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RESEARCH ARTICLE :

Response of cut dahlia cv. 'PINK ATTRACTION' to inorganic nutrition

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SUMMARY : A field experiment was performed with three levels of N (100, 175, 250 kg ha^{-1}) and two levels of each P_2O_5(100, 150 kg ha^{-1}) and K_2O (50, 75 kg ha^{-1}) to find out the optimum doses of N, P_2O_5 and K_2O for better growth, flower and tuber production of dahlia cv. "PINK ATTRACTION" under temperate conditions of Kashmir. Increasing levels of N, P_2O_5 and K_2O significantly increased the plant height, number of branches/plant, spike length, flower size, flower weight and tuber yield. Highest plant height was recorded with nutrient combination of 250 kg N, 150 Kg P_2O_5 and 75 kg K_2O^{-ha} ($N_3P_2K_2$) which was at par with $N_3P_2K_1$, $N_3P_1K_2$, $N_3P_1K_1$ but significantly more than $N_2P_2K_2$, Similarly spike length and flower number/plant also improved with combinations of increased N & P (250 and 150 kg ha^{-1}). Combinations of highest N, P & K doses also resulted in significantly higher tuber yields both in terms of weight and number. Highest of 1.042 kg/plant was recorded under $N_3P_2K_2$ whereas the lowest tuber yield of 0.820 kg/plant was recorded with $N_1P_1K_1$ combination.

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KEY WORDS :
Plant height, Dahlia, Crops, Spike

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BACKGROUND AND OBJECTIVES

Dahlia (*Dahlia variables* L.) is a tuberous rooted half hardy herbaceous perennial belonging to the family Asteraceae. The variety of forms, size and colours and the ease of cultivation have made dahlia immensely popular among garden flowers. Dahlias are extensively used for exhibition, garden display, decoration, cut flowers and flower arrangements. Cultivation of cut flower varieties of dahlia is recently increasing in India.

Cut flower varieties of Dahlia yield large number of cut flowers over the extended flowering period of Dahlia. Dahlia is a heavy feeder and removes a lot of nutrient from the soil. In Kashmir valley most of the flower growers are marginal farmers having limited area of land. They have to grow crops in the same piece of land year after year. Dahlia being a heavy feeder removes a lot of nutrient from the soil. In order to sustain production and yield over the years there is a need for proper nutritional replenishment of not only the soil but also the current crop growth. Soil fertility in modern age is considered to be the soil having additional fertility than its natural fertility. Nutrition plays an important role in

proper growth and development of the plants (Marschner, 1986). Balanced dose of nutrients with other cultural practices are indispensable for maximum returns from any crop (Jane *et al.*, 1974). Since information on nutritional management of cut dahlia especially under the temperate conditions of Kashmir is scanty, an attempt was made to find out the optimum levels of nitrogen, phosphorus and potash for better growth, flowering and tuber production of dahlia.

RESOURCES AND METHODS

The present investigation was carried out at the Research farm of Division of Floriculture and Landscape Architecture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, during dahlia cropping season 2008-2009.The organic carbon of the soil was found to be 0.98 per cent and pH/6.93. The experiment was conducted in Randomized Block Design with three levels of N (100, 175, 250 kg ha^{-1}) and two levels of each P_2O_5(100, 150 kg ha^{-1}) and K_2O (50, 75 kg ha^{-1}) with three replications. Healthy and uniform dahlia tubers were planted in 1 square meter plot at 30 x 50 cm. The half dose of N in the form of urea and full dose of P_2O_5 and K_2O in the form of single super phosphate and muraite of potash were applied as a basal dose just before planting and remaining half dose of N was applied in two split doses at 40 and 60 days after sprouting of tubers.The observations were recorded on plant height, number of branches/plant, spike length, flower size, flower weight and tuber yield. Data was analysed statistically.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Growth parameters :

The analysis of data (Table 1) revealed that influence of different levels of nitrogen had significant effect on plant height and number of branches/plant. Maximum plant height (87.50cm) were recorded with 250 kg ha^{-1} N followed by 78.018 cm under 175 kg ha^{-1} N. 200 kg N ha^{-1} resulted in 11.930 branches/ plant followed by 10.953 and 9.479 branches with 175 and 100 kg of N ha^{-1}.The improvement in vegetative parameters due to the supply of higher doses of nitrogen may be attributed to its effect on cell division and elongation. Similar findings have also been reported by Agarwal *et al.* (1999) and Rehman and Mitra (1974).

Phosphorus also had a significant effect on plant height. 150 kg ha^{-1} P_2O_5 resulted in 78.433 cm plants whereas 100 kg ha^{-1} P_2O_5 resulted in 74.000 cm tall plants. Number of branches/plant followed a similar trend. It may be due to application of optimum dose of phosphorus which result in proper and vigorous growth of the plant. Being an integral part of ATP, phosphorus plays an indispensable role in energy metabolism and thus plant growth. An accelerated growth of plant due to phosphorus may also be due to an improved root system.

Table 1 : Effect of N, P and K on growth and flowering in Dahlia cv 'PINK ATTRACTION'

Treatments	Plant height (cm)	No. of branches /plant	Spike length (cm)	No. of flowers/plant	Flower size (cm)	Flower wt. (g)	Tuber wt. kg/Plant	No. of tubers/Plant
Nitrogen Kg ha^{-1}								
100	67.701	8.779	23.152	25.267	8.582	9.416	0.830	26.853
175	76.127	10.437	26.031	28.865	9.453	9.854	0.929	28.050
250	84.831	11.467	27.645	32.450	10.085	10.686	1.003	28.838
C.D. (P=0.05)	4.235	0.843	0.933	1.753	0.315	1.068	0.231	1.608
P_2O_5 Kg ha^{-1}								
100	74.006	9.708	25.100	27.438	8.153	9.153	0.903	27.458
150	78.433	10.747	26.119	29.841	8.383	9.085	0.938	28.358
C.D. (P=0.05)	3.457	0.688	0.761	1.431	NS	NS	0.188	1.312
K_2O Kg ha^{-1}								
50	78.267	10.195	25.490	28.681	8.750	9.235	0.912	27.814
75	79.582	10.261	25.729	29.041	9.530	10.536	0.929	28.001
C.D. (P=0.05)	NS	NS	0.761	1.431	0.257	0.871	NS	NS

NS=Non-significant

Table 2 : Effect of interaction of N, P and K on growth and flowering in Dahlia cv 'PINK ATTRACTION'

Treatments	Plant height (cm)	No. of branches /plant	Spike length (cm)	No. of flowers/plant	Tuber wt. Kg/Plant	No. of tubers/Plant
$N_1 P_1 K_1$	65.473	8.018	22.750	23.172	0.820	26.453
$N_1 P_1 K_2$	66.186	8.089	22.833	23.453	0.825	26.752
$N_1 P_2$ KI	69.425	9.533	23.458	27.128	0.835	26.950
$N_1 P_2 K_2$	69.721	9.479	23.570	27.315	0.840	27.185
$N_2 P_1 K_1$	73.755	10.015	25.500	28.413	0.895	27.430
$N_2 P_1 K_2$	74.286	9.890	25.631	28.523	0.925	27.711
$N_2 P_2 K_1$	78.451	10.891	26.245	28.950	0.937	28.451
$N_2 P_2 K_2$	78.018	10.953	26.750	29.577	0.959	28.610
$N_3 P_1 K_1$	81.155	11.015	26.833	31.853	0.973	28.153
$N_3 P_1 K_2$	83.186	11.225	27.057	31.874	0.983	28.250
$N_3 P_2 K_1$	87.485	11.698	28.158	32.572	1.015	29.452
$N_3 P_2 K_2$	87.501	11.930	28.533	33.504	1.042	29.500
C.D. (P=0.05)	8.470	1.686	1.866	3.506	0.462	3.216

These results are in conformity with the findings of Mukherjee *et al*. (1994) and Kawarkhe *et al*. (2001)

The perusal of the data in Table 2 reveals the influence of interaction of nitrogen and phosphorus as maximum plant height was recorded with nutrient combination of 250 kg N, 150, Kg P_2O_5 and 75 kg K_2O $^{-ha}$ ($N_3P_2K_1$) which was at par with $N_3P_2K_1$, $N_3P_1K_2$, $N_3P_1K_1$ but significantly more than $N_2P_2K_2$, $N_2P_2K_1$. Lowest plant height was recorded with $N_1P_1K_1$. Branch number increased significantly with increased dose of N (250 kg ha^{-1}) and P_2O_5 (150 kg ha^{-1}). The probable reason may be the application of optimum dose of major nutrient like nitrogen and phosphorus results in promotion of vigorous of the plants. Nitrogen and phosphorus can improve the growth by providing energy and improving the metabolic efficiency of the plant. Similar findings have been reported by Agarwal *et al*. (1999); Singh and Binjimal (2000); Bhattacharjee and Mukherjee (1983) and Jana *et al*. (1974).

Flowering parameters :

All the three nutrients improved spike length with the highest of 27.645, 26.119 and 25.729 cm recorded under 250, 150 and 75 kg ha^{-1}, respectively. Increments in nitrogen from 100 to 175 and 175 to 250 kgha^{-1} resulted in significant improvement in flower size with highest of 10.085 cm recorded under 250 kg N^{-ha}. 75 kg of K_2O^{-ha} also resulted in significant improvement of flower size (9.530 cm) as against 8.750 cm recorded with 50 kg K_2O^{-ha}. Variation in flower weight followed a trend like flower size. Application of optimum dose of nitrogen and phosphorus result in vigorous growth of plant which in turn result good flowering. Since potassium has an important role in regulating water and nutrient movement in plant cells, its optimum dose mayresult in good flowering. These results agree with the results of Starek *et al*. (1991); Mukherjee *et al*. (1994); Kawarkhe *et al*. (2001) and Arora and Saini (1976).

Tuber parameters :

Perusal of the data (Table 1) revealed that tuber parameters were significantly influenced by increments with N and P doses. Highest tuber yield of 1.003 kg/ plant was recorded with 250 kg N^{-ha}. 100 kg ha^{-1} application resulted in a yield of 0.830 kg of tubers/plant. 150 kg of P_2O_5 also significantly improved tuber yield (0.938kg) as well as tuber number (28.358) per plant.Combinations of highest N, P and K doses (Table 2) also resulted in significantly higher tuber yields both in terms of weight and number. Highest of 1.042 kg/plant was recorded under $N_3P_2K_2$ whereas the lowest tuber yield of 0.820 kg/plant was recorded with $N_1P_1K_1$ combination. In all bulbous crops tuber is another important sink for photosynthates (photoassimilates) after flowering. Therefore, the increased height and number of branches (in the present study) and thus total photosynthetic capacity might have also provided greater photosynthates to the tuber and helpful in increasing the number as well as fresh weight of the tubers. Similar results have also been reported by Singh and Gupta (1995) and Baboo *et al*. (2006).

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