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Effect of fertigation scheduling on growth attributes of *Dendrobium* orchid *cv.* Sonia-17

Koushik Nag and Goutam Mandal

Abstract
Dendrobium nobile (commonly abbreviated as 'Den' in horticulture) is one of the second largest genera of Orchidaceae family and has high potential to become a high-value flower crop at cut flower industry. The major constraints encountered in *Dendrobium* orchid cultivation is lack of detail knowledge about exact fertigation scheduling in different stages of growth. An experiment was conducted to investigate the effects of fertigation at 7, 10 and 13 days interval with different rates at different plant growth stages on vegetative growth of *Dendrobium* orchid *cv* Sonia-17 during 2017-2018 at Howrah Krishi Vigyan Kendra, Jagatballavpur, Howrah, West Bengal. Height of pseudobulb (33.47 cm), number of pseudobulbs per plant (6.02), intermodal length (4.30), leaf length (13.92 cm), leaf breadth (2.62 cm), Leaf Area (39.35 cm^2), Leaf Area Index (5.25), leaf chlorophyll content **(**67.21 SPAD value**)** were found with fertilizer applications at 7 days interval (F_1) than 10 or 13 days interval. Fertigation with NPK @ 300 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 300,75, 150 $mg.lt^{-1}$ at further development phase & flowering phases, no fertilizer at cool phase had registered maximum pseudobulb height (36.82 cm), Leaf Area (44.66 cm^2), LAI (5.95) and chlorophyll content (71.29 SPAD value) whereas NPK @ 200 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 200, 50, 100 $mg.lt^{-1}$ at further development phase & flowering phases, no fertilizer at cool phase recorded highest girth of pseudobulb (4.40 cm), length of internodes (5.05 cm), leaf length (15.04 cm) and leaf breadth (2.93 cm). When it was about interaction between frequencies and rate of applications, fertigation of NPK @ 300 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 300,75, 150 $mg.lt^{-1}$ at further development phase & flowering phases, no fertilizer at cool phase at 7 days interval resulted maximum pseudobulb height (40.22 cm), highest leaf length (15.87 cm), Leaf Area (48.28 cm^2), Leaf Area Index (6.44) and chlorophyll content (78.57 SPAD value). Leaf breadth (3.14 cm) and intermodal length (5.35 cm) were found maximum with application of NPK @ 200 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 200, 50, 100 $mg.lt^{-1}$ at further development phase & flowering phases, no fertilizer at cool phase at 7 days interval.

Keywords: *Dendrobium*, Fertigation, orchid Nutritions

Introduction
Dendrobium (Commonly abbreviated as 'Den' in horticulture) is one of the second largest genera of Orchidaceae family. Orchidaceae is the largest family in the plant kingdom containing approximately 750 genera and more than 25,000 species. *Dendrobium* is a member of subfamily *Epidendroideae*, tribe *Dendrobieae* and subtribe *Dendrobiinae* (Dressler, 1990) [4]. *Dendrobium*s are most popular tropical orchid getting fame as cut flower in the world (Sugapriya *et al.*, 2012) [16].

In their natural habitats, *Dendrobium nobile* is epiphytic and usually grows on trees. Their growth habit is sympodial (Hew and Yong, 2004) [7]. Between December and January of each year, vegetative growth begins by activating a vegetative bud at the base of the old pseudobulb, leading to produce a new pseudobulb. Leaves are alternate and flower buds are formed in the leaf axis.

At the global level, at present flora business is around US$ 176 billion, which is expanding day by day and with an annual average growth rate of 10.3 per cent and is expected to reach US$ 250 billion by 2025 (Global Horticulture Market Outlook 2015) [5].

Besides economic considerations, optimum plant nutrition is very much essential in plant growth and development, if it is not in sufficient amount then it reduces the vigor of the plant and affects yield of flower crops (Melvin and James, 2001) [12]. The type of nutrients, their quality and frequency of application play a significant role on the growth and quality of flower. Fertilizer application is effective for better growth and flower production in commercial cultivation of *Dendrobium* sp.

Nitrogen (N), Phosphorus (P) and Potassium (K) are the three macronutrients focused upon when forming a fertilizer mixture for application because they make up most of the plants' composition. Nitrogen is of the maximum importance in research. However, N is dependent on other nutrients also for its effectiveness (Hew and Yong, 2004) [7]. For example, to activate and synthesize nitrate reductase, K is required. Deficiencies of both N and P can affect photosynthesis of the plants. Chloroplasts develop in the presence of nitrogen. Green leaf cells' chloroplasts contain up to 75% of the total organic nitrogen. (Marschner, 2003) [11]. Reduced photosynthetic efficiency can result from N shortage. This is also applicable for P, where plants lacking in P, accumulate carbohydrates in their roots and leaves, and feedback inhibition lowers the source leaves' photosynthetic efficiency. Fertigation controls quantity of nutrients, timing of application and most important component of water distribution. Again, fertigation offers significant fertilizer usage savings and lowers leaching losses (Kumar *et al*., 2017) [8]. The major constraints encountered in *Dendrobium* orchid cultivation are growing conditions, lack of detail knowledge about exact fertigation scheduling in different stages of growth.

It is essential to work out an economically feasible and technologically efficient fertigation scheduling for optimum use of water and nutrients to different growth and developmental stages. Hence, it is important to evaluate fertigation scheduling for improving vegetative performance of different potential varieties of *Dendrobium* orchids for better yield.

Material and Methods

The experiment was conducted at High-tech Horticulture Unit of Howrah Krishi Vigyan Kendra, BCKV, ICAR, Jagatballavpur, Howrah, West Bengal under shade house condition during 2016- 2019.

The experimental station is located at 22°40'35.7" North latitude and 88°07'22.7" East longitude and at an altitude of 8 meters above mean sea level. The climate is a little bit of hot and humid and very much favourable for growing tropical orchids like *Dendrobium* under protected condition throughout the year.

Eighteen months old hardened plants were planted at coconut husk blocks measuring 35cm X 35 cm X 12 cm (Length X Width X Debth) as growing media. The blocks were placed on G.I. made raise benches with GI/PVC platform. Mega-net mister (16 LPH discharge) and micro-sprinkler (8 LPH discharge) were installed for irrigation and fertigation.

The experiment was laid out in RCBD design with fifteen treatment combinations along with three replications. Replicated data over two years were subjected to analysis of variance (ANOVA) for a randomized complete block design (RBD) (Gomez and Gomez 1984) [6]. Subsequently Tukey's honest significant difference (HSD) test was computed across frequency and rates of fertigation to identify and evaluate the precise grouping according to their performances on them. In this test, means in the same column(s) followed by the same letters are not significantly different. Correlations between variables were tested for significance (Gomez and Gomez 1984) [6]. Data were analyzed in SAS 9.3 version.

Different frequencies of fertigation of NPK fertilizers with different rates set up to four distinct phases (Vegetative, Further Development, Cool and Flowering phase) of growth for cultivar Sonia-17 was under consideration as follows-

- T1- NPK @ 100 mg.lt^{-1} at Vegetative, Further Development, Cool and Flowering phases.
- T2- NPK @ 50 mg.lt^{-1} at Vegetative phase, NPK (4:1:2) @ 50, 12.5, 25 mg.lt^{-1} at Further development phase & flowering phases, no fertilizer at cool phase.
- T3- NPK @ 100 mg.lt^{-1} at Vegetative phase, NPK (4:1:2) @ 100, 25, 50 mg.lt^{-1} at Further development phase & flowering phases, no fertilizer at cool phase.
- T4- NPK @ 200 mg.lt^{-1} at Vegetative phase, NPK (4:1:2) @ 200, 50, 100 mg.lt^{-1} at Further development phase & flowering phases, no fertilizer at cool phase.
- T5- NPK @ 300 mg.lt^{-1} at Vegetative phase, NPK (4:1:2) @ 300, 75, 150 mg.lt^{-1} at Further development phase & flowering phases, no fertilizer at cool phase.

Plants were treated with the above mentioned different doses of fertilizer as fertigation in different frequencies *i.e* 7, 10 and 13 days interval.

Results and Discussion

The vegetative parameters *viz.*, Height of pseudobulb /Plant height, Girth of pseudobulb, Number of pseudobulbs per plant, Number of leaves per pseudobulb, Length of internode, Leaf length and breadth, Leaf area, Leaf area index and leaf chlorophyll content (SPAD value) as influenced by different fertigation scheduling at different phases of plant growth with three frequencies of applications are discussed below.

Height of pseudobulb (33.47 cm), number of pseudobulbs per plant (6.02) and intermodal length (4.30 cm) were found maximum when fertigation done at 7 days interval (F_1) whereas minimum height of pseudobulb (27.98 cm), number of pseudobulbs per plant (5.00) and intermodal length (3.89 cm) were recorded at fertigation of 13 days interval. The increase in height & number of pseudobulb as well as length of internode with fertigation more frequently might be due to adequate moisture and nutrients provided in the coconut media throughout the crop period. Adequate moisture resulted in greater development of meristematic tissues leading to higher rate of photosynthesis and assimilation in the plant system. According to Sukma and Setiawan (2010) [17], the frequency of fertilizing for shorter days provides better orchid growth. On the other hand; it was found that girth of pseudobulb (4.15 cm) was maximum when height of pseudobulb, number of pseudobulbs per plant and intermodal length were at minimum with a fertigation frequency of 13 days interval (F_3). Frequency level at 13 days interval also exhibited more number of smaller leaves per pseudobulb (Table-1).

Table 1: Effect of different frequencies of NPK application on height of pseudobulb (cm), Girth of pseudobulb (cm), Number of pseudobulb per plant, Length of internode (cm) and Number of leaves /pseudobulb

Frequency	Height of pseudobulb (cm)	Girth of pseudobulb (cm)	Number of pseudobulb/ plant	Length of internode (cm)	Number of leaves /pseudobulb
F_1 (7 days interval)	33.47^{A}±4.97	3.87^{BA}±0.54	6.02^{A}±1.28	4.30^{A}±0.96	6.69^{A}±0.76
F_2 (10 days interval)	32.10^{B}±4.91	3.75^{B}±0.73	5.65^{B}±0.92	3.97^{B}±0.86	6.73^{A}±0.84
F_3 (13 days interval)	27.98^{C}±4.93	4.15^{A}±0.46	5.00^{C}±0.81	3.89^{B}±0.78	6.96^{A}±0.70
MEAN	31.19	3.92	5.56	4.05	6.79
LSD($_{p=0.05, p=0.01}$)	1.04**	0.33*	0.37**	0.30*	0.34NS

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level.

For different NPK treatments in four distinct phases, T_5 had registered the maximum pseudobulb height (36.82cm) followed by T_4 (34.96 cm). It was also observed that T_4 level of treatment resulted maximum pseudobulb girth (4.40 cm) with highest intermodal length (5.04 cm) though minimum number of leaves per pseudobulb (6.13) was observed with the same treatment, T_4. Maximum number of pseudobulb per plant (6.42) was found with T_3 treatment followed by with T_4 treatment (6.37) and same grouping in the table revealed that they were statistically at per (Table-2). The findings are consistent with those of Bichsel *et al*. (2008) [2] and Sagarik and Siripong (1963) [14], who discovered that increasing nutrients up to certain limit has a positive effect on plant height in *Dendrobium* hybrids. The highest pseudobulb circumference and production of new pseudobulbs in plants might be due to the contribution of mineral nutrients and carbohydrates from the older (mature and healthy) pseudobulbs to the developing new pseudobulb. Similar finding was reported by Usha (2000) [18] in *Dendrobium* cv. Sonia 17. Saravanan (2001) [15] also reported the maximum internodal length with higher doses of fertilizers in *Dendrobium* cv. Sonia 17. This might be due to the fact that fertilizer containing high level of nitrogen might have improved the internodal length of pseudobulbs.

Table 2: Effect of different rates of NPK application on height of pseudobulb (cm), Girth of pseudobulb (cm), Number of pseudobulb per plant, Length of internode (cm) and Number of leaves /pseudobulb

Treatment	Height of pseudobulb (cm)	Girth of pseudobulb (cm)	Number of pseudobulb / plant	Length of internode (cm)	Number of leaves / pseudobulb
T_1	23.77^{E}±3.05	3.33^{C}±0.53	5.05^{C}±0.69	3.24^{C}±0.36	6.97^{B}±0.38
T_2	29.18^{D}±2.68	3.67^{BC}±0.41	4.13^{D}±0.31	3.33^{C}±0.42	7.85^{A}±0.36
T_3	31.20^{C}±2.73	4.19^{A}±0.37	6.42^{A}±0.76	3.87^{B}±0.43	6.37^{CD}±0.51
T_4	34.96^{B}±1.93	4.40^{A}±0.50	6.37^{A}±0.65	5.05^{A}±0.48	6.13^{D}±0.43
T_5	36.82^{A}±3.58	4.04^{BA}±0.57	5.82^{B}±0.82	4.78^{A}±0.60	6.66^{CB}±0.65
MEAN	31.19	3.92	5.56	4.05	6.79
LSD ($_{p=0.05, p=0.01}$)	1.35**	0.43**	0.48**	0.39**	0.43**

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level.

Now coming to the interaction effect between days of frequency and various treatments (Table-3), with 7 days of interval and T_5 level of treatment (F_1T_5) registered the maximum pseudobulb height (40.22 cm) and exhibited better performance, F_1T_3 recorded the maximum number of pseudobulb per plant (7.16) and F_1T_4 exhibited highest intermodal length (5.35 cm). Minimum number of leaves per pseudobulb (6.06) was observed with F_3T_4 treatment combination. Similar findings were reported by Lunt and Kofranek (1961) who also reported that higher rates of liquid fertilizer upto certain limit applied at weekly intervals promoted vegetative growth in Cymbidium. Among different combined interaction effects, the girth of pseudobulb and number of leaves per pseudobulb showed non-significant results. The number of pseudobulbs per clump gradually rose with increasing frequency of fertilizer application and concentrations to a specific level. Here also similar finding has been reported by Usha (2000) [18] in *Dendrobium cv.* Sonia 17. The above findings are also consistent with those of Adiputra (2014) [1]. Naik *et al*. (2013) [13] also found that the pseudobulb length and girth gradually increased with increasing concentrations of fertilizer solution with an EC of up to 1.5 mS cm^{-1} and thereafter showed a declining trend on cymbidium hybrid.

Table 3: Effect of interaction between different frequencies and rates of NPK application on height of pseudobulb (cm), Girth of pseudobulb (cm), Number of pseudobulb per plant, Length of internode (cm) and Number of leaves /pseudobulb

Freq*Treatment	Height of pseudobulb (cm)	Girth of pseudobulb (cm)	Number of pseudobulb /plant	Length of internode (cm)	Number of leaves/pseudobulb
F_1T_1	26.30±1.86	3.65±0.41	5.16±0.41	3.23±0.29	7.17±0.29
F_1T_2	32.25±0.82	3.65±0.44	4.24±0.46	3.75±0.40	7.52±0.40
F_1T_3	32.85±2.56	4.10±0.53	7.16±0.48	4.12±0.50	6.50±0.50
F_1T_4	35.75±1.61	4.02±0.58	7.00±0.68	5.35±0.60	6.06±0.60
F_1T_5	40.22±1.84	3.95±0.87	6.56±0.83	5.07±0.89	6.21±0.89
F_2T_1	25.00±0.67	2.78±0.38	5.66±0.49	3.05±0.43	6.70±0.43
F_2T_2	29.02±1.09	3.33±0.20	4.16±0.22	3.23±0.19	7.98±0.19
F_2T_3	32.75±0.32	4.03±0.26	6.52±0.27	4.00±0.23	5.85±0.23
F_2T_4	36.25±1.51	4.45±0.53	6.12±0.56	4.92±0.56	6.26±0.56
F_2T_5	37.50±2.20	4.15±0.69	5.78±0.67	4.65±0.67	6.85±0.67

F_3T_1	20.00±0.41	3.55±0.37	4.32±0.36	3.44±0.36	7.05±0.36
F_3T_2	26.27±0.29	4.03±0.28	3.98±0.27	3.02±0.27	8.04±0.27
F_3T_3	28.00±0.33	4.43±0.25	5.58±0.30	3.48±0.30	6.75±0.30
F_3T_4	32.87±0.21	4.73±0.10	6.00±0.19	4.88±0.19	6.06±0.19
F_3T_5	32.75±0.14	4.03±0.14	5.12±0.13	4.61±0.13	6.91±0.13
MEAN	31.19	3.92	5.56	4.05	6.79
$LSD_{(p=0.05, p=0.01)}$	2.13*	0.73NS	0.75*	0.72**	0.71NS

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level.

Highest leaf length (13.92 cm), leaf breadth (2.62 cm), Leaf Area (39.35 cm^2) and Leaf Area Index (LAI) (5.25) as well as chlorophyll content (67.21) were found with fertilizer applications at 7 days interval (F_1) than 10 or 13 days interval.

Table 4: Effect of different frequencies of NPK application on Leaf length (cm), Leaf breadth (cm), Leaf Area (cm^2), Leaf Area Index (LAI) and Chlorophyll content

Frequency	Leaf length (cm)	Leaf breadth (cm)	Leaf Area (cm^2)	Leaf Area Index (LAI)	Chlorophyll content (SPAD value)
F_1 (7 days interval)	13.92^{A}±2.36	2.62^{A}±0.64	39.35^{A}±6.68	5.25^{A}±0.95	67.21^{A}±7.86
F_2 (10 days interval)	13.28^{A}±2.43	2.54^{BA}±0.58	36.62^{B}±6.34	4.88^{A}±1.01	62.87^{B}±7.00
F_3 (13 days interval)	11.71^{B}±1.92	2.33^{B}±0.41	32.37^{C}±4.31	4.32^{B}±0.68	54.56^{C}±5.14
MEAN	12.97	2.50	36.11	4.81	61.54
$LSD_{(p=0.05, p=0.01)}$	0.90**	0.28*	1.70**	0.45**	0.99**

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level

Regarding the rate of NPK applications, higher doses *i.e.* NPK @200 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 200mg, 50 mg, 100 mg. lt^{-1} at Further development phase & flowering phases, no fertilizer at cool phase (T4) recorded highest leaf length (15.04 cm) and leaf breadth (2.93 cm) whereas NPK @300 $mg.lt^{-1}$ at vegetative phase, NPK (4:1:2) @ 300 mg, 75 mg, 150 $mg.lt^{-1}$. at Further development phase & flowering phases, no fertilizer at cool phase (T_5) resulted maximum Leaf Area (44.66 cm^2) and LAI (5.95) (Table-5). When it was about interaction between frequencies and rate of applications, fertigation at 7 days interval with T_5 level of doses (F_1T_5) resulted highest leaf length (15.87 cm), Leaf Area (48.28 cm^2) and LAI (6.44) leaf breadth was found maximum with F_1T_4 treatment combinations (Table-6).

The above findings are also consistent with those of Wang (1996) [19] who found nitrogen supplied at 200 mg. lt^{-1} can benefit young plants by allowing them to grow more rapidly. Wang used rates of 100 and 200 $mg.lt^{-1}$ N of six fertilizers containing varying percentages of N, P, and K as well as different sources of N and reported that phalaenopsis produced larger leaves that were wider when N was applied at the higher rate.

From this investigation, it was clear that for better leaf growth in term of length, breath, leaf area *vis-à-vis* leaf area index, more frequently application of higher doses of NPK is necessary. N plays a major role for chlorophyll synthesis ultimately leading to better leaf growth. However, the efficiency of N is reliant on the presence of other nutrients (Hew and Yong, 2004) [7].

K is necessary to activate and manufacture nitrate reductase, for example. Photosynthesis can be hampered by both N and P deficiencies. The development of chloroplasts necessitates the presence of nitrogen. The chloroplasts of green leaf cells contain up to 75% of total organic nitrogen (Marschner, 2003) [11]. A lack of nitrogen can result in a reduction in photosynthetic efficiency. This is also true for P, where carbohydrates build in the leaves and roots of P-deficient plants, reducing the photosynthetic efficiency of source leaves due to feedback inhibition (Marschner, 2003) [11]. Lee and Lin (1987) [9] also found that full-strength Johnson's solution (0.224 g N/ liter) resulted in better leaf growth of *Phalaenopsis* orchid.

Table 5: Effect of different rates of NPK application on Leaf length (cm), Leaf breadth (cm), Leaf Area (cm^2), Leaf Area Index (LAI) and Chlorophyll content

Treatment	Leaf length (cm)	Leaf breadth (cm)	Leaf Area (cm^2)	Leaf Area Index (LAI)	Chlorophyll content (SPAD value)
T_1	10.96^{C}±1.81	2.07^{C}±0.32	31.61^{C}±2.38	4.21^{C}±0.52	60.40^{C}±0.36
T_2	10.63^{C}±0.98	2.07^{C}±0.29	30.05^{C}±1.80	4.01^{C}±0.58	54.05^{E}±0.60
T_3	13.59^{B}±1.42	2.48^{B}±0.33	36.15^{B}±4.64	4.82^{B}±0.89	58.11^{D}±0.12
T_4	15.04^{A}±1.38	2.93^{A}±0.49	38.09^{A}±4.92	5.08^{B}±0.77	63.85^{B}±1.37
T_5	14.62^{BA}±2.05	2.92^{A}±0.57	44.66^{B}±4.66	5.95^{A}±0.54	71.29^{A}±0.38
MEAN	12.97	2.50	36.11	4.81	61.54
$LSD_{(p=0.05, p=0.01)}$	1.17**	0.36**	2.20**	0.58**	1.28**

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level

Table 6: Effect of interaction between different frequencies and rates of NPK application on Leaf length (cm), Leaf breadth (cm), Leaf Area (cm^2), Leaf Area Index (LAI) and Chlorophyll content

Freq*Treatment	Leaf length (cm)	Leaf breadth (cm)	Leaf Area (cm^2)	Leaf Area Index (LAI)	Chlorophyll content (SPAD value)
F_1T_1	12.32±1.90	2.14±0.29	33.54±2.54	4.47±0.72	66.64±1.00
F_1T_2	11.56±0.80	2.21±0.40	31.25±0.75	4.17±0.17	57.64±1.31
F_1T_3	14.25±2.50	2.56±0.50	41.04±2.04	5.47±0.47	63.23±0.91
F_1T_4	15.61±1.60	3.14±0.60	42.63±2.63	5.68±0.59	69.95±0.05
F_1T_5	15.87±1.89	3.03±0.89	48.28±2.28	6.44±0.11	78.57±1.21

F_2T_1	11.53±0.70	2.08±0.43	31.25±1.75	4.17±0.64	60.34±0.99
F_2T_2	10.24±1.10	2.07±0.19	30.15±2.15	4.02±0.92	56.97±0.71
F_2T_3	13.75±0.29	2.55±0.23	36.05±2.95	4.81±1.10	58.34±1.66
F_2T_4	15.56±1.56	3.05±0.56	39.38±1.62	5.25±0.25	64.45±1.10
F_2T_5	15.31±2.10	2.95±0.67	46.25±2.25	6.17±0.09	74.23±1.09
F_3T_1	9.02±0.36	2.00±0.36	30.05±1.95	4.01±0.01	54.23±1.07
F_3T_2	10.10±0.27	1.92±0.27	28.74±1.74	3.83±0.63	47.55±1.20
F_3T_3	12.78±0.30	2.34±0.30	31.35±1.65	4.18±0.72	52.76±1.10
F_3T_4	13.96±0.19	2.61±0.19	32.26±1.74	4.30±0.70	57.16±2.96
F_3T_5	12.67±0.13	2.78±0.13	39.45±3.55	5.26±0.06	61.08±1.25
MEAN	12.97	2.50	36.11	4.81	61.54
$LSD_{(p=0.05,\ p=0.01)}$	2.12**	0.69*	3.81*	1.00**	2.05*

Mean±SD ** means significant at $p_{0.01}$ level * means significant at $p_{0.05}$ level

Conclusion

The results of the present investigation thus reveal that the application of NPK @ 200 mg.lt^{-1} at vegetative phase, NPK (4:1:2) @ 200, 50, 100 mg.lt^{-1} at further development phase & flowering phases, no fertilizer at cool phase as well as NPK @ 300 mg.lt^{-1} at vegetative phase, NPK (4:1:2) @ 300,75, 150 mg.lt^{-1} at further development phase & flowering phases, no fertilizer at cool phase again NPK @ 200mg, 50mg, 100 mg.lt^{-1} at flowering phase at 7 days interval for *Dendrobium cv* Sonia-17 performed better vegetative parameters in maximum aspects. Fertigation of NPK @ 300 mg.lt^{-1} at vegetative phase, NPK (4:1:2) @ 300,75, 150 mg.lt^{-1} at further development phase & flowering phases, no fertilizer at cool phase at 7 days interval resulted maximum pseudobulb height, highest leaf length, Leaf Area, Leaf Area Index and leaf chlorophyll content.

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