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Short Communication

Effect of foliar application of zinc and boron on growth of *Ascocenda* orchid var. Big Suksamran

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Abstract

A study to assess the influence of foliar application of zinc and boron on the growth of *Ascocenda* var. Big Suksamaran was carried out at Vellanikkara during the period from May 2018 to May 2019. Foliar application of micronutrients, *viz.,* zinc (as zinc sulphate) and boron (as boric acid), was done at 100 ppm and 250 ppm at fortnightly intervals. Application of 100 ppm boron was the best for plant height, shoot diameter, number of leaves, and leaf area.

Key words: Ascocenda, Boron, Foliar application, Micronutrients, Zinc.

Orchids exert a mysterious fascination for many people around the world due to their unique characteristics. According to the growth habit of stem, there are two types of orchids: monopodials with vertical growth and sympodials with horizontal growth habit. *Ascocenda* is a monopodial epiphytic orchid hybrid obtained by crossing *Ascocentrum* and *Vanda* (Rajeevan et al., 2002). It is mainly grown as pot plant in hanging basket using charcoal pieces, bricks, coconut husk, etc. as potting media. Since the availability of nutrients from growing media is limited, the nutrients required for growth and flowering have to be supplied artificially. Since the roots of epiphytic orchids are aerial, foliar application of nutrients, including both macro and micronutrients, and growth regulators at regular intervals is needed for proper growth and flowering. Among different micronutrients, zinc and boron have profound influence on improving growth and flowering of orchids (Saud et al., 2016). In this context, the present study was conducted to find out the effect of zinc and boron on growth of *Ascocenda* orchid.

The experiment was conducted in the top ventilated poly house of Department of Floriculture and Landscaping, College of Horticulture, Vellanikkara, from May 2018 to May 2019. The temperature inside the polyhouse during the period of observation ranged from 26.33^0 C to 34.61^0 C and relative humidity varied from 42.77% to 95%. Three month old tissue cultured plants of *Ascocenda* var. Big Suksamran were used for the study. They were planted in plastic pots of size 8 cm x 9.5 cm x 6.5 cm with brick pieces and charcoal pieces in the ratio 1:1 as potting media. After planting they were hung in the poly house. There were five treatments, T_1 (Zn @ 100 ppm), T_2 (Zn @ 250 ppm), T_3 (B @ 100 ppm), T_4 (B @ 250 ppm) and T_5 (control) with three replications and five plants per replication. The experiment was laid out in CRD. Foliar application of zinc in the form of zinc sulphate and boron in the form of boric acid was done at fortnightly intervals. Apart from the treatments, all the plants were sprayed with NPK (3:1:1) @ 0.2% twice weekly, and with organic manure as cow dung slurry at monthly intervals (KAU, 2016). Mist irrigation

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Table 1. Effect of micronutrients on plant height (cm) at different stages in *Ascocenda* orchid var. Big Suksamran

Treatments	Plant height (cm)												
	At the time of planting	1 MAP	2 MAP	3 MAP	4 MAP	5 MAP	6 MAP	7 MAP	8 MAP	9 MAP	10 MAP	11 MAP	12 MAP
T_1	2.62	3.14	3.38	4.06	4.45	5.93	6.16	6.63	6.72	6.86	7.09	7.28	7.33
T_2	2.72	3.22	3.30	3.85	4.21	5.63	6.00	6.43	6.55	6.72	6.89	7.08	7.15
T_3	2.65	3.03	3.62	4.25	4.64	6.80	7.06	7.34	7.82	8.25	8.43	8.77	8.81
T_4	2.63	2.96	3.32	3.98	4.40	5.62	6.03	6.20	6.38	6.53	6.78	6.97	7.06
T_5	2.65	3.04	3.54	4.04	4.60	6.31	6.49	6.76	7.39	7.49	7.69	7.81	7.82
CD(0.05)	NS	NS	NS	NS	NS	0.46	0.49	0.45	0.42	0.51	0.62	0.64	0.67
CV	6.32	5.03	6.79	4.62	6.14	4.14	4.23	3.73	3.31	3.90	4.61	4.64	4.79

*T_1– Zn @ 100 ppm, T_2- Zn @ 250 ppm, T_3- B @ 100 ppm, T_4- B @ 250 ppm, T_5– control
*MAP - Month After Planting

was provided inside the poly house. Other cultural operations such as weeding, plant protection measures, etc. were carried out as and when needed. Observations on vegetative characters *viz*., plant height, shoot diameter, number of leaves and leaf area were recorded at monthly intervals. Observations regarding leaf parameters were recorded on third leaf from each plant. Statistical analysis of the recorded data was carried out using the software WASP (Web Agri Stat Package).Data pertaining to the effect of treatments on plant characters of *Ascocenda* var. Big Suksamran are presented in Tables 1 to 4. The effect of different micronutrient treatments on plant height was non-significant for the first four months after planting (MAP) (Table 1). Five months after planting, the greatest plant height of 6.80 cm was observed in the treatment T_3 (B @ 100 ppm + PoP), which was significantly superior to all other treatments and this trend was followed till 12 MAP. The lowest plant height of 5.62 cm was observed in T_4 (B @ 250 ppm + PoP) which was on par with T_2 (Zn @ 250 ppm) (5.63 cm) and T_1 (5.93 cm). At 6 MAP, the lowest plant height (6.00 cm) was observed in T_2, which was on par with all other treatments except T_3. From 7 MAP onwards the lowest plant height was noticed in T_4 which was on par with T_2 and T_1. The same trend continued till 12 MAP. At 12th month of observation, the greatest plant height recorded was 8.81 cm (T_3).

The data pertaining to shoot diameter in different months are presented in Table 2. Significant difference between treatments was observed from 3 MAP. Highest shoot diameter was observed in T_3 (7.61 mm) which was on par with T_1 (7.42 mm) and T_2 (7.21 mm). The treatments T_4 and T_5 were having thinner shoots which were on par with each other (6.88 mm and 6.86 mm respectively). At 4 and 5 MAP, greatest shoot diameter was observed in T_3 (8.10 mm and 8.42 mm) and it was on par with T_1 (7.84 mm and 8.05 mm). At 6 MAP, highest shoot diameter was observed in T_3 (8.72 mm), while lowest value was observed in T_4 (7.78 mm) which

Table 2. Effect of micronutrients on shoot diameter (mm) at different stages in *Ascocenda* orchid var. Big Suksamran

Treatments	Shoot diameter (mm)												
	At the time of planting	1 MAP	2 MAP	3 MAP	4 MAP	5 MAP	6 MAP	7 MAP	8 MAP	9 MAP	10 MAP	11 MAP	12 MAP
T_1	6.21	6.57	6.97	7.42	7.84	8.05	8.15	8.29	8.53	8.71	8.82	9.12	9.37
T_2	6.03	6.31	6.92	7.21	7.56	7.86	8.00	8.09	8.24	8.53	8.74	8.96	9.01
T_3	6.09	6.67	7.12	7.61	8.10	8.42	8.72	9.00	9.20	9.42	9.64	10.01	10.20
T_4	5.92	6.43	6.67	6.88	7.17	7.46	7.78	8.04	8.34	8.65	9.13	9.21	9.25
T_5	6.19	6.37	6.66	6.86	7.14	7.55	7.92	8.17	8.37	8.59	8.71	8.92	9.11
CD(0.05)	NS	NS	NS	0.44	0.41	0.44	0.34	0.28	0.35	0.33	0.43	0.47	0.37
CV	3.10	3.19	2.87	3.35	2.99	3.06	2.28	1.84	2.25	2.04	2.60	2.80	2.18

*T_1– Zn @ 100 ppm, T_2- Zn @ 250 ppm, T_3- B @ 100 ppm, T_4- B @ 250 ppm, T_5– control
*MAP - Month After Planting

Table 3. Effect of micronutrients on number of leaves at different stages in *Ascocenda* orchid var. Big Suksamran

Treatments	Number of leaves												
	At the time of planting	1 MAP	2 MAP	3 MAP	4 MAP	5 MAP	6 MAP	7 MAP	8 MAP	9 MAP	10 MAP	11 MAP	12 MAP
T_1	11.08	13.42	13.17	13.50	12.67	14.33	14.00	14.17	12.05	11.92	12.08	12.25	12.69
T_2	11.67	12.83	14.00	13.58	13.75	14.83	13.94	14.25	11.83	12.03	12.39	12.94	13.25
T_3	11.50	14.25	14.42	14.05	14.28	15.58	15.11	16.50	12.77	12.25	12.80	13.14	13.69
T_4	10.92	13.00	13.00	12.94	13.58	14.28	14.44	14.05	11.17	11.17	11.14	11.67	11.00
T_5	11.00	12.17	12.89	13.39	13.67	14.17	13.42	13.19	11.17	10.83	11.50	12.58	12.58
CD(0.05)	NS	NS	NS	NS	NS	NS	NS	1.44	NS	NS	NS	NS	NS
CV	8.50	5.52	8.64	4.35	5.42	3.77	7.89	5.48	6.86	8.76	7.99	8.90	8.26

*T_1 - Zn@ 100 ppm, T_2 - Zn @ 250 ppm, T_3- B @ 100 ppm, T_4 - B @ 250 ppm, T_5 – control

was on par with T_5 (7.92 mm) and T_2 (8.00 mm). Highest shoot diameter was observed at 7 MAP in T_3 (9.00 mm), while the rest of the treatments were on par. Similar trend was noticed till 12 MAP except at 10 MAP. At 10 MAP, the lowest shoot diameter was noticed in T_5 (8.71 mm) and it was on par with T_2 (8.74 mm) and T_1 (8.82 mm). At 12 MAP, highest shoot diameter recorded was 10.20 mm.

Data on number of leaves recorded at monthly intervals in different treatments are depicted in Table 3. The influence of different micronutrients on number of leaves per plant was found non-significant throughout the period of observation except at 7 MAP, wherein, the highest number of leaves per plant was observed for T_3 (16.50). All the other treatments T_2, T_1, T_4, and T_5 were statistically on par with one another (14.25, 14.17, 14.05, and 13.19 respectively).

Data on leaf area as influenced by different micronutrient treatments are presented in Table 4. Effect of treatments on leaf area was found non-significant for the first seven months of planting. At 8 MAP, highest leaf area of 19.56 cm^2 was recorded by T_3, which was significantly superior over other treatments. The same trend followed upto 12 MAP.

For all the vegetative characters studied, foliar application of 100 ppm boron in the form of boric acid coupled with application of recommended dose of NPK was found effective. Ganesh and Kannan (2013) reported that boron was involved in the physiological processes like carbohydrate metabolism, sugar and starch translocation, protein synthesis, meristematic cell division, phloem development, and translocation of nitrogen, phosphorus and certain hormones. Boron was also involved in the process of DNA synthesis (Shukla et al., 2009). The present findings were in conformity with those of Halder et al. (2007) in gladiolus, where plant height and number of leaves were highest with the application of boron @ 2 kg ha^{-1}. Ahmad et al., (2010) reported that foliar application of boron in the form of boric acid @ 0.5% could result in the production of taller plants with maximum number of leaves in *Rosa hybrida*. Similar result was reported by Sharma et al., (2013) in gladiolus cv. Aldebran, who reported that application of boron @ 0.20% as borax resulted in the greatest plant height and number of leaves. In tuberose, increased plant height and number of leaves were observed when sprayed with 100 ppm boron at fortnightly intervals (Nath and Biswas, 2002). The present finding of the favourable effect of boron on vegetative characters was also in conformity with the finding of Rajput et al. (2003) in *Tagetes minuta* and Patidar (2011) in pot mum cultivars of chrysanthemum.

However, the increased dose of boron (250 ppm) did not elicit significant response as compared to the lower dose (100 ppm). Similar result was reported by Halder et al., (2007) in gladiolus, i.e., application of boron @ 2 kg ha^{-1} produced plants

with greatest plant height and number of leaves, while that of 3 kg ha^{-1} did not have any significant effect on plants. It indicated that the concentration at which micronutrients were applied was very important in relation to their need by plants (Whitcomb et al., 1975). Yellowing or chlorosis of mature leaves from tip was also noticed in T_4 (250 ppm B + PoP). Marginal or tip chlorosis and necrosis in older leaves were the main toxicity symptoms of boron in leaves (Roessner et al., 2006). This might be due to the decreased rate of photosynthesis and chlorophyll content in leaves under elevated levels of boron in plants (Nable et al., 1997).

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