

EFFECT OF PINCHING AND CYCOCEL ON SEED PRODUCTION OF AFRICAN MARIGOLD

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ABSTRACT

A field experiment was carried out at the farm of Horticulture Section, College of Agriculture, Nagpur during *kharif* season of the year 2015-2016. The experiment was laid out in Factorial Randomised Block Design with sixteen treatment combinations. The treatments comprised of two factors i.e. factor A and factor B. Factor A consist of 4 levels of pinching (P₁ – Control (No pinching), P₂ – Pinching at 15 DAT, P₃ – Pinching at 30 DAT, P₄ – Double pinching at 15 and 30 DAT) and factor B consist of 4 levels of cycocel (C₁ – Control, C₂ – 1000 ppm, C₃ – 1500 ppm and C₄ – 2000 ppm) in African marigold. Significantly, maximum flowers plant⁻¹, number of seeds flower⁻¹, seed yield plant⁻¹, seed yield plot⁻¹ and seed yield hectare⁻¹ were recorded in individual treatment of single pinching at 30 DAT (P₃) and cycocel at 2000 ppm (C₄) and treatment combination of P₃C₄ i.e single pinching at 30 DAT and application of cycocel at 2000 ppm. Similarly, the maximum weight of seeds flower⁻¹, test weight and germination percentage were recorded in individual treatment of single pinching at 30 DAT (P₃) and cycocel at 2000 ppm (C₄).

(Key words: African marigold, pinching, cycocel, seed, yield, quality)

INTRODUCTION

Marigold is widely cultivated as bedding plant in landscape design. Besides, the pristine used as loose flower, marigold occupies anthelmintic, analgesic, antiinflammatory, aromatic, bronchodilatory, digestive, diuretic, emmenagogue, sedative and stomachic properties. It is also widely used in perfumes, herbal gual, insect and nematode repellent, organic manure, nutrient supplement for poultry feed, anticarcinogenic agent, antioxidant in retinotherapy and for *Tagetes oil* extraction.

It is popularly known as “Rose of Indies”. *Tagetes erecta* is a common ornamental herbaceous plant. Marigold is broadly divided into two groups, viz., *Tagetes erecta* (L.) and *Tagetes patula* (L.) which have their origin in Mexico and South Africa, respectively. *Tagetes erecta* (L.) is popularly known as “African marigold” while *Tagetes patula* (L.) as “French Marigold”.

Seed is considered as the best propagating material for annual flowers like marigold. But due to lack of scientific information on seed production of marigold, the large scale production of seed is limited. For the maximization of growth, flower yield, seed yield and quality of any flower crop selection of various agro techniques like suitable variety, cultural and management practices like optimum dose of manures and fertilizers, spacing, irrigation, staking, pinching, plant protection etc. are required to be properly followed. The seed production in marigold can be increased by application of growth regulators and adopting special horticultural practice like pinching.

MATERIALS AND METHODS

The present experiment was carried out at the farm of Horticulture Section, College of Agriculture, Nagpur during *kharif* season of the year 2015-2016, with sixteen treatment combinations in Factorial Randomised Block Design. The treatments comprised of two factors i.e. factor A and factor B. Factor A consist of 4 levels of pinching (P₁ – Control (No pinching), P₂ – Pinching at 15 DAT, P₃ – Pinching at 30 DAT, P₄ – Double pinching at 15 and 30 DAT) and factor B consist of 4 levels of cycocel (C₁ – Control, C₂ – 1000 ppm, C₃ – 1500 ppm and C₄ – 2000 ppm) in African marigold.

The marigold seeds were obtained from Horticulture Section, College of Agriculture, Nagpur. The seeds were sown 30 days before the actual transplanting date on previously sterilized raised bed and seedlings were prepared. Seeds were sown on nursery bed of 3 m x 1 m x 0.15 m size. Necessary care was taken to raise healthy and strong seedlings for transplanting. Beds were watered lightly with the help of rose can. After about 3 to 4 days the seeds started germinating. The beds were watered regularly and weeding operation was carried out in order to keep the beds free of weeds. Seedlings were transplanted on raised bed with planting of one seedling hill⁻¹ in the experimented field on 12th July, 2015 at the distance of 45 cm x 30 cm.

Recommended dose of farm yard manure and chemical fertilizers for marigold was 5 tones ha⁻¹ FYM and 100:50:25 NPK kg ha⁻¹. The half dose of nitrogen and full dose of phosphorus and potassium were applied at time of

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transplanting. The remaining half dose of nitrogen (N) was applied one month after transplanting.

The single pinching was done at 15th day and 30th day of transplanting. However, the double pinching was done at 15th day and repeated at 30th day of transplanting as per the treatment combinations. The solutions of cycocel (1000, 1500, 2000 ppm) were prepared by taking the required quantity of chemical diluted with water as per the treatment concentrations. The cycocel of the respective concentration were sprayed twice, first at 25 DAT and second at 40 DAT as per the treatment combinations.

Observations on number of flowers plant⁻¹, number of seeds flower⁻¹, seed yield plant⁻¹(g), plot⁻¹(kg), ha⁻¹ (q) number of were recorded after harvest. In terms of seed quality weight of seeds flower⁻¹, test weight (g), germination (%) were also recorded and analyzed statistically as per the method suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Seed yield parameters

Pinching

Significantly, maximum number of flowers plant⁻¹ was recorded in the treatment of pinching at 30 DAT which was followed by double pinching at 15 and 30 DAT and single pinching at 15 DAT. Whereas, minimum number of flowers plant⁻¹ were recorded in no pinching. This might be due to pinching which leads to development of large auxiliary shoots with flowers located terminally. However, Shivankar *et al.* (2014) observed that maximum number of flowers plant⁻¹, flower yield plant⁻¹ and ha⁻¹ were recorded in pinching at 30 DAT in chrysanthemum.

Significantly, maximum number of seeds flower⁻¹ was recorded in single pinching at 30 DAT which was at par with the treatment of double pinching at 15 and 30 DAT. However, minimum number of seeds flower⁻¹ was recorded in no pinching. Significantly maximum seed yield plant⁻¹, seed yield plot⁻¹, seed yield ha⁻¹ were recorded in single pinching at 30 DAT which was followed by double pinching at 15 and 30 DAT and single pinching at 15 DAT. Whereas, minimum seed yield plant⁻¹, seed yield plot⁻¹, seed yield ha⁻¹ were recorded in no pinching. Pinching reduced the apical dominance of the plant so more laterals produced and number of branches increased. Augmented more total leaf area increased and accumulated more photosynthates and ultimately production of more seeds of marigold. Sunitha *et al.* (2007) found that, single pinching at 45 DAT had recorded significantly higher seed yield plant⁻¹ and hectare⁻¹ in *Tagetes erecta* (L.). Singh *et al.* (2015) observed that, maximum number of seeds flower⁻¹ was recorded with double pinching + 2% nitrogen. Similarly double pinching + 2% nitrogen application registered maximum weight of seeds plant⁻¹ and seed yield m⁻¹ in African marigold.

Cycocel application

Significantly, maximum number of flowers plant⁻¹ and number of seeds flower⁻¹ were recorded with the

application of cycocel at 2000 ppm which was at par with the treatment cycocel at 1500 ppm. Whereas, significantly minimum number of seeds flower⁻¹ was recorded in control.

Significantly maximum seed yield plant⁻¹, seed yield plot⁻¹ and seed yield ha⁻¹ were recorded with the application of cycocel at 2000 ppm which was followed by treatments cycocel at 1500 ppm and cycocel at 1000 ppm. Whereas, significantly minimum seed yield plant⁻¹, seed yield plot⁻¹ and seed yield ha⁻¹ were recorded in control. This might be due to enhanced uptake of nitrogen, phosphorus and potassium, by the plant and this better uptake of nutrients might have supported vegetative growth *viz.*, plant height, number of branches, flowering and finally increased the number of seeds flower⁻¹. Sainath *et al.* (2012) found that, significantly higher number of seeds flower⁻¹ recorded with the application of cycocel @ 2000 ppm as compared to control in chrysanthemum (*Chrysanthemum coronarium* L.).

Interaction effect of pinching and cycocel

Significantly maximum seed yield plant⁻¹, seed yield plot⁻¹, seed yield ha⁻¹ were recorded in the treatment combination of P₃C₄ (single pinching at 30 DAT and cycocel at 2000 ppm) which was followed by treatment combination of (P₃C₃) single pinching at 30 DAT and cycocel at 1500 ppm. Gnyandev *et al.* (2014) observed that, pinching at 25 DAT with fertilizer application (270 kg N + 180 kg P + 100 kg k ha⁻¹) and foliar spray of CCC at 2000 ppm increased seedling dry weight, 1000 seed weight, seed yield plant⁻¹ in China aster

Seed quality parameters

Pinching

Significantly maximum weight of seeds flower⁻¹ and germination per cent was recorded in single pinching at 30 DAT which was found at par with the treatments of double pinching at 15 and 30 DAT. Whereas, minimum weight of seeds flower⁻¹ and germination were recorded in no pinching.

Significantly maximum test weight was recorded in double pinching at 15 and 30 DAT which was at par with single pinching at 30 DAT and single pinching at 15 DAT. Whereas, minimum test weight was recorded in no pinching. Due to pinching unwanted excessive vegetative growth has been restricted. The higher weight of seeds flower⁻¹ by pinching might be due to maximum utilization of reserved food and increased mobilization of biomass to seed from the source which resulted higher in seed weight. Singh *et al.* (2015) observed that maximum weight of seeds flower⁻¹ recorded with double pinching + 2% nitrogen in African marigold cv, Pusa Narangi Gaiinda.

Cycocel application

Significantly maximum weight of seeds flower⁻¹ and test weight were recorded with the application of cycocel at 2000 ppm which was followed by cycocel at 1500 ppm and cycocel at 1000 ppm. Whereas, significantly minimum weight of seeds flower⁻¹ and test weight were recorded in control treatment.

Table 1. Effect of pinching and cycocel on seed production of African marigold

Treatments	Number of flowers plant ⁻¹ at 90 DAT	Number of seeds flower ⁻¹	Seed yield plant ⁻¹ (g)	Seed yield plot ⁻¹ (kg)	Seed yield ha ⁻¹ (q)	Weight of seeds flower ⁻¹ (g)	Test weight (g)	Germination (%)
Factor A - pinching (P)								
P ₁ - No pinching	30.91	169.97	10.23	0.41	6.06	0.33	1.89	81.77
P ₂ -Pinching at 15 DAT	32.02	178.51	11.85	0.48	7.02	0.37	2.05	83.47
P ₃ -Pinching at 30 DAT	35.21	216.20	16.50	0.66	9.78	0.46	2.12	86.60
P ₄ -Pinching at 15 and 30 DAT	32.52	205.46	14.33	0.57	8.49	0.44	2.14	85.78
SE (m) ±	0.58	6.54	0.47	0.02	0.28	0.01	0.06	1.23
CD at 5%	1.67	18.87	1.35	0.06	0.80	0.03	0.19	3.55
Factor B- Cycocel (C)								
C ₁ - Control	30.77	157.04	9.06	0.36	5.36	0.29	1.86	81.79
C ₂ - CCC 1000 ppm	32.67	177.03	11.87	0.47	7.03	0.36	2.00	83.20
C ₃ - CCC 1500 ppm	32.91	209.48	14.78	0.59	8.76	0.45	2.13	85.45
C ₄ - CCC 2000 ppm	34.32	226.60	17.20	0.69	10.19	0.50	2.20	87.17
SE (m) ±	0.58	6.54	0.47	0.02	0.28	0.01	0.06	1.23
CD at 5%	1.67	18.87	1.35	0.06	0.80	0.03	0.19	3.55
Interaction effect (PXC)								
SE (m) ±	1.16	13.08	0.93	0.04	0.55	0.02	0.13	2.46
CD at 5%	-	-	2.69	0.11	1.60	-	-	-

*Day After Transplanting - DAT

Table 2. Interaction effect pinching and cycocel on seed production of African marigold

Sr. No.	Treatment combinations	Seed yield plant ⁻¹ (g)	Seed yield plot ⁻¹ (kg)	Seed yield ha ⁻¹ (q)
1	P ₁ C ₁	6.64	0.27	3.93
2	P ₂ C ₁	8.55	0.34	5.07
3	P ₃ C ₁	10.52	0.42	6.23
4	P ₄ C ₁	10.51	0.42	6.23
5	P ₁ C ₂	7.10	0.28	4.21
6	P ₂ C ₂	11.16	0.45	6.61
7	P ₃ C ₂	13.87	0.55	8.22
8	P ₄ C ₂	15.34	0.61	9.09
9	P ₁ C ₃	12.29	0.49	7.28
10	P ₂ C ₃	12.89	0.52	7.64
11	P ₃ C ₃	19.21	0.77	11.39
12	P ₄ C ₃	14.71	0.59	8.72
13	P ₁ C ₄	14.90	0.60	8.83
14	P ₂ C ₄	14.78	0.59	8.75
15	P ₃ C ₄	22.38	0.90	13.26
16	P ₄ C ₄	16.75	0.67	9.93
SE (m) ±		0.93	0.04	0.55
CD at 5%		2.69	0.11	1.60

The maximum germination per cent was recorded with the application of cycocel at 2000 ppm which was found at par with the treatments of cycocel at 1500 ppm. Whereas, minimum germination per cent was recorded in control. The higher weight of seeds by foliar application of cycocel might be due to maximum utilization of reserved food materials and increased mobilization of biomass to seed from the source which resulted higher seed weight. Sainath *et al.* (2014) observed that, number of capitulum plant⁻¹, capitulum diameter, dry weight of capitulum, 1000 seed weight and seed yield plant⁻¹ and ha⁻¹ was obtained with the foliar spray of cycocel @ 1000 ppm and 2000 ppm at 30 and 40 DAT as compared to control in annual chrysanthemum (*Chrysanthemum coronarium* L.).

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