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Studies on Color Intensity of Petals and Chlorophyll Content of *Dendrobium* Varieties Grown Under Different Environment Conditions

Sudeep, H. P.*, Seetharamu, G. K., Munikrishnappa, P. M. and Basavaraj, G.

Department of Horticulture, College of Horticulture, Bengaluru-65,

University of Horticulture Sciences, Bagalkot, Karnataka

*Corresponding Author E-mail: sudeebesati@gmail.com

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ABSTRACT

The present investigation was carried out at orchidorium, Regional Horticultural Research and Extension Centre, University of Horticultural Sciences campus, GKVK, Bengaluru during October 2015 to June 2017. The results indicated a significant influence on color intensity of L a* b* on fresh petals of each variety of Dendrobium orchid grown under different environment conditions. Maximum brightness of L* value in petals (49.10) and red to green of a* value (30.47) was recorded in flowers grown under polyhouse condition (G_1) and it was minimum under shadehouse (G_2). Highest flower color from yellow to blue b* value (15.74) was observed in polyhouse condition (G_1) than the shadehouse condition (G_2) (14.42). With respect to Dendrobium varieties, maximum brightness of color intensity (85.63) was recorded in var. Charming White (V_3) and it was minimum color intensity (22.41) was found in var. Mona Red (V_2). Highest red color development (65.51) was recorded in var. Mona Red (V_2) followed by var. Sonia-17 (V_6) and lowest in var. Big White (V_7) (-3.93). Maximum development of yellow color (35.01) was recorded in var. Burana Jade (V_6) and minimum intensity of blue color was recorded in var. Mona Red (V_2) and var. Bubble Gum (V_4) (-4.84 and -6.35 respectively). Highest chlorophyll content in leaves (36.21, 41.89 and 47.69 spad units respectively) was recorded under plants grown under polyhouse condition (G_1) and lowest (33.82, 39.39 and 44.85 spad units respectively) was recorded under shadehouse condition (G_2).Maximum chlorophyll content in Dendrobium leaves (57.08 spad units) was found in var. Sonia-17 (V_7) and it was observed minimum (38.86 spad units) was noticed in var. Charming White (V_3).*

Key words: *Color intensity, Chlorophyll, Dendrobium.*

INTRODUCTION

Orchids are one of the most distinctive plants of nature and highly priced in the international flower trade due to their incredible range of diversity in size, color, shape, forms, appearance and long lasting qualities of flowers. Orchids belong to the family orchidaceae, it is the largest family of flowering plants with 25,000 species belonging to 600-800 genera. *Dendrobium* is the second largest genera of orchids which consist of 1,400 species.

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Dendrobium orchids are commercially grown in green house condition, it requires shade with low temperature and high humidity. The performance of any crop or variety largely depends on genotypic and environmental interaction. As a result, varieties, which perform well in one region, may not perform same in other region of varying climatic conditions. Hence, it is necessary to collect and evaluate the available varieties under polyhouse and shade house condition to find out the suitable varieties for the specific region. Keeping this in view, the present investigation was undertaken to evaluate the performance of *Dendrobium* varieties for color intensity and chlorophyll content under polyhouse and shade hose condition.

MATERIAL AND METHODS

The present investigation was carried out at orchidorium, Regional Horticultural Research and Extension Centre, , Bengaluru during October 2015 to June 2017 to study the comparative performance of eight varieties of *Dendrobium* orchid *Viz*. Ear Sakul (V1), Mono Red (V2), Charming White (V3), Bubble Gum (V4), Sonia-17 (V5), Burana Jade (V6), Big White (V7) and Nopporn Pink (V8) under naturally ventilated polyhouse (G1), and 50 per shade house condition (G2), Six months old healthy rooted tissue culture plants were taken for experiment. Before planting plants were treated with 0.3 per cent bavistin solution for 15-20 minutes to avoid fungal infection. Plants were planted in five inch size plastic pots and placed on iron bench system. The iron bench is made up of GI pipes have mesh with the size of 2 meter length and 1.5 meter width and having two feet height from the ground. In shade house, plants were potted and placed on the bench system using locally available bamboo materials. The trial was conducted in form of a factorial experiment following completely randomized design with three replications. *Dendrobium* plants require equal quantities of Charcoal, Brick pieces and Coco peat (1:1:1) were used as a growing media. During vegetative phase N. P and K at the ratio of 3:1:1 and during flowering blooming phase 1:2:2 were provided. The commercially available water soluble fertilizers of different grade were used as a source for nutrients and applied through foliar spray. Temperature, Relative humidity and light intensity under different growing environments were measured at weekly interval during the experimental period. All the cultural management practices were followed throughout the experiment to grow a successful crop. Color intensity of flowers from five labelled plants was identified with the help of standard colorimeter method and chlorophyll content in fully developed leaves was estimated with the help of spad chlorophyll meter at six month interval and the mean was worked out and recoded in spad units were periodically recorded and analyzed statistically.

RESULTS AND DISCUSSION

The experimental results revealed a significant influence on color intensity of L* a* b* on fresh petals of each variety of *Dendrobium* orchid grown under different environment conditions. The data pertaining to brightness (L* value), Red to green (a* value) and yellow to blue (b* value) are presented in table 1. Brightness of L* value in petals had shown significant effect on growing conditions. Plants grown under polyhouse had showed maximum brightness (49.10) under polyhouse condition and it was less (47.19) under shadehouse condition. Whereas, red to green (a* value) color value of petals had shown significant influence on growing conditions. Plants grown under polyhouse had showed maximum color from red to green (30.47) and minimum (28.95) under shadehouse environment. This variation in petals color of *Dendrobium* might be responsible for synthesis of phytohormones under congenial environmental condition. Similar findings are also observed in Naik and Kumar[4] in *Dendrobium*. Yellow to blue (b* value) intensity of colors in different varieties of *Dendrobium* fresh flower had shown significant effect on growing conditions. Highest color from yellow to blue (15.74) was

recorded under polyhouse condition as compared to shadehouse condition (14.42).Color variation in petals of different flowers might be due to synthesis of pigments which are responsible for color development under favorable micro climatic condition These results were also in findings of Mohanty *et al.*[3] in rose, Sugapriya *et al.*[6] and Naik and Kumar[4] in *Dendrobium*.

Among varieties, highest brightness in petals (85.63) was observed in var. Charming White and it was on par with var. Big White followed by var. Burana Jade (82.11 and 80.93 respectively) whereas, least lightness (22.41) was registered in var. Mona Red. Fresh *Dendrobium* petals showed maximum red color values (65.51) was recorded in var. Mona Red followed by var. Sonia-17 and intensity of green color showed negative correlation was observed in var. Charming White, var. Burana Jade and var. Big White (-3.97, -2.69 and -3.93 respectively). With respect to yellow to blue color in varieties was found significant, maximum intensity of yellow color (35.01) was recorded in var. Burana Jade followed by var. Nopporn Pink and minimum intensity of blue color was recorded in var. Mona Red and var. Bubble Gum (-4.84 and -6.35 respectively).The difference in intensity of color among the varieties may be attributed to the inherent genetic character associated with the varieties. These results are in conformity with the reports of Ramachandradu[5], Sugapriya *et al.*[6] and Naik and Kumar[4] in *Dendrobium*.

The interaction between growing conditions and varieties resulted in significant difference with respect to color intensity of L* a* b* on fresh petals of *Dendrobium*. Variety Charming White (87.33) grown under polyhouse shown maximum brightness L* value and minimum (21.37) was noticed invar. Mona Red under shadehouse condition. In interaction study, significant results were observed with respect to red to green color petals. Highest (a* value) red color (66.68) was recorded in var. Mona Red grown under polyhouse whereas, least green color (-2.56) was found in var. Burana Jade under shadehouse condition. With respect to yellow to blue color petals (b* value), highest yellow color (36.35) was noticed in var. Burana Jade in polyhouse and least green color (-4.54) was recorded in var. Mona Red under shadehouse. This may be due to favorable micro climatic condition and also gentical character of varieties which leads to get good color spikes. These findings are in line with the observations of earlier studies of Mohanty *et al.*[3] in rose, Sugapriya *et al.*[6] and Naik and Kumar[4] in *Dendrobium* orchid.

Significant variation with respect to chlorophyll content in *Dendrobium* leaves obtained in different growing conditions during the growth period are presented in table 2. The *Dendrobium* plants grown under polyhouse recorded highest chlorophyll content in leaves at 6, 12 and 18 months after planting of 36.21, 41.89 and 47.69 spad units respectively. Whereas, it was lowest in shadehouse condition (33.82, 39.39 and 44.85 spad units respectively). In polyhouse, the uniform environmental conditions were maintained throughout the growth phase of the plants. This might be due to adaptations for maintaining the better physiological process of the plants. These observations are in conformity of Kallihal[2] in carnation and Sugapriya *et al.*[6] in *Dendrobium*. Naik and Kumar[4] in *Dendrobium* orchid stated that, variation in chlorophyll content in leaves had a direct relationship with higher photosynthesis rate.

There was significant difference with respect to chlorophyll content in *Dendrobium* varieties at 6, 12 and 18 months after planting, the maximum chlorophyll content in *Dendrobium* leaves (40.08, 48.42 and 57.08 spad units) was noticed in var. Sonia-17 and it was on par with var. Big White and minimum content of chlorophyll (28.83, 34.83 and 38.86 spad units respectively) was recorded in var. Charming White. This variation in chlorophyll content may be due to better photosynthetic activity and their utilization for building up of new cells and also genetic constitution of individual variety, such variation in varieties was previously reported by Sugapriya *et al.*[6] and

Gopal *et al.*[1] in *Dendrobium* orchid. The interaction between growing conditions and varieties was found non significant on chlorophyll content in *Dendrobium* orchid during the experimental period.

Table 1: Color intensity of *Dendrobium* fresh petals as influenced by growing conditions, varieties and interaction effect

Color intensity (L* a* b*) of *Dendrobium* orchids									
	L*			a*			b*		
Varieties (V)	**G_1**	**G_2**	**Mean**	**G_1**	**G_2**	**Mean**	**G_1**	**G_2**	**Mean**
V_1-Ear Sakul	25.46	23.79	24.63	43.24	39.91	41.57	9.73	8.99	9.36
V_2-Mona Red	23.44	21.37	22.41	66.68	64.35	65.51	-5.14	-4.54	-4.84
V_3- Charming White	87.33	83.93	85.63	-4.12	-3.81	-3.97	11.58	10.25	10.91
V_4-Bubble Gum	27.12	23.85	25.49	39.24	36.57	37.91	-7.02	-5.68	-6.35
V_5-Sonia-17	27.77	26.67	27.22	51.51	50.74	51.13	10.57	9.70	10.13
V_6-Burana Jade	81.38	80.48	80.93	-2.83	-2.56	-2.69	36.35	33.68	35.01
V_7-Big White	82.61	81.61	82.11	-4.13	-3.73	-3.93	12.50	10.83	11.67
V_8-Nopporn Pink	37.65	35.78	36.71	32.05	29.93	30.99	33.05	31.72	32.39
Mean	49.10	47.19	48.14	30.47	28.95	29.71	15.74	14.42	15.08
	G	**V**	**G X V**	**G**	**V**	**G X V**	**G**	**V**	**G X V**
S.Em ±	0.59	1.19	1.68	0.23	0.46	0.65	0.45	0.90	1.27
C.D.@ 5%	1.71	3.43	4.84	0.67	1.33	1.88	1.29	2.58	3.65

G_1: Polyhouse G_2: Shadehouse V: Varieties

Note: L* - Brightness, a*- Red to green color, b*- Yellow to blue color

Table 2: Chlorophyll content in leaves of *Dendrobium* as influenced by growing conditions, varieties and interaction effect

Chlorophyll content in leaves (Spad units) at different months after planting									
	6 MAP			12 MAP			18 MAP		
Varieties (V)	**G_1**	**G_2**	**Mean**	**G_1**	**G_2**	**Mean**	**G_1**	**G_2**	**Mean**
V_1-Ear Sakul	35.25	31.77	33.51	38.59	37.77	38.18	45.92	40.44	43.18
V_2-Mona Red	37.63	34.96	36.30	41.63	40.63	41.13	48.30	45.63	46.96
V_3- Charming White	30.49	27.17	28.83	36.49	33.17	34.83	40.82	36.51	38.66
V_4-Bubble Gum	29.27	30.83	30.05	36.83	33.94	35.38	43.49	38.27	40.88
V_5-Sonia-17	41.70	38.46	40.08	50.04	46.79	48.42	57.37	56.79	57.08
V_6-Burana Jade	38.04	32.95	35.50	42.38	38.61	40.50	44.04	44.28	44.16
V_7-Big White	40.73	36.29	38.51	48.06	45.29	46.68	56.40	53.95	55.18
V_8-Nopporn Pink	36.59	38.15	37.37	41.15	38.93	40.04	45.15	42.93	44.04
Mean	36.21	33.82	35.02	41.89	39.39	40.64	47.69	44.85	46.27
	G	**V**	**G X V**	**G**	**V**	**G X V**	**G**	**V**	**G X V**
S.Em ±	0.75	1.49	2.11	0.74	1.47	2.08	0.71	1.42	2.00
C.D.@ 5%	2.15	4.30	NS	2.12	4.24	NS	2.04	4.08	NS

MAP: Months after planting G_1: Poly house G_2: Shadehouse

V: Varieties NS = Non Significant

CONCLUSION

Results from the present investigation, it can be concluded that color intensity and chlorophyll content in *Dendrobium* plants which ultimately enhances ideal growth, flower quality and flower production.

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