Influence of different organic manures and inorganic fertilizers on growth attributes and flower yield of marigold (*Tagetes erecta* L.) under foot hills of Himalaya

ABSTRACT

The experiment was conducted at farmer's field, Deoria, Uttar Pradesh during 2021-22 and 2022-23.The experiment consisted of 11 treatments which were replicated thrice in Randomized complete blocks design (RCBD).The result showed significant effect on plant height (66.40 cm), girth of stem (1.43 cm), number of branches plant^{-1}(17.10),plant spread along the row(38.30 cm),plant spread across the row(38.32 cm),days to start flowering(68.10 days),flowering duration(24.40 days), number of flower plant^{-1}(23.50), circumferences of flower (24.20 cm),fresh weight of flower(12.25 g) and fresh yield plant^{-1}(264.08 g) was observed in T_{10} i.e.2.5 tonne poultry manure ha^{-1} with 50% Recommended Dose of Fertilizers(RDF) followed by T_4,T_7 and T_3.

Key Words: *Marigold, Poultry Manure, Inorganic Fertilizers and Vermicompost*

INTRODUCTION

In India,the African marigold is one of the most of the commonly flowers and used extensively on religious and social functions in different forms. It was introduced in India during the 16th century and since then it has been naturalized in different agro-climatic regions of India in such a way that it now appears to be native of the country. It has gained popularity amongst gardeners and flower dealers on account of its easy culture and wide acceptability. Further its habit of profuse flowering short duration to produce marketable flowers,wide spectrum of attractive colours,shape and size and good keeping quality.

Flowers are sold in the market as loose or as garlands. Due to its variable height and colour, marigold is used for decoration. There are 33 species of marigold. Botanical name of African marigold is *Tagetes erecta* L. and belongs to theAsteraceae family. Theorigin place of marigold is Mexico.The main features of African marigold are hardy, tall (90-100 cm), erect and branched. (Arora, 2010)Marigold are also grown commercially for extraction of carotene pigments mainly xanthophyll. The carotenoid extracted from petals are added to poultry feed for intensification ofthe yellow colour of egg yolk. (Singh and Sisodia, 2017**)**).Farm Yard Manure (FYM) holds significant importance as a widely utilized organic manures in India. FYM is an abundant source of essential nutrients and beneficial microorganism.Vermicompost is another organic manure that is nutrient rich organic manures. Vermicompost enriches the soil by providing essential nutrients. Vermicompost improves soil structure, promoting better aeration and water holding capacity.Poultry manure is a rich source of slow release source of macro and micronutrients and acts as a soil amendment.In recent time, however, more attention has beenbeing given to the use of organic manure. Information obtained in this experiment will be useful in marigold production. Keeping this in view, an experiment was conducted to evaluate the performance of different organic manures and inorganic fertilizers on growth attributes and flower yield under foot hills of Himalaya.

MATERIALS AND METHODS

This study was conducted with Pusa Narangi Gainda variety of African marigold during 2021-22 and 2022-23 at farmer's field, Deoria, Uttar Pradesh. Deoria is located in tarai region of northern Uttar Pradesh. The experiment field was sandy loam in texture with 7.6 pH, medium organic carbon(0.40%),phosphorous (16 kg ha^{-1}), potassium (164 kg ha^{-1}) and available nitrogen (215 kg ha^{-1}).The choosen variety was Pusa Narangi Gainda. This variety was procured from Indian Institute of Agricultural Research, Pusa, New Delhi.The experiment was laid out in Randomized complete blocks Design(RCBD) with three replications and 11 treatments.The treatments under investigation wereT_1-Control,T_2-50% Recommended Dose of Fertilizers(RDF),T_3-100% Recommended Dose of Fertilizers(RDF),T_4-2.5 tonne ha^{-1} Vermicompost+T_2,T_5-5.0 tonne ha^{-1} Vermicompost, T_6-7.5 tonne ha^{-1} Vermicompost,T_7-20 tonne ha^{-1} FYM(FarmYard Manure)+T_2,T_8 -25 tonne ha^{-1} FYM(Farm Yard Manure),T_9 -30 tonne ha^{-1}FYM (FarmYard Manure),T_{10}-2.5 tonne ha^{-1} Poultry Manure,+ T2(50 % Recommended Dose of Fertilizer), T_{11}-5.0 tonne ha^{-1}Poultry Manure.

The seeds were sown in the last week of October,2021 and 2022.The width of thenursery bed was 100 cm and 150 cm in length. The bed was thoroughly prepared and enriched with well- decomposed FYM.The seeds were sown in lines at a depth of 1 cm. After sowing, the seeds were covered with paddy straw. At the3-4 leaf stage, the seedlings were transplanted in thefield(30 days).Data were recorded on growth, flowering and yield attributes. A recommended dose of nitrogen (80 kg ha^{-1}), phosphorous (80 kg ha^{-1}) and potassium (200 kg ha^{-1}) was applied in the form of Urea, Single Super Phosphate(SSP) and Muriate of Potash, respectively. All results were subjected to statistical analysis.

RESULT AND DISCUSSION

Growth Attributes

It is evident from the data given in Table 1 that organic manures and inorganic fertilizers had a significant promotive influence on growth and flower attributes. Plant height (66.40 cm), girth of stem (1.43 cm), number of braches $plant^{-1}$(17.10),plant spread along the row(38.30 cm),plant spread cross the row(38.32 cm),days to start flowering(68.10 days),flowering duration(24.40 days), number of flower $plant^{-1}$(23.50),circumferences of flower(24.20) was recorded significantly highest in treatment T_{10} i.e. 2.5 tonne ha^{-1}Poultry Manure +T_2 i.e.50 % RDF followed by T_4 i.e.2.5 tonne ha^{-1} Vermicompost +T_2 i.e.50 % RDF,T_7 i.e.20 tonne ha^{-1} FYM +T_2 i.e.50 % RDF,T_3-i.e. RDF whereas treatment T_1(Control) showed minimum plant height(56.60 cm),girth of stem(1.23 cm),no. of branches $plant^{-1}$(13.10),plant spread along the row(33.50 cm),plant spread across the row(33.10 cm),days to start flowering(75.08),flowering duration(18.40 days),no. of flower $plant^{-1}$(17.60), circumferences of flower(19.14 cm).

It has been reported that among the organic sources of nutrients, poultry manure prove to be the best source of organic manure which helped in improving the physic-chemical properties(pH,organic carbon,macro andmicro nutrients) of soil because of its higher analytical values(Jeyabasakaran,*et.al*,2001). It has also been experimentally proved that considerably amount of N present in poultry manure consist of uric acid, which is readily available to the plants. The C: N ratio of poultry manure reported to be narrower than others, which attenuates the release of nitrogen.(Chadwick, 2000). These results are in agreement with the observation obtained by Ajit Kumar (2002) in marigold, Munikrishnappa *et.al.*

(2004) in tuberose, Shadanpour *et.al.* (2011) in marigold, Pooja *et.al.* (2012), Karupppaiah (2005) in marigold, Rao and Reddy (2006) in marigold, Kumar and Prasad (2023) in marigold.

Yield Attributes:

The data recorded on thefresh weight of flower and flower yield plant $^{-1}$ have been epitomized in Table 2.It is obvious that application of poultry manure with 50 % RDF showed maximum fresh weight of flower and flower yield plant^{-1} under T_{10} i.e. 12.25 g and 264.08 g, respectively followed by T_4,T_7 and T_3.The lowest data are recorded under control(T_1).Poultry manure when applied to soil improves texture makes soil loose increase water holding capacity and uplift humus status which maintain the optimum conditions for microorganism activity (Razzaq*et al,* 2014). These findings are in accordance with the results of Pooja and Kumari(2012) in marigold, Rajanna (2001) in marigold, Bhatt *et.al.*(2010) in marigold and Mukesh *et.al.*(2007) in marigold.

CONCLUSION

Plant height,girth of stem, number of branches plant^{-1},plant spread along the row, plant spread across the road, days to start flowering, flowering duration, number of flower plant^{-1},circumferences of flower, fresh weight of flower , and flower yield plant^{-1} was boosted under T_{10} i.e. Poultry Manure +50 % RDF during investigation.

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REFERENCES

Ajit Kumar (2002).Effect of organic and inorganic fertilizers on growth, yield and post-harvest life of marigold, M.Sc. Agri.) Thesis, University of Agricultural Science, Bangalore

Arora, J.S. (2010) Introductory Ornamental Horticulture, Kalyani Publishers, pp.83-89

Chadwick, D.R., John, F., Pain, B.F. Chambers, B.J. and Williams, J. (2000) Plant uptake of nitrogen from the organic nitrogen fraction of animal manures, laboratory experiment. J. Agric. Sci., 154:159-168

Jeyabasakaran, K.J., Pandey, S.D. Mustaff, M.M. and Sathiamoorthy, S. (2001). Effect of different organic manures with graded levels of inorganic fertilizers on ratoon of poovan banana. South Indian Hort., 49: 105-109

Karuppaiah, P. (2005) The effect of Azospirillum, phosphobacteria and organic manures on growth and yield of French marigold (*Tagetes patula* L.) *Plant Archives*, 5:2,661-664

Kumar, Mukesh and Prasad, Bindhya (2023) Impact of different organic and inorganic sources of nutrients on vegetative growth of marigold (*Tagetes erecta* L.) under agro-climatic conditions of Ajmer zone. *International Journal of Advanced Biochemistry Research*, SP-791): 01-04

Munikrishnappa, P.M., Katimani, K.N. and Ravi Kumar, M. (2004) Effect of vermicompost on growth and yield of tuberose (*Pollianthus tuberosa*) under semiarid tropics of north Karnataka. National Symposium on Recent Trends and Future Strategies in Ornamental Horticulture, University of Agricultural Sciences, Dharwad, pp.61

Pooja, G.S. and Kumari D.S.N. (2012) Response of African marigold (*Tagetes erecta* L.) to integtated nutrient management. *Annals of Biology*, 28:1, 66-67

Rajanna, P.H. (2001). Effect of spacing and levels of nitrogen and phosphorous on growth, flower and yield of China aster (*Callistephus chinensis Nees*.) c.v. Kamini, M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad

Rao, C.C. and Reddy, K.M. (2006). The effect of integrated nutrient management on yield and quality of African marigold (*Tagetes erecta* L.).*Research on Crops*, 7:1,288-293

Razzaq, O.I., Prasad, V.M. and Saravanan (2014) Effect of organic manures on flower yield of African marigold (*Tagetes erecta* L.) CV Pusa Narangi Gainda

Shadanpour, F., Torkashvand, AM and Majd, K.H. (2011).The effect of cow manure vermicompost as the planting medium on the growth of marigold. *Annals of Biological Research*, 2:6, 109-115

Singh, A.K. and Sisodia, A. (2017) Text Book of Floriculture and Landscaping, New Delhi Publishing Agency, pp. 380-388

Table-1: Growth Attributes of African marigold (*Tagetes erecta* L.) as Influenced by different organic manures and inorganic fertilizers (Pooled Data)

Treatments	Plant Height (cm)	Girth of Stem	No.of branches per plant	Plant spread (cm) along the row	Plant spread (cm) across the row	Days to start flowering(Days)	Flowering Duration(Days)	No of flower per plant	Circumferences of flower(cm)
T_1	56.60	1.23	13.10	33.50	33.10	75.08	18.40	17.60	19.14
T_2	57.00	1.25	14.20	33.80	33.85	74.20	18.90	18.08	20.08
T_3	62.02	1.40	16.14	37.10	36.00	70.15	22.70	22.10	23.17
T_4	65.10	1.42	16.80	37.40	37.30	69.40	23.12	23.70	24.10
T_5	58.58	1.30	14.50	34.25	34.35	74.70	19.10	18.35	21.30
T_6	58.15	1.32	14.70	34.72	34.30	74.85	20.40	19.75	21.20
T_7	64.08	1.41	16.60	37.20	37.23	70.25	22.80	23.10	23.80
T_8	59.10	1.34	14.02	35.08	35.20	74.20	20.20	20.18	22.30
T_9	59.06	1.33	14.30	35.15	35.40	73.16	21.30	20.40	22.08
T_{10}	66.40	1.43	17.10	38.30	38.32	68.10	24.40	23.50	24.20
T_{11}	59.17	1.36	15.o8	35.90	35.60	73.05	21.05	19.05	22.50
S.Em±	1.90	0.0	0.84	0.67	0.81	3.14	0.64	0.7	0.81

		14						0	
CD (P= 0.05)	5.8	0.045	1.60	1.99	2.30	6.02	1.90	2.06	2.36A

Table-2: Flower yield of African marigold (*Tagetes erecta* L.) as Influenced by different organic manures and inorganic fertilizers Two Year (Pooled Data)

Treatments	Fresh Weight of Flowering(g)	Flower Yield Plant^{-1}(g)
T_1	9.40	166.10
T_2	10.27	168.25
T_3	10.90	225.10
T_4	11.10	225.30
T_5	10.15	169.22
T_6	11.30	170.10
T_7	10.80	224.03
T_8	11.15	180.35

T_9	11.27	181.37
T_{10}	12.25	264.08
T_{11}	10.60	185.55
S.Em+	0.53	14.15
C.D.(P=0.05)	1.56	42.10