Original Research Article

Effect of growing media on growth and flowering of cymbidium orchid (*Cymbidium spp*) in Godawari, Nepal

Abstract

The experiment was conducted at Himalayan Orchid Farm, Godawari during 2013 to 2014. The study aimed to evaluate the effect of growing media including mineral nutrition and sucker management to determine the effective growing media composition for plant growth and early flowering. Three factors: media (viz. control, bark + charcoal + litter, and bark only); NPK and agronomy practice (control and removal of side sucker) were evaluated under factorial design with four replications. The result revealed that emergence of flower differed among the media and NPK level as media having bark only gave the highest number of flowering plants, while farmers practiced media was resulted in none flowering plants. The sucker retained management showed the higher vegetative growth; while sucker removed treatment gave the higher flowering plants. Similarly, bimonthly application of NPK 19:19:19 was found superior over control.

Key words: *cymbidium orchid; mineral nutrition; juvenile; vegetative growth; flowering; sucker*

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INTRODUCTION

Cymbidium orchids (*Cymbidium spp*) account a large share both as cut flowers and as potted plants in the global floriculture trade (De et al., 2014; Chugh et al., 2009; Lopez and Runkle, 2005; Zhenjian et al., 2008). In Nepal, it has been grown commercially for last decade and the annual production was estimated at 20000-25000 cut stems in 2014 (AEC, 2009). There are many aspects affecting the commercial production, of which, plant nutrition is very important (Wang, 1996). Orchids usually have long juvenile periods up to 13 years that causes delayed transition to reproductive development (Kostenyuk et al., 1999; Zhang et al., 2018). The transition from vegetative growth to flowering may be influenced by various factors, including hormones and nutrients (Kostenyuk et al., 1999). Thus, the shortening the period of vegetative growth, especially in commercial varieties and hybrids, is of paramount important for commercial production.

Currently, pine bark mixed with leaf litter and compost is the common growing media for orchid cultivation in Nepal (Pun, 2016; Pun et al., 1995). In the existing condition, mineral nutrition is not applied in the growing media. Moreover, agronomical practice for sucker management is lacking in the existing orchid cultivation in Nepal. As the result, plants normally take almost 4 to 5 years to bear flowers (Pun, 2016), which is too longer that makes cost of production very high. If agronomic management is practiced with appropriate nutrient and sucker management, the flowering period can be significantly reduced (Bichsel et al., 2008; Wang and Gregg1994; Poole and Seeley, 1974). So far, research work on these aspects is lacking (Pun & Pun, 2009). Moreover, knowledge on the physiology and factors affecting growth and development of orchids in the specific climate are essential (Chugh et al., 2009). To expand the production, improved production husbandry including plant nutrition has to be adopted.

In this context, the aim of this study were to evaluate the effect of different growing media including mineral nutrition, and sucker management on the plant growth and flowering behaviour of cymbidium orchid to determine the appropriate growing media mixture including mineral nutrition and sucker management.

MATERIALS AND METHOD

The experiment was conducted under screen house condition at Himalayan Orchid Farm, Godawari in two consecutive seasons from November 2013 to May 2014. The temperature inside the screen house during the experimental period was measured at 5 to 30˚C. The experimental site was shaded with a 60% agro-net. The tissue-cultured plants of 5-year-old were hardened in community pots for 6 to 8 weeks before transferring them into experimental pots. Three factors: NPK (viz. control, 19:19:19 NPK, 25:19:25 NPK); media (control, bark + charcoal + litter, bark only); and sucker management (side sucker retained and removal of side sucker) were evaluated under 3 x 3 x 2 factorial design with 4 replications, with one plant per replication. The leaf length, leaf breath, sucker diameter, number of leaves, number of branches and number of flowers were observed. The data were analyzed using analysis of variance and the least significant difference (LSD) test.

RESULTS AND DISCUSSION

The results of sucker management, growing media and NPK on vegetative growth are presented in Table 1 that all have non-significant effect on the growth of leaf and sucker except the effect of growing media and NPK respectively on leaf length and sucker growth. The effect of sucker management that leaf and sucker growth were found similar between suckers retained and sucker removal treatments. On comparing the growing media, it is evident that media combination with leaf-litter, charcoal and bark was slightly better over farmers' media and media with bark only for leaf and sucker growth.

The result showed a significant variation on the number of leaves and branch per plant due to the effect of media, while it was non-significant on NPK effect. The leaf numbers were differed from 9 to 11 and branch from 4 to 5 at different media. It was observed the same leaf number (nos 10) and branch number of 4 to 5 at NPK effect.

Table 1. Effect of growing media and NPK on the vegetative growth during 2013-1014

Treatments	Leaf Length (cm)	Leaf Breath (mm)	Sucker Diameter (mm)
Sucker management			
1. Sucker retained	39.82	11.22	18.0
2. Sucker removed	39.87	11.11	17.69
P-value	ns	ns	ns
LSD (0.05)	1.688	0.3738	1.397
CV %	9.1	7.1	16.5
Growing media			
1. Farmer's media	38.14	11.3	17.45
2. Leaf litter + charcoal + bark	40.79	11.23	18.83
3. Bark only	40.61	10.98	17.25
P-value	*	ns	ns
LSD (0.05)	2.068	0.4578	1.71
CV %	9.1	7.1	16.5
NPK			
1. Control	40.92	11.19	17.37

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2. NPK 19:19:19	39.55	11.34	19.27
3. NPK 25:19:25	39.06	10.97	16.9
P-value	ns	ns	*
LSD (0.05)	2.068	0.4578	1.71
CV %	9.1	7.1	16.5

*Notes: Values are the means of four replications. Means in the column with different letters indicate significantly differences (P≤0.05); * indicates significantly differences at P≤0.05 level.*

The effect of sucker management was found significant on production of number of leaf and branch, while it was insignificant to the number of plants producing flower. However, higher numbers of flower plants was found at sucker removal compared to sucker retained management. Similarly, emergence of flower differed among the media and NPK levels. The media having bark only gave the highest number of plants producing flower (nos 0.250), while farmers practiced media as having higher proportion of compost had none of flowering plant (Table 2).

Table 2. Effect of growing media and NPK on the leaf and branch number, and emergence of flower during 2013-2014

Treatments	**No. of leaves/ branch**	**No of branch/ Plant**	**No of plants producing flowers (n=24)**
Sucker management			
1. Sucker retained	9.69	3.81	0.083
2. Sucker removed	10.31	4.53	0.167
P-value	*	*	ns
LSD (0.05)	0.605	0.449	0.148
CV %	12.8	22.8	55.9
Growing media			
1. Farmer's media	10.75	4.21	0.000
2. Leaf litter + charcoal + bark	9.46	4.5	0.125
3. Bark only	9.79	3.79	0.250
P-value	*	*	*
LSD (0.05)	0.742	0.550	0.1812
CV %	12.8	22.8	55.9
NPK			
1. Control	10.04	3.83	0.250
2. NPK 19:19:19	10.04	4.5	0.125

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3. NPK 25:19:25	9.92	4.17	0.000
P-value	ns	ns	*
LSD (0.05)	0.742	0.550	0.1812
CV %	12.8	22.8	55.9

*Notes: Values are the means of four replications. Means in the column with different letters indicate significantly differences (P≤0.05); * indicates significantly differences at P≤0.05 level.*

DISCUSSION

The results revealed that media combination with leaf-litter, charcoal and bark was found better over farmers' media and media with bark only for leaf and sucker growth, however, media with bark only appeared better for bearing highest flowering. In the review study of Pun and Adhikari (2015), a proper combination of peat moss, bark, compost, and wood pieces including litters has been recommended for potting medium, having porous and drainable. Similarly, bimonthly application of NPK 19:19:19 gave the better results in the present study that similar finding was obtained by ……In an investigation, Vaz et al. (2004) observed increased flower spike number on high carbohydrate levels accumulated in the plants.

In the present study, the media having bark only gave the highest number of plants producing flower, while farmers practiced media as having higher proportion of compost had none of flowering plant. Ng and Hew (2000) showed that the active accumulation of mineral nutrients during the period of pseudo bulb development constitutes an important source of reserve in determining the numbers of flowers produce. It is therefore recommended that special attention be paid to the fertilization regime, especially during the period of new shoot development.

In the investigation of Kostenyuk et al. (1999) that it was reported that concerted actions of cytokinin, root excision and restricted nitrogen supply resulted in early flowering of C. niveo-marginatum in vitro.

De Kreij & Van den Berg (1990) found that good vegetative growth is needed to obtain a large number of generative buds, but too much vegetative growth can reduce generative bud formation, thus a combination of a high Nitrogen level during vegetative growth and omitting fertilizer during generative bud emergence should give the highest yield and earlier flowering. Griesbachs' (2002) studies showed that fertilization was critical for commercial production.

CONCLUSION

Based on the results, the emergence of flowers found excellent on the media having bark only among the media and NPK level as while farmers practiced media was resulted in none flowering plants. Thus, growing media having higher proportion of pine bark would be advised for early flowering in contrast to compost on the media.

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