Effect of nitrogen level on the vegetative growth and flower production of *Delphinium grandiflorum*, L.

M. R. HASSAN AND M. KATTAB

ABSTRACT

The effect of nitrogen levels, namely control, 0.5, 1.0, 1.5, 2.0, 2.5 and 3 grams nitrogen per plant was studied on *Delphinium grandiflorum* in 1979 and 1980. The results indicated that the highest leaf number, stem length, as well as the heaviest stem and leaf dry weight, were induced by adding 1.5 gram nitrogen per plant (7.5 grams fertilizer). Also, the length of the flowering spike, its diameter, dry weight, and the number of florets per spike were increased when the nitrogen level was 1.5 grams per plant. When the nitrogen level was increased more than 1.5 grams per plant, there was no significant decrease in most of the previous characteristics. Time taken from planting to the showing colours stage was delayed with the increase in the nitrogen level.

INTRODUCTION

Delphinium is one of the valuable hardy perennials for outdoor cutting which responds well to forcing. Delphinium is a perennial, but could be grown as an annual in the field under Egyptian condition, and is excellent for cut flowers in the white as well as the light and dark blue colours.

Pot plants require nitrogen fertilizer about every two weeks after they become pot pound. This is necessary because the frequent watering during the growing season leaches the nitrogen from the soil and it must be replenished regulary, otherwise the plant will be hardened or starved (1, 3, 4, 8 an 10).

In Egypt there is a lack of information regarding the effect of nitrogen on the vegetative growth and flower production of *D. grandiflorum*. Therefore, the effects of different levels of nitrogen on the vegetative growth and flower quality were studied to determine the most suitable inorganic nitrogen level for the best growth of this flowering plant.

MATERIALS AND METHODS

The present work was carried out through the years 1979 and 1980 in the Experimental Station of Floriculture and Ornamental Horticulture, Faculty of Agriculture, Alexandria University.

Seeds of *D. grandiflorum* were sown on the second week of September, 1979 in seed pans using two parts by volume of light soil and one part of sand. In November of the same year the seedlings were transplanted to pots of 10 cms diameter using the same medium mentioned before, where a single seedling was planted in each pot. The plants were transplanted to the final pots of 25 cms diameter on 28 February, 1980 using hea-

Horticulture Department, Faculty of Agriculture, University of Alexandria, Egypt.

vy loam soil. Super phosphate as well as potassium sulphate fertilizers were added to that medium at preparation (10).

In the third week of April, the fertilizer treatments were started. The Nitrogen fertilizer was added to the plants two times at biweekly intervals at the levels zero (Control), 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 grams nitrogen. Ammonium sulphate (20% N) was used as a source of nitrogen so that the former concentrations were zero, 2.5, 5.0, 7.5, 10.0, 12.5, and 15.0 grams of amminium sulphate, respectively. Plants were grown without terminal pinching and all lateral branches were removed to allow one terminal spike per plant to develop.

The experiment layout was designed to provide randomized complete blocks with 7 replicates. Each treatment was represented by two pots (plot) in the replicate.

Analysis of variance was calculated for the mean of each plot as described by Snedecor (11). The observations recorded at flowering time were, plant height, stem dry weight, number of leaves per plant, leaf dry weight, length of flowering spike, Diameter and dry weight of flowering spike, number of florets per flowering spike, and the number of days taken from seed sowing to flowers showing colour. The experiment was repeated in 1980.

RESULTS AND DISCUSSION

It is clear from the results of the two years experiments that the nitrogen levels added to the potted plants affected both the vegetative growth and flower production.

Vegetative growth: Generally, increasing the nitrogen to 1.5 gm N/plant increased the stem length, stem dry weight, the number of leaves per plant and the leaf dry weight. Meanwhile, increasing the nitrogen level to 3.0 gm N/plant had no significant effect on the previous vegetative characteristics as compared with the control treatment

Table 1 — Effect of nitrogen level on the vegetative growth and flower production of *Delphinium grandiflorum* during the seasons, 1979 and 1980

Measurements	Season	Nitrogen level (grams)							L.S.D. at	
		Control N0	0.5 N1	1.0 N2	1.5 N3	2.0 N4	2.5 N5	3.0 N6	0.005	1.01
Plant height (cm)	1979	56.3	58.7	62.1	57.1	56.3	53.6	49.7	6.96	9.32
	1980	56.9	61.6	62.7	61.4	59.0	57.0	55.0	3.73	4.99
Leaf number/ plant	1979	12.0	13.6	14.3	14.6	12.6	12.4	11.9	1.29	1.73
	1980	13.4	13.6	15.0	15.5	13.4	12.4	11.3	1.03	1.37
Leaf dry weight (grams)	1980	5.37	8.51	10.35	11.23	9.57	9.10	7.81	1.67	2.23
	1980	5.95	7.29	10.03	10.91	9.63	8.08	7.89	1.24	1.66
Stem dry weight (grams)	1979	2.28	3.38	3.59	3.94	3.08	2.89	2.70	0.62	0.83
	1980	2.79	3.24	3.64	4.38	3.40	3.07	2.98	0.28	0.37
Days to showing Colour	1979	231	225	225	228	229	231	230	N.S.	N.S.
	1980	227	227	231	232	229	233	233	2.53	3.39
Florets number per plant	1979	22.0	29.4	30.4	32.2	27.4	27.4	27.4	5.59	7.49
	1980	22.6	32.0	30.3	38.2	27.7	25.4	22.3	5.16	6.91
Length of Fl St. (cms)	1979	23.7	25.1	26.6	29.7	28.4	28.3	22.0	2.89	3.87
	1980	23.9	28.6	29.1	29.6	26.9	25.6	24.3	2.23	2.99
Diameter or Fl St. (cms)	1979	7.00	8.10	8.40	8.90	7.7	7.9	8.1	0.73	0.97
	1980	7.00	8.3	8.3	9.70	7.4	7.7	7.9	0.83	1.12
Dry weight of Fl. St. (grams)	1979	2.22	2.83	3.03	4.00	3.12	3.13	2.9	0.53	.07
	1980	2.91	3.42	4.09	4.16	3.04	3.27	3. 1	0.66	0.89

(Zero gm N/plant) (Table 1). This is probably due to the importance of nitrogen at a specific concentration in increasing the activity of the growing apex via increasing cell formation and elongation. Similar results were obtained by Jioner and Smith (5) and Mostafa et. al (9) on Chrysanthemum plants.

There were no beneficial effects on the previous vegetative characteristics by increasing nitrogen to the higher levels, whereas the maximum increases were obtained by adding 1.5. gm N/plant. This may be due to the slight increase of initial soluble salts content as mentioned by Jioner and Poole (6).

Flower quality: The results in Table 1 show that the increase in nitrogen level led to an increase in length, diameter, dry weight and number of florets per flowering spike as compared with the control treatment. However, the best results for flower quality were obtained by the addition of 1.5 gm N/plant as compared with the other treatments including the control.

These results may be attributed to the importance of the 1.5 grams nitrogen level to produce a proper balance between nitrogen and other elements in the substrate to obtain the optimum growth and consequently, optimun flower quality, and/or the importance of nitrogen, at a specific concentration, in the synthesis of materials to build up the flower buds. These results are in agreement with those obtained by Bik (2) and Khattab and Hassan (7) on chrysanthemum plants. The sowing date to the showing colour stage, was effected by nitrogen addition during the second season.

Generally, the effect of nitrogen level on the time taken from planting to the showing colour stage was not consistent (Table 1). These results may be due to the fact that the initiation of floral primordia in delphinium which is caused by a special hormone, was not influenced by the nitrogen status of the plants. Similar results with chrysanthemum plants, were found by Khattab and Hassan (7).

REFERENCES

1. Laurie, A., D. C. Kiplinger, and K.S. Nelson, 1969. *Commercial chrysanthemum forcing*. McGraw-Hill Book Co. P. 282 - 310.
2. Bik, P. A., 1970. *Moisture supply, nitrogen fertilizer and internal water balance in ornamental flower crops*. Hort. Abstr. 40: 4391.
3. Boodley, J.W., and M. Meyer, 1965. *The nutrient content of Bonnaffon Deluxe chrysanthemums from juvenile to mature growth*. Proc. Amer. Soc. Hort. Sci. 87: 472 - 478.
4. Boodley, J. W. and others, 1968. *Fertilizer proportioners for floriculture and nursery crop production management*. Horst. Abstr. 37: 5273.
5. Jioner. J.M., and T.C. Smith, 1962. *Effects of nitrogen and potassium levels on the growth, flowering responses and foliar composition of* ***Chrysanthemum morifolium*** *«Bluechip»*. Proc. Amer. Soc. Hort. Sci. 80: 571 - 580.
6. Jioner, J. M., and R. T. Poole, 1967. *Relationship of fertilizers frequency to chrysanthemum yield and nutrient levels in soil and foliage*. Proc. Amer. Soc. Hort. Sci. 90: 397 - 402.
7. Khattab, M. and M. R. Hassan, 1989. *Effect of different ratios and levels of fertilizer on the vegetative growth and flower production of chrysanthemum*. Alex. Jour. Agric. Res. 28 (3): 225 - 231.
8. Lunt. O.R., and A. M. Kofranek, 1958. *Nitrogen and potassium nutrition of chrysanthemum*. Proc. Amer. Soc. Hort. Sci. 72: 287 - 497.
9. Mostafa, M. M., M. Hassan and M. Badr, 1979. *The effect of level and source of nitrogen on the vegetative growth and flower production of* ***Chrysanthemum morifolium***.
10. Post, K., 1949. *Florist crop production and Marketing*. Orange Judd Pubblishing Co. Inc., New York.
11. Snedecor G. W., 1956. *Statistical methods*. 5th Ed. The Iowa State University Press, Ames., Iowa.

تأثير مستوى النيتروجين على النمو الخضرى والزهرى لنبات العايق

م. ر. حسن
م. خطاب

المستخلص

درس تأثير مستويات مختلفة من النيتروجين على النمو الخضرى والزهرى لنبات العايق عريض الأوراق وقد أجريت هذه الدراسة خلال موسمى 1979 - 1980 بمزرعة كلية الزراعة ـ جامعة الاسكندرية ويمكن تلخيص أهم النتائج فى الآتى:

زيادة مستوى النيتروجين حتى 1,5 جرام لكل نبات أدت لأقصى زيادة معنوية فى معظم صفات النمو الخضرى والزهرى التى درست، أما زيادة مستوى النيتروجين حتى 3 جرام لكل نبات ليس له تأثير معنوى على معظم الصفات التى درست.

أما موعد ظهور اللون فى البراعم الزهرية فلم يتخذ اتجاها محددا نتيجة للمعاملة بالنيتروجين.