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Nutrient Status and Yield of French marigold as Influenced by Application of Spent Mushroom Compost, Biofertilizer and MKP Foliar Application

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

An experiment was carried out in open field condition during the year 2018-19 to ascertain the effect of spent mushroom compost, biofertilizers and MKP foliar application on nutrient status, yield and profitability of French marigold. The experiment was laid out in Completely Randomized Block Design (CRBD) and comprised of twenty three treatments replicated thrice. The highest available soil nitrogen content (259.95 Kg/ha), available soil P (33.23 Kg/ha) and available soil potassium content (244.60 Kg/ha) was recorded with Control (100% RDF).Maximum total leaf nitrogen (1.367%), leaf phosphorus (0.433%) and leaf potassium content (1.88%) was recorded with treatment 75% RDF + spent mushroom compost + biofertilizers + 1% foliar spray of MKP (T_9) whereas, the lowest total leaf nitrogen content (1.103%), leaf phosphorus content (0.313%) and total leaf K (1.33 %) was recorded with no fertilizer application (Farmers practice)**.** Plants treated with 75% RDF + Biofertilizers + 1% foliar spray of MKP (T_8) recorded the highest benefit cost ratio (2.81:1) closely followed by benefit cost ratio of 2.54 in 100% RDF whereas lowest benefit cost ratio (0.36:1) was recorded in the treatment T_{17} comprising 25 % RDF + Spent mushroom compost (1 kg/m^2).Highest chlorophyll content (48.89%) was recorded with T_8.

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1. INTRODUCTION

One of Jammu's most well-known and lucrative loose flower crops is marigold. The Jammu region, often known as the "city of temples," experiences a high demand for marigold flowers throughout various festival occasions for use in garlands, offerings at temples, and other decorative uses. Because of this, Jammu alone cannot produce enough flowers to match the demand, necessitating the purchase of thousands of dollars' worth of flowers from neighbouring states. The research was done with the aim of optimising an appropriate Integrated Nutrient Management plan for economical and profitable flower production of French marigold under Jammu subtropics, keeping in mind the value of crop and the current demand for quality flowers. Farmers today utilise chemical fertilisers excessively, relying on test methods that lead to nutrient imbalances, poor soil health, and ineffective fertiliser use overall. Additionally, small-scale farmers lack access to chemical fertiliser because to the high cost, limited availability, and other associated socio-economic problems. As a result, the modern approach to nutrient management focuses on the ideas of sustainability and environmental friendliness. The need of the hour is for natural, affordable, and environmentally acceptable sources of nutritional components that not only meet the needs of the crop but also maintain the health of the soil.

2. MATERIALS AND METHODS

2.1 Location and Site

The experimental field of Division of Vegetable Science and Floriculture, SKUAST, Jammu is situated at 32^{o} 40'N latitude and 74^{o} 58' E longitude and has an elevation of 332 m above mean sea level. Agro climatically the location represents Zone V of Jammu and Kashmir and is characterized by subtropical climate. The place experiences hot dry summer, hot and humid rainy season and cold winter months, the maximum temperature goes up to $45^{\circ}C$ during summers (May to June) and the minimum temperature falls to $1^{\circ}C$ during winters.

2.2 Treatment Details

A completely randomized block design was used to evaluate the effect of twenty three different nutritional treatments on flower yield, media physico-chemical properties and foliar nutrient content of French marigold. Treatments comprised of

T_1 = Farmers practice (i.e. no fertilizer application);
T_2 = Control (Recommended dose fertilizer, RDF) (200 kg N, 100 kg P_2O_5 and 100 kg K_2O/ha).
T_3 = 75% RDF + Spent mushroom compost (1 kg/m^2);
T_4 = 75% RDF + Biofertilizers;
T_5 = 75% RDF + 1% foliar spray of MKP (00:52:34);
T_6 = 75% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers;
T_7 = 75% RDF + Spent mushroom compost (1 kg/m^2) + 1% foliar spray of MKP (00:52:34);
T_8 = 75% RDF + Biofertilizers + 1% foliar spray of MKP (00:52:34);
T_9 = 75% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers + 1% foliar spray of MKP (00:52:34);
T_{10}= 50% RDF + Spent mushroom compost (1 kg/m^2);
T_{11}= 50% RDF + Biofertilizers;
T_{12}= 50% RDF + 1% foliar spray of MKP (00:52:34);
T_{13}= 50% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers;
T_{14}= 50% RDF + Spent mushroom compost (1 kg/m^2) + 1% foliar spray of MKP (00:52:34); T_{15}= 50% RDF + Biofertilizers + 1% foliar spray of MKP (00:52:34);
T_{16}= 50% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers + 1% foliar spray of MKP (00:52:34);
T_{17}= 25% RDF + Spent mushroom compost (1 kg/m^2);
T_{18}= 25% RDF + Biofertilizers;
T_{19}= 25% RDF + 1% foliar spray of MKP (00:52:34);
T_{20}= 25% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers;
T_{21}= 25% RDF + Spent mushroom compost (1 kg/m^2) + 1% foliar spray of MKP (00:52:34); T_{22}= 25% RDF + Biofertilizers + 1% foliar spray of MKP (00:52:34);
T_{23}= 25% RDF + Spent mushroom compost (1 kg/m^2) + Biofertilizers + 1% foliar spray of MKP (00:52:34).)

Marigold seedlings were transplanted in the experimental plots at a spacing of 40 cm x 40 cm thereby accommodating 21 seedlings per bed of 2.80 m × 1.20 m dimension. Biofertilizers viz. *Azotobacter chroococcum* and phosphorous solubilizing micro-organisms (*Bacillus polymyxa* +*Pseudomonas striata*) was applied as root dip of marigold seedlings into a slurry of 200 g of the inocula dissolved in one litre of 10% sugar solution at the time of planting. Foliar spray of 1% MKP (Mono potassium phosphate; 00:52:34 water soluble fertilizer) was given twice during the experiment. First application was given at 30 days after transplanting and second application was given at 60 days after transplanting. One year old spent mushroom compost from which the crop of button mushroom has been harvested was procured from Mushroom Research and Training Centre, Division of Plant Pathology, SKUAST-Jammu. Spent mushroom compost before incorporation into the field was treated with 4% formalin and kept covered with polythene for 48 hours. After 48 hours, the cover was taken off, and the compost from the used mushrooms was frequently turned upside down to let the formalin fumes out. The treatment criteria were followed when the formalin fumes were removed from the spent mushroom compost before it was mixed into the plots. Periodically, standard intercultural operations were carried out in accordance with the suggested set of procedures. Throughout the experiment, no instances of disease or insect pests were noted.

2.3 Chemical Analysis

The soil samples were collected following the standard procedure after the termination of the experiment. Available N was determined by alkaline potassium permanganate method [1], Phosphorous by Olsen method [2] and Pottassium by Neutral ammonium acetate method [3]. Organic carbon was determined by Chromic acid titration method [4]. A basic study of the soil of the experimental field was conducted before starting the experiment The physio-chemical characteristics of soil taken revealed sandy loam textural class with Available N (232.54 kg/ha), Available P_2O_5 (27.71 kg/ha), Available K_2O (225.81 kg/ha), EC (0.35 dS/m) and Organic carbon content of 0.38%. Leaf N analysis was determined by Micro Kjeldahl method [5], Potassium by flame-photometry and phosphorous was determined by Vanado-molybdate yellow colour method [5].

2.4 Statistical Analysis

Data related to each parameter was recorded and statistically analyzed by applying the technique of analysis of variance using Randomized Block Design [6]. The level of significance for t-test was kept at 5% (P=0.05).

3. RESULTS AND DISCUSSION

3.1 Flower Yield and Percent Yield Response

Findings revealed higher flower yield (0.50 kg) with the scheduled application of 75% RDF + spent mushroom compost + biofertilizers + 1% foliar spray of MKP (T_9) and lowest flower yield of 0.19 kg) with farmers practice (T_1). Highest percent yield response of 52.50 was recorded with farmers practice. The maximum increase in flower yield with the scheduled application of T_9 might be ascribed to improved fertilizer use efficiency through timely applications of N, P and K that had led to increased photosynthetic rate and in turn resulted in production of more flowering in comparison to other treatments. In addition foliar application through MKP also promoted better uptake of nutrients and hence resulted in higher utilization and translocation. Similar findings have been reported by Laishram et al. [7] and Laishram et al. [8] in chrysanthemum, Singh et al. [9] and Singh et al. [10] in carnation, Kumawat et al. [11], Goutham et al. [12] in marigold.

3.2 Media Physico-Chemical Properties

The present study revealed that after termination of the experiment highest organic carbon content (0.78%), highest available soil nitrogen content (259.95 Kg/ha), available soil P (33.23 Kg/ha) and available soil potassium content (244.60 Kg/ha) was recorded with control (100% RDF).This might be ascribed to the high application rates which after meeting out the plant requirements have contributed to the buildup of the available N, P and K in the soil or may be other treatments (compost, bio-fertilizer and foliar application) offered more available nutrients to meet the plant needs, therefore, the basic RDF stayed in the soil. The results are in conformity with the findings of Singh [13] who observed an increase in the availability of P and K in the soil after harvest of the bean crop with higher application of P and K. Thakur [14] also reported highest levels of NPK applied enhanced the status of the available nutrients in the soil after harvest in tomato. Bhan [15] reported significant increase in the available N, P and K content in the soil after harvest of potato with the subsequent increase in the dose of N, P and K. Angadi [16] recorded highest available NPK status in soil at harvest with the conjoint application of biofertilizers along with 50% RDF in garland chrysanthemum (*Chrysanthemum coronarium* L.). Pandey et al. [17] reported maximum soil nutrient status in chrysanthemum with the conjoint application of 75% RDF +*Azotobacter*+ VAM +Vermicompost.Different integrated nutrient management treatments did not influence the soil electrical conductivity significantly over untreated control. However, the highest electrical conductivity (0.47 dS/m) was recorded with treatment T_{17} (25% RDF + Spent mushroom compost) and lowest electrical conductivity (0.35 dS/m) was recorded with treatment T_{12} (50% RDF + 1% foliar spray of MKP). Dalawai and Naik [18] reported maximum available NPK in soil and total NPK content with conjoint application of *Azospirillum* + PSB + Vermicompost + 75% RDF in carnation cv. Soto plants. Tiwari et al. [19] reported maximum available nitrogen in post-harvested soil with treatment 100% R.D of NPK (100 kg N, 75 kg P and 75 kg K) + R.D of Vermicompost to 25% N (17.85 q/ha).

3.3 Foliar N, P and K Content (%)

The findings revealed the maximum total leaf nitrogen (1.367%), leaf phosphorus (0.433%) and leaf potassium content (1.88%) with treatment of 75% RDF + spent mushroom compost + biofertilizers + 1% foliar spray of MKP (T_9) whereas, the lowest total leaf nitrogen content (1.103%), leaf phosphorus content (0.313%) and total leaf K (1.33%) was recorded with Farmers practice (T_1). Leaf analysis is the suitable diagnostic tool to analyse the status of nutrients in the plant. Positive relationships between leaf content of sufficient/deficient nutrients and yield of marigold have already been established. Leaf is the donor organ from which nutrients and other assimilates are translocated to various sinks to support various metabolic activities. The growth and flowering of a plant can therefore be considered as an index of the leaf nutrient status. The addition of organic amendments might have improved the physical conditions of soil, root network and more moisture retention which increased the absorption of water and nutrients and improved the leaf nutrient contents. These findings are in confirmity with the findings of Mengel and Kirkby [20] and Pattanayak et al. [21] who reported enhanced leaf P and K content by addition of organic manures in soil. Angadi [16] also reported increased leaf nutrient contents with the conjoint application of biofertilizers along with 50% RDF in garland chrysanthemum (*Chrysanthemum coronarium* L.). Application of biofertilizers (*Azotobactor* and PSB) plus 50% RDF + 10 t ha^{-1} Vermicompost resulted in significantly higher uptake of mineral nutrients by chrysanthemum plants from soil [22].

3.4 Chlorophyll Content (%)

The perusal of data given in Table 1 revealed that different nutritional treatments significantly influenced the chlorophyll content of French marigold. Maximum chlorophyll content (48.89%) was recorded with 75% RDF + Biofertilizers + 1% foliar spray of MKP (T_8) whereas minimum chlorophyll content (39.01%) was recorded with the application of 25% RDF + Spent mushroom compost.

3.5 Cost Benefit Ratio

While evaluating the cost of production for different treatments it was observed that the plants treated with 75% RDF + Biofertilizers + 1% foliar spray of MKP (T_8) recorded the highest benefit cost ratio (2.81:1) closely followed by benefit cost ratio of 2.54 in 100% RDF whereas lowest benefit cost ratio (0.36:1) was recorded in the treatment T_{17} comprising 25% RDF + Spent mushroom compost (1 kg/m^2).The variation in net returns and cost: benefit ratio might be due to the difference in yield, price of flowers and other inputs like spent mushroom compost, biofertilizers and MKP. Jadhav et al. (2014) reported the maximum benefit cost ratio with the application of 75% RDN + *Azotobacter* in marigold cv. Pusa Basanti Gainda. Rao et al. [23] reported maximum B: C ratio with conjoint application of 75% RDF and biofertilizers in tuberose. Sharma et al. [24] reported highest B: C ratio with application of *Azospirilium*+ PSB+ 5% cow urine + 50% recommended dose of N through vermicompost + 50% recommended dose of NPK in African .Similar findings have also been reported by Laishram et al. [8] in chrysanthemum and Singh et al*.* [25] in carnation.

Table 1. Effect of conjoint application of spent mushroom compost, biofertilizer and MKP foliar application on soil and foliar nutrient status, yield and profitability of French marigold

Treatments	Flower yield/plant (g)	Percent yield response	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	Total leaf N (%)	Total leaf P (%)	Total leaf K (%)	Chlorophyll content (%)	Electrical conductivity (dS/m)	Organic carbon (%)	B:C Ratio
T_1	0.19	52.50	231.80	26.89	236.50	1.103	0.313	1.33	44.89	0.41	0.58	0.70
T_2	0.40	0.00	259.95	33.23	244.60	1.310	0.380	1.66	47.60	0.36	0.78	2.54
T_3	0.34	15.00	247.87	30.15	242.93	1.277	0.347	1.50	45.95	0.41	0.67	1.77
T_4	0.35	12.50	249.85	30.20	243.21	1.213	0.347	1.52	44.81	0.42	0.67	1.19
T_5	0.36	10.00	251.22	30.51	243.49	1.257	0.367	1.58	47.19	0.44	0.68	1.98
T_6	0.27	32.50	254.60	30.53	243.61	1.337	0.377	1.66	46.68	0.38	0.72	0.68
T_7	0.36	10.00	255.50	30.55	243.63	1.330	0.380	1.69	47.14	0.35	0.73	1.25
T_8	0.46	-15.00	256.62	30.72	243.88	1.323	0.410	1.76	48.89	0.43	0.74	2.81
T_9	0.50	-25.00	257.17	30.86	243.94	1.367	0.433	1.88	45.13	0.35	0.75	2.11
T_{10}	0.29	27.50	238.32	29.19	241.58	1.283	0.330	1.40	42.14	0.42	0.66	0.84
T_{11}	0.30	25.00	238.74	29.36	241.61	1.253	0.337	1.48	42.18	0.44	0.66	1.55
T_{12}	0.27	32.50	239.82	29.55	241.88	1.247	0.343	1.50	41.31	0.35	0.67	1.30
T_{13}	0.25	37.50	243.86	29.56	242.18	1.220	0.350	1.55	44.26	0.39	0.67	0.58
T_{14}	0.31	22.50	244.36	29.63	242.57	1.157	0.360	1.55	41.59	0.45	0.68	0.97
T_{15}	0.36	10.00	247.09	29.70	242.88	1.253	0.363	1.55	42.84	0.45	0.70	2.05
T_{16}	0.34	15.00	247.55	29.85	242.91	1.223	0.363	1.57	43.27	0.36	0.71	1.15
T_{17}	0.21	47.50	233.93	28.19	240.61	1.147	0.323	1.36	39.01	0.47	0.61	0.36
T_{18}	0.22	45.00	235.34	28.36	240.85	1.180	0.327	1.38	42.90	0.47	0.63	0.91
T_{19}	0.27	32.50	236.03	28.65	241.06	1.137	0.327	1.38	39.52	0.39	0.64	1.35
T_{20}	0.31	22.50	236.31	28.82	241.17	1.177	0.330	1.39	42.44	0.45	0.64	1.00
T_{21}	0.33	17.50	236.76	28.83	241.54	1.120	0.333	1.41	41.70	0.46	0.65	1.13
T_{22}	0.33	17.50	237.01	29.10	241.54	1.220	0.337	1.46	40.86	0.40	0.65	1.86
T_{23}	0.31	22.50	238.10	29.17	241.58	1.160	0.337	1.46	41.93	0.41	0.65	1.00
SE ± (m)	0.04	-	2.32	0.89	1.17	0.032	0.019	0.009	2.67	0.05	0.03	-
CV	20.35	-	1.64	5.19	0.84	4.531	9.310	1.047	7.47	19.58	8.36	-
$CD_{0.05}$	0.11	-	6.63	2.55	3.36	0.092	0.054	0.026	5.390	N.S	0.09	-

4. CONCLUSION

Maximum total leaf nitrogen (1.367%), leaf phosphorus (0.433%) and leaf potassium content (1.88%) was recorded with treatment 75% RDF + spent mushroom compost + biofertilizers + 1% foliar spray of MKP (T_9) whereas, the lowest total leaf nitrogen content (1.103%), leaf phosphorus content (0.313%) and total leaf K (1.33 %) was recorded with no fertilizer application (Farmers practice). 75% RDF + Biofertilizers + 1% foliar spray of MKP recorded the highest benefit cost ratio (2.81:1) closely followed by benefit cost ratio of 2.54 in 100% RDF.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Subbiah BV, Asija GL. A rapid procedure for the estimation of the available nitrogen in soils. Current Science. 1956;25:259-260.
2. Olsen SR., Cole CV, Watanabe FS, Dean LA. Estimation of available phosphorous by extraction with sodium bicarbonate. U.S.D.A*.* Circular. 1954;939:19.
3. Merwin HD, Peech M. Exchangeable of sodium potassium in the sand, silt and clay fractions, as influenced by the nature of the complimentary exchangeable cations. Soil Sci. Amer. Proc. 1951;15:125-128.
4. Walkley AE, Black JA. An examination of the Degtiga vet. method for determining oil organic matter and proposed modification of the chromic acid titration method. Soil Science. 1934;37:29-38.
5. Jackson ML. Soil chemical analysis. Prentice Hall of India. Pvt. Ltd., New Delhi. 1973;498.
6. Gomez LA, Gomez AA. Statistical procedure for agricultural research. (2nd ed.) John Wiley and Sons, Inc., NewYork. 1985;680.
7. Laishram N, Dhiman SR, Gupta YC, Bhardwaj SK, Singh A. Microbial dynamics and physicochemical properties of chrysanthemum (*Dendranthema grandiflora*) as influenced by integrated nutrient management. Indian Journal of Agriculture Sciences. 2013;83(4):447-55.
8. Laishram N, Dhiman SR, Singh A, Gupta YC. Profitability of chrysanthemum cut flower production as influenced by integrated nutrient management under mid hill conditions of Himachal Pradesh. Journal of Ornamental Horticulture. 2016; 19(3&4):125-131.
9. Singh A, Sharma BP, Gupta YC, Dilta BS, Laishram N. Response of carnation (*Dianthus caryophyllus*) cv. Master to water soluble fertilizer sujala (19:19:19 NPK). Indian Journal of Agriculture Sciences. 2013;83(12):1364-67.
10. Singh A, Sharma BP, Dilta BS Laishram N, Gupta YC, Bhardwaj SK. Effect of fertilization on quality flower production and foliar nutrient content of carnation (*Dianthus caryophyllus*) cv.Master. Bangladesh Journal of Botany. 2015;44(1): 133-137.
11. Kumawat K, Khanderwal SK, Choudary MR, Kumawat PK, Sharma G, Panwar P. Effect of integrated nutrient management on growth flowering and yield of African marigold (*Tagetes erecta* L.) International Journal of Current Microbiology and Applied Sciences. 2017;6(8):60-65.
12. Goutham BK, Parul P, Mamta B. Efficacy of Azotobacter and Phosphate solubilizing bacteria on vegetative and floral attributes of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda under hilly regions of Uttarakhand. International Journal of Agriculture Sciences. 2018;10(4):5212-5215.
13. Singh S. Response of graded levels of phosphorous and potassium on yield and quality of French bean cv. Contender under mid-hill condition of Himachal Pradesh. M.Sc. Thesis submitted to Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, Hmachal Pradesh (H.P); 1995.
14. Thakur SS. Response of NPK combinations on some tomato hybrids. M.Sc. Thesis submitted to Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh (H.P.); 1996.
15. Bhan N. Response of NPK and spacings on potato cultivars. M.Sc. Thesis submitted to Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh (H.P.); 2002.
16. Angadi AP. Effect of integrated nutrient management on yield, economics and nutrient uptake of garland chrysanthemum (*Chrysanthemum coronarium* L.) The Asian Journal of Horticulture. 2014;9(1): 132-135.

17. Pandey G, Kumar R, Kumar S, Kumar A. Effect of integrated nutrient management on floral parameters and soil nutrient status in Chrysanthemum (*Chrysanthemum morifolium* Ramat.). International Journal of Current Microbiology and Applied Sciences. 2018;7(5):1984-1990.
18. Dalawai B, Naik BH. Influence of nutrient sources on performance of Carnation (*Dianthus caryophyllus* L.) Cv. Soto under naturally ventilated polyhouse. Journal of Pharmacognosy and Phytochemistry. 2017;6(5):2049-2051.
19. Tiwari H, Kumar M, Naresh RK.Effect of nutrient management and gibberellic acid on growth, flowering and nutrients availability in post-harvested soil of Marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. International Journal of Chemical Studies. 2018;6(4):510-514.
20. Mengel K, Kirkby A. Principles of Plant Nutrition. International Potash Institute, Bern, Switzerland. 1987;413.
21. Pattanayak SK, Mohanty RK, Sethy AK. Response of okra to *Azotobacter* and *Azospirillum* inoculation grown in acid soil amended with lime and FYM. 2nd North Eastern Regional Conference on Biofertilizer. AAU, Jorhat, Assam. 2001; 35.
22. Mahadik MK, Dalal SR, Vaidya PP, Shirsat L. Influence of integrated nutrient management on various mineral nutrients uptake by chrysanthemum. International Journal of Chemical Studies. 2017;5(5): 1371-1375.
23. Rao KD, Kameswari PL, Rani TB. Impact of integrated nutrient management on growth, flowering, yield and economics of tuberose. Agric. Sci. Digest. 2015;35(1): 66-69.
24. Sharma G, Sahu NP, Shukla N. Effect of Bio-Organic and Inorganic Nutrient Sources on Growth and Flower Production of African Marigold. Horticulturae. 2017; 3(11):1-5.
25. Singh A, Sharma BP, Dilta BS, Gupta YC, Laishram N, Baweja HS. Economic analysis of carnation cv. Master cut flower production as influenced by fertilizer schedules under naturally ventilated poyhouse. Bangladesh Journal of Botany. 2016;45(1):25-31.

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