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Effect of different growing media on morpho-physiological traits of orchid (*Dendrobium nobile* L.) under shade net house

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Abstract

An experiment was carried out during *rabi* season in 2020-2021 at Department of Plant Physiology, AB & MAP, COA, IGKV, Raipur (C.G.) under shade net house. The experiment was laid out in completely randomized design (CRD) with four treatments, each treatment replicated thrice. The effect of four different media i.e., cow dung and vermicompost, charcoal, tree barks and pieces of bricks was studied. It was observed that treatment of tree barks was found superior to improve in height of pseudobulb (19.20 cm), number of internodes per plant (3.80), internode length (4.60 cm), number of leaves (5.26), shoot girth (4.16 cm). The treatment pieces of bricks recorded best for root length (17.16 cm). The treatment cow dung + vermicompost recorded best for leaf area (44.68), light intensity (153.90), chlorophyll value (46.70).

Keywords: *Dendrobium*, media, morpho-physiological

Introduction

Orchids are the most beautiful flowers in God's creation. Orchids are members of the Orchidaceae family, which is the biggest flowering plant family, with 25,000 species divided into 600-800 genera (Chowdhery, 2001) [3]. The *Dendrobium* plant has a unique look, since it is sympodial, epiphytic, and lacks a bulb, yet it has stalks that produce the papery-green leaves (Hew and Yong, 2004) [4]. Each year, throughout the months of December and January, vegetative growth begins. The pseudobulb or thickened stem are useful for the storage of food and water. Flower buds develop in the leaf axis. Pseudobulb is ready to harvest in November and December of the following year. Following proper cooling, flowers begin to bloom in February and March of the following year. Up to three blooms can be produced from each node. Rapid vegetative development occurs in most *Dendrobium* orchids at temperatures between 24 °C and 30 °C (Leonhardt, 2000) [6]. *Dendrobium* orchids are professionally cultivated in greenhouses, where they demand shade, a cool environment and a high level of humidity. Plants that are exposed to direct sunlight have charred leaves and wilt (Lavanya *et al.*, 2009) [5]. *Dendrobium* orchids growth is primarily governed by the right planting media combination and media has a protective effect against diseases (Naik *et al.*, 2014) [8]. A good planting media provides proper aeration, drainage and water holding capacity. Therefore, the present study was aimed to investigate the effect of growing media on morpho-physiological traits of orchid.

Materials and Methods

The present study was conducted at Department of Plant Physiology, AB & MAP, COA, IGKV, Raipur (C.G.) under shade net house in plastic pots in completely randomized design (CRD). The epiphytic *Dendrobium nobile* is grown in different growing media i.e., T1 (cow dung and vermicompost), T2 (charcoal), T3 (tree barks) and T4 (pieces of bricks) and is replicated thrice. A one-year-old *Dendrobium* orchid was utilised in the experiment. Foliar application of NPK 19:19:19 was tested at a concentration of 0.1% and fertigated three times weekly. It boosts the plant's morpho-physiological activities. The overhead misting system was used to irrigate the plants in net house. Fusarium wilt, Phytophthora rot and leaf spot were all controlled using the fungicide Bavistin (1.5 m/l) before planting. To minimize weed competition and adequate aeration, weeding was done manually. Uniform cultural practices were followed throughout the experiment. The data were recorded on vegetative growth parameters, viz. height of pseudobulb, leaf number, number of shoots, number of internodes per plant, internodal length, shoot girth, root length and physiological parameters, viz. leaf area, light intensity and chlorophyll value.

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Results and Discussion

The results of the experiment conducted on the effect of different growing media on morpho-physiological traits of orchid (*Dendrobium nobile* L.) under shade net house are presented in (Table 1 and Table 2). Among different growing media, plants grown in T3 (tree barks) recorded significantly maximum height of pseudobulb (19.20 cm), number of leaves (5.26), number of internodes per shoot (3.80), internodal length (4.60 cm) and shoot girth (4.16 cm). Tree bark media provides balanced nutritional supplements to the plant and nitrogen is a chief constituent of proteins for the formation of protoplasm, providing metabolic energy to cell division and cell enlargement (Ramya 2007, Swapna 2000) [9, 11]. Lower number of leaves in charcoal media is due to less porous in nature so that the aeration and drainage is not good, also the water holding capacity and nutrient absorption was low (Arthagama *et al.* 2019) [1]. Among different growing media, T4 (pieces of bricks) media found best for root length (17.16

cm), followed by T1, cow dung+ vermicompost media (16.76 cm) and T3, tree barks (16.33 cm). Pieces of bricks media are not compact, provided good aeration and allowed free growth of roots which resulted in increase of length of roots (Sanghamitra *et al.* 2019) [10].

Among different growing media, T1 (cow dung and vermicompost) media recorded best for leaf area (44.68), light intensity (153.90) and chlorophyll value (46.70), followed by T3 (tree barks), leaf area (44.01), light intensity (151.53) and chlorophyll value (44.56). Cow dung and vermicompost media is highly organic, well aerated with good water retention capacity and drainage (Muraleedharan and Karuppaiah 2015) [7]. Cow dung and vermicompost media provides optimum dose of nitrogen received by the plants and nitrogen is the major constituent of chlorophyll and involved in major physiological process like photosynthesis (Baboo and Singh 2006) [2].

Table 1: Effect of different media on morphological traits of *Dendrobium* orchid

Treatment	Growing media	Height of pseudobulb (cm)	Number of leaves	Number of shoots per plant	Number of internodes per shoot	Internodal length (cm)	Shoot girth (cm)	Root length (cm)
T1	Cow dung and vermicompost (1:1)	15.26	4.86	2.06	3.4	4.13	4.06	16.76
T2	Charcoal	12.53	4.4	1.93	3.26	3.43	3.36	14.93
T3	Tree barks	19.2	5.26	2.2	3.8	4.6	4.16	16.33
T4	Pieces of bricks	14.26	4.46	2	3.53	4.33	3.8	17.16
S.Em		0.97	0.18	0.09	0.09	0.18	0.15	0.43
CD (P=0.05)		3.22	0.6	NS	0.31	0.59	0.5	1.44
CV (%)		11	6.65	7.96	4.66	7.57	6.87	4.63

Table 2: Effect of different media on physiological traits of *Dendrobium* orchid

Treatment	Growing media	Leaf area	Light intensity	Chlorophyll value
T1	Cow dung and vermicompost (1:1)	44.68	153.90	46.70
T2	Charcoal	37.41	138.53	39.43
T3	Tree barks	44.01	149.06	44.56
T4	Pieces of bricks	43.66	144.63	43.84
S.Em		1.32	4.34	1.30
CD (P=0.05)		4.39	NS	4.33
CV (%)		5.41	5.13	5.19

Conclusion

The study revealed that growing media tree bark was found better for vegetative growth and cow dung and vermicompost media appeared better for physiological parameters of *Dendrobium nobile* orchid.

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