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Identifying A Most Suitable Growing Medium for Acclimatizing Dendrobium Orchids for Commercial Purposes

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ABSTRACT
Dendrobium orchid highly valued as cut flowers. During acclimatization different growing media are being used. However, these media have not scientifically tested, thus, the effect of growing media on acclimatization stage of Dendrobium orchid type 'TC 05' was evaluated under glass house conditions to assist in producing quality pot plants. The experiment was carried out at the Orchid Section of the Floriculture Research and Development Unit (FRDU), Department of National Botanic Gardens (DNBG), Peradeniya, Sri Lanka. Six months old tissue cultured Dendrobium plants with an average mean height of 2.4 cm were potted in 12.7 cm clay pots and five different potting media were tested. Fifteen pots were used for each treatment with 05 plants in each pot (total number of plants in each treatment = pots 15 x 5 plants = 75 plants) with the total number of plants 5 x 15 x 5 = 375 plants. Five different potting media were (T1) Coir dust+ Roof tile pieces + Sand (1:1:1), (T2) Coir dust + Granite + Sand (1:1:1), (T3) Coir dust + Roof tile pieces + Charcoal (1:1:1), (T4) Coir dust + Roof tile pieces + Granite (1:1:1), and (T5) Coir dust + Charcoal + Paddy husk (1:1:1) were used in the experiment. The experiment was arranged according to the Randomized Complete Block Design. The T1 medium Coir dust+ Roof tile pieces + Sand (1:1:1), which is regularly used as the growing media of the FRDU of the DNBG, was considered to be the control treatment. Observation on growth parameters (height, number of new leaves and number of new tillers) of plants were recorded twice a month from October 2022 to June 2023. Mean height of plants in treatment two is (6.4 ± 0.58) significantly higher than those of T3, T4 and T5 ($F=5.7$, $P<0.01$). Similarly mean number of new leaves in treatment two (5.2 ± 0.69) is significantly higher than those of T3, T4 and T5 ($F=25.72$, $P<0.01$). However, mean number of tiller in treatment two (1.9 ± 0.35) is significantly higher than that of T5 ($F=4.3$, $P<0.01$). Thus growing media (T2) Coir dust + Granite + Sand (1:1:1) showed the best performance in average plant height, number of leaves produced and number of tillers. It may be concluded that Coir dust + Granite + Sand (1:1:1) is the most suitable media for the acclimatization stage (6 to 14 months plants after tissue culture) of Dendrobium verity 'TC 05' under local climatic condition in a glass house with 70% shade.

Keywords: Dendrobium, floriculture, acclimatization, growing medium, potted plants.

INTRODUCTION
Orchids are valued for cut flower production and as potted plants in commercial floriculture owing to the

wide range of colours, shapes, sizes and fragrance they display. They are marketed globally as cut flowers for making corsages, floral arrangements and boquets. They are also suitable for interior decoration and remain fresh for many days. They comprise the largest family (Orchidaceae) of flowering plants with 25,000 to 35,000 species belonging to 600-800 genera (Chowdhery, 2001). *Dendrobium* is the second largest orchid genera consisting of more than 16,000 species (Puchooa, 2004). Most *Dendrobium* species are sympodial orchids that originate from subtropical and tropical regions. The genus is popular for the production of cut flowers. The flower spikes of *Dendrobium* are extremely beautiful, medium sized with flowers numbering between 5-20, in colours such as white, mauve, pink, red, blue, purple, yellow and are very popular in the National and International markets.

The orchid plant is an epiphyte that lives by only taking parts of other plants that have decayed (Mondragon et al., 2015, Yong et al., 2014). Only a small proportion of orchids grow on the ground and are in dire need of high humus. Due to this characteristic, it does not require a large area for its cultivation, so it is possible to be grown in the yard in urban areas which is often referred to as urban farming (Guitart et al., 2012, Malhotra, 2013). *Dendrobiums* also being epiphytic in nature spread their roots over the branches of trees exposing them fully, therefore, the type of media used for growing them should provide a surface over which the plants can cling to.

A good mixture of media is useful in terms of all vegetative and flowering parameters. An ideal growing medium facilitates proper aeration, adequate drainage and good anchorage to the plant and should provide a healthy environment for roots. It should be inert, porous, and resistant to organic decomposition. It should be cheap and easily available (Bose and Bhattacharjee, 1980). A vigorous and healthy root system in epiphytic orchids is the first step towards ensuring maximum growth. Hence, selection of an ideal rooting media provides a high degree of success for profuse root growth.

The growth of Dendrobium orchids is usually determined by plant placement, humidity conditions and providing nutrients through fertilization (Teixeira da Silva et al., 2017, Trimanto & Rahadiantoro, 2017, Hariyanto et al., 2019). Adequacy of nutrients accelerates growth of orchids and the continuity of flowering (Naik et al., 2017, Herastuti & Hardiastuti, 2020).

Fertilizer applications for orchids can be done by provided through the planting medium or by spraying the plant (Samseemoung et al., 2017). Fertilizer given to the planting medium is usually in the form of liquid spray so that the nutrient supply is filled slowly. Orchids need to be fertilized once a month with fertilizers that contain N, P, K & Ca nutrients and other micro elements (Trepanier et al., 2008, Hapsoro et al., 2018, Zulfita et al., 2019). Liquid organic fertilizers can also be applied by spray or sprinkled on the planting medium (Madusari, 2019, Fahrurrozi et al., 2019). The growth of Dendrobium orchids is largely determined by the appropriate planting medium and surrounding environmental condition (Naik et al., 2014).

The aim of potting is to provide a confined space for the roots in conditions that favour healthy growth. The interior of the pot is a microclimate, and the potting material (or medium) is expected to provide a reasonable lasting combination of moisture and aeration to form a suitable microclimate. Soilless media are easy to handle and may provide an excellent growing environment to plants as compared to soil (Bilderback *et al*., 2005 & Mastouri *et al*., 2005) one reason being the lack of soil pests.

Coir dust is widely used for the commercial floriculture industry and many Dendrobium orchid growers also mix coir dust with many other materials such as sand, Charcoal, granite chips, paddy-husk and Rooftile pieces. The main objective of this study was to select the most suitable combination of inert material for young plants at the acclimatization stage.

Coir dust used in this experiment was in the size between 1.5-3 mm. Coir dust is a by-product of the coconut industry and is composed of the husks of coconuts. It is a natural, organic material that is highly absorbent and has a high cation exchange capacity. It is also resistant to decomposition and has a low bulk density. When consider the physical properties, it is brown in colour, coarse in texture with irregular shape. Particle size range from 0.5-5 mm and bulk density 0.2-0.4 g/cm^3. Considering the chemical properties; pH of coir dust is 5.5-6.5 while cation exchange capasity varies from 40-50 meq/100g. Its organic matter content is 40-50%, Nitrogen content 0.2-0.4%, Potassium content 0.2-0.4%, Calcium content 0.2-0.4%, Magnesium content 0.2-0.4% and Sulfur content 0.2-0.4%.

Wood charcoal used in this research was in size of 1.5-3mm. Charcoal is primarily composed of carbon. It is formed through the process of pyrolysis, which involves heating organic materials, such as wood or peat, in the absence of oxygen. This process removes volatile components and leaves behind a carbon-rich residue. The chemical properties of charcoal include its ability to undergo combustion, releasing energy in the form of heat and light. It is also known for its adsorption properties, as charcoal can attract and bind to certain molecules and impurities. This property make charcoal useful for various applications, such as water filtration and purification.

The size of granite chips used in this research was of 1.5-3 mm. Granite is a light-colored plutonic rock found throughout the continental crust, most commonly in mountainous areas. It consists of coarse grains of quartz (10-50%), potassium feldspar, and sodium feldspar. These minerals make up more than 80% of the rock. It is hard and durable enough to resist abrasion and bear significant weight. It is also considerably inert in nature.The chemical composition of granite is typically 70-77% silica, 11-13% alumina, 3-5% potassium oxide, 3-5% soda, 1% lime, 2-3% total iron, and less than 1% magnesia and Titania. Granite indeed possesses interesting physical and chemical properties. Physically, granite has an average density between 2.65 and 2.75 g/cm3 (165 and 172 lb/cu ft) and a compressive strength usually above 200 MPa. The melting temperature of dry granite at ambient pressure is 1215–1260 °C (2219–2300 °F), but it can be significantly reduced in the presence of water. Granite also exhibits poor primary permeability overall, but it can have strong secondary permeability through cracks and fractures if they are present.

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. Considering Physical Properties of Sand: Color: Sand can range in color from white to various shades of brown, red, yellow, or even black, depending on the minerals and impurities present. Particle Size used in the experiment was 1.5-3mm .Texture: Sand has a gritty or granular texture due to the small, discrete particles. It can feel smooth or rough to the touch. Sand is highly porous and has many small spaces or pores between particles, which allows it to hold water and air. The density of sand can vary depending on its composition, moisture content, and compaction. Dry sand typically has a density of around 1.6 to 2.7 grams per cubic centimeter (g/cm^3). Sand grains can have various shapes, including rounded, angular, or irregular, depending on their source and how they were transported and eroded. Sand is often highly permeable, allowing water to pass through it easily. This property is essential in applications like soil drainage. Sand has a relatively high heat-absorbing capacity, which makes it feel warm to the touch in sunny conditions. When considering the Chemical Properties of Sand: Sand is primarily composed of silica (silicon dioxide, SiO_2) in the form of quartz crystals. The specific mineral composition can vary based on the source of the sand. Depending on the source, sand may contain other minerals and impurities, such as feldspar, mica, clay, iron oxides, and organic matter. These impurities can influence the sand's color and other properties. Silica is chemically stable, which means that sand is resistant to most chemical reactions and does not easily dissolve in water or react with acids or bases. Sand is generally considered chemically inert. However, certain types of sand, such as silica sand, are used in various industrial processes and can react with chemicals under specific conditions.Silica (SiO_2) has low solubility in water, which means that sand does not dissolve in water under normal conditions. Sand is highly resistant to acids, which makes it suitable for use in acid-resistant materials and construction applications.Sand is a poor conductor of electricity due to its low mineral content and lack of free ions. Some types of sand, particularly those with high levels of certain minerals like monazite, may contain trace amounts of naturally occurring radioactive elements.

Paddy husk constitutes about 20% of the weight of rice and its composition is as follows: cellulose (50%), lignin (25%–30%), silica (15%–20%), and moisture (10%–15%). The composition of the rice husk organic compounds; C 39.8-41.1%, H 5.7-6.1%, O 0.5-0.6%, and N 37.4-36.6. Paddy husk can absorb and hold moisture, due to its cellulose and hemicellulose components. Paddy husk typically has a slightly acidic to neutral pH, which can be adjusted depending on its intended use. Paddy husk is biodegradable, meaning it can decompose naturally over time. Paddy husk's chemical composition and porous structure make it effective at both absorbing and adsorbing substances. These physical properties make paddy husk a versatile material with a range of potential applications in agriculture, construction, energy production, and more. Its lightweight, insulating, and absorbent nature, along with its abundance in regions where rice is cultivated, make it valuable in various industries. Paddy husk is typically light brown to yellowish in color. They are usually small and elongated, with a length ranging from a few millimeters to about 6-7 millimeters. Paddy husks have a rough and fibrous texture due to the presence of silica and cellulose. The density of paddy husk is typically ranging from 80 to 120 kg/m^3. Paddy husk has a relatively low moisture content that lies between 10% to 15%, which contributes to its stability and resistance to microbial degradation. It has a high porosity. The surface area of paddy husk is relatively high due to its fibrous structure. This can make it effective for adsorption and filtration applications. Paddy husk has relatively low thermal conductivity. The rough texture of paddy husk lends itself to abrasive applications. It is relatively brittle, which can affect its handling and processing in various applications. Paddy husk is a poor conductor of electricity.

Roof tile pieces, which are commonly used in construction for roofing purposes, can be made from clay. Considering Physical Properties, Clay roof tiles are typically reddish-brown or terracotta in color. They have a smooth, glazed, or textured surface. The size used in the experiment 1.5-3mm in size. Considering the Chemical Properties, clay roof tiles are primarily composed of natural clay or clay mixed with other minerals. Clay tiles are fired at high temperatures to harden them, which gives them their durability and water resistance. Clay tiles are generally porous, but they are often coated with glaze to make them waterproof and reduce water absorption.

MATERIALS AND METHODS

Trials were carried out in a glass house with flowing environment conditions; temperature 25^0 C -32^0 C, relative humidity 75-85%, light intensity 1400-1600 Lux and 70% shade at the Floriculture Research and Development Unit (FRDU), Department of National Botanic Gardens (DNBG), Peradeniya with tissue-cultured Dendrobium verity 'TC 05' (hybrid between Dendrobium Doreen x D. Supenbury white and Dendrobium buranana charming). In this experiment, 6 months old tissue cultured plants with an average mean height of 2.44cm were potted in 12.7cm clay pots and five different potting media were tested. 15 pots were used for each treatment with 05 plants in each pot (i. e. total number of plants in each treatment = pots 15 x 5plants=75plants) the total number of plants 5x 15x 5= 375 plants. Five different growing media tested are as follows:

(T1) Coir dust+ Rooftile pieces + Sand (1:1:1)
(T2) Coir dust + Granite + Sand (1:1:1),
(T3) Coir dust + Rooftile pieces + Charcoal (1:1:1)
(T4) Coir dust + Rooftile pieces + Granite (1:1:1)
(T5) Coir dust + Charcoal + Paddy husk (1:1:1) were used subsequent to sterilization.

During the first three weeks inorganic fertilizer in liquid form (N: P: K 10:52:10) was applied twice a week. In the next 2 weeks a combination of N:P:K 20:20:20 was applied twice a week coupled with an organic liquid fertilizer (Maxi-crop) that was applied once a week. Subsequently N:P:K 30:10:10 and 20:20:20 were alternated twice a week, an organic liquid fertilizer (Maxi-crop) was also applied once a week and plants were watered once a day.

The experiment was arranged according to a Randomized Complete Block Design. The T1 medium Coir dust+ Rooftile pieces + Sand (1:1:1), which is regularly used as the growing media of the FRDU of the DNBG, was considered to be the control treatment.

Observation on growth parameters of plants were recorded twice a month from October 2022 to June 2023. Plant height (from the base to the top of the plant) was measured while number of new leaves and number of new tillers were counted.

Statistical analysis was performed using Past4.03 statistical package. Krukal-Wallis test was also done on data. Data were subjected to analysis of variance (ANOVA). Mean separation was done using Tukey's pairwise procedure.

RESULTS AND DISCUSSION

Production of Leaves

Number of leaves in plants affects the rate of photosynthesis, which is a main metabolic activity that affects growth and development (Suarez, 2010). According to results obtained, plants in T2 (Coir dust + Granite + Sand (1:1:1) growing media had highest number of leaves (Figure 01; 5.2 ± 0.69; F= 25.7, $P<0.001$), was the best combination of potting mixture for leaf production. The medium T1 (Coir dust+ Rooftile pieces + Sand (1:1:1)) was the second best medium. An average number of 5.2 new leaves was observed in medium T2, the second highest number of 3.5 new leaves was shown in medium T1 which was the control. Both media T4 (Coir dust + Rooftile pieces + Granite 1:1:1) and T3 (Coir dust + Rooftile pieces + Charcoal 1:1:1) were better than T5 (Coir dust + Charcoal + Paddy husk (1:1:1)) in supporting leaf production (Fig 01). It was found that there was a significant difference (P<0.05) in leaf production. However, there was no significant difference between the second-best treatments T1 and T4 for leaf production.

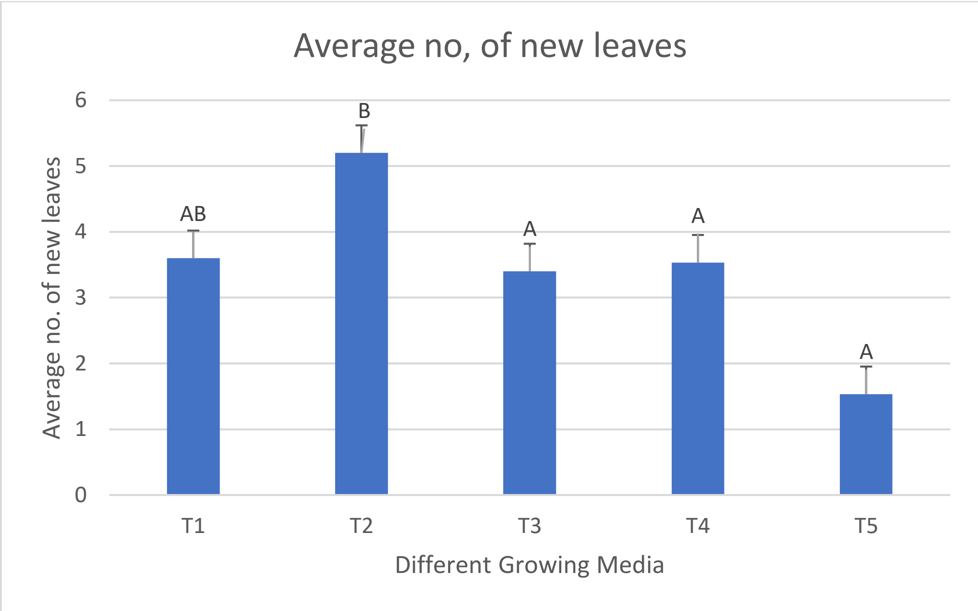

Fig 01. Average number of new leaves in different growing media

Error bars are +SE. Different uppercase latters indicates significant differences among treatments T1, Coir dust+ Rooftile pieces + Sand (1:1:1); T2, Coir dust + Granite + Sand (1:1:1); T3,) Coir dust + Rooftile pieces + Charcoal (1:1:1); T4, Coir dust + Rooftile pieces + Granite (1:1:1); T5, Coir dust + Charcoal + Paddy husk (1:1:1)

Initiation of New Tillers

The potting mixture T2 showed good performance for initiation of new Tillers (Figure 02; 1.9 ± 0.35; F= 4.3, P<0.05), Average number of new tillers is a good indicator for growth of plants. Dendrobium is more beautiful with many shoots and flowers. Therefore, number of new shoots per plant is a very important parameter. The mixture T2 (Coir dust + Granite + Sand (1:1:1), was the best medium for initiation of new tillers. The second-best medium was T1 and both media T4 and T3 were better than T5 as indicated in Fig 02 for initiation of new Tillers. An average number of new shoots of 1.9 was observed in medium T2, the second highest number of 1.6 new shoots was shown in medium T1. It was also found that there was no significant difference (P<0.05) between both treatments T1 and T2 however, at 0.1 significant level T1 was significantly different.

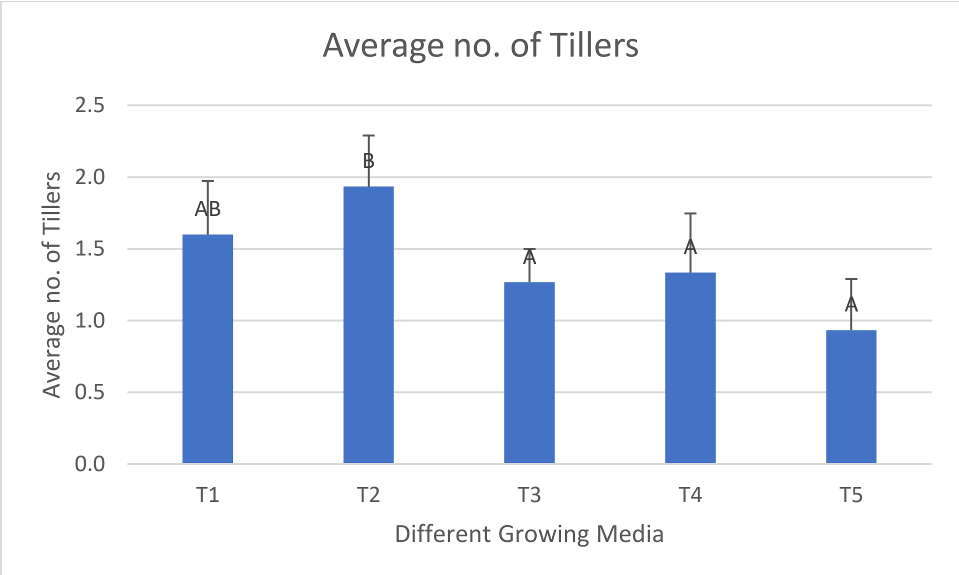

Fig 02. Average number of new Tillers in different growing media

Error bars are +SE. Different uppercase latters indicates significant differences among treatments T1, Coir dust+ Rooftile pieces + Sand (1:1:1); T2, Coir dust + Granite + Sand (1:1:1); T3,) Coir dust + Rooftile pieces + Charcoal (1:1:1); T4, Coir dust + Rooftile pieces + Granite (1:1:1); T5, Coir dust + Charcoal + Paddy husk (1:1:1)

Plant Height

Average plant height of 6.4 cm was significantly ($P<0.001$) highest in medium T2 as shown in (Figure 03; 6.4 ± 0.58; $F= 5.7$, $P<0.001$), Fig 03. Plants in medium T1showed the second best performance with an average height of 5.5 cm. Plants grown in both media T4 and T3 performed better than those in T5. A significant difference was observed between growing media T2 and T1 for plant height.

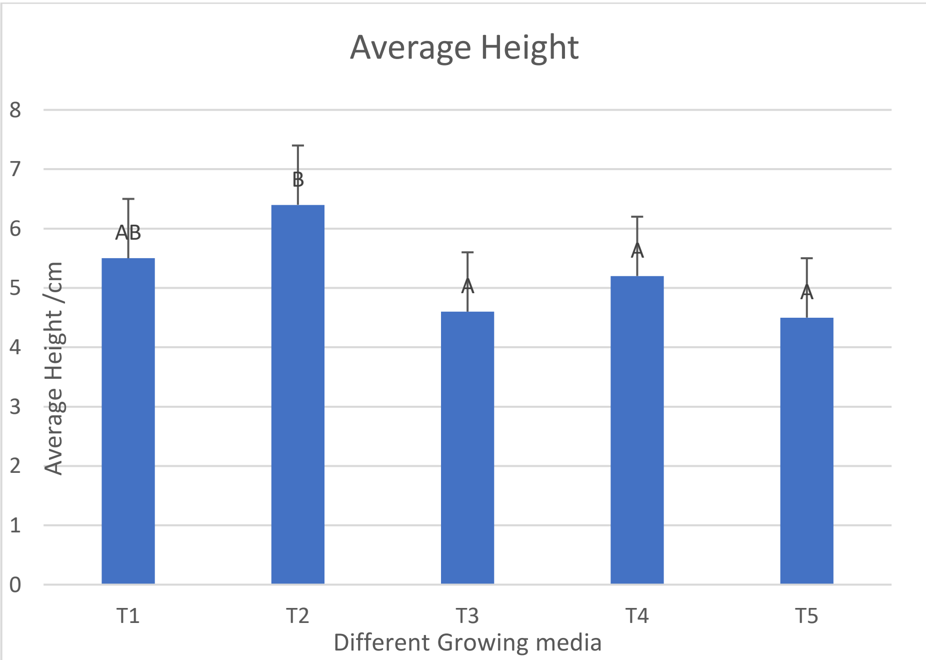

Fig 03. Average plant height (cm) in different growing media

Error bars are +SE. Different uppercase latters indicates significant differences among treatments T1, Coir dust+ Rooftile pieces + Sand (1:1:1); T2, Coir dust + Granite + Sand (1:1:1); T3,) Coir dust + Rooftile pieces + Charcoal (1:1:1); T4, Coir dust + Rooftile pieces + Granite (1:1:1); T5, Coir dust + Charcoal + Paddy husk (1:1:1)

Orchids are generally potted in long lasting inert media as indicated above, the list of media that has been tried out alone or in combination includes saw dust, bark, charcoal, peat, rice hulls, scoria, pumice, sand, rock wool, turf roots, coconut fiber, sphagnum moss, expanded polystyren and varous other plastics. The salient features are that they are either inert or slow to decompose (James, 1993). The selection of media in this experiment was in keeping with these requirements. Both Granite chips, Rooftile pieces and Sand are inert and slow to decompose. Coir dust and paddy husk are easy to decompose. Yet coir dust when combined with Granite chips and Sand, promoted growth of plants as observed in this study. Besides, Coir dust combined with Rooftile pieces and Sand was the second best media.

Selection of ideal rooting media provides a high degree of success for profuse root growth. The materials used as potting media for epiphytic orchids are entirely different from those used for other plants because of their peculiar habit. Gowing media must contain enough water and air, for optimal growth of plants and this mainly depends on physical properties of the medium. Soilless plant culture is any method of growing plants without the use of soil as a rooting medium (Savvas *et al.*, 2013). Most of the light weight, soilless media are combinations of two or more components formulated to achieve desirable physical and chemical properties. Compared with soil-based cultivation, soilless production can be more cost-effective (Grafiadellis *et al*., 2000), producing higher yields and prompter harvests from smaller areas of land (Raviv and Lieth, 2008, Nejad and Ismaili, 2014). Plants growing in containers have their root system confined to a limited volume of medium.Thus major founcions of growing media are allowing maximum root growth, physical support to plants, and providing water and aeration to plants.

Growing media should also be open to air circulation and facilitate free drainage (Rittershausen 1985). Granite chips and Sand allow easy drainage and are open to air circulation. Thus, a combination of both these materials provided a proper medium to support the growth of young dendrobium orchid young plants, since both materials were slow to decompose, provided aeration for roots and help in easy drainage of water.

Considering growth parameters; leaf production, plant height and initiation of new tillers, the growing medium T2 consisting of Coir dust + Granite + Sand showed the best performance. This may be due to its ability to provide optimum growing conditions for root growth, physical support to plants, as well as providing moiture and aeration to plants. Gravel was suggested as the best medium for producing quality flowers in Orchids by Bateman (1957), who compared it with osmunda and bark and recorded more flowers per plant grown in gravel culture. Cibes *et al.*, (1957) observed linear increase in plant height, length of flower stalk and number of florets per spike, when Orchids were grown in gravel culture. A similar finding was observed in this experiment too, granite, and sand which are similar to gravel showed the best combination with coir dust.

Growing media T5 showed lowest performance for all three growth parameters (i.e. leaf production, initiation of new tillers, and plant height). This may be due to high water holding capacity of the growing medium because to the precence of Coir dust and Paddy husk which may have caused disturbance to root penetration. Moreover, root penitation may have also been distubed since, Dendrobiums have an aerial root system, which prefer a well aerated growing medium. However an appropriate water holding capacity will also provide a soil solution to make nutrients avilable to the plant (Alth, 1977). These epiphytic orchids have fleshy roots that are covered with a white coating called velamen. These roots can rot easily, if the medium is not allowed to dry out between waterings. Further, Coir dust and Paddy husk may be washed and block air cavities in the medium which may create poor aeration in the T5 medium.

Other important considerations of growing media include availability, cost, and ease of handling (Higaki & Poole, 1978; Umaharan & Elibox, 2011). Early Orchid growers had manufactured their own growing media, increasing labour costs and larger production scales however, most growers now purchase 'ready-to-use' soilless growing media (McCann, 2015; pers. comm, 20th Nov). Orchid growers use different media which are often expensive and difficult to obtain. However, it is quite important to find out cheap and suitable growing media from the materials available locally, in order to bring down the cost of cultivation.

Bose and Bhattacharjee (1972) suggested large pieces of charcoal as an excellent growing medium for Cattleya, Epidendrum, Phalaenopsis, Dendrobium, Rhynchostylis and Vanda. Arora et al., (1978) suggested the same medium for Dendrobium. However, in this experiment T3, Charcoal with Coir dust and Rooftile as well as T5, charcoal with coir dust and paddy husk did not perform well.
Studies on effect of different potting media on plant growth and spike yield of *Dendrobium* Orchid was investigated by Neeteesh Gupta *et al.*, (2013). They reported that pieces of tile bits were found to be the best potting medium for growing *Dedrobium* orchids and produced the best vegetative growth and spike yield. Singh (1978) proposed brick pieces and shredded tree fern fiber in a 6: 1 ratio for growing Dendrobium, Aerides and Vanda. In this experiment Rooftile pieces similar to tile bits pieces and brick pieces, in combination with coir and sand (T1) showed the 2^{nd} best performance. Rooftile pieces with (T4) coir and Granite as well as (T3) coir and charcoal were next best in performance.

Arumugam and Jawaharlal (2004) revealed that coconut fiber as a growing media increase, number of shoots per plant, early flowering, spike length and number of florets per spike followed by tile bits in *Dendrobium* orchid cv. Sonia-17. Bose and Bhattacharjee (1980) reported that dry coconut husks could be used for commercial propagation of *Dendrobium* hybrid Pompadour by cuttings. Similarly, to coconut fiber and coconut husk pieces, coir dust is good for plantlets of Dendrobium. Both coconut husks and coir dust hold moisture and supply food to growing plants and is found to be very suitable for growing ornamental plants.

According to Bhattacharjee and Mukherjee (1981), growing media differ with types of orchids and the climate in which they are grown. Orchids could also be grown successfully in inert potting materials such as silica gravel. The advantage of using these inert potting materials is that they do not decay and remain porous and intact indefinitely providing better aeration for roots (Stephen, 1981). Studies performed by Paul and Rajeevan (1992) on the influence of potting media on growth of *Dendrobium* revealed that a

combination of charcoal, gravel, brick and coconut husk gave the maximum results in terms of percentage of plant survival and vegetative growth parameters such as plant height, number of leaves and leaf area. In this experiment Coir dust, Granite and Sand showed the best performance; coir is similar to coconut husk while granite and sand are similar to gravel.
Saravanan (2001) noted that among different growing media tested coconut dust was found to be the best for plant height, leaf area, number of roots per plant, root length and early flower bud appearance, number of spikes per plant and spike length. Saravanan and Amit (2009) conducted an experiment on effect of different growing media on *Dendrobium* hybrid "Sonia-17. The best growing media for *Dendrobium* were found to be Gravel+ Ground nutshell+ Cow dung and Charcoal+ Cow dung+ Coconut fiber for commercial cultivation of Orchids. In this experiment too, we tried different components with Coir dust and found that a combination of sand and granite with coir dust was the most suitable combination. Indicating that coir dust as a component in the growing media aided plant growth in Orchids similar to other reports.
Ahmad and Saravanan (2014) Opined that NPK 10: 30: 30 + 0.3% Brick pieces + Gravel+ Poultry manure was found to be statistically significant over other treatments which recorded highest plant height, no. of leaves, leaf area, no. of new shoots per plant, shoot girth, root length, no. of roots per plant, total no. of spikes per plant, no. of florets per spike and longevity of spike in *Dendrobium* Orchid cv Sonia Hiskula. Similarly in the present study too it was concluded that the potting media with components of coir dust, granite, sand and roof tile pieces was good for commercial cultivation of Orchids during the acclimatization stage.

Plants grown in a Coir dust, substrate pieces of Granite and Sand at a ratio of 1:1:1, was the significantly best medium for growth of 6-14 month old Dendrobium orchids TC05 plants in parameters of initiation of new tillers with highest performance for both plant height as well as leaf production. However, this study needs to be continued to observe performance of plants during further growth and flowering as well.

CONCLUSION

A mixture of Coir dust + Granite + Sand at a ratio of 1:1:1, was the best medium for growth of 6–14-month-old Dendrobiumorchid type 'TC 05' for acclimatization under 70% shade in a glass house.

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REFERENCES

1. Ahmad G. and S. Saravanan. 2014. Effect of NPK and potting media on plant growth and spike yield of Dendrobium orchid cv. Sonia Hiskula. HortFlora Res. Spectrum, **3**(4): 383-385
2. Alth, M. 1977. How to farm your backyard the mulch-organic way. Mcgraw-Hill Book Company, New York: 69-103
3. Arora, Y. K, S.K. Jain and A. Mukherjee. 1978. Ornamental Dendrobiums of North East India. Indian Journal of Horticultural sciences. 22(1): 16-19.
4. Arumugam and Jawaharlal. 2004. Effect of Shade Levels and Growing Media on Growth and Yield of Dendrobium Orchid Cultivar Sonia-17. Journal of Ornamental Horticulture. 7(1):107-110.
5. Bateman, R.B. 1957. Gravel culture of orchids. American Orchid Society. Bulletin. 26: 778-787.

6. Bhattacharjee, S K. 1981. Effect of fertilizers on Dendrobium masehatunt. Die Gartenbauwiss. 46: 178-181.
7. Bhattacharjee, S. K. and T.K. Mukherjee. 1981. Effect of potting media on the growth and flowering of some epiphytic and terrestrial orchids. Haryana Journal of Horticultural sciences. 10(1/2): 58-66.
8. Bilderback, T.E., S.L. Warren, J.S.Owen, and J.P. Albano. 2005. Healthy substrates need physicals too. Hort. Technology, 15: 747–751.
9. Bose TK and S.K. Bhattacharjee. 1980. Orchids of India, Naya Prakash, Calcutta, India, 132
10. Bose, T.K. and S.K. Bhattacharjee, 1972. Orchid growing in warm climate. Indian Horticulture. 17(2): 25-27.
11. Caldari J.P. 2004. Técnicas de cultivo do antúrio (Anthurium andraeanum). Revista Brasileira de Horticultura Ornamental 10:42-44.
12. Chowdhery H.J. 2001. Orchid diversity in north- east India. Journal of Orchid society in India. 15:1-17.
13. Cibes, H.R, C. Cernuda, and A.J. Loustalot. 1957. New orchid medium lowers the production cost. *American Orchid Society*. Bulletin. 26: 409-411.
14. Fahrurrozi, F., Z. Muktamar, N. Setyowati, S. Sudjatmiko and M. Chozin. 2019. Comparative Effects of Soil and Foliar Applications of Tithonia-Enriched Liquid Organic Fertilizer on Yields of Sweet Corn in Closed Agriculture Production System. AGRIVITA Journal of Agricultural Science 41(2): 238–245
15. Grafiadellis I, K. Mattas, E. Maloupa., I. Tzouramani, and K. Galanopoulos. 2000. An economic analysis of soilless culture in Gerbera production, HortScience, 35 (2), pp. 300-303
16. Guitart, D., C. Pickering, and J. Byrne. 2012. Past Results and Future Directions in Urban Community Gardens Research. Urban Forestry & Urban Greening. 11: 364-373
17. Hapsoro, D., V.A. Septiana, S. Ramadiana, and Y. Yusnita. 2018. A Medium Containing Commercial Foliar Fertilizer and Some Organic Additives Could Substitute Ms Medium For In Vitro Growth of Dendrobium Hybrid Seedlings. J.Floratek 13(1): 11-22.
18. Hariyanto, S., A. Jamil, and H. Purnobasuki. 2019. Effects of Plant Media and Fertilization on The Growth of Orchid Plant (dendrobium sylvanum rchb. F.) in Acclimatization Phase. Planta Tropika: Journal of Agro Science. 7(1) :66-72.
19. Herastuti, H. and S.E.K. Hardiastuti. 2020. Effect of Fertilizer Frequency on Growth Varieties of Dendrobium Orchid. Proceeding on Engineering and Science Series (ESS) 1 (1): 246-252.
20. Higaki, T and R.T. Poole. (1978). A media and fertilizer study in anthurium. Jo Amer Soc. Hort. Sci. 103(1):-100
21. James I.D., 1993. Growing Orchids. Cassell Publishers Ltd. London, U.K. Chapter 6, Pp24
22. Malhotra, S. 2013. Urban and Peri-urban Horticulture- A Perspective. Confederation of Horticulture Associations of India.
23. Mastouri, F., M.R. Hassandokht, M.N. Padasht Dehkaei, 2005. The effect of application of agricultural waste compost on growing media and greenhouse lettuce yield. Acta Horticulturae, 697: 153–158.
24. Mondragon, D., T. Valverde, and M. Hernandez. 2015. Population Ecology 0f Epiphytic Angiosperms: A review. Tropical Ecology 56 (1): 1-39.
25. Naik, M.R., K. Ajithkumar, A.V. Santhoshkumar, and K.N. Anith. 2017. Flowering and Physiological Traits of Dendrobium Cv. Earsakaul as Influenced by Various Nutrients and Microclimatic

Conditions. Bulletin of Environment, Pharmacology and Life Sciences, Vol. 6 Special issue [1]: 50-54
26. Naik, S., S. Maurya, and J. Choudhary. 2014. Growing Orchid: An Overview. ICAR Research Complex For Eastern Region,India
27. Nejad A.R, A. Ismaili. 2014. Changes in growth, essential oil yield and composition of geranium (Pelargonium graveolens L.) as affected by growing media, J. Sci. Food Agric., 94 (5), pp. 905-910
28. Paul C, P.K. Rajeevan. 1992. Influence of media on growth parameter in Dendrobium. Journal of Orchid Society of India. 6(1-2):125-30.
29. Puchooa D. 2004. Comparision of different culture media for the in vitro culture of Dendrobium. International Journal of Agriculture Biology. 6:884-88.
30. Raviv M and J.H. Lieth. 2008. Significance of soilless cultivation in agriculture, Soilless Culture: Theory and Practice, Academic Press, San Diego, USA, pp. 1-11
31. Rittershausen B. and W. Riettershausen. 1985. Orchid Growing Illustrated. Blandforf, 41-17 Strand, London, U.K. Pp 53.
32. Sakai E. 2004. Cultivo de antúrio: uma experiência no Vale do Ribeira. Revista Brasileira de Horticultura Ornamental 10: 27-34.
33. Saravanan, S. 2001. Studies on standardization of certain production technologies for Dendrobium orchid hybrid sonia-17.A thesis submitted to Tamilnadu agricultural university.
34. Saravanan, S. and K. Amit. 2009. Stardardization of Agro-Techniques of Dendrobium Orchids under protected condition. New agriculturist. 20(1,2): 141-45.
35. Savvas D., G. Gianquinto, Y. Tuzel and N. Gruda. 2013. Soilless culture, Good Agricultural Practices for Greenhouse Vegetable Crops, Principles for Mediterranean Climate Areas, 217, FAO Plant Production and Protection Paper, pp. 303-354.
36. Samseemoung, G., P. Soni and C. Sirikul. 2017. Monitoring and Precision Spraying for Orchid Plantation with Wireless WebCAMs. Agriculture 7, 87: 1 – 14.
37. Singh, F. 1978. Orchid growing in Bangalore. Indian Horticulture. 22(4): 14-17.
38. Stephen, R.B. 1981. Orchid culture and Growing media. American Orchid Society Bulletin. 50(11): 1318-1324.
39. Suárez, N. 2010. Leaf lifetime photosynthetic rate and leaf demography in whole plants of Ipomoea pes-caprae growing with a low supply of calcium, a ‘non-mobile’nutrient. Journal of Experimental Botany, 61(3): 843-855
40. Teixeira da Silva, J., M. Hossain, M. Sharma, J. Dobránszki, J. Cardoso, and Z. Songjun. 2017. Acclimatization of in Vitro-derived Dendrobium. Horticultural Plant Journal. 3 : 110-124.
41. Trepanier, M., M.P. Lamy, and B. Dansereau. 2008. Phalaenopsis can absorb urea directly through their roots. Plant and Soil. 319 : 95-100.
42. Trimanto and A. Rahadiantoro. 2017. Acclimatization of plant collection from Moyo Island Forest, West Nusa Tenggara, Indonesia at Purwodadi Botanic Garden. Tropical Drylands 1 (1) :43-49
43. Umaharan P, W. Elibox. 2011. The UWI St. Augustine Anthurium Web Site: Horticultural Management, Available at http://sta.uwi.edu/ anthurium/ horticultural Management.
44. Yong, J.W.H., J.W. Wang, Y. Khew, C.R. Sheue, and W.S. Wong. 2014. A Guide to the Common Epiphytes and Mistletoes of Singapore. Centre of Urban Greenery and Ecology, National Parks Board. Singapore

45. Zulfita, D., Maulidi and A. Hariyanti. 2019. Application of Leaf Fertilizer Using Nano Technology to Read Vegetative Growth of Vanda sp. Journal of Tropical Horticulture, 2 (1) : 19-23.