International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 2894-2896

Received: 05-07-2018
Accepted: 06-08-2018

Chaitra PN
M .Sc. (Agri) in Horticulture
Department of Horticulture, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Gopinath G
Professor and Technical Officer, Dean (Agri), Department of Horticulture, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Correspondence
Chaitra PN
M .Sc. (Agri) in Horticulture
Department of Horticulture, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Yield and economics of marigold (*Tagetes erecta* L.) as influenced by spacing and fertigation under open filed conditions

Chaitra PN and Gopinath G

Abstract
A field experiment comprising of six treatment combinations with spacing (60 cm x 45 cm) (60 cm x 60 cm) and water soluble fertilizers (WSF) as a nutrient source, three levels (80, 100 and 120% recommended dosage of fertilizers) and was conducted at department of horticulture, Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bengaluru during 2017-2018. The yield parameters of marigold cv. Supreme Yellow in terms of number of flowers per plant(30.80), number of flowers per unit area (450.50), single flower weight (6.20 g), and weight of 30 flowers (163.22 g), yield of flowers per plant (91.58 g), yield of flower per unit area (3.40 kg), yield of flowers per hectare (11.30 t) diameter of flower (5.74 cm) and cost benefit ratio (1:1.50) increased significantly with wider spacing at (60 cm x 60 cm) and water soluble fertilizers at 100 percent recommended dosage of fertilizers supplied through fertigation at fifteen days intervals from the study. It is evident that maximum growth parameters in marigold could be obtained by application of water soluble fertilizers at 100 percent of RDF through fertigation.

Keywords: Marigold, spacing, fertigation, yield

Introduction
Marigold is one of the most important commercially grown loose flower crops in India. It is used as loose flower or to make garlands, which are extensively used in the religious and social functions. Marigold is broadly classified into two groups, *Viz*., African marigold (*Tagetes erecta* L.) and French marigold (*Tagetes patula* L.) African marigold (*Tagetes erecta* L.) is a seasonal flowering plant which belonging to the family Asteraceae and is a native of South and Central Americas, especially Mexico. It can be used in landscaping and can also be used as bedding or potted plant. The petals of the flowers serve as a major source of Carotenoids and leaves are effective in controlling root-knot nematodes. Hence it is being grown for flowers, in addition to its medicinal value compared to ornamental plants like lilies.
In supplement to all the above applications, carotene pigments especially, lutein, a constituent of xanthophyll, from marigold flowers are extracted and plants are commercially used to manufacture poultry feed for increasing the yellow colour of yolk of eggs (Bird, 1996) [2].
Spacing plays an important role in growth and flowering of the crop. It influences the Environmental conditions. Proper spacing helps in the availability of more nutrients, aeration and light intensity by which the crop can grow properly in terms of quality and quantity.
The advantages of fertigation are that the required nutrients can be applied uniformly to each and every plant even on daily basis, thereby creating an ideal and optimum environment for the plants to absorb the required nutrient so as to reduce wastage and increase the yield substantially.

Material and methods
The experiment was conducted at the department of horticulture, Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bengaluru during 2017-2018. The soil of the experimental area was red sandy loam soil having a p^H of 6.8. the experiment consisting of two levels of spacing (60 cm x 45 cm) and (60 cm x 60 cm) and three levels of fertilizers 80, 100 and 120% recommended dosage of fertilizers (225: 60: 60 kg NPK ha^{-1}) was laid out in randomized complete block design and replicated four. There were total six treatments as given below.

T_1: 60 cm x 45 cm with 80 percent of Recommended Dosage of Fertilizers
T_2: 60 cm x 45 cm with 100 percent of Recommended Dosage of Fertilizers
T_3: 60 cm x 45 cm with 120 percent of Recommended Dosage of Fertilizers
T_4: 60 cm x 60 cm with 80 percent of Recommended Dosage of Fertilizers
T_5: 60 cm x 60 cm with 100 percent of Recommended Dosage of Fertilizers
T_6: 60 cm x 60 cm with 120 percent of Recommended Dosage of Fertilizers

The single plot size 3x3 m. and number of plants/ unit area is 12 plants, and FYM 25 t ha^{-1} were applied. Fertigation treatments received fertilizers at 15 days intervals from date of transplanting till harvesting.
Weeding and plant protection measures were taken up when required. From each treatment 10 plants were selected at random for recording yield characters, *viz*, number of flowers per plant, number of flowers per unit area, single flower weight, weight of 30 flowers, yield of flowers per plant, yield of flower per unit area, yield of flowers per hectare, diameter of flower and cost economics. And the flowers were harvested as and when flowers attained full bloom stage.

Results and discussion
From the data presented in Table 1, Flower characteristics such as number of flowers per plant, (30.80) number of flowers per unit area, (450.50) single flower weight (6.20 g) and weight of 30 flowers and (163.22 g) were found to be significantly higher with T_5 (60 cm x 60 cm and 100 percent RDF) supplied through fertigation Highest number of marigold flowers per plant, per unit area, single flower weight and weight of 30 flowers were found to be associated with wider spacing and medium level of recommended dosage of fertilizers, better vegetative traits, uptake of Nitrogen, phosphorus and potassium through fertigation as reported in the data obtained by soil and plant analysis, thus resulting in early flower bud initiation, first flowering and fifty percent flowering, might have produced higher yield of flowers per plant, per unit area and per hectare taking influence from the favourable environmental factors prevailing during the period of growth.
In contrast, lower number of flowers per plant and per unit area, lower single flower weight and weight of 30 flowers which were found to be associated with closer spacing and the lesser level of recommended dosage of fertilizers might be the result of competition between the marigold plants for space, nutrients, water and light as reflected in lower height of and marigold plant and minimal spread of marigold plant delayed first flower bud initiation, first flowering, and fifty percent flowering, ultimately observed in the results obtained with respect to lowest yield of flowers per plat, per unit area and per hectare. The results so obtained could be attributed to better root proliferation, more photosynthates enhancing the food accumulation that might have resulted in better plant growth and subsequently, number of flowers per plant and per unit area. (Singh *et al.* 1989) in African marigold and (Dongre 1984) [3] in cosmos also recorded more number of flowers with wider spacing. Similar results also have been reported by (Krishna 1998) [6] in carnation, (Nelmesh and Roychowdhury 1989) [7] in gladiolus, (Sharma and Mohammad 2004) [8] in tuberose.

Table 1: Yield parameters as influenced by levels of spacing and fertigation in marigold Cv. Supreme Yellow under open field conditions

Treatment	Number of flower / plant	Number of flowers / unit area	Single flower weight (g)	Weight of 30 flowers (g)	Yield of flower / plant (g)	Yield of flower / unit area (kg)	Yield of flower hectare (t)	Diameter of flower (cm)
T_1 : 60 cm x 45 cm with 80 percent of RDF	28.53	403.00	5.23	148.34	57.38	2.68	8.90	4.32
T_2 : 60 cm x 45 cm with 100 percent of RDF	29.43	410.50	5.54	157.03	87.83	3.00	9.93	5.62
T_3 : 60 cm x 45 cm with 120 percent of RDF	29.63	434.25	5.40	159.25	70.52	2.85	9.49	5.23
T_4 : 60 cm x 60 cm with 80 percent of RDF	29.47	406.75	5.35	157.44	63.83	2.91	9.69	5.43
T_5 : 60 cm x 60 cm with 100 percent of RDF	30.80	450.50	6.20	163.22	91.58	3.40	11.30	5.74
T_6 : 60 cm x 60 cm with 120 percent of RDF	30.10	430.75	5.70	159.69	82.15	3.20	10.60	5.41
Mean	29.99	422.62	5.58	157.49	74.54	3.00	9.98	5.52
F-test	*	*	*	*	*	*	*	*
S.Em±	0.23	4.77	1.05	1.40	4.14	0.17	0.01	0.15
CD@ 5%	0.69	14.31	0.35	4.18	12.42	0.50	0.02	0.45

From the data presented in Table 1, yield of flowers per plant (91.58 g), yield of flower per unit area (3.40 kg), yield of flowers per hectare (11.30 t), and diameter of flower (5.74 cm). were found to be significantly higher with T_5 (60 cm x 60 cm and 100 percent RDF) supplied through fertigation. The advantages of wider spacing coupled with better uptake of soil moisture and nutrients, as depicted in soil and plant sample analysis, coupled with congenial environmental conditions during the period of growth have produced the positive results of higher yield of marigold flowers per plant, per unit area and per hectare. Maximum diameter of marigold flower was registered with wider spacing and medium level of recommended dosage of fertilizers. This may be due to shorter period of vegetative growth followed by early breaking of apical dominance and better uptake and translocation of water and nutrients as distributed in soil and plant analysis samples, in which was found lower levels of NPK contents in soil and higher level of NPK contents in plant samples during reproductive phase of marigold plant. The results are in conformity with the findings of (Anuradha *et al.* 2015) [15] and (Jitendra *et al.* 2003) [5].

Economics
From the data presented in Table 2 Maximum total yield (11.30 t ha^{-1}), gross returns (Rs. 3,39,000 /-) and net returns (Rs. 1,16,378 /-), Cost: Benefit ratio of (1:1.50) were found to be associated with T_5 (60 cm x 60 cm with 100 percent of RDF). The cost economics have indicated that wider spacing with optimum level of recommended dosage of fertilizers was beneficial for marigold crop.
(Krishna 1998) [6] obtained similar results wherein maximum net profit (Rs. 59,168/m^2) was associated with fertigation level of 100 percent recommended dosage of fertilizers.

Table 2: Cost of cultivation of marigold grown under open field conditions

Treatment	Total Yield (t ha^{-1})	Gross Returns (Rs.)	Total cost of Cultivation (Rs.)	Net returns (Rs.)	Cost: Benefit
T_1 : 60 cm x 45cm with 80 percent of RDF	8.9	2,67,000	2,43,808	23,192	1:1.09
T_2 : 60 cm x 45 cm with 100 percent of RDF	9.93	2,97,900	2,50,288	47,612	1:1.19
T_3 : 60 cm x 45 cm with 120 percent of RDF	9.49	2,84,700	2,56,762	27,938	1:1.10
T_4: 60 cm x 60 cm with 80 percent of RDF	9.69	2,90,700	2,16,142	74,558	1:1.30
T_5 : 60 cm x 60 cm with 100 percent of RDF	11.3	3,39,000	2,22,622	1,16,378	1:1.50
T_6 : 60 cm x 60 cm with 120 percent	10.6	3,18,000	2,29,096	88,904	1:1.35

References

1. Anuradha K, Pampapathy K, Narayana N. Effect of nitrogen and phosphorus on flowering, yield and quality of marigold. Indian J Hort. 2015; 47(3):353-357.
2. Bird JN. Cost Effecttive egg yolk pigmentation. In: Proceeding of the 8thAustralian Poultry Science Symposium, 1996, 219.
3. Dongre GN, Standardization of horticultural practices and for commercial production of marigold (*Tagetes erecta* L.). M.Sc. (Hort.) Thesis, University of Agricultural Sciences, Bangalore, 1984, 56.
4. Janakiram, Rao. preliminary studies on genetic parameters as affected by plant density in marigold (*Tegetus erecta* L.) J Ornam. Hort. 1995; 3(1):45-48.
5. Jitendra SS, Chauhan, Singh PV, Response of N, P fertilization on china aster. J Orna. Olerticulture. 2003; 6(1):82-88.
6. Krishna B. Studies on fertigation on carnation (*Dianthus caryophyllus* L.) under cover. M.Sc. Thesis, University of Agricultural Sciences, Bangalore. 1998; 8(2):15-45.
7. Nelmesh N. Roychowdhury M. Effect of plant spacing and growth and flower yield of gladiolus grown under polythene tunnel. Acta Hort. 1989; 246:259-263.
8. Sharma RK, Mohammad S. Influence of graded levels of nitrogen and sulphur on growth, flowering and essential oils content in tuberose cultivar mexican single. J Ornam. Hort. 2004; 7(1):52-57.