

Effect of pinching and foliar application of organics on vegetative, floral attributes and quality of African marigold (*Tagetes erecta* L.)

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ABSTRACT

To study the effect of pinching and foliar application of organics on vegetative, floral attributes and quality of African marigold (*Tagetes erecta* L.) var. Maxima yellow, a field experiment was conducted in randomized block design in 2015-2016 at floriculture unit, Annamalai University, Annamalainagar, Tamilnadu. The experiment comprised of 10 treatment combinations of which pinching was carried out at 15, 20 and 25 days after transplanting along with foliar application of organics viz., humic acid @ 1%, Panchagavya @ 3%, Vermiwash @ 1:5 dilution and Control (without pinching). Among the treatments, pinching at 15 days after transplanting along with foliar spray of humic acid @ 1% significantly increased the growth parameters viz., number of laterals(76.73), number of leaves(186.26), leaf area (55.30 cm²), plant spread (41.98 cm), stem diameter (1.75 cm), days taken for flower appearance(29.70) and number of flowers per plant(33.16). The flower quality parameters viz., bud size (1.47 cm), pedicel length (8.94 cm), diameter of fully opened flower (9.48 cm), length of flower stalk (8.80 cm) and single flower weight (12.25 g), period of bloom (106.75 days), shelf life (8.25 days) and physiological parameter like chlorophyll content (1.35 mg g⁻¹) and xanthophyll content (6.73 mg g⁻¹) were also registered the highest in the treatment (T₁). In general, pinching at 15 days after transplanting along with foliar spray of humic acid @ 1 per cent dilution could adjudged as the best treatment in performance of marigold.

Keywords: Maxima yellow, pinching, vermiwash, panchagavya, humic acid

INTRODUCTION

Marigold is one of the commercially exploited flower crops that belong to the family Asteraceae and genus *tagetes*. The two main popularly grown species in marigold are *Tagetes erecta* L. is popularly known as "African marigold" while *Tagetes patula* L. as "French marigold". There are several other important species viz., *Tagetes tenuifolia* L. (the striped marigold), *Tagetes lacera* L. Presently, the commercial extractions of marigold carotenoids are very popular and so it is cultivated commercially in most parts of India. Consequently large area in karnataka, Andra Pradesh, Tamil Nadu and Maharashtra are under contract farming of marigold for Xanthophyll extraction. African marigold (*Tagetes erecta* L.) is a widely cultivated as bedding plants, commercial loose flower and to extract perfume, natural colouring pigments, carotenoids, insect and nematodes repellants, nutrient supplements etc., It has the 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 of producers and traders. In order to meet the demand for fresh flowers several effects are carried out by the researchers to increase the production through improved management techniques. pinching, the terminal portion of shoots is removed early, emergence of side branches starts earlier and more number of flower with uniform size are produced (Maharnor *et al.*,2011). Foliar spray of organic nutrients act not only as a source of nutrients, but also increase size, biodiversity and activity of the plant tissues, influence structure, nutrients get turnover and many other changes related to vegetative and flower quality parameters of the plant (Ramaprabha and Vasantha. 2010). Application of organic nutrients viz., vermiwash, panchagavya, humic acid and seaweed extract have a adverse effects on production of marigold. In light of the facts an attempt was made to find a appropriate pinching and with different foliar application of organic nutrients for increasing growth and flower quality of Marigold.

MATERIALS AND METHODS

The experiment was conducted in the Floriculture Unit of Department of Horticulture, Annamalai University, Annamalai Nagar, Cuddalore district of Tamilnadu, India. As per the treatment details (table 1), the experiment was laid out in randomized block design with 10 treatments and replicated three times. Twenty five days old uniform healthy seedlings were transplanted in to the experimental field. The seedlings were planted in a uniform spacing of 30 cm x 45 cm in the plots. The inorganic nutrients (90:90:75 kg of NPK ha⁻¹) recommended fertilizer dose were applied during the last ploughing. Pinching was done at 15, 20 and 25 DAT as per the treatment schedule. The terminal growing of meristem was pinched by removing 7 cm length of shoot from top. Foliar application of required quantity of Humic acid @ 1%, Panchagavya @ 3%, Vermiwash @ 1:5 dilution and given in two sprays starting from 30 and 60 days after transplanting. The observations were recorded on the selected five randomly selected plants for each treatment in each replication. The mean data was statistically analyzed by Panse and Sukhatme (1985).

Table 1: Treatment details

Treatment no:	Treatment details
T ₁	Pinching at 15 DAT + Humic acid @ 1% foliar spray
T ₂	Pinching at 20 DAT + Humic acid @ 1% foliar spray
T ₃	Pinching at 25 DAT + Humic acid @ 1% foliar spray
T ₄	Pinching at 15 DAT + Panchagavya @ 3% foliar spray
T ₅	Pinching at 20 DAT + Panchagavya @ 3% foliar spray
T ₆	Pinching at 25 DAT + Panchagavya @ 3% foliar spray
T ₇	Pinching at 15 DAT + Vermiwash @ 1.5 dilution
T ₈	Pinching at 20 DAT + Vermiwash @ 1.5 dilution
T ₉	Pinching at 25 DAT + Vermiwash @ 1.5 dilution
T ₁₀	control

RESULTS AND DISCUSSION

The production of economical yield and better quality of marigold flowers requires proper crop management techniques. Crop regulation and flower forcing are important techniques to make the marigold production profitable. Growth regulation can be done by adopting pinching and foliar application of organics (Humic acid, Panchagavya and vermiwash). The response for these practices may vary depending upon the variety cultivated. Growth regulation and flower forcing are important techniques to make the marigold production profitable (Sehrawat *et al.*, 2003). Growth regulation can be done by adopting pinching and foliar application of organics (Humic acid, Panchagavya and Vermiwash). The results of the present investigation showed that highest plant height was recorded with treatment T₁₀ (54.13 cm) without pinching followed by T₁ with the height of 45.52 cm. The maximum number of laterals per plant (16.73), number of leaves per plant (368.13), leaf area (55.30 cm²), plant spread (41.98 cm), stem diameter (1.75 cm) were found in the treatment T₁ (Pinching at 15 DAT + Humic acid @ 1% foliar spray). The days taken for flower appearance (29.70 days) were significantly influenced by the foliar application of organics and pinching (Table 2). The day's taken for appearance of flowering was delayed in control T₁₀ (54.46 days). The increase in growth parameters is due to the elimination of apical dominance and diversion of the plant metabolites from vertical growth to horizontal growth by influencing more number of branches per plant. The increase in number of leaves per plant, leaf area, plant spread and stem diameter seems may be due to enhanced cell division and cell enlargement, promotion of protein synthesis coupled with higher dry matter accumulation in the plant. Similar results were reported by Soad *et al.*, (2013) in *Gerbera* and Mazhar *et al.* (2012).

Growth is the multidimensional web of many parameters. It is the phenotypic expression with respect to nutrient status, provided all other conditions are favorable. In the present study, minimum days taken for flower appearance (29.70 days) were registered in the plants sprayed with Humic acid @ 1% along with pinching 15 days after transplanting. These might be due to the significant effects of auxins

Table 2: Effect of pinching and foliar application of organics on growth parameters of African marigold

Treatments	Plant height (cm)	No. of laterals per plant	No. of leaves per plant	Leaf area (cm ²)	Plant spread (cm)	Stem diameter (cm)	Days taken for flower bud appearance	No. of flowers per plant
T ₁	45.52	16.73	186.26	55.30	41.98	1.75	29.70	33.16
T ₂	39.17	14.39	142.93	47.21	40.21	1.55	35.48	28.48
T ₃	32.82	11.97	99.24	39.16	38.41	1.32	47.07	23.84
T ₄	42.78	15.70	167.60	51.83	41.39	1.68	32.29	31.15
T ₅	36.43	13.31	124.07	43.74	39.04	1.47	42.87	26.47
T ₆	30.01	10.94	80.86	35.67	37.82	1.23	50.26	21.81
T ₇	41.89	15.39	161.41	50.70	40.79	1.62	36.51	30.51
T ₈	35.56	13.02	117.90	42.63	38.99	1.38	43.88	25.55
T ₉	29.21	10.63	74.37	34.54	37.22	1.15	51.29	21.17
T ₁₀	54.13	9.58	55.69	30.07	35.81	1.05	54.46	19.14
S.ED	1.24	0.35	6.52	1.26	0.27	0.02	1.23	0.70
CD(P=0.05)	2.49	0.72	13.05	2.52	0.54	0.05	2.47	1.40

with gibberellins generally obtained in short day's plants. The delayed flowering is due to lesser mitotic activity and preservation of biosynthesis of plant hormones. The maximum numbers of flowers (33.16) were noticed with pinching done of 15 days after transplanting along with foliar application of humic acid @ 1%. The minimum number of flowers was registered in control. The results are in agreement with the findings of Grawal *et al.* (2004) in chrysanthemum, Naresh Chandra Pushkar and Singh, (2012) in African marigold. The increase in flower parameters with the application of humic acid and pinching operation. Pinching is

one of the suitable horticultural techniques for successful cultivation of marigold due to pinching the apical meristem and young expanding leaves constitute a metabolic sink and auxin source that inhibit the outgrowth of lateral buds by improving the flower yield. Application of bio regulator seems to encourage the development of flower parameters is due to the probable reasons for increased morphological characters may be due to cumulative effect of foliar application of humic acid which ultimately lead to enhanced cell division and cell enlargement, promotion of protein synthesis coupled with higher dry matter accumulation in the plant.

Table 3: Effect of pinching and foliar application of organics on flower quality parameters of African marigold

Treatments	Bud size (cm)	Pedicle length (cm)	Flowers stalk length (cm)	Flower diameter (cm)	Single flower weight (g)	Period of bloom (days)	Shelf Life (days)	Chloro-phyll content (mg g ⁻¹)	Xantho-phyll Content (mg g ⁻¹)
T ₁	1.47	8.94	8.80	9.48	12.25	106.75	8.25	1.35	6.73
T ₂	1.27	8.16	8.11	8.44	10.81	98.11	7.41	0.98	5.82
T ₃	1.09	7.37	7.45	7.44	9.41	89.44	6.28	0.63	4.92
T ₄	1.41	8.69	8.50	9.03	11.63	103.86	7.96	1.19	6.34
T ₅	1.22	7.89	7.81	7.99	10.19	95.22	7.12	0.82	5.44
T ₆	1.15	7.15	7.13	6.97	8.77	86.52	6.57	0.46	4.53
T ₇	1.34	8.41	8.43	8.91	11.45	100.98	7.68	1.15	6.21
T ₈	1.16	7.61	7.75	7.89	10.03	92.32	6.84	0.79	5.31
T ₉	1.12	6.89	7.06	6.85	8.59	83.71	6.02	0.42	4.41
T ₁₀	1.01	6.17	6.74	6.40	7.97	78.15	5.44	0.26	4.02
S.ED	0.02	0.10	0.10	0.15	0.21	1.43	0.12	0.05	0.13
CD(P= 0.05)	0.04	0.21	0.20	0.30	0.42	2.86	0.24	0.10	0.27

Similarly, the flower quality in respect of bud size (1.47 cm), pedicle length (8.94 cm), diameter of fully opened flower (9.48 cm), length of flower stalk (8.80 cm) and single flower weight

(12.25 g) were significantly influenced by interaction effects of the different pinching period and foliar application of various organics (Table 3). The maximum flower diameter, length of

flower stalk and single flower weight were noticed in the treatment T₁ (Pinching at 15 DAT + Humic acid @ 1% foliar spray) and it was minimum in control respectively. The maximum period of bloom (106.75 days), Shelf Life (8.25 days), Chlorophyll content (1.35mg g⁻¹), Xanthophyll Content (6.73 mg g⁻¹) is also registered in the treatment T₁(Pinching at 15 DAT + Humic acid @ 1% foliar spray). The increase in all floral attributes and quality of African marigold is due to pinching at right period along with application of humic acid at appropriate quantity enhances all the parameters. The Humic acid is well known for its promoter effects on cell division and cell

elongation. Therefore application of humic acid might be due to increase in auxin activity in the floral buds and hence it is reported to increase the permeability of plant membrane resulting in higher metabolic activity. Similar findings were also reported by Ona *et al.*, (2015) in Snowball Chrysanthemum and Sunitha *et al.*, (2007) in African marigold.

Based on the results of the present studies it may be concluded that pinching carried out at 15 days after transplanting along with foliar application of Humic acid @ 1% was found to be superior in good growth, profuse flowering and flower yield than other treatments.

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