



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(6): 517-519
Received: 22-09-2017
Accepted: 24-10-2017

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Effect of Growth regulators and pinching on Economics with cost benefit ratio for commercial cultivation of marigold cv. Calcutta Orange

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Abstract

Investigation on "Effect of pinching and plant growth regulators on growth, flowering, yield and quality of African marigold (*Tagetes erecta* L.) cv. Calcutta Orange" was carried out during October, 2015 to February, 2016. The field experiments were carried out to find the effect of two levels of pinching *i.e.*, no pinching and pinching and different plant growth regulators *viz.*, GA₃ at 200 ppm, NAA at 60 ppm, CCC at 1000 ppm and TIBA at 1000 ppm. Among the growth regulators, benefit cost ratio was found to be maximum in GA₃ followed by NAA and CCC and minimum benefit cost ratio was found in TIBA. Among pinching, pinching had highest benefit cost ratio compared to unpinched plants, among the interactions, benefit cost ratio was found to be maximum and positive in G₁P₁, G₂P₁ and minimum for control G₄P₀. The experiment can be concluded that pinching of apical bud and foliar spray of GA₃ at 200 ppm independently gave higher yield, better quality flowers with maximum benefit in African marigold cv. Calcutta Orange.

Keywords: Growth regulators, pinching, *Tagetes erecta*

1. Introduction

African marigold (*Tagetes erecta* L.) is a widely cultivated as bedding plants, loose flower, perfume, natural colour, pigments, carotinoids, insect and nematodes repellents, nutrient supplement for poultry feed. Marigold plant habit of profuse flowering, short duration to produce marketable flowers, wide spectrum of attractive colours, shape and size and good keeping quality, attracted the attention producers and traders mostly. Effect of pinching, both manual and chemically; using growth regulators was ascertained for improving the production of compact African marigold cv Calcutta orange. Although a lot of information is available to maximum flowering and yield in commercially important plants yet comparative studies involving the use of growth regulators and pinching scarce. Therefore, an experiment was carried out to compare the effects of growth regulators and manual pinching on African marigold cv Calcutta orange. The objective of study the economics of loose marigold flowers by applying different pinching and growth regulator approaches.

2. Materials and methods

The experiment was laid out in randomized block design (R.B.D.). All treatments were randomly allocated among the plot and replicated five times. Four growth regulators namely gibberellic acid (G₁- GA₃ at 200 ppm), NAA (G₂- at 60 ppm), cycocel (G₃- CCC at 1000 ppm) and TIBA at 1000 ppm (G₄) were taken. These four growth regulators along with one control (G₀-water spray), were taken for both the growth regulators. The marigold cultivar Calcutta Orange seedlings used for the experiment were collected from C.S. Biradar nursery, Ghataprabha.

After field preparation one month old, healthy, uniform seedlings were used for transplanting as shown in the plate 1. Seedlings were planted at a spacing of 60 x 45 cm and light irrigation was given soon after transplanting. Well decomposed FYM @ 20 tonnes per hectare was applied at the time of land preparation. The recommended dose of fertilizer 225:60:60 kg NPK/ha (Anon, 2012) [2]. Seven and ten days after transplanting the gap filling was done twice with fresh seedling, in order to maintain 100 per cent plant population in each plot. Hence for whole experimental site necessitated 3L of growth regulator spray of mentioned concentration which are prepared out of respective stocks and diluted for 3L volume with distilled water. Only control treatment plot was water sprayed. The spraying was done in the morning hours with the help of hand sprayer.

Observations were recorded at 45 and 90 days after transplanting.

The various growth parameters like height of plant (cm), number of primary branches per plant, number of primary branches per plant and plant spread (cm²) were recorded for observation. The flowering parameters like emergence of first flower bud, commencement of first flowering (days) and the yield parameter flower yield per plant (g) were also recorded. The cost of all inputs prevailed in the market at the time of their use and labour cost was used to calculate the cost of cultivation is furnished. The price of the inputs and produce that prevails at the time of their use will be considered for working out the economics. Net returns per hectare will be calculated by deducting the cost of cultivation from gross income per hectare and benefit cost ratio (BC) will be worked out.

2.1 Cost of cultivation (Rs./ha)

The prices of all inputs prevailing at the time of their use and the labour cost were used to work out the cost of cultivation and expressed in rupees per hectare.

2.2 Gross return (Rs./ha)

The gross income was worked out based on the prevailing market of the flower and xanthophylls produce and expressed in rupees per hectare.

Net returns (Rs./ha) =Gross returns (Rs./ha)- Cost of cultivation (Rs./ha)

2.3 Benefit: cost ratio

$$\text{Benefit Cost Ratio (\%)} = \frac{\text{Net return (Rs/ha)}}{\text{Cost of cultivation}}$$

Statistical analysis

The data on various biometrical parameters recorded during the period of investigation was tabulated and subjected to statistical analysis using factorial randomized complete block design (RCBD). The test of significance ('f' test) and critical difference (CD) were read at 0.05 probabilities (Sunderaraju *et al.*, 1972) [3].

Result and discussion

Among the growth regulators, benefit cost ratio was found to be maximum in GA₃ followed by NAA and CCC and minimum benefit cost ratio was found in TIBA. Among pinching, pinching had highest benefit cost ratio compared to unpinched plants, among the interactions, benefit cost ratio was found to be maximum and positive in G₁P₁, G₂P₁ and minimum for control G₄P₀ as shown in the table 1. The experiment can be concluded that pinching of apical bud and foliar spray of GA₃ at 200 ppm independently gave higher yield, better quality flowers with maximum benefit in African marigold cv. Calcutta Orange as shown in the figure 1.

Table 1: Economics with cost benefit ratio for commercial cultivation of marigold cv. Calcutta Orange per ha.

Particulars	G ₀ P ₀	G ₀ P ₁	G ₁ P ₀	G ₁ P ₁	G ₂ P ₀	G ₂ P ₁	G ₃ P ₀	G ₃ P ₁	G ₄ P ₀	G ₄ P ₁
Land preparation	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00
Seedling cost	13333.33	13333.33	13333.33	13333.33	13333.33	13333.33	13333.33	13333.33	13333.33	13333.33
FYM	20000.00	20000.00	20000.00	20000.00	20000.00	20000.00	20000.00	20000.00	20000.00	20000.00
NPK	8358.00	8358.00	8358.00	8358.00	8358.00	8358.00	8358.00	8358.00	8358.00	8358.00
Transplanting + Pinching	2000.00	2500.00	2000.00	2500.00	2000.00	2500.00	2000.00	2500.00	2000.00	2500.00
Growth regulator application	0.00	0.00	55000.00	55000.00	682.50	682.50	3250000.00	3250000.00	582500.00	582500.00
Irrigation Weeding	2320.00	2320.00	2320.00	2320.00	2320.00	2320.00	2320.00	2320.00	2320.00	2320.00
Harvesting	8800.00	8800.00	8800.00	8800.00	8800.00	8800.00	8800.00	8800.00	8800.00	8800.00
Miscellaneous	4400.00	4400.00	4400.00	4400.00	4400.00	4400.00	4400.00	4400.00	4400.00	4400.00
Cost of cultivation	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00	3000.00
Flower yield Gross (tonnes/ha)	2.65	3.28	5.84	7.03	4.39	5.04	3.83	3.96	3.56	3.92
Return (In Rs.)	79500.00	98400.00	175200.00	210900.00	131700.00	151200.00	114900.00	118800.00	106800.00	117600.00
Net return (In Rs.)	14288.67	32688.67	54988.67	90188.67	65806.17	84806.17	-3200311.33	-3196911.33	-540911.33	-530611.33
B:C ratio	0.22	0.50	0.46	0.75	1.00	1.28	-0.97	-0.96	-0.84	-0.82

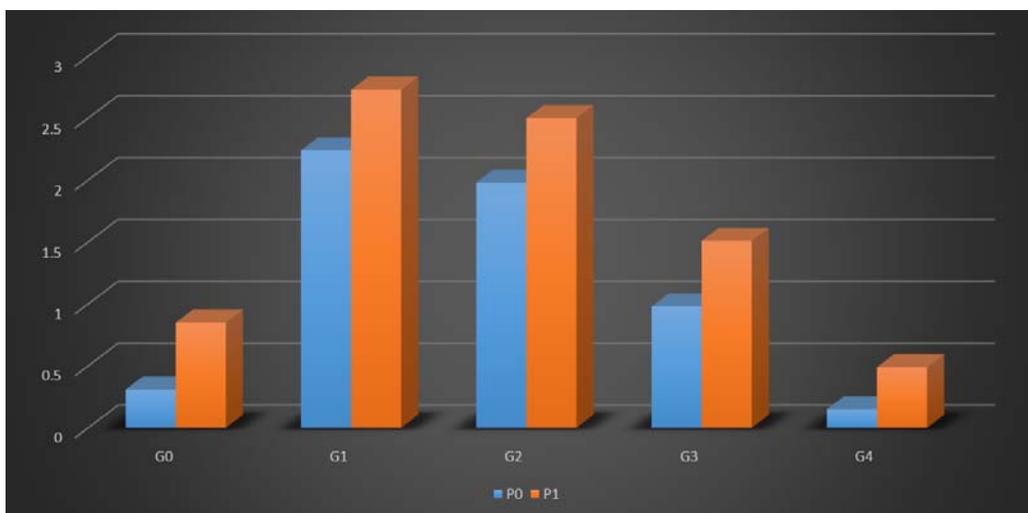


Fig 1: Benefit cost ratio as influenced by the growth regulators and pinching in African marigold cv. Calcutta Orange



Plate 1: Experimental plot a) During preparation b) After transplanting c) During flowering

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