Effect of Nitrogen Concentration Levels on Growth and Flowering of Eucrosia bicolor Ker-Gawl

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Abstract : Effect of nitrogen concentration levels on growth and flowering of Eucrosia bicolor Ker-Gawl was studied at Agricultural Technology Research Institute, Rajamangala University of Technology Lanna, during January - December 2012. The experimental design was a completely randomized design with 4 treatments and 10 replications. Results showed that the number of leaves per cluster, second leaf length, quantifications of leaf greenness (SPAD) of the first and the third leaf, total bulb and total bulb weight gave the best results when the plant were supplied with 300 ppm of nitrogen. The plants supplied with 200 and 300 ppm of nitrogen gave the greatest leaf weight shown in the forth leaf width and the first leaf length was longer than those of other treatments. On the other hand, the plant supplied with 100 and 200 ppm of nitrogen gave the greatest root weight. The plants with nitrogen deficiency gave the least of leaf growth and SPAD. However, the nitrogen concentration did not affect inflorescence quality and old bulb weight.

Keywords : Nitrogen, Eucrosia bicolor Ker-Gawl

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1. Introduction

Eucrosia bicolor, a tropical bulb native to Ecuador, has been evaluated for landscape performance and its utility as a cut flower. (Roh and Meerow, 1992; Roh et al., 1992). The attractive leaves of Eucrosia are light green and elliptic in shape with short stems. Each bulb produces 2-3 leaves. A flowering size bulb produces 2-4 offsets every year, as well as several smaller bulbils. A bulbil with a minimum fresh weight of 5 grams will grow to flowering size in one season of growth (Roh and Meerow, 1992). In the landscape, eucrosia is a spring flowering bulb. Inflorescences appear shortly before leaf emergence, usually in April. In the landscape, eucrosia is best situated in partial shade. Full sun beyond noon will bleach and possibly burn the leaves. In October or November, the leaves of eucrosia will begin to yellow,
indicating the onset of dormancy. (Roh and Meerow, 1991). Nitrogen is a structural component of chlorophyll and an important constituent of proteins. It is essential for cell division and expansion while acute lack of this element arrests vegetative growth and yellowing of foliage. The new leaves with nitrogen deficient are thin and fragile and due to a reduction in growth. (Tisdale and Nelson, 1975; Buasap, 2001). Excessive application of nitrogen too much can delay flowering and fruiting while deficiencies can reduce yields and cause yellowing of the leaves and stunt growth (Bergmann, 1992). In addition, nitrogen deficiencies can lead to small size plants and bulbs with early maturity, while excessive nitrogen can result in soft bulbs which are more susceptible to rotting and delayed maturity in bulbous plants. (Tsutsui, 1975; Ruamrungsri, et al., 1997).
In Lachenalia, application of nitrogen had a positive influence on the leaf area, bulb fresh mass and circumference of both cultivars and bulb firmness was negatively influenced by nitrogen application (Engelbrecht, 2004). Since nitrogen concentration optimum in eucrosia have never been described.
the research was aimed to determine effect of nitrogen concentration levels on growth and flowering of Eucrosia bicolor Ker-Gawl

2. Methodology

The experimental design was a completely randomized design with 4 treatments nitrogen concentrations (i.e. 0, 100, 200, and 300 ppm) and 10 replications. Bulbs of 60-70 g were grown in soilless media comprised sand : rice husk charcoal: rice husk (1:1:1 v/v). The plants were supplied with 4 different nitrogen levels with 0, 100, 200 and 300 ppm, the same concentrations of other minerals in the nutrient solution. The flower quality were measured at 10 WAP and leaves, bulb and root weight were measured at early dormancy.

3. Results and discussion

The nitrogen deficient plants were shown to have the longest days to flowering. However, the nitrogen concentration did not affect number of floret/inflorescence, inflorescence stalk length and inflorescence stalk diameter (Table 1). consistent with the inflorescence stalk quality of Sandersonia was not significantly influenced by nitrogen levels (Clark, 1997).

Table 1 Flower quality of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	Days to flowering	Number of floret/ inflorescence	inflorescence stalk length (cm)	inflorescence stalk diameter (cm)
0	18.10 a	9.60	57.20	0.77
100	14.80 b	9.30	56.90	0.77
200	14.70 b	9.80	56.90	0.74
300	14.00 b	9.60	56.50	0.79
F - test	*	ns	ns	ns

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05
ns=non significant

The plants were supplied with nitrogen concentration at 300 ppm produced the highest number of leaves/cluster than the other treatments. As well as the weight of the leaves the plants were supplied with nitrogen concentration at 300 ppm gave the higher number of bulbs/cluster than the other treatments (Table 2)

Table 2 Number of leaves and leaf weight of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	Number of leaves/cluster	Number of bulb/cluster
0	22.30 b	16.30 b
100	21.60 b	11.80 c
200	23.20 b	14.10 bc
300	40.90 a	30.90 a
F - test	*	*

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05

The nitrogen treated plants gave the greatest leaf width and conversely the nitrogen deficiency plants produced gave the least of leaf width (Table 3). The nitrogen supplied plants gave the greatest leaf length while the nitrogen deficiency plants had the least of leaf length (Table 4). According to Engelbrecht, (2004) reported that nitrogen applied at the nursery phase promoted the leaf area of both Rupert and Ronina and in spider plant (Cleome gynandra) where nitrogen fertilizer increased plant height, number of marketable leaves (Mauyo, 2008)

Table 3 Leaf width of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	1st leaf	2nd leaf	3rd leaf	4th leaf
	cm	cm	cm	cm
0	6.34 b	6.01 b	6.63 b	2.31 c
100	7.98 a	8.51 a	8.08 a	4.99 b
200	8.56 a	9.05 a	8.05 a	6.15 a
300	8.82 a	9.25 a	8.22 a	6.46 a
F - test	*	*	*	*

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05

Table 4 Leaf length of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	1st leaf	2nd leaf	3rd leaf	4th leaf
	cm	cm	cm	cm
0	15.80 c	19.20 c	18.90 b	18.28 c
100	21.23 b	23.15 b	25.49 a	20.57 bc
200	25.43 a	25.21 ab	24.39 a	24.74 a
300	24.63 a	26.90 a	25.85 a	22.53 ab
F - test	*	*	*	*

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05

The 300 ppm nitrogen supplied plants gave the greatest SPAD of 1st leaf and 3rd leaf. while All nitrogen concentrations treated plants gave the greatest SPAD of 2nd leaf and 4th leaf. It was also found that the nitrogen deficiency plants gave the least of leaf SPAD (Table 5).

Table 5 Leaf SPAD of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	1st leaf	2nd leaf	3rd leaf	4th leaf
	(SPAD)	(SPAD)	(SPAD)	(SPAD)
0	25.35 c	25.98 b	30.40 c	30.30 b
100	32.57 ab	34.17 a	34.32 b	36.21 a
200	31.31 b	33.05 a	37.31 ab	37.30 a
300	35.56 a	36.18 a	40.42 a	37.44 a
F - test	*	*	*	*

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05

The nitrogen supplied at 200 and 300 ppm plants gave the greatest leaf weight and bulb weight, while those nitrogen supplied at 100 and 200 ppm gave the greatest leaf weight. It was also found that the nitrogen deficiency plants produced the least of leaf weight, bulb weight and root weight (Table 6). In Sorghum, the decrease in whole plant and leaf dry weight were reported to be the greatest, while the root dry weight was the smallest under nitrogen deficiency (Zhao et al., 2005)

Table 6 Leaf weight, bulb weight and root weight of Eucrosia bicolor at different nitrogen concentrations

Nitrogen concentrations (ppm)	Leaf weight(g)	Bulb weight (g)	Root weight (g)
0	22.02 c	80.30 b	28.84 b
100	49.98 b	103.39 b	60.16 a
200	61.56 a	125.56 a	55.48 a
300	64.63 a	147.47 a	41.31 b
F - test	*	*	*

Values within columns followed by different letters were significantly different at P<0.05
*= significant at P<0.05

4. Conclusion

The number of leaves per cluster, second leaf length, SPAD of first and third leaf, total number of bulb and bulb weight were at the best results when the plants were supplied with nitrogen at 300 ppm. The plants were supplied with nitrogen at 200 and 300 ppm gave the greatest leaf weight, the forth leaf width and the first leaf length than the other treatments, while the plant were supplied with nitrogen at 100 and 200 ppm gave the greatest root weight. The nitrogen deficiency plants gave the least of leaf growth and SPAD. The nitrogen concentrations did not affect inflorescence quality.

5. Reference

Bergmann, W., 1992. Nutritional disorders of plants: development, visual and analytical diagnosis. Gustav Fisher Verlag Jena, New York.

Buasap, U. 2001. “Plant nutrition of fruit”. Handbook of technical. Chumphon : Chumphon Provincial Agricultural Extension Office. 18 p.

Clark, G.E., 1997. Effects of nitrogen and potassium nutrition on soil-grown Sandersonia aurantiaca stem and tuber production. N. Z. J. Crop Hortic. Sci. 25:385-390.

Engelbrecht, G. M. 2004. The Effect of Nitrogen, Phosphorus and Potassium Fertilization on the Growth, Yield and Quality of Lachenalia. Ph. D. thesis, University of the Free State Bloemfontein.

Mauyo, L. W., V. E. Anjichi, G. W. Wambugu and M. E. Omunyini. 2008. Effect of nitrogen fertilizer levels on fresh leaf yield of spider plant (Cleome gynandra) in Western Kenya. Scientific Research and Essay. 3 (6) : 240-244.

Roh, M. 1991. Eucrosia for cuts. Greenhouse Grower. 9(9): 100-104.

Roh, M. S. and A. W. Meerow. 1992. Flowering of Eucrosia as influenced by bulb weight. HortScience: 1227.

Roh, M. S., K. C. Gross, R. S. Lawson and A. W. Meerow. 1992. Flower bud initiation and development of Eucrosia bicolor as influenced by bulb storage temperatures. Acta Hortic. 325: 105-111.

Ruamrungsri, S., Ruamrungsri, S., Ikarashi, and T. Ohyama., 1997. Uptake, translocation and fractionation of nitrogen in narcissus organs by using 15N. Acta Hort. 430: 73-78.

Tisdale, S.L. and W.L. Nelson. 1975. Soil Fertility and Fertilizers. New York : Macmillan Publishing Co. Inc., 397 p.

Tsutsui, T. 1975. Nitrogen fertilization on tulip bulb production in Japan. Acta Hort. 47: 347-352.

Zhaoa, D, K., R. Reddya., V. G. Kakania, and V.R. Reddy. 2005. Nitrogen deficiency effects on plant growth, leaf photosynthesis, and hyperspectral reflectance properties of sorghum. Europ. J. Agronomy 22 : 391–403.