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Interaction Effect of Nitrogen and Phosphorus on Growth, Flowering and Yield of Bird of Paradise (*Strelitzia reginae*)

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A B S T R A C T

An experiment was conducted at Floriculture Research Farm, ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari to study the effect of nitrogen and phosphorus on growth, flowering and yield of bird of paradise in Large Plot Technique and data were analyzed in Completely Randomized Design with Factorial concept (FCRD) with nine treatment combinations and three replications. Combined application of nitrogen @ 30 g and phosphorus @ 15 g/plant/year (N_2P_2) recorded significantly higher vegetative as well as flowering attributes. The same treatment also improved quality and yield of flowers of bird of paradise.

Introduction

Bird of paradise is one of the majestic flower crop grown in the regions having moderate subtropical and tropical climate. It is native to South Africa and an evergreen perennial, herbaceous, underexploited cut flower plant.

The brilliant colors and unusual appearance of the flower have made it exceptionally popular as cut flower. Therefore, the crop is cultivated in many parts of the world in order to produce cut flowers for both domestic and international markets. Hence, in some country, farmers have started growing this crop on commercial scale. Nutrition has direct influence on crop physiology because it plays a prime role in the production of any crop.

A suitable nutritional dose certainly helps in deciding the quantities and periods of fertilizer application for higher production and subsequent higher yields in bird of paradise cultivation. Nitrogen plays a vital role in metabolic activities of plants.

It is responsible for synthesis of protein, amino acids, nucleic acids, chlorophyll and protoplasm of cell which help in harvesting solar energy through chlorophyll compounds. Phosphorus serves as a structural component of cell constitutes like chloroplast and mitochondria, it is a part of sugar phosphates (ATP and ADP), which plays an inevitable role in photosynthesis and respiration,

consequently leading to increase vegetative growth and flower production of plants. The present investigation was, therefore, undertaken in order to standardize the optimum dose of fertilization (nitrogen and phosphorus) in three years old bird of paradise plants.

Materials and Methods

The experiment on bird of paradise was laid out in Large Plot Technique and data were analyzed in Completely Randomized Design with Factorial concept (FCRD) during 2015 - 16 at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat.

Three levels of each of nitrogen *viz.*, N_1: 20, N_2:30 and N_3:40 g N/plant/year and phosphorus *viz.*, P_1:10, P_2:15 and P_3:20 g P/plant/year were applied. Thus, there were nine treatment combinations with three replications. Nitrogen and phosphorus was applied in four and two equal doses, respectively.

Nitrogen and phosphorus were applied in the form of urea and Single Super Phosphate, respectively. The treatment was imposed on three year old bird of paradise plants to know the effects of nitrogen and phosphorus on growth, flowering and yield. The plants were planted at a spacing of 1.75 m × 1.0 m under 50 per cent shade net. Observations on plant growth, flowering and yield attributing characters were recorded.

Results and Discussion

It is explicit from the data (Table 1) that among all the growth parameters under study, the interaction effect of nitrogen and phosphorus had significant effect on vegetative growth at 12^{th} month. The treatment combination of N_2P_2 (30 g N + 15 g P/plant/year) recorded significantly higher plant height (171.50 cm), leaf length (53.42 cm), leaf width (19.67 cm), leaves per clump (32.08) and suckers per plant (6.42).

The increase of vegetative growth characteristics due to combined application of nitrogen and phosphorus may be attributed to the fact that both N and P might have cumulative effect of nitrogen and phosphorus. Nitrogen plays a vital role in metabolic activities of plants. It is responsible for synthesis of protein, amino acids, nucleic acids, chlorophyll and protoplasm of cell which help in harvesting solar energy through chlorophyll compounds.

Phosphorus serves as a structural component of cell constitutes like chloroplast and mitochondria, it is a part of sugar phosphates (ATP and ADP), which plays an inevitable role in photosynthesis and respiration, consequently leading to increase vegetative growth and flower production of plants.

Similar results were found by Kumar and Mishra (2011) in the gladiolus, Chandana and Dorajeerao (2013) in gladiolus, Kumar and Kumar (2013) in China aster, Sharma *et al.*, (2006) in African marigold, Barman *et al.*, (2004) in *Cymbidium*, Ahirwar *et al.*, (2012) in African marigold and Kaur and Kumar (1998) in pansy.

An interaction between nitrogen and phosphorus was also found significant with respect to various flowering parameters of bird of paradise (Table 2). The minimum days to flowering from initiation of inflorescence (40.75 days), maximum florets per bract (9.75), stalk length (104.92 cm), stalk diameter (0.56 cm), longevity of inflorescence (27.92 days), vase life (14.17 days) and inflorescence per plant per year (4.08) were found in the treatment combination of N_2P_2 (30 N + 15 P g/plant/year).

Table.1 Interaction effect of nitrogen and phosphorus on vegetative growth of bird of paradise

Treatment	Plant height (cm)	Leaf length (cm)	Leaf width (cm)	Leaves /clump	Suckers/plant
N_1P_1	151.25	39.67	14.42	23.00	4.83
N_1P_2	153.08	43.42	15.75	25.17	4.92
N_1P_3	151.92	45.00	15.08	24.58	4.83
N_2P_1	157.00	43.42	18.08	26.17	5.25
N_2P_2	171.50	53.42	19.67	32.08	6.42
N_2P_3	159.33	47.67	16.92	26.75	5.25
N_3P_1	159.83	48.17	15.83	26.83	5.17
N_3P_2	165.17	48.75	18.50	27.75	5.75
N_3P_3	158.75	46.17	17.83	26.58	5.33
C.D. at 5 %	3.25	2.91	1.35	1.98	0.43

Table.2 Interaction effect of nitrogen and phosphorus on flower quality and yield of bird of paradise

Treatment	Days to flowering from initiation of inflorescence	Florets/bract	Stalk length (cm)	Stalk diameter (cm)	Longevity of inflorescence (days)	Vase life (days)	Inflorescence/plant/year
N_1P_1	45.25	7.75	98.42	0.49	23.83	10.83	2.58
N_1P_2	41.33	8.00	100.83	0.53	24.42	12.42	3.17
N_1P_3	43.75	8.17	100.42	0.51	25.58	12.33	3.08
N_2P_1	42.50	7.92	99.50	0.52	25.08	12.75	3.17
N_2P_2	40.75	9.75	104.92	0.56	27.92	14.17	4.08
N_2P_3	41.42	8.42	101.92	0.54	25.92	12.58	3.25
N_3P_1	44.92	8.33	102.33	0.53	26.17	13.17	3.08
N_3P_2	43.08	8.67	101.00	0.54	26.42	13.17	3.50
N_3P_3	41.08	8.25	100.92	0.50	25.33	12.58	3.00
C.D. at 5 %	1.68	0.78	3.01	0.03	1.67	0.98	0.32

The increase in the flower quality characters are might be due to nitrogen and phosphorus which are essential constituents which helps in the formation of starch and sugar in plant body, it is also very important in forming carbohydrate and translocation of starch resulting in improved plant growth which might have favoured increase in flowering as well as qualitative characters. This finding was also supported by Acharya and Dashora (2004) in marigold, Rahayanavar (1985) in chrysanthemum, Sigedar *et al.,* (1991) in calendula, Sarkar *et al.,* (1991) in calendula, Singatkar *et al.,* (1995) in gaillardia, Sharma *et al.,* (2006) in African marigold and Chawla *et al.,* (2007) in chrysanthemum.

The increase in number of inflorescences per plant per year may be attributed to the fact that both N and P are essential plant nutrients and both these nutrients (N and P) might have cumulative effect in enhancing number of flowers in the present study. Dorajeerao *et al.,* (2012) also reported the similar results in chrysanthemum with the application of 150 kg of nitrogen along with 100 kg phosphorus.

Higher concentration of both N and P nutrients are enough to reduce growth of plant and yield of flowers. This might be because of the excessive nutrients concentration being able to cause an imbalance in other essential nutrients which also reduce growth and yield of plant.

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