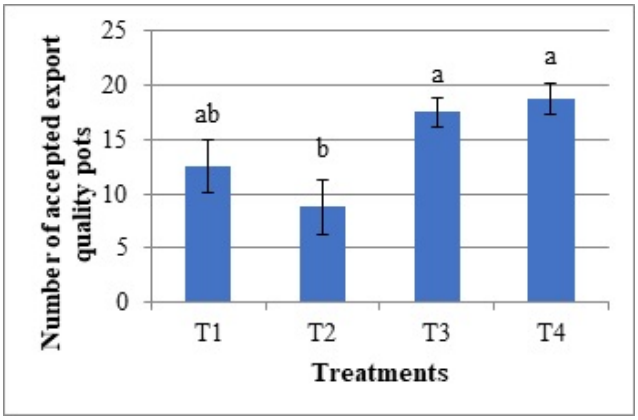

Figure 6: Number of commercially accepted pots in each treatment. Bars with the same letters are not significantly different according to Tukey HSD at 5% level.

of roots that emerged from the bottom (rooting media) with healthy leaves from each stem. Based on the examinations, the 1st and 2nd highest number of commercially accepted pots were obtained from T4 (19) and T3 (17) respectively with no significant differences among these treatments. However, the lowest count for acceptable quality pots was obtained from T2 (10) (Figure 6) (Table 2). These results elucidate the contribution of novel rooting media in determining the quality of plant production.

The growth and development of stem and root depend on number of factors (Davies, 2012). Primarily the nutrient provided with ideal pH levels in the rooting media is beneficial when appropriate aeration and water holding capacities are met. Moreover, the level of endogenous/exogenous hormones and other growth promoters within stem cuttings influence the shoot length (Srivastava, 2002). Further, the mild dosage of IAA promotes shoot development, while an increased dosage has shown positive effects on root production in numerous horticultural plants (Liscum & Reed, 2002). Based on the results of the present study, it is speculated that the idealized ratios of the above factors in T4 may be contributed to enhance the shoot and root growth compares to the remainder treatments. Overall, the results suggest that the rooting media selected based on coir dust mixed with an equal ratio of imported peat moss gave rise to an idealized plant growth and development. Hence that may satisfy the expected quality required by the ornamental plant industry in Sri Lanka, while the coir dust alone (T3) contributed well, though there was a substantial delay in the production of roots (Table 2), thereby commercial mass production of export quality cutting within a short period of times may be impeded for *E. aureum* (N'joy) plants.

IV. Conclusions

According to the results of the present investigation, the coir dust + peat moss (1:1) medium, showed better responses in number of roots, number of shoots, root length, percentage of successful cuttings, and number of accepted pots with the highest mean values for the respective parameters. This better performances of the media might be related to the better aeration and drainage conditions and water maintenance capability of these substrates compared to the other media. However, as a propagation medium, oasis foams denoted very low values for all the tested parameters. The poor water maintenance capability of the oasis media would be a reason for these lower performances. Therefore cuttings were quickly destroyed. The function of endogenous physiological and morphological factors effect on root formation in cuttings. Hence, the stem cuttings grown on coir dust + peat moss medium performed better than those on other media used in this experiment, coir dust + peat moss (1:1) media can be recommended to be used in the commercial cultivation of *Epipremnum aureum* (N'joy) plants so as to enhance its growth and development.

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