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GROWTH AND FLOWER YIELD OF ANNUAL CHRYSANTHEMUM AS INFLUENCED BY NITROGEN AND PHOSPHORUS LEVELS

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Abstract

The present investigation was undertaken during 2009-10 at Horticulture Section, College of Agriculture, Nagpur with four levels of nitrogen *viz*., 0 kg (N_1), 100 kg (N_2), 150 kg (N_3) and 200 kg (N_4) and four levels of phosphorus *viz*., 0 kg (P_1), 50 kg (P_2), 75 kg (P_3) and 100 kg (P_4) ha^{-1} in factorial randomized block design with three replications. The study revealed that nitrogen 200 kg ha^{-1} and phosphorus 100 kg ha^{-1} significantly increased plant height, number of primary branches, diameter of main stem, plant spread, number of flower $plant^{-1}$, yield $plant^{-1}$ and ha^{-1} .

Key words : Nitrogen, phosphorus, growth, flower yield, annual chrysanthemum.

Introduction

Among the flowers, annual chrysanthemum (*Chrysanthemum coronarium*) has its own importance. It is one of the most important flower crop grown in India. Maharashtra is one of the leading states in flower production. It has a great demand during various functions, festivals, marriages for floral decorations. In Maharashtra, annual chrysanthemum is more popular among the farmers because of easy cultivation for cut as well as loose flowers. The growers get attracted towards annual chrysanthemum due to its short duration to produce marketable attractive yellow and white colour flowers with good keeping quality.

In Vidarbha region, the demand of chrysanthemum flowers is for various purposes and increasing tremendously. Growers in this region facing problem in scientific cultivation of chrysanthemum due to lack of technical information and improved agro-technique like fertilizer dose. Fertilization plays an important role in growth and flower yield production in flower crops. Therefore, the present investigation was undertaken to study the effect of nitrogen and phosphorus on growth and flower yield of annual chrysanthemum and to find out the suitable dose of nitrogen and phosphorus for better growth and quality flowers yield.

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Material and Methods

The present study was undertaken during 2009-10 at Horticulture Section, College of Agriculture, Nagpur with four levels of nitrogen *viz*., 0 kg (N_1), 100 kg (N_2), 150 kg (N_3) and 200 kg (N_4) and four levels of phosphorus *viz*., 0 kg (P_1), 50 kg (P_2), 75 kg (P_3) and 100 kg (P_4) ha^{-1} in factorial randomized block design with three replications.

The soil was medium black with uniform texture, colour and good drainage. The seeds were sown on raised bed for preparation of seedlings. The seedlings of annual chrysanthemum having 30 days old were planted at spacing of 45 cm row to row and 30 cm plant to plant. The protective irrigations were given at timely interval as and when required. The field was kept free from weeds by adopting hand weeding at time to time. The field was kept free from weeds by adopting hand weeding from time to time. Urea was used as a source of nitrogen and single super phosphate of phosphorus. Nitrogen and phosphorus were applied as per the treatments. Half dose of nitrogen and entire dose of phosphorus was applied as a basal dose, at the time of transplanting and remaining half dose of nitrogen was given one month after transplanting. The observations on growth parameter were recorded *viz*., plant height (cm), number of primary branches $plant^{-1}$, diameter of main stem (cm) and plant spread (cm) at 90 days after transplanting, the observations on flower yield, number of flowers $plant^{-1}$, flower yield $plant^{-1}$ (g) and per ha^{-1} were recorded at

Table 1 : Plant height of annual chrysanthemum as influenced by nitrogen and phosphorus levels.

Treatments	Plant height (cm)				
	Phosphorus levels				
Nitrogen levels	**0 kg ha^{-1} (P_1)**	**50 kg ha^{-1} (P_2)**	**75 kg ha^{-1}(P_3)**	**100 kg ha^{-1}(P_4)**	**Mean**
0 kg ha^{-1} (N_1)	112.80	113.73	113.67	113.07	113.32
100 kg ha^{-1} (N_2)	115.53	116.13	116.93	118.73	116.83
150 kg ha^{-1} (N_3)	117.47	118.00	119.60	120.47	118.88
200 kg ha^{-1} (N_4)	118.73	121.20	120.73	122.73	120.85
Mean	116.13	117.26	117.73	118.75	
	SE (m) ±		**CD at 5 %**		
N	0.108		0.314		
P	0.108		0.314		
N × P	0.217		0.628		

Table 2 : No of branches, stem diameter and plant spread of annual chrysanthemum as influenced by nitrogen and phosphorus levels**.**

Treatments	Number of primary branches plant^{-1}	Diameter of main stem (cm)	Plant spread (cm)
Nitrogen levels (N)			
N_1-0 Kg N ha^{-1}	28.23	2.43	35.02
N_2-100 Kg N ha^{-1}	31.42	2.54	43.37
N_3-150 Kg N ha^{-1}	32.77	2.57	49.22
N_4-200 Kg N ha^{-1}	34.10	2.62	50.25
SE (m) ±	0.206	0.009	0.414
C.D.at 5%	0.594	0.028	1.196
Phosphorus levels (P)			
P_1-0 Kg P_2O_5 ha^{-1}	30.53	2.50	42.31
P_2-50 Kg P_2O_5 ha^{-1}	31.20	2.51	44.09
P_3-75 Kg P_2O_5 ha^{-1}	31.93	2.56	44.88
P_4-100 Kg P_2O_5 ha^{-1}	32.85	2.57	46.55
SE (m) ±	0.206	0.009	0.414
C.D.at 5%	0.594	0.028	1.196
Interaction effect N × P			
SE (m) ±	0.412	0.019	0.829
C.D.at 5%	-	-	-

harvesting and statistical analyzed as per Panse and Sukhatme (1967).

Results and Discussion

Effect of nitrogen on growth parameter

Data presented in tables 1 and 2 showed that an application of nitrogen to annual chrysanthemum crop significantly influenced the growth parameters. The results revealed that significantly maximum plant height (120.85 cm), number of primary branches plant^{-1} (24.10), diameter of main stem (2.62 cm) and plant spread (50.25 cm) were recorded due to the application of 200 kg N ha^{-1}, which was at par with 150 kg N ha^{-1}. Minimum plant height (113.32 cm), number of primary branches plant^{-1} (28.23), diameter of main stem (2.43 cm) and plant spread (35.02 cm) were recorded in control treatment.

This might be due to an increased uptake of the nutrient. Being, nitrogen is a constituent of protein, component of protoplasm and chlorophyll, all the factors contributed to cell multiplication, cell enlargement and cell differentiation resulting in increased photosynthesis and translocation The similar result were also reported by Acharya and Dashora (2004) an application of 200 kg

ha^{-1} of nitrogen produced the maximum vegetative growth in *Tagetes erecta* cv Pusa Basanti Gainda.

Effect of nitrogen on yield parameter

Data from table 3 revealed that an application of 200 kg N ha^{-1} recorded significantly maximum number of flowers plant^{-1} (107.25), flower yield plant^{-1} (247.67 g) and ha^{-1} (183.45q) followed by the treatments 150 kg N ha^{-1}whereas, minimum number of flowers plant^{-1} (77.12) , flower yield plant^{-1} (156.70 g) and ha^{-1} (116.06q) were recorded in control treatment. This might be attributed due to excessive vegetative growth converted in to a reproductive growth and high nitrogen appears to favour development of flowers. Higher level of nitrogen produced the maximum yield flower was also reported by De and Dhiman (1998) in chrysanthemum, Sehrawat *et al*. (2003) and Jadhav *et al*. (2002) in marigold.

Effect of phosphorus on growth parameters

Application of phosphorus significantly influenced the plant growth in annual chrysanthemum. The results (tables 1 & 2) revealed that plant height (118.75), number of primary branches plant^{-1}(32.85), diameter of main stem (2.57 cm) and plant spread (46.55 cm) were recorded significantly maximum in an application of 100 Kg P_2O_5 which was at par with 75 kg P_2O_5. Minimum values in respect of plant height (116.13 cm), number of primary branches plant^{-1}(30.53), diameter of main stem (2.50 cm) and plant spread (42.31 cm) were recorded in control treatment. This might be due to phosphorus is an essential part of the process of photosynthesis, it required for the general health, vigour of all plants and root development. Phosphorus is noted especially for its role in capturing and converting the sun's energy into useful plant compounds. The results are in close conformity with the finding of Belgaokar *et al.* (1996) and Patil (1989) in annual chrysanthemum, Acharya and Dashora (2004) and Nagaich *et al*. (2003) in African marigold.

Effect of phosphorus on yield parameters

Data presented in table 3 revealed that significantly maximum number of flowers plant^{-1} (100.65), flower yield plant^{-1} (225.46 g) and ha^{-1} (166.09 q) were recorded an application of 100 kg P_2O_5 ha^{-1}, which was at par with the application of 75 kg P_2O_5 ha^{-1}. However, significantly minimum number of flowers plant^{-1} (88.90), flower yield plant^{-1} (190.11 g) and ha^{-1} (140.81 q) were recorded in control treatment. This might be due to the abundant availability of phosphates in the rooting medium, which affects the earlier maturation of plant that tends to develop the flower. The similar results were also reported by Belgoakar *et al.*(1996) in annual chrysanthemum, and

Table 3 : Yield parameters of Annual chrysanthemum as influenced by nitrogen and phosphorus levels

Treatments	Number of flowers plant^{-1}					Flower yield plant^{-1} (g)					Flower yield ha^{-1} (q)				
	Phosphorus levels					Phosphorus levels					Phosphorus levels				
Nitrogen levels	0 kg ha^{-1} (P_1)	50 kg ha^{-1} (P_2)	75 kg ha^{-1} (P_3)	100 kg ha^{-1} (P_4)	Mean	0 kg ha^{-1} (P_1)	50 kg ha^{-1} (P_2)	75 kg ha^{-1} (P_3)	100 kg ha^{-1} (P_4)	Mean	0 kg ha^{-1} (P_1)	50 kg ha^{-1} (P_2)	75 kg ha^{-1} (P_3)	100 kg ha^{-1} (P_4)	Mean
0 kg ha^{-1} (N_1)	71.53	74.53	76.67	85.73	77.12	147.79	154.97	156.78	167.26	156.70	109.46	114.78	116.12	123.88	116.06
100 kg ha^{-1} (N_2)	89.87	86.67	97.80	97.93	93.07	189.53	181.87	215.78	224.52	202.93	140.39	134.64	159.83	166.30	150.29
150 kg ha^{-1} (N_3)	91.93	95.73	107.20	109.47	101.08	195.50	194.55	236.60	251.06	219.43	144.80	144.11	175.25	185.96	162.53
200 kg ha^{-1} (N_4)	102.27	108.33	108.93	109.47	107.25	227.65	251.41	252.60	259.03	247.67	168.62	186.22	187.10	191.86	183.45
Mean	88.9	91.31	97.65	100.65		190.11	195.69	215.44	225.46		140.81	144.93	159.57	166.99	
	SE(m) ±		**CD at 5 %**			**SE(m) ±**		**CD at 5 %**			**SE(m) ±**		**CD at 5 %**		
N	0.638		1.841			3.481		10.04			2.579		7.442		
P	0.638		1.841			3.481		10.04			2.579		7.442		
N × P	1.276		3.682			6.962		20.08			5.159		14.88		

Acharya and Dashora (2004) in African marigold.

Interaction effect on growth and yield parameters

Interaction effect of nitrogen and phosphorus on plant height was found to be significant. The maximum plant height (122.73 cm) was recorded in treatment combination N_4P_4 (200 kg N ha^{-1} and 100 kg P_2O_5 ha^{-1}) as compared to all other treatment combinations. However, significantly minimum plant height (112.80 cm) was recorded control treatment (N_1P_1). Regarding interaction effect on number of branches, stem diameter and plant spread were found to be non significant.

The treatment combination N_4P_4 (200 kg N ha^{-1} and 100 kg P_20_5 ha^{-1}) was recorded maximum number of flowers $plant^{-1}$ (109.47) and flower yield $plant^{-1}$ (259.03 g) and ha^{-1} (191.86 q). Whereas, minimum number of flowers $plant^{-1}$ (71.53) and flower yield $plant^{-1}$ (147.79 g) and ha^{-1} (114.78 q) were recorded in control (N_1P_1) treatment. Increase in more number of flowers $plant^{-1}$ and flower yield $plant^{-1}$ might be due to higher levels and balanced application of nitrogen and phosphorus, which would have increased the primary branches and gave more number of flowers and flower yield. The results were in close conformity with the finding of Belgaokar *et al*. (1996) in annual chrysanthemum.

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