HortFlora Research Spectrum
Vol. 5, Issue 1; 57-60 (March 2016)
www.hortflorajournal.com
ISSN: 2250-2823

RESPONSE OF HYBRID ORCHID (*Dendrobium spp.*) CV. SONIA TO APPLICATION OF MICRONUTRIENTS

B. K. Saud*, Biju Barman and Madhumita Choudhuri Talukdar

Dept. of Horticulture, Assam Agricultural University, Jorhat-785 013
**Corresponding Author's E-mail:bijit1969@rediff.com*

ABSTRACT : An experiment on response of hybrid orchid, *Dendrobium spp.,* cv. 'Sonia' to selected micronutrients was conducted in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during 2012 to 2013. The experiment was conducted in shade net house with eight treatments each replicated thrice. Micronutrient treatments viz.,T_1- Zinc 500 ppm, T_2-Zinc 750 ppm, T_3-Zinc 1000 ppm, T_4-Manganese 200 ppm, T_5-Manganese 400 ppm, T_6-Boron 100 ppm and T_7-Boron 200 ppm were applied as foliar spray at an interval of 15 days along with fertilizer mixture 19 All @ 2 g per liter (control) sprayed twice a week. Among the micronutrient treatments, Zinc 1000 ppm (T_3) was found superior in respect of the parameters *viz.,* pseudo bulb height (29.85), number of leaves/plant (7.08), leaf area (68.66 cm^2), inter nodal length (5.26 cm), cane girth (2.43 cm), spike length (28.91 cm), number of florets/spike (4.03), flower spike yield /coco block/year (5.53), number of flowering canes / clump (2.00), duration of flowering (149.20 days), self life (52.22 days), vase life (37.00 days), total soluble sugar (107.24 mg/g DW), soluble protein (436.39 mg/g FW), net assimilation rate (0.35 mg/cm2/day) and total chlorophyll content (0.83 mg/g FW) while treatment T_2(RDF + Zn 750 ppm) recorded best for days to flower bud appearance (133.37 days) and days to harvest of spike (3.47 days).

Keywords : *Dendrobium orchid, micronutrients, zinc, boron, manganese, pseudo bulb, cane,*

Dendrobium orchids and their hybrids form the second largest group of orchids after the Bulbophyllum. There is report of over 1,500 species and thousands more types hybrids in the Dendrobium orchid group. Dendrobium orchids have different cultural needs and go through many growth phases and then a rest phase during the course of one year. Micronutrients as well as macro nutrients play crucial and vital role in orchid flower production. Though micronutrients are required in small quantities, they are very essential for the growth and development of the plant. Application of micronutrient in commercial orchid flowers is inevitable to attain the world class orchid flower quality. The deficiency of micronutrients creates different deficiency disorders leading to decreased growth and production of the plant. So, due to influence of different important activities in plant metabolism and synthesis, zinc, manganese and boron were chosen for finding out the effect on growth and development of Dendrobium orchid. Proper proportion is yet essential as foliar spray for quality and flower production.

MATERIALS AND METHODS

The experiment was conducted in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during the period from June 2012 to November 2013, under 35% shade net condition.The planting materials used were 19 months old Hybrid Orchid 'Sonia'. The experiment was laid out in a completely randomized block design with 8 treatments (including control treatment) and 3 replications each. The treatment details were T_0; Control (RDF = NPK @ 19-19-19, 2g/lit twice a week), T_1 : RDF + Zn (500 ppm), T_2 : RDF + Zn (750 ppm), T_3: RDF + Zn (1000 ppm), T_4: RDF + Mn (200 ppm), T_5: RDF + Mn (400 ppm), T_6 : RDF + B (100 ppm) and T_7 : RDF + B (200 ppm). RDF (Fertilizer mixture NPK-19:19:19 @ 2 g per liter) was given twice a week as foliar spray. The micronutrient treatments - Zinc (500, 750 and 1000 ppm), Manganese (200 and 400 ppm), Boron (100 and were applied as foliar spray at an interval of 15 days.

Article's History:
Received : 23-01-2016 ***Accepted : 18-02-2016***

RESULTS AND DISCUSSION

Micronutrient application had significant effect on growth and flowering of hybrid Dendrobium (Table 1 and 2). Foliar application of fertilizer mixture NPK-19:19:19 + Zn 1000ppm resulted production of maximum pseudo bulb height (29.85 cm) and number of leaves (7.08). Halder *et al.* (4) had also reported highest plant height and maximum effective leaves with the single application of zinc at higher dose in gladiolus. Maximum leaf area (68.66 cm^2) and inter nodal length (5.26 cm) as well as highest cane girth (2.43 cm) were also with RDF + Zn 1000 ppm

Table 1 : Impact of micronutrient application on vegetative growth of hybrid orchid var. Sonia.

Treatments	Pseudobulb height (cm)	Number of leaves/ plant	Leaf area (cm^2)	Inter nodal length (cm)	Cane girth (cm)	No. of flowering canes / clump
T_1	26.20	5.42	55.18	4.92	2.37	1.25
T_2	27.03	5.58	60.36	4.63	2.07	1.25
T_3	29.85	7.08	68.66	5.26	2.43	2.00
T_4	23.32	5.83	52.71	4.60	1.96	1.00
T_5	25.01	5.92	48.94	4.95	2.28	1.00
T_6	27.75	6.17	61.15	5.00	2.19	1.75
T_7	25.50	4.58	51.23	4.89	2.16	1.00
T_0	22.87	4.92	45.81	4.56	1.92	1.00
Mean	25.94	5.69	55.50	4.85	2.17	1.28
CD (P=0.05)	2.25	0.74	9.16	0.16	0.22	0.38

Table 2 : Impact of micronutrient application on flowering of hybrid orchid var. Sonia.

Treatments	Days to flower bud appearance	Spike length (cm)	No. of florets/ spike	Flower spike yield /coco block/year	Duration of flowering (days)	Self life (days)	Vase life (days)
T_1	156.87	26.00	3.44	4.33	123.67	45.78	32.00
T_2	133.37	26.25	3.78	5.07	140.67	49.33	34.50
T_3	137.67	28.91	4.03	5.53	149.20	52.22	37.00
T_4	159.90	26.18	3.89	4.20	118.33	46.89	33.00
T_5	156.60	26.00	3.11	4.00	117.93	43.11	30.00
T_6	150.17	27.03	3.94	5.20	136.17	49.00	35.00
T_7	151.20	25.91	3.44	4.00	116.27	47.33	33.00
T_0	162.33	24.83	3.00	3.80	104.57	42.78	28.50
Mean	191.70	26.39	3.58	4.52	125.85	47.06	32.88
CD (P = 0.05)	18.46	2.04	0.43	0.57	24.09	5.70	4.24

Table 3 : Impact of micronutrient application on physiological parameters of hybrid orchid var. Sonia.

Treatments	Total soluble sugar (mg/g DW) at flowering stage	Soluble protein (mg/g FW) at flowering stage	Net assimilation rate (NAR) ($mg/cm^2/day$) during flowering stage	Total chlorophyll content in leaf (mg/g FW) during vegetative stage
T_1	89.21	372.06	0.23	0.72
T_2	99.89	424.43	0.26	0.78
T_3	107.24	436.39	0.35	0.83
T_4	84.21	359.29	0.24	0.73
T_5	80.14	360.98	0.23	0.70
T_6	95.57	397.44	0.28	0.81
T_7	78.14	329.86	0.20	0.69
T_0	74.88	302.13	0.20	0.64
Mean	88.66	372.82	0.25	0.74
CD (P = 0.05)	19.50	57.59	0.08	0.07

treatment followed by treatment T_6 (RDF + B 100 ppm). Zinc has been found to play a role in coagulating the auxin concentration and nitrogen metabolism, which might have increased the leaf area in orchid plant. The results are in line of reports of Ganga *et al.* (3) in *Dendrobium* orchid cv. Sonia 17, and Sharova *et al.* (9) and Singh and Tiwari (10) in gladiolus and onion,

respectively. The increase in the cane girth might be due to improved growth attributes as a result of positive influence of zinc on growth regulators confirming to reports of Alam *et al.* (1) in onion who reported increased diameter of bulb due to application of zinc.

Data on flowering and yield characters of Dendrobium orchid (Table 1 and 2) clearly showed significant influences on the flowering and yield characters due to the application of micronutrients spray.The maximum number of flowering canes per clump (2canes/clump) was observed in treatment T_3 (RDF + Zn 1000 ppm). Zinc is involved in the synthesis of plant hormones which might have resulted in more flowering canes in Dendrobium orchid. The data revealed that the treatment T_2 (RDF + Zn 750 ppm) took the least number of days (133.37 days) for flower bud appearance. The time taken for flower bud appearance and harvesting of the flower spikes is an important character, which decides the early yield of the crop. Zinc is involved in the synthesis of plant hormones and hence induces early maturity of shoot to induce early flowering (Chen *et al.,* 2). The profound beneficial influence of zinc in reducing the number of days taken to harvest of the flower spike could be attributed to the enhancing effect of zinc in enzymatic reaction, cell division as well as in growth. The maximum spike length (28.91 cm) and number of florets per spike (4.03) was observed in treatment T_3 (RDF + Zn 1000 ppm) which is supported by the reports of Katiyar *et al.* (7) in gladiolus and Kakade *et al.* (6) in China aster. The increase in the spike length due to zinc foliar spray might be due to the ability of this nutrient in activating several enzymes and its involvement in chlorophyll synthesis and various physiological activities. The same treatment *i.e.,* T_3 (RDF + Zn 1000 ppm) produced the maximum number of flower spikes/coco block/year (5.53) followed by T_6 (5.20) in *Dendrobium* orchid which is in line of Halder *et al.* (4) as reported in gladiolus. A maximum flowering duration of 149.20 days was also observed with treatment of RDF + Zn 1000 ppm followed by flowering duration of 140.67 days in treatment T_2 (RDF + Zn 750 ppm). The results are in agreement with the findings of Ganga *et al.* (3) in *Dendrobium* orchid cv. Sonia 17 and Jat *et al.* (5) in African marigold. The longest self life (52.22 days) and vase life (37 days) of flowers were recorded in plants treated with RDF + Zn 1000 ppm. The increased self life of the flowers due to foliar application of zinc observed in the present study could be attributed to the role of zinc in retarding formation of abscission layer in flower pedicel leading to prevention of flower drop. The increase in the vase life of cut flowers by foliar application of zinc might be due to extra photosynthates present in the flower part as it had increased in growth parameters. Similar results were reported by Ganga *et al.* (3) in *Dendrobium* orchid cv. Sonia 17 and Nagaraju *et al.* (8) in rose. A perusal of Table 3 also revealed that treatment T_3 (RDF + Zn 1000 ppm) resulted in the highest TSS (107.24 mg/g DW), total soluble protein (436.39 mg/g FW), net assimilation rate (0.35 mg/cm^2/day) and total chlorophyll content (0.83 mg/g FW).

CONCLUSION

It may be concluded that under the environmental condition of Assam as well as subtropical climate of NE region, zinc (1000 ppm) applied as foliar spray at 15 days interval along with recommended dose of fertilizer (*i.e.* NPK @ 19-19-19, 2g/lit twice a week) is suitable for improving the growth and quality parameters of *Dendrobium* orchid. The growers and farmers can fetch a good harvest in terms of produce and return by using simple nutrient application technique.

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Citation : Saud B.K., Barman B. and Talukdar M.C. (2016). Response of hybrid orchid (*Dendrobium spp.*) cv. Sonia to application of micronutrients. *HortFlora Res. Spectrum,* **5**(1) : 57-60.