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Original Research Article

Impact of Nitrogen and Potassium on Quality Parameters of African Marigold

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Keywords

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A B S T R A C T

An experiment was conducted to study the Impact of different nitrogen and potassium levels on flower quality of African marigold at Horticulture Section, College of Agriculture, Nagpur during kharif- 2018. The experiment was laid out in Factorial Randomized Block Design with sixteen treatment combinations consisting four levels of nitrogen viz., 0, 80, 100 and 120 kg ha^{-1} and potassium four levels viz., 0, 20, 25 and 30 kg ha^{-1} with three replications. The study on quality aspect revealed that days to opening of first flower from flower bud initiation, fresh weight and dry weight of flower, flower diameter, shelf life, longevity of flower and protein content in leaf were found maximum at highest level of nitrogen 120 kg ha^{-1} and potassium 30 kg ha^{-1}. The Interaction effect of nitrogen and potassium levels was found significant results in all parameters except days to opening of first flower from flower bud initiation

Introduction

Floriculture is most developing branch of world in agribusiness with a much higher potential for returns. Total area under floriculture in India is 912 thousand ha with production of 32.06 lakh MT and 3.52 MT productivity. Among various flowers grown in India, marigold has a unique status. Marigold being a large consumer of macronutrients hence it requires optimal fertilizer management. Nitrogen and potassium are needed by plants throughout their life cycle. Nitrogen is part of amino acids that is needed for protein synthesis in plants. Whereas, potassium is responsible for improving quality of flowers (Shinde *et al*., 2014). Suitable combination of both nitrogen and potassium had promising effect on flower production (Solanki and Ganie, 2010) and application in splits resulted satisfactory performance in quality of flowers (Ravichandran and Sriramachandrasekharan, 2011). As marigold is hardy in nature and adaptable to varying climatic conditions and soil types, a research work was carried out to study the "Impact of nitrogen and potassium on quality parameters of African marigold".

Materials and Methods

The present investigation was carried out at Horticulture Section, College of Agriculture, Nagpur, (M.S.), during 2018-19. The experimental plot brought to fine tilth by ploughing, and harrowing. At the time of land preparation, well-rotted FYM @ 10 t ha^{-1} was mixed uniformly in the soil before last harrowing.

Table.1 Flowering parameters as influenced by nitrogen and potassium levels.

Factor-A. Nitrogen (N)	Days to first flower opening	Weight of fresh flower	Weight of dry flower	Flower diameter	Longevity of flower	Shelf life of flower	Protein content from leaf
N_1 – 0 kg ha^{-1}	12.89	4.81	1.19	4.56	10.93	2.66	9.51
N_2 – 80 kg ha^{-1}	11.21	5.46	1.88	5.69	12.49	2.97	11.47
N_3 – 100 kg ha^{-1}	10.82	6.55	2.43	5.94	13.85	3.64	13.53
N_4 –120 kg ha^{-1}	9.65	7.82	2.75	6.77	13.95	4.10	16.90
F test	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**
SE (m) ±	0.35	0.15	0.06	0.13	0.31	0.15	0.31
CD at 5%	1.02	0.43	0.18	0.40	0.91	0.43	0.90
Factor-B. Potassium (K)							
K_1 – 0 kg ha^{-1}	12.13	5.64	1.84	5.46	11.90	2.97	11.36
K_2 – 20 kg ha^{-1}	11.08	6.04	2.07	5.64	12.79	3.25	12.45
K_3 – 25 kg ha^{-1}	10.69	6.28	2.13	5.85	12.89	3.54	13.38
K_4 – 30 kg ha^{-1}	10.67	6.66	2.20	6.01	13.64	3.61	14.23
F test	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**
SE (m) ±	0.35	0.15	0.06	0.13	0.31	0.15	0.31
CD at 5%	1.02	0.43	0.18	0.40	0.91	0.43	0.90
Interaction -(AxB) (N x K)							
N_1K_1	-	4.54	0.93	4.11	10.26	2.39	8.36
N_1K_2	-	4.38	1.16	4.70	10.51	2.65	9.24
N_1K_3	-	5.45	1.31	4.42	11.13	2.51	9.95

N_1K_4	-	4.87	1.37	5.03	11.81	3.11	10.48
N_2K_1	-	5.39	1.72	5.16	12.07	2.70	10.97
N_2K_2	-	5.42	1.95	5.39	12.86	2.72	10.81
N_2K_3	-	5.08	1.80	6.09	12.31	3.14	11.68
N_2K_4	-	5.95	2.06	6.11	12.74	3.32	12.43
N_3K_1	-	5.60	2.05	6.39	14.28	2.55	11.04
N_3K_2	-	6.35	2.77	5.95	13.06	4.17	13.27
N_3K_3	-	6.61	2.58	5.78	13.50	4.20	14.61
N_3K_4	-	7.63	2.31	5.63	14.56	3.65	16.19
N_4K_1	-	7.05	2.64	6.19	10.99	4.25	16.07
N_4K_2	-	8.04	2.42	6.50	14.75	3.48	16.43
N_4K_3	-	8.00	2.86	7.12	14.61	4.32	17.29
N_4K_4	-	8.18	3.07	7.26	15.47	4.36	17.81
F test	**NS**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**
SE (m) ±	0.70	0.30	0.12	0.26	0.63	0.30	0.76
CD at 5%	-	0.87	0.36	0.80	1.83	0.86	2.21

The field was then laid out with raised beds of the dimension 2.70 m x 3.15 m size and seedling having uniform size were transplanted at spacing of 45 x 30 cm. The soil of the experimental plot was medium black with good drainage. The soil was analyzed for nutritional status. After analysis, the nutritional status was nitrogen 280 kg ha^{-1}, phosphorus 16.20 kg ha^{-1} and potassium 294.73 kg ha^{-1} available in soil. Considering the dose of marigold i.e. 100:50:25 NPK Kg ha^{-1}, the four levels of nitrogen (0, 80,100,120 kg ha^{-1}) and four levels of potassium (0, 20, 25, 30 kg ha^{-1}) were decided for experimentation with sixteen treatment combinations and as a statistical tool Factorial Randomized Block Design was applied (Panse and Sukhatme, 1967). The fertilizers, urea, single super phosphate and muriate of potash were taken as the sources of N, P_2O_5 and K_2O respectively. The nitrogen was equally applied in four splits at 20 days interval while potassium was applied in a two splits, half as a basal dose and remaining half at the time of flowering. Phosphorus in the form of single super phosphate was applied as per the recommendation as a basal dose.

Results and Discussions

The data presented in table 1 revealed that different nitrogen and potassium levels had significant effect on all quality parameters. Similarly, interaction effect on all these parameters was also found significant except days required for opening of first flower from bud initiation.

Application of nitrogen 120 kg ha^{-1} recorded significantly minimum days to first flower opening from bud initiation (9.65) followed by Nitrogen 100 kg ha^{-1} whereas, maximum days (12.89) were recorded in the control. This might be due to adequate availability of nitrogen resulting in more protein and carbohydrate synthesis resulting in early floral primordial development. These results obtained are in close conformity with the findings of Satar *et al.*, (2012) in annual chrysanthemum.

Similarly, an application of Potassium 30 kg ha^{-1} was observed significantly minimum days for first flower opening from bud initiation (10.67). Whereas, maximum days (12.13) were recorded in control treatment. This might be due to adequate amount of potassium availability and its positive influence on flower opening. The results are in close conformity with the findings of Jamil *et.al*. (2016) in hippeastrum.

However, the interaction effect of nitrogen and potassium level in terms of days required for first flower opening was found non-significant.

Significantly, weight of fresh flower (7.82 g), weight of dry flower (2.75 g), flower diameter (6.77cm), longevity of flower (13.95 days), shelf life of flower (4.10 days) and protein content in leaf (16.90 %) was noticed maximum in nitrogen 120 kg ha^{-1} and followed by nitrogen 100 kg ha^{-1}. Whereas, weight of fresh flower (4.81 g), weight dry flower (1.19 g), flower diameter (4.56 cm), longevity of flower (10.93 days), shelf life of flower (2.66 days) and protein content in leaf (9.51 %) were recorded minimum in the control treatment. Similar results were obtained by Lasztity *et al.*, (1992) in winter cereals, Rolaniya *et al.*, (2017), Hassanain *et al*., (2018) and Palekar *et al.*, (2018) in African marigold.

An application of potassium 30 kg ha^{-1} recorded significantly maximum weight of fresh flower (6.66 g), weight of dry flower (2.20 g), flower diameter 6.01 cm), longevity of flower (13.64 days), shelf life of flower (3.61 days) and protein content in

leaf (14.23 %) and found at par with potassium 25 kg ha^{-1}. While, minimum was recorded in the control treatment. Application of potassium in split doses enhances the potassium uptake, meeting the crop requirement which may increase the flower quality. The results obtained were in close conformity with the findings of Ahmad *et al.,* (2011), Ayemi *et al.,* (2017) in gerbera and Rolaniya *et al.,* (2017) in African marigold.

The interaction effect of nitrogen and potassium levels for all quality parameters were found significant.

The treatment combination of Nitrogen 120 Kg ha^{-1} and Potassium 30 kg ha^{-1} recorded significant results in quality parameters viz. weight of fresh flower (8.18 g), weight of dry flower (3.07 g), flower diameter (7.26 cm), longevity of flower (15.47 days), shelf life of flower (4.36 days) and protein content in leaf (17.81 %). However, treatment combinations Nitrogen o kg ha^{-1} and Potassium 0 kg ha^{-1} recorded minimum results in all quality parameters. The nitrogen and potassium both when applied at higher level in splits increased photosynthesis rate and translocation of photo-assimilates to different parts of plant may have resulted in obtaining good quality flowers. Similar results were found by Lasztity *et al.,* (1992) in winter cereals, Ahmad *et al.,* (2011) and Kishore *et al.,* (2016) in African marigold, Ayemi *et al.,* (2017) in gerbera.

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