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Growth and Flowering of Marigold as Influenced by Pinching and Spraying of Nitrogen

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A B S T R A C T

An experiment was conducted to study the effect of pinching and nitrogen on growth and flowering in marigold cv. Pusa Narangi Gainda at Horticultural nursery, Institute of Agricultural Science, Banaras Hindu University, Varanasi during Rabi season, December 2015 to May 2016. The experiment was planned out in Randomized Block Design with 12 treatments in three replications. The treatments include three levels of pinching *i.e.* no pinching, single pinching at 40 days after transplanting and double pinching at 40 and 60 days after transplanting with four levels of nitrogen *i.e.* 0%, 1%, 2% and 3%. Among the treatment, no pinching at 3% N recorded maximum plant height (84.14 cm), fresh weight of flower (4.86 g), dry weight of flower (1.01 g), flower diameter (5.12 cm), length of peduncle (5.38 cm) whereas, leaf area (181.14 cm^2) and fresh weight of leaf was found highest in no pinching at2% N (1.11 g). The number of secondary branches per plant (37.40) and flower yield per plant (193.52 g) was maximum in double pinching + 2% N. The number of leaves recorded maximum in double pinching + 1% N (221.07). Treatment with no pinching without N recorded earliest days to bud initiation (51.67 days) and maximum duration of flowering (81.33 days).

Introduction

Marigold is a leading loose flower crop of India which can be grown all over the world. It occupies special importance due to its hardiness, easy cultivation and wider adaptability to wide range of agro-climatic conditions. In India, the total area under marigold cultivation is 42.88 thousand hectares with production of 501.87 thousand tonnes (Anon., 2015). It is a very popular annual flower crop widely grown as garden plant, pots plant, bedding plant and herbaceous border for beautification and commercially used for making garlands, wreaths, religious offering, cut flowers and other purposes such as oil extraction and pigment extraction mainly xanthophyll. In most of the flower crops, the flowering and yield is mainly dependent on number of flower bearing branches which can be manipulated by checking vertical growth of plants and encouraging side shoot by means of pinching apical bud (Sasikumar *et al.*,., 2015). The main purpose of pinching is to encourage branching to produce a bushy growth and or the production of more flowers and flower yield. Nitrogen is well known for its influence on growth, flower production and quality of flower in marigold (Mahornar

et al., 2011). Spraying of nitrogen on marigold has been found beneficial. Present study was carried out with the objective growth and flowering of marigold as influenced by pinching and spraying of nitrogen.

Materials and Methods

The present investigation was carried out at the Horticultural nursery, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India during December 2015 to May 2016. Seeds of African marigold (*Tagetes erecta*) cv. Pusa Narangi Gainda were sown in the raised nursery bed during December. Healthy seedlings with uniform growth having 3-4 leaf were transplanted at spacing of 60cm×45cm in 2.4×1.8 m plots. After transplanting light irrigation was given in field. The experiment was planned out in Randomized Block Design with 12 treatment combinations replicated thrice. The treatments include three levels of pinching *i.e*. no pinching, single pinching at 40 days after transplanting and double pinching at 40 and 60 days after transplanting with four levels of nitrogen *i.e*. 0%, 1%, 2%, and 3%. Nitrogen was applied as foliar spray from urea a day after single pinching. The observations *viz*. number of secondary branches per plant, number of leaves per plant, plant height, fresh weight of leaf, leaf area, days to bud initiation, duration of flowering, flower diameter, length of peduncle, fresh weight of flower, dry weight of flower and flower yield per plant were recorded. The results obtained from the experiment were analyzed statistically.

Results and Discussion

Effect on growth characters

Data recorded on growth characters (Table 1) revealed that number of secondary branches per plant significantly maximum in case of double pinching + 2% N (37.40). The increase in number of secondary branches per plant is might be due to effect of removing apical portion of the plant and foliar spray of nitrogen. When the apical buds are pinched, the lowering in concentration of IAA encourages the lateral buds to grow and produces new shoots and branches which can be relate to the fact that decrease in IAA overcome apical dominance. Similar results were also reported by Meena *et al.,* (2015) and Shrivastava *et al.,* (2002) in marigold. The number of leaves per plant was maximum with double pinching at 1% N (221.07). This increase in number of leaves might be due to increase in secondary branching and positive effect of nitrogen fertilization.

The present finding agrees with the views of Singh *et al.,* (2015) in marigold and Gnyandev *et al.,* (2014) in China aster. The plant height was significantly maximum in no pinching at 3% N (84.13 cm) and minimum with double pinching at 2% N (62.07 cm). This could be credited to apical dominance and simultaneous positive effect of nitrogen spray that promotes robust longitudinal growth of plant. Similar results were reported by Parhi *et al.,* (2016), Sasikumar *et al.,* (2015), Rajyalakshmi and Rajashekhar (2014), Mahornar *et al.,* (2011) in marigold. The fresh weight of leaves was recorded maximum in no pinching + 2% N (1.11 g) and lowest in single pinching + 1% N (0.83 g). This is might be due to the fact that the photosynthate and protein translocated to the growing branches and leaves of single and double pinched plant overweight the photosynthetic energy consumed by general growth in height of plant in case of no pinching which result in more net gain of dry matter in leaves of no pinching as the carbon partitioning and energy distribution is less compare to pinched plants. Thus fresh weight gain in leaves of no pinching was assumed to be significant.

Table.1 Effect of pinching and nitrogen on growth in marigold cv. Pusa Narangi Gainda

Treatment	No. of secondary branches/plant	No. of leaves/plant	Plant height (cm)	Fresh weight of leaf (g)	Leaf area (cm^2)
No pinching	27.47	192.91	81.47	1.06	174.14
Single pinching	29.53	204.95	72.33	0.93	162.59
Double pinching	35.38	201.00	67.67	0.98	150.09
CD at 5%	2.47	16.46	5.85	0.05	3.74
Nitrogen 0%	29.13	196.84	73.11	1.00	155.01
Nitrogen 1%	30.44	212.58	77.02	0.96	159.47
Nitrogen 2%	32.02	194.71	71.82	0.98	166.92
Nitrogen 3%	31.71	194.36	73.69	1.02	167.69
CD at 5%	2.85	19.01	6.76	0.06	4.31
Interaction(P×N)					
No pinching×0%N	26.20	183.87	80.80	1.01	164.63
No pinching×1%N	25.93	202.87	83.07	1.04	174.98
No pinching×2%N	28.40	187.20	78.93	1.11	181.14
No pinching×3%N	29.33	197.73	84.13	1.07	175.80
Single pinching×0%N	28.00	212.13	71.13	1.04	160.87
Single pinching×1%N	28.73	213.80	76.53	0.83	161.50
Single pinching×2%N	30.27	205.80	74.47	0.89	161.92
Single pinching×3%N	31.13	188.07	67.20	0.96	166.06
Double pinching×0%N	33.20	194.53	67.40	0.94	139.53
Double pinching×1%N	36.67	221.07	71.47	1.02	141.92
Double pinching×2%N	37.40	191.13	62.07	0.95	157.69
Double pinching×3%N	34.67	197.27	69.73	1.02	161.22
CD at 5%	4.94	32.93	11.71	0.11	7.47

Table.2 Effect of pinching and nitrogen on flowering in marigold cv. Pusa Narangi Gainda

Treatment	Days to bud initiation	Duration of flowering (days)	Flower diameter (cm)	Length of peduncle (cm)	Fresh weight of flower (g)	dry weight of flower (g)	Flower yield /plant (g)
No pinching	54.50	77.25	4.77	5.07	4.43	0.86	155.30
Single pinching	67.67	65.33	4.74	4.94	4.21	0.80	164.43
Double pinching	74.33	56.08	4.42	4.78	4.13	0.77	181.81
CD at 5%	0.60	0.61	0.07	0.16	0.11	0.04	9.98
Nitrogen 0%	62.56	70.00	4.50	4.89	4.29	0.81	158.79
Nitrogen 1%	65.00	67.11	4.58	4.92	4.37	0.86	168.17
Nitrogen 2%	66.11	64.89	4.66	5.05	4.04	0.74	171.46
Nitrogen 3%	68.33	62.89	4.85	4.97	4.34	0.83	170.30
CD at 5%	0.70	0.71	0.09	0.19	0.13	0.04	11.53
Interaction(P×N)							
No pinching×0%N	51.67	81.33	4.48	4.99	4.35	0.83	140.58

No pinching×1%N	54.00	78.33	4.68	5.06	4.53	0.89	155.11
No pinching×2%N	54.67	75.67	4.80	5.20	3.98	0.73	148.15
No pinching×3%N	57.67	73.67	5.12	5.38	4.86	1.01	177.38
Single pinching×0%N	65.00	69.33	4.74	4.88	4.38	0.83	161.64
Single pinching×1%N	67.33	66.67	4.76	4.97	4.18	0.82	164.12
Single pinching×2%N	68.67	64.00	4.71	5.13	4.25	0.81	172.72
Single pinching×3%N	69.67	61.33	4.76	4.77	4.04	0.74	159.25
Double pinching×0%N	71.00	59.33	4.26	4.81	4.12	0.78	174.14
Double pinching×1%N	73.67	56.33	4.30	4.72	4.41	0.88	185.28
Double pinching×2%N	75.00	55.00	4.47	4.82	3.89	0.67	193.52
Double pinching×3%N	77.67	53.67	4.67	4.75	4.11	0.75	174.29
CD at 5%	1.21	1.23	0.15	0.33	0.23	0.08	19.97

The treatment with no pinching at 2% N (181.14 cm^2) was recorded maximum leaf area. Yielding of less number of leaves in no pinching comparing to pinched treatment benefit greater availability of energy which helps in progression and increase in leaf area. Whereas, in case of pinched treatment the energy demand for leaves growth also increase with increase in their number which counter effect the advancement of leaf area.

Effect on flowering characters

Data recorded on flowering characters (Table 2) indicated that earliest bud initiation (51.67 days) and maximum duration of flowering (81.33 days) were obtained from treatment no pinching without N whereas, double pinching at 3% N takes maximum days to bud initiation (77.67 days) and shortest duration of flowering (53.67 days). This is might be due to the fact that pinching of apical bud suppresses the bud initiation process by inhibiting cell division in the lateral meristem resulting in prevention of flower primordial development in the meantime and also supplement of N promotes vegetative growth of the plant, which would have ultimately resulted in delayed initiation of bud and shortest duration of flowering. Similar results were reported by Parhi *et al.,* (2016), Sehrawat *et al.,* (2003), Chauhan *et al.,*(2005), in marigold and Dalal *et al.,* (2006), Kumar *et al.,* (2002) in carnation. Diameter of flower (5.12 cm), length of peduncle (5.38 cm), fresh weight of flower (4.86 g) and dry weight of flower (1.01 g) were found maximum in no pinching at 3% N. The reason of increased diameter of the flowers, length of peduncle, fresh and dry weight of flower with no pinching may be due to availability of more food material and better allocation of energy pertaining to lesser number of flowers. Similar finding were revealed by Sasikumar *et al.,* (2015), Rathore *et al.,* (2011) in marigold, Sailaja *et al.,* (2013), Khobragade *et al.,* (2012) in China aster. The flower yield per plant was recorded maximum in double pinching at 2% N (193.52 g). Double pinching with nitrogen application supplements the greater growth and number of flowers. This increase in flower yield per plant under pinching treatment might be due to gain of extra energy in the production of more number of flowers per plant and ultimately surge in flower yield. The present finding is in agreement with the observation made by Chauhan *et al.,* (2016), Prakash *et al.,* (2016), Singh *et al.,* (2015) in marigold, and Dalal *et al.,* (2006) in carnation.

References

Anonymous. 2015. Indian Horticulture Data Base, National Horticulture Board, Gurgaon, pp.

165-167.

Chauhan, S., C.N. Singh and Singh, A.K. 2005. Effect of vermicompost and pinching on growth and flowering in marigold cv. Pusa Narangi Gainda. *Progressive Horticulture*, 37(2): 419-422.

Chauhan, S., V.K. Rao., A. Kumar and Ghosh S. 2016. Response of pinching on African marigold cv. Pusa Basanti Gainda under hill condition of Uttarakhand. *J. Hill Agri.,* 7(1): 46-51.

Dalal, S.R., D.R. Nandre, S.G. Bharad, S. Utgikar and Shinde R.D. 2006. Effect of pinching on carnation cv. Yellow Solar under polyhouse condition. *Int. J. Agri. Sci.,* 2(2): 356-357.

Gnyandev, B., M.B. Kurdikeri, A.A. Patiland and Channappagoudar, B.B. 2014. Influence of pinching, nitrogen level and growth retardants spray on seed yield and quality of China aster cv. Phule Ganesh. *Int. J. Trop. Agri.*, 32(3-4): 377-380.

Khobragade, R.K., S. Bisen and Thakur, R.S. 2012. Effect of planting distance and pinching on growth, flowering and yield of China aster cv. Poornima. *Indian J. Agri. Sci.,* 82(4): 334-339.

Kumar, R.K. Singh and Reddy, B.S. 2002. Effect of planting time, photoperiod. GA_3 and pinching in carnation. *J. Ornamental Horticulture*, 5(2): 20-23.

Maharnor, S.I., N. Chopde, S. Thakre and Raut, P.D. 2011. Effect of nitrogen and pinching on growth and yield of African marigold. *Asian J. Horticulture*, 6(1): 43-45.

Meena, Y., H.S. Sirohi, S. B. Tomar and Kumar, S. 2015. Effect of planting time, spacing and pinching on growth and seed yield of African marigold cv. Pusa Narangi Gainda. *Indian J Agri. Sci.,* 85(6): 797-801.

Parhi, R., A. Mohanti and Harichandan S. 2016. Performance of various characters in African marigold due to different in pinching levels and planting dates. *Annals of Agri-Bio Res.*, 21(1): 44-48.

Prakash, S., P. Anitha., M.P. Giridharan, A. Rajgopalan and Rao, S.V.G. 2016. Impact of seasons and pinching on growth and flowering in African marigold. *J. Trop. Agri.*, 54(1): 50-54.

Rajyalaksmi, R., and Rajshekhar, M. 2014. Effect of different growth regulators and pinching on growth and flowering of African marigold cv. Pusa Narangi Gainda in different planting dates. *The J. Res. Angrau*, 42(1): 52-54.

Rathore, I., A. Mishra, S. K. Moond and Bhatnagar, P. 2011. Studies on effect of pinching and plant bio regulators on growth and flowering of marigold (*Tagetes erecta* L.). *Progressive Horticulture*, 43(1): 52-55.

Sailaja, S.M., D. M. Panchbhai and Sunitha K. 2013. Response of China aster varieties to pinching for growth, yield and quality. *Hort. Flora Res. Spectrum*, 2(4): 366-368.

Sasikumar, K., V. Baskaran and Abirami, K. 2015. Effect of pinching and growth retardants on growth and flowering in African marigold cv. Pusa Narangi Gainda. *J. Horticultural Sci.,* 10(1): 109-111.

Sehrawat, S.K., D.S. Dahiya, S. Singh, and Rana, G.S. 2003. Effect of nitrogen and pinching on growth, flowering and yield of marigold (*Tagetes erecta* L.) cv. African Giant Double Orange. *Haryana J. Horticultural Sci.*, 32: 59-60.

Singh, A.K., S.V. Singh, A. Sisodia and Hembrum, R. 2015. Effect of pinching and nitrogen on growth flowering and seed yield of African marigold cv. Pusa Narangi Gainda. *Environ. Ecol.*, 33(4B): 1876-1879.

Srivastava, S.K., H.K. Singh and Srivastava, A.K. 2002. Effect of spacing and pinching on growth and flowering of Pusa Narangi gainda marigold (*Tageteserecta* L.). *Indian J. Agri. Sci.*, 72(10): 611-612.

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