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Short Communication:

Effect of NPK treatments on vegetative growth and oil yield of scented geranium (*Pelargonium graveolens* L. 'Herit ex Ait)

VINEET KANDPAL[1] • PRASOON K JOSHI[1]* • NEETA JOSHI[1] • PUSKAR S BISHT[2]

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ABSTRACT

The present investigation was carried out to study the effect of various NPK treatments on vegetative growth and oil yield of scented geranium (Pelargonuim graveolens L.; *Family: Geraniaceae. The results revealed that the plant height was significantly increased with the increased dose of NPK inorganic, inorganic and integrated forms. The results also suggested that essential oil yield was also significantly influenced by different doses of NPK.*

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INTRODUCTION

Pelargonium graveolens (Rose scented geranium) is an important and a widely cultivated aromatic herb. The name of the genus *Pelargonium* comes from the Greek word 'Pelargos' means a "stock", due to its 'stock bill shaped' flowers and stem. It is a bushy plant measured up to 1.2 meter in height. The stem is cylindrical, woody at base, pubescent, green when young and turns brown with age. Its leaves are simple, alternate, 5-7 lobes, each segment again lobed, toothed, bracteates and umbellate; pedicels shorter than flower and highly aromatic. The flowers are bisexual and hypogenous with pink corolla, 10 large stamens and hairy ovary, superior and breaking up distally into 5 stigmas [1]. *Geranium* is mainly grown for production of its light yellow to light greenish essential oil, obtained through hydro-distillation of fresh herbage. The geraniol-rich oil of geranium is frequently used in aromatherapy to cure post-menopausal problems, skin disease, mental fatigue and anxiety [5, 6, 7]. It is also used as a cheap substitute of rose oil in high grade perfumery products.

MATERIALS AND METHODS

Experimental tratments of fertilizers

The present investigation was carried out at G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand. A Randomized Block Design with eight treatment combinations, replicated four times, was employed. Plot size in all the treatments was uniformly maintained at 2 m x 3 m. The experimental site was located at an altitude of 1900 m above MSI and represents east aspect of Hill Campus, Ranichauri. Treatment consists of different doses of NPK in organic, inorganic and integrated forms.

*Corresponding Author; Email: prasoonjoshi2012@gmail.com

[1]Department of Chemistry, M.B.G.P.G. College, Haldwani (Nainital) Uttarakhand-India

[2]College of Forestry & Hill Agriculture, Uttarakhand University of Horticulture and Forestry, P.O. Ranichauri, Distt. Tehri Garhwal - 249 199

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Table 1: effect of inorganic fertilizers and FYM on yield contributing traits of geranium

Treatments	Plant height (cm)		Average number of tillers		Foliage biomass (q/ ha)		Leaf area (cm^2)		Oil yield (kg/ha)	
	I harvest	II harvest	I harvest	II harvest	I harvest	II harvest	I harvest	II harvest	I harvest	II harvest
T_1: Control (0:0:0 kg NPK)	42.08	71.20	3.28	3.52	56.10	72.35	21.87	19.60	8.40	12.00
T_2 : 30:30:30 kg NPK	45.68	92.00	3.23	3.37	213.38	180.23	37.16	23.37	25.60	30.40
T_3 : 40:40:40 kg NPK	57.08	96.03	3.78	3.98	122.20	339.03	51.78	30.12	16.40	55.20
T_4: 60:60:60 kg NPK	62.73	98.35	3.43	3.75	132.75	406.23	38.86	29.68	15.15	63.15
T_5 : FYM @ 20 t/ ha	43.30	73.23	2.75	2.93	61.60	90.08	27.99	20.76	8.75	16.00
T_6: T_2 + FYM@ 10 t/ ha	50.98	92.80	3.20	3.68	127.55	203.08	24.05	18.34	15.60	36.00
T_7: T_3 + FYM@10 t/ ha	45.35	97.58	2.78	3.38	149.85	262.23	49.89	20.52	20.33	38.40
T_8: T_4 + FYM@10 t/ ha	53.48	100.30	2.76	3.85	231.58	270.93	39.71	20.54	31.25	35.15
Grand Mean	50.08	90.19	3.15	3.56	136.71	228.02	36.11	22.87	17.69	35.79
CD (p=0.05)	10.80	7.30	0.76	0.75	18.08	27.37	1.66	3.98	1.36	5.05
SEM	3.67	2.48	0.25	0.25	6.15	9.30	0.56	1.35	0.46	1.71

FYM = Farm Yard Manure, CD = Critical Difference, SEM = Standard Error of Mean

Detail about treatments of the experiment is as follows: T_1: control (0:0:0 kg NPK), T_2 : 30:30:30 kg NPK, T_3: 40:40:40 kg NPK, T_4: 60:60:60 kg NPK, T_5: Recommended Farm Yard Manure @ 20 t/ha, T_6 : T_2 + Farm Yard Manure @ 10 t/ha, T_7 : T_3 + Farm Yard Manure @10 t/ha, T_8 : T_4 + Farm Yard Manure @10 t/ha. Nitrogen was supplied through urea (46% N), phosphorous through di-ammonium phosphate (46% P and 18% N) and potassium through muriate of potash (60% K) as per the treatments. The organic manure pine leaf compost (contains 1 % N, 0.5% P and 1% K) was applied to respective treatments. Additional requirement of phosphorous was supplied by adding single super phosphate (16% P) to the pine leaf compost.

Harvesting

Randomly selected eight plants from each replicated plots of 8 fertilizer treatments were harvested for comparison. The plant part above 10 cm from the ground level was cut with the help of secateurs. This includes leaves as well as young tender shoots. The leaves were then collected and weighed as fresh herbage. The harvesting was done twice at 6-month interval during the period of experiment. The observation on plant height was recorded by averaging data on 8 plants per plot. For this, individual plant height of 8 plants per plot was measured using a meter scale and then dividing the sum of plant height by the number of plants. The numbers of tillers were calculated from all treatments by counting the number of tillers just from the base of the randomly selected plants. The leaf area was measured with the help of leaf area meter.

Hydro-distillation of essential oil

Fresh plant material was partially dried and then placed into a Clevenger apparatus. The distillation was carried out using herb and water in 3:1 ratio for a period of 1 hrs. The extracted oil was separated from water and dehydrated using anhydrous Na_2SO_4.

Statistical analysis

The experimental data were analyzed statistically as per the method described by Cochran and Cox [5]. The interpretation of results was based on 'f' test at 0.05 level of significance.

RESULTS AND DISCUSSION

The data on plant morphological traits, foliage biomass and essential oil yield as affected by NPK treatments in summarized in Table-1. All plant

growth and yield parameters of the geranium crop were found positively and significantly correlated with increased dose of NPK in inorganic, organic or integrated forms. With respect to plant height at the time of 1st harvest, treatments T_4, T_3, T_8 and T_6 favoured best influence with a mean plant length of 62.73, 57.08, 53.48 and 50.98 cm in comparison to that of control plants (42.08 cm). However, during 2nd harvest, the average height of the plants under T_8 treatment (100.30 cm) was maximum, followed by T_4 (98.35 cm), T_7 (97.58 cm), T_3 (96.03 cm), T_6 (92.80 cm) and T_2 (92.00 cm). Plants grown with T_5 fertilizer dose measured comparable (73.23 cm) with those of control T_1 (71.20 cm). Average number of tillers during growth at 1st and 2nd harvests in different treatments did not show any marked change and ranged from 3.2 to 3.78 in T_6, T_2, T_3, T_4 in comparison to 3.28 in the control (1st harvest). In treatments T_5 (2.75), T_8 (2.76) and T_7 (2.78) the number of tillus per plant was, however, significantly low than that of the control plant during 1st harvest. In second harvest, mean number of tiller in all the treatments was comparable (3.37 to 3.98) to control (3.52) except in T_5 (2.93 tiller/plant). The trend in results on foliage biomass during 1st & 2nd harvest in all fertilizer application treatments also followed a similar pattern. Highest herb biomass was recorded in T_8 (231.58 q/ha) in the first harvest and T_4 (406.23 q/ha) in the second harvest when compared with control (i.e 56.1 and 72.35 q/ha, respectively) Treatment T_5 again showed its minimum influence on herb yield resulting in a foliage biomass gain of 61.60 and 90.08 q/ha only at the time of 1st and 2nd harvest, respectively. Treatments T_3, T_7, T_8, T_4 and T_2 were found most effective in terms of leaf area measurement (51.78, 49.89, 39.71, 38.86 and 37.16 cm^2, respectively, in comparison to (21.87 cm^2) in the control plants in the first harvest (Table 1). In the second harvest, however, only treatment T_3 and T_4 (30.12 and 29.68 cm^2 leaf area) out classed rest of the treatments (18.34-23.37 cm^2) including the control (19.60 cm^2 leaf area). With respect to essential oil yield, T_8 and T_2 treatments in the 1st and T_4 and T_3 in the 2nd harvest were most effective.

The result of the present investigation, therefore largely corroborated with many earlier sutides on *P. graveolens* [3, 4]. Khan [3] have also observed that significantly superior herbage yield (94.33% higher than control) was obtained at Kodaikanal with N, P_2O_5 and K_2O each at 60 kg/ hectare whereas application of only 60 kg N/ hectare gave a minimal increase in herbage yield over the control. Our results are also parallel to the findings of Mani [4] who have also reported that maximum oil yield of 60 kg/ha was obtained at a NPK dose of 60:60:60 as was the case with the present investigation.

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