

Feasibility of Water Hyacinth (*Eichhornia crassipes*) for Potting Media of Dendrobium Orchids

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Abstract - Dendrobiums are often grown as cut flowers. Due to high economic potential, plants are mass propagated using tissue culture. Plants developed by tissue culture are required for maintenance in a plant house and potting media plays a major role in supporting growing plants. Often coconut husk pieces are used in combination with charcoal and brick pieces. This study was conducted to determine the suitability of Water hyacinth widely available in the dry zone as an ingredient in the potting media. Several combinations of potting media prepared using Water hyacinth, coconut husk pieces, charcoal, and brick pieces were tested for the *Dendrobium burana pearl srimahapho* variety in a completely randomized design with three replicates. Plant height was highest in potting media 1 (T1

- coconut husk, charcoal, and brick pieces as 2:1:1 – control) and potting media 4 (T4 - water hyacinth, charcoal, and brick pieces as 1:1:1), showed a progressive increase and differences were not significant between the two. The rest had lower plant heights than T1 and T4. The same treatments had the highest bulb formation, while T1, T4, and T5 (potting media with Water hyacinth chips and charcoal at 1:1) had the highest leaf formation. The number of roots was higher in T1, however, T6 which had only water hyacinth also had increased root production. This study confirmed the possibility of using Water hyacinth plant pieces to replace coconut husk in the potting media for maintaining orchid plants.

I. INTRODUCTION

Orchids are a group of plants in the family of *Orchidaceae* widely grown for cut flowers. Orchids, being an epiphyte are grown from sea level up to 500-600 m. It is grown commercially due to high demand from domestic and foreign markets. Mainly propagated by tissue culture. Small plants yielded from tissue culture in the laboratory under controlled conditions are required to acclimatize when transferring plantlets to plant houses. The potting mixture is crucial for the successful growth of small plants.

The potting media must effectively contribute toward higher production with a good water holding capacity, aeration, and supply of nutrients (Kaushal & Kumari, 2020). Hence a good quality growth media plays an important role in supporting orchid plants to achieve their vegetative growth and flowering (Kaushal & Kumari, 2020). There are already recommended potting media with different ingredients and ratios for orchid

cultivation (Kaushal & Kumari, 2020). Coconut husk pieces, also known as coco chips are a commonly used ingredient in the potting media, and which is known for their ability to retain moisture and support root development. On the other hand, there are many plant materials that may be suitable for potting media in orchids as aerial roots need a substrate to grow on. Water hyacinth (*Eichhornia crassipes*) is widely and readily available in water environments.

Water hyacinth is considered an aquatic weed that often grows profusely in irrigation and drainage canals, lakes, and reservoirs and reduces storage and carrying capacities thus requiring it to be used for a productive purpose.

Due to high demand, prices of coconut husk have increased in the market, and orchid growers are required to incur a high cost for potting media. The stem of water hyacinth appeared fibrous and hence assumed to be able to fulfil certain requirements that are provided by coconut husks. As a result, water hyacinth could be used for partial or full replacement of coconut husk in potting media of orchids. The compost prepared from leaves, stems, and roots has been used as potting media in soilless culture (Fan et al., 2015). Therefore, this study attempted to evaluate the growth performances of Dendrobium orchids under different potting media composed of combinations of water hyacinth, coco husk, and other commonly used materials.

II. MATERIALS AND METHODS

The orchid variety *Dendrobium burana pearl srimahapho* was selected for the study. This study was conducted at Eppawala in the Anuradhapura district. Eight potting media prepared using some combinations of coco chips, charcoal pieces, roof tile pieces, and water hyacinth chips were tested for the selected orchid plants. Water hyacinth pieces were prepared by cutting into smaller pieces, then drying in the sun before using for media preparation. Potting media prepared as per the combinations shown in Table 1 were filled in $\frac{3}{4}$ th of the depth of net pots. Fourteen-day-old tissue cultured orchid plants were purchased from 'Orchid Growers' Plant nursery in Kalutara. Initially, plants were transplanted in net pots of 5.3 cm in diameter and 5 cm in height and maintained in a net house. Each treatment had eight pots and was arranged in a completely randomized design (CRD) with three replicates. After two months, plants in the mentioned net pots were transferred to

larger pots of 13 cm in diameter and 9 cm in height and maintained for five months.

Table 1. Potting media prepared using different combinations of selected ingredients and used as experimental treatments

Treatment No.	Composition of potting mixture, parts			
	Coconut husk chips	Water hyacinth chips	Charcoal pieces	Brick pieces
T1 - Control	2	0	1	1
T2	1	1	1	1
T3	0	2	1	1
T4	0	1	1	1
T5	0	1	1	0
T6	0	1	0	0
T7	1	0	0	0
T8	1	0	1	1

Data were collected every other week commencing from the first week onward and continued until week 21. The data included plant height, number of bulbs, leaves, and roots formed, and the length and width of leaves produced during the period of observations.

Plant height, length, and width of leaves were analysed using analysis of variance, and means were separated using Fisher's Protected LSD when the treatment effect was significant at $p \leq 0.05$. Count data were analysed using non-parametric analyses.

III. RESULTS AND DISCUSSION

Plant Height of orchid plants

Mean plant height varied among the treatments from the beginning. Until 11 weeks, there was no noticeable change in the plant height of all treatments. Thereafter, there were noticeable variations in the plant height. T1 (coconut husk, charcoal, and brick pieces as 2:1:1 – control) and T4 (water hyacinth, charcoal, and brick pieces as 1:1:1), showed a progressive increase in plant height and differences were significant from the rest of the treatments.

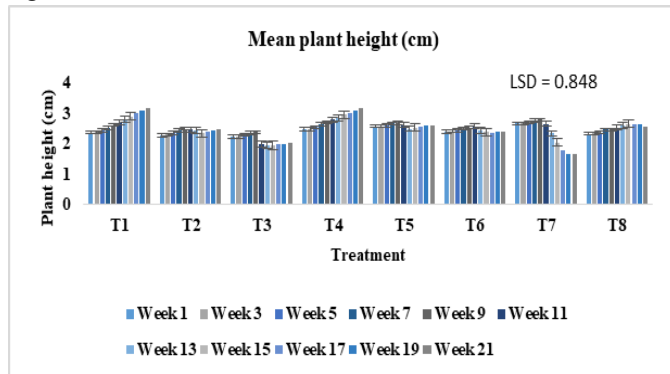


Figure 1. Bi-weekly plant height of orchid plants as influenced by the potting media.

T2 (coconut husk, water hyacinth, charcoal, and brick pieces as 1:1:1:1), T5 (Water hyacinth and charcoal only as 1:1), and T8 (coconut chips, charcoal, and brick pieces at 1:1:1) had similar trends but the plant heights were lower than T1 and T4. Treatments 2, 3, 5, 6, and 7 showed no increase in plant height, instead, there was a decrease after the seventh week. Treatment 1 is the control that had coconut husk had similar growth to plants in treatment 4 which had no coconut husk but Water hyacinth. This confirms the similar potential for the use of Water hyacinth in place of coconut husks.

Number of new bulbs

The number of new bulb formations did not take place in most of the treatments during the 5-month period. However, treatments 1 and 4 showed increasing the number of bulbs after 9 weeks after transplanting. Treatment 7 showed a decreasing number of bulbs after some time, indicating the deterioration of bulbs of orchids when only coconut chips (husk) were in the potting media.

Leaf number per plant

The highest production in terms of the leaf number was found in treatments 1, 4, and 5. Leaf number showed its increase after 13 weeks in treatments 1 and 4. The rest of the treatments showed a decrease in the leaf number. Although T5 (Water hyacinth chips and charcoal at 1:1) had a decrease in leaf number, the plants had the second highest leaf number among the treatments. This shows that Water hyacinth is not inferior in its support to orchid plants.

Root number per plant

The highest root number was in T1. Similar, but lower root production occurred in the rest of the treatments, except in T7 which had only coconut husk and showed a decline in root production after the ninth week. T6 which had only Water hyacinth pieces did show an increase in the root number. Therefore, Water hyacinth seems to be better in promoting root production of orchids.

IV. CONCLUSION

This study compared the potential of different ingredients for potting media to maintain tissue-cultured orchid plants in plant houses. Coconut husk pieces, air-dried water hyacinth stem, leaf pieces, charcoal, and brick pieces were tested with different combinations. The results confirmed the suitability of water hyacinth similar to coconut husk pieces and hence recommended to be used for full or partial replacement of coconut chips in potting media for orchids.

References

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