



Effect of Vermicompost, Nitrogen and Phosphorus Growth and Flower Yield of African Marigold (*Tagetes erecta* L.)

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Abstract

The results of field study conducted at School of Agriculture and Environmental Sciences, Shobhit University, Gangoh, Saharanpur, U.P., India during 2016-2017 evaluated the Performance of marigold var. Pusa Basanti Gainda to various manures and fertilizers levels. The productivity and quality of flowers is greatly influenced by the quantity and source of nutrients. The experiment were laid out in a randomized block design with three replications and eight treatment combinations comprised of organic manure (Vermicompost) and NP fertilizers. Application of vermicompost, phosphorus and nitrogen conjointly at a recommended dose of 5000, 80 and 120 kg ha⁻¹ respectively, was most effective in enhancing the vegetative growth parameters, such as plant height, number of branches, plant spread, as well as flower yield parameters viz. number of flowers, flower circumference, plant height, fresh weight of flowers, flower yield, flowering duration, number of leave and branches per plant etc as compared to that of control samples. Thus, use of inorganic fertilizers in combination with organic manures resulted in excellent vegetative growth and flower yield attributes in African marigold.

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Introduction

African marigold (*Tagetes erecta* Linn.) native of central and south America and belong to the family compositeae, and one of the commercially exploited flower crop, has a versatile use in decoration, landscaping, industries and medicinal sector. It is suitable for potted plants, bedding, edging, garland making, religious offerings and also for making different products. It has important role in preparation of garlands, bouquets and for floral decoration at the time of marriages and other ceremonies. In India, marigold occupies an area of 55.89 thousand hectare with the production of 511.31 thousand MT and Rajasthan, occupies an area of 1079 hectare with the production of 1039 tonnes (Anonymous 2013-14). Besides having ornamental, medicinal, industrial uses, it has additional use in controlling the soil nematodes. All varieties of marigold are resistant to *Meloidogyne incognita* and can be used for control of *Meloidogyne incognita* in highly infected areas (Warden and Windrich, 1974). Phosphorus is also a major nutrient required by the crops. It is indispensable constituent of nucleic acid, phospholipids and several enzymes. The most essential function of phosphorus in a plant is energy storage and transfer for proper metabolism. A good supply of phosphorus is associated with increased root growth and early maturity of crop besides disease resistance in plants (Tisdale *et al.*, 1995). About 98 per cent soil of cultivated area in India need phosphorus fertilization for good harvest (Luthra *et al.*, 1983). Application of phosphorus not only increases the crop yield but also improves the quality. These products are helpful in minimizing the environmental hazards and increase of Soil fertility. Vermicompost is an excellent soil conditioning agent. Incorporation of vermicompost in soil improves the texture, structure, permeability and water holding Capacity of soil.

Materials and Methods

The field experiment conducted at School of Agriculture and Environmental Sciences in Shobhit University Gangoh Saharanpur U.P. in India during 2016-2017 to evaluate the performance of marigold var Pusa Basanti Gainda to Nitrogen, Phosphorus and Vermicompost on growth and flower yield. The experimental soil was sandy loamy having low available with neutral. The experiment laid out in randomized complete block design with three replications. Eight treatments consisted of vermicompost@5t/ha, nitrogen @120 kg/ha, and phosphorus 80 kg/ha were compared with control plot (lal singh *et al.*, 2015). Seeds were sown in the month of January February and transplanted in main field February march on each plot size was 1.2 m x 1.2 m with a spacing of 40x30 cm (Gaurav Sharma *et. al* 2016 and G. S. Saini *et. Al*). Observations were recorded on growth and yield characters with the help of meter scale and vernier callipers and top balance respectively. The different organic manure and fertilizer treatments tried were the field experiment conducted at School of Agriculture and Environmental Sciences in Shobhit University Gangoh Saharanpur (U.P) India; during 2017-2018 to find out the performance of marigold

T₁ No manure control

T₂ Vermicompost @ 5 t ha⁻¹

T₃ Nitrogen @ 120 kg ha⁻¹

T₄ Phosphorus 80 kg ha⁻¹

T₅ Vermicompost @ 5 t ha⁻¹ + Nitrogen @ 120 kg ha⁻¹

T₆ Vermicompost @ 5 t ha⁻¹ + Phosphorus @ 80 kg ha⁻¹



T₇ Nitrogen @ 120 kg ha⁻¹+ Phosphorus @ 80 kg ha⁻¹

T₈ Vermicompost @ 5 t ha⁻¹ + Phosphorus @ 80 kg ha⁻¹+ Nitrogen @ 120 kg ha⁻¹

Results and Discussion

Growth parameters

It is revealed from the data presented in table 1 that among the vermicompost, nitrogen and phosphorus the application of N₁₂₀ P₈₀ and vermicompost 5t/ha gave the maximum vegetative growth characters like plant height (65.86cm), and girth of stem (1.41cm), number (18.16) and length (57.86 cm) of branches per plant, and plant spread (36.83 cm). This might be due to nitrogen is an essential part of nucleic acid this plays vital role in promoting the plant growth. This confirms the finding of Mandloi *et al.* (2008) and Singh & Singh (2003). It is obvious that phosphorus is a constituent of chlorophyll and is involved in many physiological processes including cell division, development of meristematic tissue, photosynthesis, metabolism of carbohydrates, fats and proteins etc. similar results have also been reported by Prakash *et al.* (2002), Mohd. Rafi *et al.* (2002), Barman *et al.* (2003) and Acharya & Dashara (2004). Of the organic manures vermicompost significantly enhanced the growth of the plants as compared to other manure. Second maximum height of plant (65.15 cm) was recorded with the application of vermicompost and phosphorus followed by nitrogen and phosphorus (64.17 cm), vermicompost and nitrogen (64.78 cm), vermicompost (64.54 cm), phosphorus (63.21 cm), nitrogen (61.76 cm) respectively. Application of vermicompost increased microbial biomass, humic materials and other plant growth influencing substances such as plant growth hormone, produced by microorganism during vermicomposting and dehydronagnose activity in soil (Aracon *et al.*, 2005). These findings are in close conformity with Sharma and Agrawal (2004), and Lal Singh *et al.*, 2015.

Table 1. Growth parameters of marigold after 85 days transplanting.

Treatments	Plant/height (cm)	Girth of stem plant (cm)	Length of branch/plant	No. of branches/plant	No. of leave/plant	Plant spread (cm)
T ₁	54.35	1.22	47.23	12.86	131.11	27.64
T ₂	64.54	1.39	54.65	17.02	134.24	32.18
T ₃	61.76	1.32	52.13	15.43	133.45	30.58
T ₄	63.21	1.35	53.24	15.84	134.86	31.63
T ₅	64.78	1.36	54.89	17.35	148.13	32.94
T ₆	65.15	1.37	55.26	17.88	152.53	33.13
T ₇	64.97	1.38	56.75	16.98	149.05	34.90
T ₈	65.86	1.41	57.86	18.16	165.02	36.83

Flowering and Yield Attributes

Data presented in Table no.2, on flowering and yield attributes, show significant responses to different treatments of nitrogen, phosphorus and vermicompost. The maximum flower circumference (24.13 cm) was with the application of T₈ followed by control T₁ (16.98). The same trend was observed for the highest number of flowers/plant (24.36), and



minimum recorded by T₁ (16.98), fresh weight of flower (12.54 g), with the maximum by T₈ and minimum recorded by T₁ (9.12 g) also had the highest flower yield/plant (293.76 g) and flower yield/ha (245.61 q), and minimum yield recorded by T₁ (165.38 g, and 187.37 q/ha). The higher values recorded for flowering attributes and yield may be due to active and rapid multiplication of vermicompost, nitrogen and phosphorus especially, creating favourable conditions for nitrogen fixation and phosphorus at higher rates making it available to the plants leading to more uptakes of nutrients and water. This in turn increases photosynthesis and enhances food accumulation and also diversion of photosynthetic towards sinks resulting in better growth and subsequently higher number of flowers/plant and flower yield/ha. The present findings are support those of Gaurav Sharma *et al.*, (2016). and M. Harsha vardhan *et al.*, (2016). In marigold. The maximum duration of flowering (75.23 days). Hence, the treatment of vermicompost, nitrogen and phosphorus proved to be most profitable.

Table 2. Yield attributed of Marigold as influenced by various treatments.

Treatments	Days to start of flowering	No. of flower/ plant	Fresh weight of flower (gm)	Circumference of flower (cm)	Flower yield/plant (g)	Flower yield q/ha
T ₁	75.23	16.98	09.12	18.84	165.38	137.87
T ₂	68.12	23.05	11.38	23.42	263.24	218.92
T ₃	73.31	18.31	10.23	19.61	171.52	167.90
T ₄	72.86	19.76	10.54	19.78	172.86	169.34
T ₅	72.15	23.54	11.65	23.68	267.05	225.61
T ₆	71.85	23.89	11.90	23.78	268.51	227.31
T ₇	71.12	22.72	11.53	23.09	270.21	231.67
T ₈	70.45	24.36	12.54	24.13	293.76	245.61

Conclusion

On the basis of results obtained in present investigation, it may be concluded that application of Vermicompost @ 5 t ha⁻¹ + Phosphorus @ 80 kg ha⁻¹ + Nitrogen @ 120 kg ha⁻¹ enhanced the growth and flower yield in marigold. A comparison of various treatments taken for study revealed that application of treatments T₈ of Vermicompost + Phosphorus+ Nitrogen registered a significant higher growth and flower yield in marigold.

REFERENCES

1. Anonymous, "Statistical data National Horticulture Board, Ministry of Agriculture, Govt. of India (2013-14).
2. S.L. Tisdale, W.L. Nelson, J.D Beaton, and J.L. Halvin, "Soil fertility and fertilizer (Sed.)" *Prentice Hall of India Private Ltd.*, New Delhi, 1995.
3. K.L. Luthra, S.K. Saha, and P.K. Awaski, "Role of rock phosphate in present day Agriculture" *Indian Journal of Agriculture Chemistry*, 15: 13-27. 1983.
4. Lal Singh, P. K. S. Gurjar, A. K. Barholia, A. Haldar and A. Shrivastava, "Effect of organic manures and inorganic fertilizers on\ growth and flower yield of marigold (*tagetes erecta* l.) Var. Pusa narangi gainda" *Plant Archives* Vol. 15 No. 2, 2015 pp. 779-783 ISSN 0972-5210, 2015.



5. Gaurav Sharma, Naresh Prasad Sahu and Neeraj Shukla, "Effect of bio-organic and inorganic nutrient sources on growth and flower production of african marigold". *Horticulture*, 2017, 3, 11, doi:10.3390/horticulturae3010011.
6. G.S.Saini, Bijendra Singh. "Oleri culture and floriculture" *Aman Publishing house*, Meerut.
7. K. S. Mandloi, U. S. Bose and K. S. Deshmukh, "Effect of organic manures and inorganic fertilizers on growth and yield of onion" (*Allium cepa* L.). *Asian J. Horticulture*, 3(1): 238-240, 2008.
8. Anil K Singh, and Yeshpal Singh, "Leaf nutrient status, growth and flower yield in rose as influenced by organic and Inorganic sources". *Journal of Ornamental Horticulture*, 6(3): 229-233, 2003.
9. Atam Prakash, S. S. Sindhu and S. K. Sharma. "Effect of phosphorus an FYM on yield parameters of marigold in chloride dominate of saline soil" *Haryana J. Hort. Sci.*, 31(3 A 4) 207-210, 2002.
10. Mohd., Rafi, P. R. Narwadkar, T. Prabhu and A. K. Sajiadranath, "Effect of organic and Inorganic fertilizer on yield and quality of Tomato" *Journal Soils and Crops*, 12(2): 167-169, 2002.
11. D Barman, M. Datta, L. C. De and S. Banik, "Efficiency of phosphate solubilising and phytoharmons producing bacteria on the growth and yield tuberose in acid soil of Tripura" *Indian Journal of Horticulture*, 60(3) : 303-306,2003.
12. M. M Acharya, and L. K. Dashora, "Response of graded levels of nitrogen and phosphorus on vegetative growth and flowering in African Marigold" *Journal of Ornamental Horticulture*, 7(2) : 179 183,2004.
13. N. Q Arancon, S. Lee, C. A. Edwards, R. Atiyeh, A. J. Morgan, R. P. Blackshaw, K. R. Butt, J. Frederickson, J. E. Morgan, T. G. Pierce and J. M. Weeks, "Effects of humic acids derived from cattle, food and paper- waste vermicomposts on growth of green house plants" 7th International symposium on Earth work Ecology, cardiff. Wales, 1-6 September, 2002. *Pedobiologia*, 47(5-6): 741-744, 2003.
14. Anuraj Sharma and A. K. Agrawal, "Organic farming To days revolution". *Tomorrow's Prosperity Agrobios news letter*, 3(2): 16-18, 2004.
15. M. Harshavardhan, D. P. Kumar, A. M. Rajesh, H. A. Yathindra and Shivanand Hongal, "Growth and development of carnation [*dianthus caryophyllus* l.] As influenced by integrated nutrient management" *An International Quarterly Journal of life science* 11(4): 2691-2694, 2016.
16. W.W. Warden, and W.A. Windrich, "Studies on nematological problem in horticulture" *Agriculture Co-operation Project Indonesia*, 393-402, 1974.