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## Comparative effect of different growing media on growth and flowering of orchid *Dendrobium L.*

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### Abstract

This research experiment was conducted to investigate the “Comparative effect of different growing media on growth and flowering of Orchid *Dendrobium L.*”. The data for both morphological and physiological parameters analyzed statistically showed significant effect of different media. Each treatment was consisted of 10 plants and was replicated thrice. Growing media are different form soil. It should preferably be inert, porous and resistant to organic decomposition and it should be cheap and easily available. An economical and high-quality production of *Dendrobium L.* can be attained by using most suitable media. Four different growth media Cocopit, Sawdust, Vermicompost and Charcoal were used. The result regarding growth showed significant increase in Charcoal media. Vermicompost media also showed positive result for plant vegetative and reproductive growth. Sawdust media was seen to prove less effective for better plant growth due to its poor aeration which leads to oxygen unavailability around the roots. Thus, it is suggested that Charcoal media can be recommended as a standard growing media for growth of *Dendrobium L.*

**Keywords:** Orchid, growth media, charcoal

### Introduction

*Dendrobium L.* is a genus of mostly epiphytic and lithophytic orchids in the family Orchidaceae. It is a very large genus, containing more than 1,800 species that are found in diverse habitats throughout much of south, east and southeast Asia, including China, Japan, India the Philippines, Indonesia, Australia, New Guinea, Vietnam and many of the island of the Pacific. Orchids in this genus have roots that creep over the surface of tree or rocks, rarely having their roots in soil. Orchid cut flowers have emerged as leader in the international market and have immensely contributed to the economy of several developed and developing countries. They are valued for cut flower production and as potted plant in commercial floriculture owing to the wide range of colours, shapes, sizes and fragrance they display. Orchids are excellent for garden and can be grown in beds, pots, baskets, split hollows of bamboo pieces etc. They are marketed globally as cut flowers for making corsages, floral arrangements and bouquets. 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.

Potting media plays a key role in quality and production of flowering plants. Natural soil and peat are the most used growing substrates for the container production of annual and perennial ornamental plants (U. Tariq., *et al.* 2012) [14]. Potting media containing peat is commercially an expensive and non-reusable component but developing inexpensive alternatives by the use of nutrient-rich organic media can potentially result in reduction of fertilization and irrigation rates as well as also decrease nursery costs (S.B Wilson., *et al.* 2002) [11]. Peat is the most widely used substrate for potted plant production in nurseries and it accounts for a significant portion of the material used to grow potted plants. (Ribeiro., *et al.* 2007) [6].

At present cultivation of Orchids, is gaining momentum in India. It has got an excellent market potential in the floriculture industry. Despite the fact that India has diversified climate, low cost of labour and progressive farming technology, the Orchid industry is still in an infant stage for commercial cultivation. This has been mainly due to non-availability of planting material for large scale cultivation, lack of technology for commercial multiplication, lack of adequate techniques on production practices resulting in poor yield and quality, lack of post-harvest handling technology for cut flower export and lack of incentives. Hence, selection of suitable media for good vegetative growth and flower yield of orchids is very important.

Bhattacharjee (1982) [1] suggested large pieces of charcoal as an excellent growing medium for

*Cattleya*, *Epidendrum*, *Phalaenopsis*, *Dendrobium*, *Rhynchostylis* and *Vanda*. Arora *et al.*, (1978) [16] suggested the same medium for *Dendrobium*. Studies of Poole and Sheehan (1977) [9] indicated that both terrestrial and epiphytic orchids could be grown in a mixture of peat and perlite (1:1) with excellent results and also seen that *Aerides multiflorum* was found to perform well in a substrate of hardwood charcoal.

In a survey conducted by White (1986) [15] on potting media used by orchid growers, an array of materials was listed. The materials included were fir bark, tree fern, osmunda fibre, coconut fibre, sphagnum moss, gravel or stones, charcoal, perlite and commercial orchid mixtures containing sugarcane waste, charcoal and perlite. A combination of different components was also tried by different orchid growers. According to Talukdar and Barooah (1987) [13], *Dendrobium densiflorum* performed best in a combination of saw dust, charcoal, brick pieces and moss, by showing superiority for number of flowers per spike and blooming period, compared to the other five media tried. According to Grove (1988) [4], *Vanda* and *Ascocenda* could be grown in excellent condition in plastic pots with lot of drainage holes or slatted wood baskets in a medium of chunks of hardwood charcoal.

Studies performed by Paul and Rajeevan (1992) [8] 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. On the other hand, Kumar (1992) [7] stated that *Dendrobium* hybrids potted in charcoal medium followed by fern roots and rubber seed husks gave the best results with regard to plant height, leaf area, length of floret stalk and number of florets per spike. Dematte (1996) [3] observed the suitability of various potting media for cultivation of epiphytic orchids and concluded that the best potting media had been the pressed coconut bark alone or mixed with charcoal. Similarly, Hersh (1997) [5] observed that potting media containing charcoal followed by fern roots promoted good plant growth, increased number of leaves and promoted early flowering in *Dendrobium* Orchids.

## Material and Methods

The present research was carried out at Department of Plant Physiology, Indira Gandhi Krishi Vishwavidyalaya, Raipur to evaluate the comparative effect of different growing media on vegetative and reproductive growth of orchids *Dendrobium* L. Pots were thoroughly filled with substrates according to treatments. Substrate samples from each treatment were collected for morphological analysis. The experiment was carried out in Completely Randomized Design (CRD) and each treatment consisting of 10 plants was replicated thrice. The application of different treatments is given in Table.1. Observation were recorded on three randomly selected plants in each treatment i.e. Plant height, Number of leaves per plants, Number of shoot per plant, Number of new shoot per plant, Shoot girth, Root length were analysed at vegetative and flowering stage.

**Table 1:** Different types of growing media used

Treatments	Growing media
T <sub>1</sub>	Cocopit
T <sub>2</sub>	Sawdust
T <sub>3</sub>	Vermicompost
T <sub>4</sub>	Charcoal

## Results and Discussion

Plant height was significantly superior among the treatments presented in [Fig.1]. The maximum plant height was recorded in T<sub>4</sub> charcoal media in stage, vegetative stage (41.36 cm) and flowering stage (45 cm). Followed by, T<sub>1</sub> cocopit media at flowering stage (42.13 cm) and T<sub>3</sub>, sawdust media at vegetative stage (38.33 cm). Minimum plant height was recorded in T<sub>3</sub>, vermicompost at vegetative stage (30.66 cm) and T<sub>2</sub>, sawdust at flowering stage (40.66 cm). Charcoal media has proven its superiority over other media in both vegetative and flowering character of orchids. Vigorous and healthy root system in epiphytic orchids was the first step towards ensuring maximum growth and favourable nutrient supply. Similar result was also supported by Bhattacharjee, (1984) [2]. Number of leaves was significantly superior among treatment presented in [Fig.2]. Maximum number of leaves was obtained in T<sub>4</sub>, charcoal media at flowering stage (6.33) and T<sub>3</sub>, vermicompost at vegetative stage (5.33), followed by T<sub>4</sub>, charcoal at vegetative stage (5.00). Minimum number of leaves observed in T<sub>1</sub>, cocopit media (2.66) and Sawdust at flowering stage (3.00). Similar result was also obtained by (S. Saravanan, 2001) [12]. Lower number of leaves per plant with sawdust and coconut husk medium, respectively, because they had high water retention and poor aeration which leads to oxygen unavailability around the roots. Number of shoots per plant was significant different in different growth media [Fig.3]. Highest number of shoot recorded in Charcoal media at flowering stage (4.33). Followed by vermicompost and sawdust at flowering stages (3.33) Minimum number of shoot per plant was recorded in Sawdust media at vegetative stage (1.33) and in Cocopit at vegetative stage (2.00). The experiment finding was also supported by (Bhattacharjee, 1980) [1] and (S. Saravanan, 2001) [12]. Charcoal media found superior because of better, root aeration, resistance to high heat and supply of nutrients. The reason for reduction in number of shoot in sawdust and coconut husk was due to poor root aeration and depletion of nutrient. Number of new shoot per plant was significant difference in flowering stage. [Fig.4]. The maximum number of new shoot per plant was recorded in T<sub>3</sub>, Vermicompost media at flowering stage (2.33) and T<sub>4</sub>, charcoal media at flowering stage (2.00). Minimum number of new shoot was observed in T<sub>1</sub>, cocopit media at both stage (1.00) and T<sub>2</sub>, Sawdust at vegetative stage (1.00). This result was also partially supported by (Arancon *et al.*, 2008 and Joshi and Vig, 2010) [17, 18] they had studied the effect of vermicompost on growth, yield and quality of tomato (*Lycopersicon esculentum* L). Vermicompost have high porosity, aeration, drainage and water holding capacity, therefore it can be used as growth media to maximize number of shoot in orchid. Shoot girth was found to be markedly influenced by growth media at both stages [Fig.5]. Different growth media found significant effect on shoot girth. The maximum shoot girth was observed in treatment T<sub>4</sub>, Charcoal at flowering stage (4.1cm) and vegetative stage (3.83 cm). Minimum shoot girth recorded in T<sub>2</sub>, Sawdust media at vegetative stage (2.56 cm) and at flowering stage (3.03 cm). This experiment was also supported by (Paul and Rajeevan, 1992) [8] and (Kumar, 1992) [7]. Charcoal media gave slow nutrient to enhanced shoot girth and good support for shoot growth. Sawdust showed lowest shoot girth because of high compactness of pores after irrigation. There was significant difference in growth media in relation to root length. [Fig.6]. The highest root length was recorded in T<sub>4</sub>, Charcoal (32.46

cm) followed by T1, Cocopit media and T3, Vermicompost and lowest root length observed in T2, Sawdust media 23.23 cm. Similar results were found by (Paul and Rajeevan, 1982)<sup>[8]</sup>, (Kumar 1992)<sup>[7]</sup>, (S. Saravanan, 2001)<sup>[12]</sup>. Charcoal media was found better for root and shoot growth they provide proper water, supply nutrients, permit gas exchange to roots.

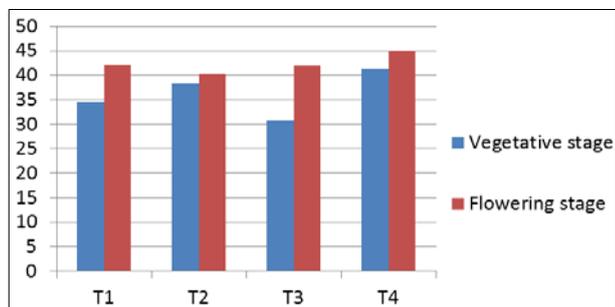


Fig 1: Plant Height

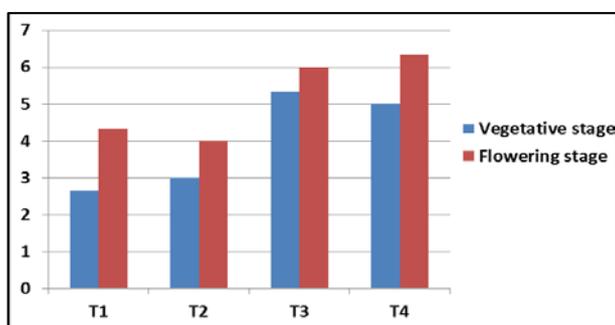


Fig 2: Number of leaves

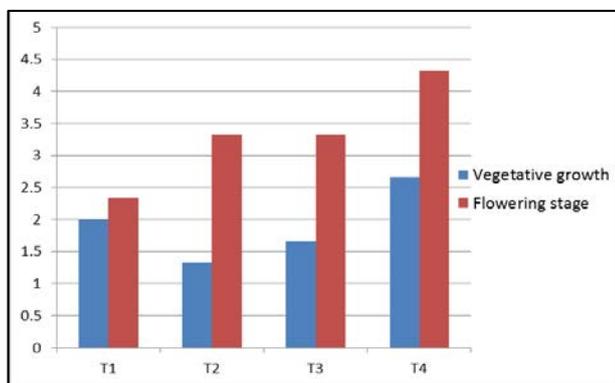


Fig 3: Number of shoots/plant

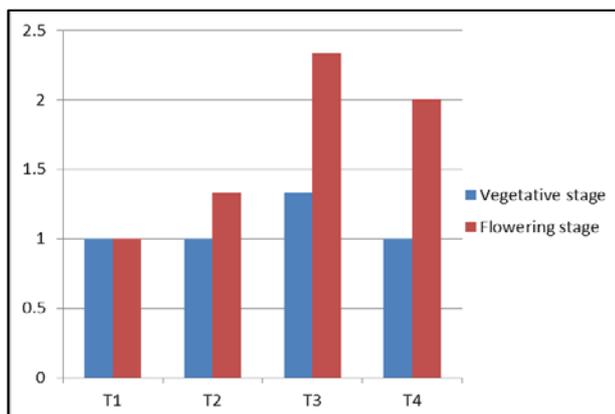


Fig 4: Number of new shoots /Plant

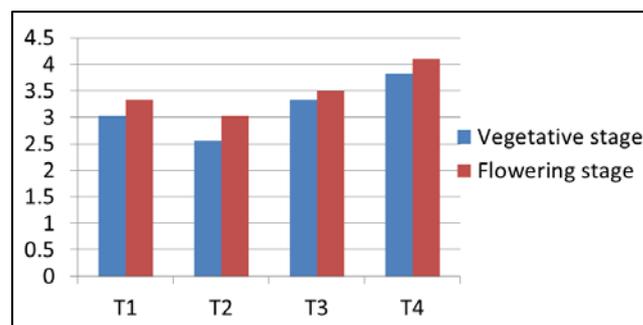


Fig 5: Shoot Girth

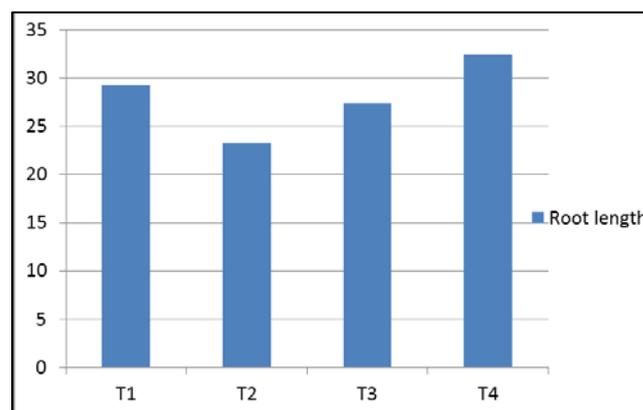


Fig 6: Root length

**Conclusion**

The present study confirms the fact that selection of the appropriate growth medium for orchid plants was very important from yield and quality point of view. The medium must ensure the production of plants of the required quality on cost effective basis. So, it is concluded that charcoal media have been identified for better performance for plant height, number of leaves per plant, maximum number of shoots per plant, shoot girth and root length. Charcoal media showed best result regarding plant growth.

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