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Effect of Different Macro Nutrients (NPK) on Growth and Spike Yield Of Dendrobium

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Abstract
The present experiment was conducted to determine the "Effect of different of macro nutrients on growth and spike yield of dendrobium orchid Var. Sonia red" in the department of horticulture, Sam Higgingbottom institute of agriculture technology and sciences, Prayagraj, (U.P), India. During the winter season 2019. The potting media for the orchids has gravel, charcoal, brick pieces and coconut husk. These are filled in 8 inch earthen pots with 1 inch holes around. Ten different NPK ratios were taken as treatments and are applied as foliar spray at an interval of twice a week at 0.2% (i.e., by mixing 2gm of NPK in 1000ml of water).the 10 treatments included in the trail VIZ., T1 [control], T2 [19:19:19, NPK @ 0.2%], T3 [10:10:20,NPK @ 0.2%], T4 [30.:20:20, NPK @ 0.2%], T5 [20:20:20, NPK @ 0.2%], T6 [15:15:15, NPK @ 0.2%],T7 [20:10:20, NPK @ 0.2%], T8 [20:10:10, NPK @ 0.2%], T9 [10:30:30, NPK @ 0.2%], T10 [10:15:20, NPK @ 0.2%] were tested in three replications. The results revealed that macro nutrient treatment which had significant response on plant height (cm), leaf area, number of leaves per plant, number of new shoots, shoot girth, total number of shoots, total number of roots per plant, root length, number of spike yield per plant, number of florets per spike, spike length and longevity of flower spike on the plant.T5(20:20:20, NPK @ 0.2%) has recorded maximum performance in all the parameters as follows, plant height (39.81) cm leaf area (47.59 cm^2), number of leaves (10.47), number of new shoots(5.76),shoot girth (4.93), total number of shoots (7.64),number of roots per plant (50.28),root length (22.35),number of spike yield per plant (2.00),number of florets per spike (5.48),spike length (28.30), longevity of flower spike on plant (44.43). The next succeeded performance was by T7 [20:10:20, NPK @ 0.2%]which showed performance just as much as T5[20:20:20, NPK @ 0.2%] and recorded as follows. plant height (37.87cm) leaf area (45.43 cm^2), number of leaves (9.26),number of new shoots(4.86),shoot girth(4.43),total number of shoots(7.85),number of roots per plant (49.45),root length (21.83),number of spike yield per plant (1.46),number of florets per spike (5.34), spike length (37.63), longevity of flower spike on plant (42.31).

Keywords: Dendrobium orchid, NPK, vegetative, floral

Introduction
Orchids are the Most pampered of all the plants and are undoubtedly the ornamental elite with their complex flowers and exquisite beauty. Orchids are grown over a wide range of climatic condition. Majority of the orchids were native of tropical countries and found in humid tropical forest of south and Central America (chakraborti, 1999). The family orchidaceae is the largest in the plant king. With about 600-800 genera, over 25000species and more than a lakh and a half man made hybrids. Despite their diversity, very few genera viz., Dendrobium, cattleya, phalaenopsis, cymbidium, aranda, Vanda, mokara, aranthera, oneidium and few others are commercially important. India has immense orchid wealth including more than 1300 indigenous types, but their commercial exploitation has been very slow.

Dendrobium is considered as the second largest genus of orchids. About 900-2000 species are reported in the genus with an estimate of 1340 species viz., *D. aduncam*, *D.farmerii*, *D. moschatum*, *D. aggregatunz*, *D. fimbriatum*, *D. nobile*, *D. pierardii* etc; were found to perform well under Indian condition (Rajeevan & Sobhana 1993). Hybrids Popular here are Sonia 17, Sonia 28(purple & white flowers), Renappa, Sabine red (pure purple), Emma white, kasem white, Fairy white (pure white) etc. Dendrobiums are most popular tropical orchid getting fame as cut flower in the world (sugapriya *et al.* 2012) [6]. Potted hybrid dendrobium plants are being cultivated at an ever increasing rate (Baker & Baker, 1996).

rapid growth, easiness of plantlet regeneration, beauty of flower, year round production, in control flowering and long lasting of the flower stalk is the advantages of dendrobium.

Orchids cannot uptake nutrients significantly from root so foliar nutrient application is very wide spread practice in orchid cultivation. Nitrogen, Phosphorous and potassium with different concentration is common used as foliar spray. Orchid should be potted in small container according to the size of the plants. It prefers plastic pots which retain moisture longer than mud pots (Patil and Singh, 2003).Orchids are slow growing plants. Slow release fertilizer mixture (NPK) can be used to get best result (Hagakl, 2007).

Application of spray nutrient containing varied. On the basis of growth stage of plants. During vegetative growth large quantities of nitrogen are required nutrient solution of NPK plays a vital role in growth and development of orchid.

Materials and Methods

The experiment was conducted in completely randomized design (CRD) with 10 treatments with 3 replications. The potting media for the orchids has gravel, charcoal, brick pieces and coconut husk. These are filled in 8 inch earthen pots with 1 inch holes around. In the orchidarium of the department of horticulture, Sam Higgingbottom, University of Agriculture, technology and sciences, Prayagraj during September 2019 to April 2020.total number of treatments were 10 *VIZ*., T1 [control], T2 [19:19:19, NPK @ 0.2%], T3 [10:10:20,NPK @ 0.2%], T4 [30.:20:20, NPK @ 0.2%], T5 [20:20:20, NPK @ 0.2%], T6 [15:15:15, NPK @ 0.2%],T7 [20:10:20, NPK @ 0.2%], T8 [20:10:10, NPK @ 0.2%], T9 [10:30:30, NPK @ 0.2%], T10 [10:15:20, NPK @ 0.2%].

Climatic conditions in Experimental site

The area of Prayagraj district comes under subtropical belt in the South East of Uttar Pradesh, which experiences extremely hot summer and fairly cold winter. The maximum temperature of the location reaches unto 46 ºC – 48 ºC and seldom falls as low as 4 ºC – 5 ºC. The relative humidity range between 20 to 94%. The average rain fall in this area is around 103.4mm annually with maximum concentration during July to September with few showers and drizzles in winter also.

Result and Discussion

The present investigation entitled on "Effect of different macro nutrients on growth and spike yield of dendrobium orchid *VAR* Sonia red" was carried out during September 2019 to April 2020in the orchidarium of the department of Horticulture, Sam Higgingbottom University of Agriculture, technology and sciences, Prayagraj (U.P) India. the results of the present investigation, regarding the effect of NPK on the parameters plant height (cm), leaf area, number of leaves per plant, number of new shoots, shoot girth, total number of shoots, total number of roots per plant, root length, number of spike yield per plant, number of florets per spike, spike length and longevity of flower spike on the plant have been discussed and interpreted in the light of various research work done in India and aboard. The experiment was conducted in completely randomized design with 10 treatments and 3 replications.

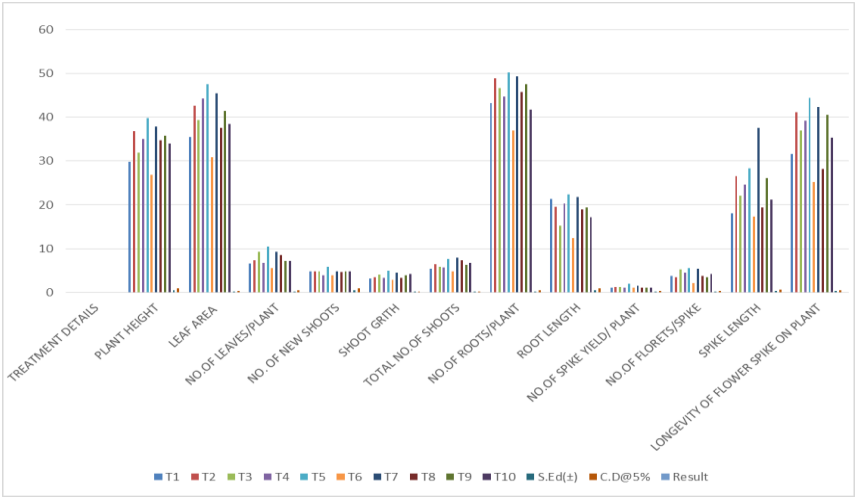
The results of the experiment is summarized below.

A. Vegetative Parameters

The treatment T5(20:20:20, NPK @ 0.2%) has recorded maximum performance in all the parameters as follows, plant height (39.81 cm) leaf area (47.59 cm^2), number of leaves (10.47), number of new shoots (5.76), shoot girth (4.93 cm), total number of shoots (7.64), number of roots per plant (50.28), root length (22.35 cm). The second in performance was by T7 [20:10:20, NPK @ 0.2%] which showed performance just as much as T5 [20:20:20, NPK @ 0.2%] and recorded as follows. plant height (37.87cm) leaf area (45.43 cm^2), number of leaves (9.26), number of new shoots (4.86), shoot girth (4.43 cm),total number of shoots(7.85),number of roots per plant (49.45),root length (21.83 cm).the minimum number of readings were observed in T6[15:15:15,NPK @ 0.2%] as plant height (26.82 cm), leaf area (30.87 cm2)number of leaves per plant (5.47) Number of new shoots per plant (3.86),shoot girth (2.58), total number of shoots per plant(4.81), number of roots per plant(37.05), root length (12.40 cm).

B. Floral Parameters

Treatment T5 [20:20:20, NPK @ 0.2%] has also recorded the maximum floral parameters, number of spike yield per plant (2.00), number of florets per spike (5.48), spike length (28.30 cm), longevity of flower spike on plant (44.43 days). Treatment T7 [20:10:20, NPK @ 0.2%] showed as, number of spike yield per plant (1.46), number of florets per spike (5.34), spike length (37.63 cm), longevity of flower spike on plant (42.31 days). The least readings were taken in T6 [15:15:15, NPK @ 0.2%], number of spike yield per plant (1.00), number of florets per spike (52.16), spike length (17.36 cm), longevity of flower spike on plant (25.28 days).



Graphical representation

Table 1: Effect of different macro nutrients on growth and spike yield of Dendrobium orchid *var*.sonia red

Treatment Symbol	Treatment Details	Plant Height (cm)	Leaf Area (cm^2)	No. of Leaves/ Plant	No. of new shoots	Shoot Girth (cm)	Total No. of Shoots	No. of Roots/ Plant	Root Length (cm)	No. of Spike Yield/ Plant	No. of Florets/ Spike	Spike Length (cm)	Longevity of Flower Spike On Plant (days)
T1	Control	29.83	35.56	6.58	4.76	3.20	5.44	43.22	21.28	1.08	3.78	18.04	31.61
T2	19:19:19 [NPK@0.2%]	36.79	42.60	7.39	4.79	3.51	6.36	48.88	19.52	1.14	3.50	26.61	41.24
T3	10:10:20 [NPK@0.2%]	31.87	39.42	9.25	4.76	3.97	5.84	46.74	15.19	1.23	5.22	22.10	37.05
T4	30:20:20 [NPK@0.2%]	35.07	44.32	6.68	3.90	3.29	5.65	44.76	20.33	1.06	4.43	24.55	39.18
T5	20:20:20 [NPK@0.2%]	39.81	47.59	10.47	5.76	4.93	7.64	50.28	22.35	2.00	5.48	28.30	44.43
T6	15:15:15 [NPK@0.2%]	26.82	30.87	5.47	3.86	2.85	4.81	37.05	12.40	1.00	2.16	17.36	25.28
T7	20:10:20 [NPK@0.2%]	37.87	45.43	9.26	4.86	4.43	7.85	49.45	21.83	1.46	5.34	37.63	42.31
T8	20:10:10 [NPK@0.2%]	34.75	37.57	8.52	4.58	3.29	7.32	45.85	18.98	1.03	3.67	19.33	28.15
T9	10:30:30 [NPK@0.2%]	35.87	41.51	7.15	4.79	3.88	6.34	47.66	19.33	1.13	3.44	26.14	40.60
T10	10:15:20 [NPK@0.2%]	33.95	38.56	7.12	4.83	4.22	6.76	41.84	17.23	1.08	4.20	21.22	35.30
S.Ed(±)		0.438	0.164	0.209	0.442	0.077	0.109	0.189	0.409	0.129	0.163	0.274	0.255
C.D@5%		0.914	0.345	0.439	0.924	0.159	0.232	0.395	0.855	0.269	0.340	0.572	0.533
Result		S	S	S	S	S	S	S	S	S	S	S	S

Conclusion

On the basis of present investigation, it is concluded that treatment T5 [20:20:20 NPK @ 0.2%] was found best treatment in all the parameters *viz.*, plant height (39.81 cm) leaf area (47.59 cm^2), number of leaves (10.47), number of new shoots (5.76), shoot girth (4.93 cm), total number of shoots (7.64), number of roots per plant (50.28), root length (22.35 cm), number of spike yield per plant (2.00), number of florets per spike (5.48), spike length (28.30 cm), longevity of flower spike on plant (44.43 days). the next succeeded performance was by T_7 [20:10:20, NPK @ 0.2%], plant height (37.87cm) leaf area (45.43 cm^2), number of leaves (9.26), number of new shoots (4.86), shoot girth (4.43 cm), total number of shoots (7.85),number of roots per plant (49.45),root length (21.83 cm), number of spike yield per plant (1.46), number of florets per spike (5.34), spike length (37.63 cm), longevity of flower spike on plant (42.31 days). The least performance was observed in T6[15:15:15, NPK @ 0.2%] as, plant height (26.82 cm), leaf area (30.87 cm^2) number of leaves per plant (5.47) Number of new shoots per plant (3.86), shoot girth (2.58), total number of shoots per plant(4.81), number of roots per plant (37.05), root length (12.40 cm), number of spike yield per plant (1.00), number of florets per spike (52.16), spike length (17.36 cm), longevity of flower spike on plant (25.28 days).

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