Indian J. Hort. 69(3), September 2012: 395-398

Effect of media and nutrition on growth and flowering of *Cymbidium* hybrid 'H.C. Aurora'

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ABSTRACT

A trial was conducted to study the influence of the media and frequency of nutrient application on growth and flowering of *Cymbidium* hybrid 'H.C. Aurora'. Treatments involved growing of *Cymbidium* in different combination of media, *i.e.*, M_1- perlite + coco peat + brick pieces; M_2- coco peat + brick pieces + leaf mould; M_3- perlite + brick pieces; M_4- thermocol + coco peat + brick pieces; M_5- rotten log + sand + coconut husk + brick pieces; M_6- *Castanopsis hysterix* bark + maize cob + leaf mould; M_7- leaf mould + sand + coconut husk + brick pieces + charcoal (Farmer's practice) and spraying of water soluble fertilizer ($N_{19}P_{19}K_{19}$) at 1 g/l concentration at weekly and biweekly interval. The result indicated that among the vegetative characters, maximum number of shoots (6.11), number of pseudobulb (4.40), pseudobulb girth (3.03 cm), length leaf (37.95 cm), and floral characters like spike length (66.51 cm) and number of spike/m^2 (15.04) were recorded at growing media *Castanopsis hysterix* bark + maize cob + leaf mould. Further frequency of water soluble fertilizer significantly influenced growth and flowering of *Cymbidium*. Maximum number of shoots (4.54), spike length (54.59 cm) and number of flowers/ spike (10.19) were recorded with biweekly spraying of water soluble fertilizer (1 g/l). Further, the growing media significantly influenced the NPK content of leaves. The physical properties, *i.e.*, pH (6.25), EC (0.23 mmhos/cm^2), bulk density (0.52 g/cc) and water holding (49%) of *Castanopsis hysterix* bark + maize cob + leaf mould medium was found to be better for growth and flowering of *Cymbidium* orchid.

Key words: *Cymbidium*, growth media, nutrition, flowering.

INTRODUCTION

The main objective of growing media is to hold the plant and supply nutrient and water. *Cymbidium* prefers fairly open composts and number of combinations are used and found successful for its cultivation (Barman *et al.*, 2; Bose *et al.*, 3). Cymbidium grows best with a mixture of chopped osmunda, sphagnum moss, fir bark and rich leafy humus for slow decaying nature.

Overall fresh aeration, high light intensity, judicious watering and nutrition are the key factors for the cultivation (Fung, 5; Heathcote, 7; Powell, 9). For orchids, fertilizers have always been a controversial subject among the growers. With the demand of growers, new products are being launched. With the introduction of various media it has become more controversial. Orchids generally grow slowly and require little quantity of fertilizers. Complete fertilizers produced best growth and had more significant effect than the growing media used. *Cymbidium* is one of the new commercial flowering crops in this region and has great potentialities and thus needs attention for cost effective cultivation and maximization of yield. Keeping this in view, an effort has been made to standardize suitable growing media using locally available materials and frequency of application of nutrition for maximization of productivity.

MATERIALS AND METHODS

The 7 × 2 factorial experiment in randomized block design with three replications were initiated to study the effect of media and nutrition on growth and flowering of *Cymbidium.* The plants were grown in 4 inch size perforated pot in a bamboo made lath house with 200 µ transparent polysheet used as cladding material. The four sides of the house were kept open for easy air circulation. Shading net (25%) was used during June to August in each year of experimentation to avoid scorching heat. One-year-old seedlings of *Cymbidium* hybrid 'H.C. Aurora' were planted in 4 inch size pot with respective media. After two years, the plants were repotted in bigger size of perforated pot (6") for proper growth of plant. In each replication nine plants were maintained. The experiment was initiated in March 2003 and continued up to April 2007. The media used were M_1 = perlite + coco peat + brick pieces; M_2 = coco peat + brick pieces + leaf mould; M_3 = perlite + brick pieces; M_4 = thermocol + coco peat + brick pieces; M_5 = rotten log + sand + coconut husk + brick pieces; M_6 = *Castanopsis hysterix* bark + maize cob + leaf mould; M_7 = leaf mould + sand + coconut husk+ brick pieces + charcoal (farmer's practice) and

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water soluble nutrition (N_{19} : P_{19} : K_{19}) was sprayed at a concentration of @ 1 g/l weekly and biweekly and designated as N_1 and N_2 respectively. Micronutrients of commercial grade comprised of Zn (5.3%), B (1.0%), Cu (2.4%), Mn (5.0%) and Mo (0.1%) was sprayed @ 2 g/l at monthly interval. The water holding capacity, pH, EC of various media used, and tissue analysis were analyzed by standard procedures. The shoot and pseudobulb production at regular interval were also taken into account. *Cymbidium* is a slow growing crop with nutrient reserves in the bulb, moreover sufficient number of shoots and backbulbs are required for emergence of flower spikes. Hence, when an agronomic programme is started, it takes a long time before its effect on spike production and quality can be observed. Therefore, the trial was conducted for four years and only the results of the second, third and fourth years were determined. Data was pooled and analyzed by analysis of variance (Gomez and Gomez, 6).

RESULTS AND DISCUSSION

Vegetative development of plants is important factor from flowering point of view because optimum growth bears quality flower. Shoots and pseudobulbs per pot, pseudobulb girth and leaf length were significantly influenced by different media combination used for *Cymbidium* (Table 1). Maximum number of shoots (6.11), pseudobulb (4.40), pseudobulb girth (3.03 cm) and leaf length (37.95 cm) were recorded at the media *Castanopsis hysterix* bark + maize cob + leaf mould in equal proportion. The growing media did not influence remarkably on pseudobulb length and leaf area. The frequency of nutrition application influenced the growth of vegetative characters. Maximum number of shoots (4.54), pseudobulb girth (2.63) and leaf length (36.29 cm) were recorded at biweekly application of nutrition. The interaction of media and nutrition also influenced the vegetative characters (Table 2). Growing of *Cymbidium* in *Castanopsis hysterix* bark + maize cob + leaf mould media and biweekly application of water soluble fertilizer improved shoot production per pot (6.50), length (5.49 cm) and girth (3.15 cm) of pseudobulb. Leaf area and number of leaves per shoot did not show any remarkable variation due to medium, frequency of nutrition and interaction of medium and nutrition. The flowering of *Cymbidium* was significantly influenced by different growing media and maximum flowers per spike (11.56), spike length (66.51 cm) and spike per m^2 (15.04) was noted with medium *Castanopsis hysterix* bark + maize cob + leaf mould. The diameter of flower (10.10 cm) was found maximum at the media comprised of rotten log + sand + coconut husk + brick pieces (Table 1). The frequency of nutrition also influenced significantly flowering characters; application of nutrition at biweekly interval improved number of flower per spike (10.19), spike length (54.59 cm) and spike per m^2 (9.93). The medium and frequency of nutrition application interaction also influenced the production significantly and maximum

Table 1. Effect of media and nutrition on growth and flowering of *Cymbidium* hybrid 'H.C. Aurora'.

Treatment	No. of shoots/ pot	No. of pseudo-bulbs/ pot	Pseudo-bulb girth (cm)	Leaf length (cm)	Leaf width (cm)	No. of flowers/ spike	Flower dia. (cm)	Spike length (cm)	Spikes per m^2
Medium (M)									
M1	3.73	3.13	2.65	31.56	1.95	9.41	8.11	48.63	8.02
M2	3.76	3.05	2.89	33.80	1.55	9.47	8.66	51.90	8.06
M3	3.30	4.03	2.42	35.14	1.51	8.63	8.00	49.08	8.59
M4	3.98	2.93	2.50	37.64	1.88	9.19	8.04	53.38	9.46
M5	4.66	4.29	2.65	31.67	2.06	11.05	10.10	57.19	10.92
M6	6.11	4.40	3.03	37.95	1.71	11.56	8.30	66.51	15.04
M7	3.61	3.70	2.20	28.94	1.70	8.60	8.72	48.82	7.43
CD at 5%	0.469	0.652	0.126	2.831	0.318	0.639	0.640	3.549	0.197
Nutrition (N)									
N1	3.79	3.60	2.60	31.38	1.75	9.24	8.44	52.72	9.39
N2	4.54	3.70	2.63	36.29	1.84	10.19	9.25	54.59	9.93
CD at 5%	0.250	NS	0.067	1.513	NS	0.342	0.342	1.897	0.104

(15.60) was recorded with *Castanopsis hysterix* bark + maize cob + leaf mould medium and biweekly spraying of nutrition (N_{19} : P_{19} : K_{19}) at 1 g/l (Table 2). The results indicated that *Cymbidium* requires porous medium, good nutrient retentive and water holding capacity for better flowering. Zhao *et al*. (10) recorded maximum number of flower spikes when *Cymbidium* grown in groundnut husk + sand media and applied was with N : P_2O_5 : K_2O (10:30:20). In a growing media comprising of brick bits, farmyard manure, charcoal and loamy soil the *Cymbidium* produced maximum yield (Barman *et al*., 1).

The tissue analysis of leaf is presented in the Table 3. The nitrogen, phosphorus and potassium content of leaves significantly influenced by the media and recorded maximum 2.27,1.13 and 2.22%, respectively at *Castanopsis hysterix* bark + maize cob + leaf mould media followed by the media rotten log + sand + coconut husk + brick pieces. The phosphorus and potassium content of leaves was also varied significantly due to frequency of nutrition application. It is assumed that external application of nutrition did not play major role in enhancing leaf nutrient content; however growing media certainly influenced the leaf

Table 2. Interaction effect of media and nutrition on the growth and flowering of *Cymbidium* hybrid 'H.C. Aurora'.

Treatment	No. of shoots /pot	Pseudo-bulb length (cm)	Pseudo-bulb girth (cm)	Leaf length (cm)	Spikes per m^2
M1N1	3.67	3.35	3.13	29.24	7.87
M2N1	3.23	2.73	3.14	29.11	7.88
M3N1	3.43	3.42	2.17	34.12	8.50
M4N1	3.27	4.97	2.31	35.34	9.10
M5N1	3.80	5.09	2.46	29.11	10.70
M6N1	5.07	4.08	2.91	36.44	14.68
M7N1	3.40	4.00	2.16	26.34	7.00
M1N2	3.80	3.82	2.18	33.88	8.18
M2N2	4.30	4.01	2.64	38.50	8.25
M3N2	3.17	3.95	2.67	36.18	8.68
M4N2	4.70	3.62	2.70	39.93	9.82
M5N2	5.53	3.40	2.83	41.57	11.15
M6N2	6.50	5.49	3.15	39.47	15.60
M7N2	3.83	3.96	2.25	31.55	7.87
CD at 5%	0.661	1.244	0.178	4.01	0.279

Table 3. Effect of media and nutrition leaf on nutrient content of *Cymbidium* hybrid 'H.C. Aurora'.

Treatment	Nitrogen (%)	Phosphorous (%)	Potassium (%)
Medium			
M1	1.39	0.88	1.30
M2	1.55	0.94	1.35
M3	1.39	0.94	1.21
M4	1.45	0.93	1.06
M5	2.13	0.95	1.98
M6	2.27	1.13	2.22
M7	1.80	0.99	1.43
CD at 5%	0.328	0.041	0.192
Nutrition			
N1	1.66	0.94	1.46
N2	1.75	0.99	1.55
CD at 5%	NS	0.021	NS

Table 4. Effect of media composition on physical properties.

Treatment	Bulk density (g/cc)	Water holding capacity (%)	pH	EC (mmhos/cm^2)
Medium				
M1	0.31	47.35	5.05	0.33
M2	0.55	46.28	7.50	0.22
M3	0.65	52.14	7.35	0.21
M4	0.62	42.67	6.10	0.13
M5	0.58	50.15	6.20	0.12
M6	0.56	45.26	6.10	0.23
M7	0.53	44.15	7.60	0.17
CD at 5%	0.0059	2.451	1.025	0.132

nutrient content. The physical properties of media play a vital role in production of orchids and significant influence was recorded. The maximum bulk density (0.65 g/cc) and water holding capacity (52.14%) were recorded at perlite + brick pieces, pH (7.60) at farmer's practice media and EC (0.33 mmhos/cm^2) at perlite + cocopeat + brick pieces media. Media used in the experiments were less compact and amount of pore spaces were more. This is in agreement with the reports of Das (4). The higher content of EC did not favour remarkably the shoot, pseudobulb and flower production. This is contradictory with the findings of Kreij and Berg (8).

Based on the above results, *Cymbidium* can be grown successfully on a mixture of *Castanopsis hysterix* bark + maize cob + leaf mould media (1:1:1) which is durable in nature, good physical properties, cost effective and more over easily available. Application of water soluble fertilizer ($N_{19}P_{19}K_{19}$) @ 1 g/l at biweekly interval was beneficial for the optimum growth and flowering.

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Received: October, 2010; Revised: December, 2011; Accepted: April, 2012