

Original Research Article

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Effect of Different Levels of Fertigation on Flowering and Storage Life of Marigold (*Tagetes erecta* L.) CV. Pusa Narangi Gainda

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ABSTRACT

Keywords

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An experiment was conducted to study the effect of levels of fertigation on flowering and shelf life of marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda under open conditions at Floricultural Research Station, Rajendranagar, Hyderabad during 2016-2017. The experiment consisted of seven levels of fertigation treatments with combination of water soluble and straight fertilizers. The results revealed that flowering and storage life of marigold flowers were significantly influenced by different levels of fertigation. Duration of flowering (45.74 days), number of pickings per month (5.10), flower yield per plot (23.37 kg /plot) and flower yield per hectare (14.42 t/ha) were maximum with the application of 75 per cent of recommended dose of fertilizers (RDF) with Water Soluble fertilizers. Further at the same fertigation level shelf life of flowers (3.59 days) and shelf life of flowers packed in polyethylene cover (5.25 days) were recorded maximum.

Introduction

In India, various traditional flowers have been growing since time immemorial, among those, marigold has a unique status. Marigold is one of the easiest grown annual flowers and has wide adaptability to different soil and climatic conditions. The plants with their attractive flower colour and long blooming period remain fresh for quite a long time after plucking. All these factors have made marigold as one of the most popular annual flowers in India, for garden display as well as for commercial cultivation.

Fertigation is found to be a most proven technique for applying nutrients through micro irrigation systems directly at the site of active root zone. It has potential for more accurate and timely crop nutrition leading to increased yields, enhanced quality and early crop maturity. Fertigation also helps to reduce the wastage of nutrients through enhanced fertilizer use efficiency, besides providing flexibility in timing of fertilizer application in relation to crop demand based on physiological stages of growth (Papadopoulos, 1992), it also helps in economizing the use of water and fertilizers and reducing the cost of

cultivation by reducing the cost of water, fertilizers, labour and energy (Khan *et al.*, 1997). Inadequate plant nutrition causes serious nutritional disorders in marigold cultivation and may eventually lead to decline of plant vigour and ultimately reduction of yield.

Hence, for successful cultivation of marigold optimum level of fertilizer dosages through fertigation need to be worked out in improving the fertilizer use efficiency and reducing the cost of cultivation. In view of above facts the present work has been taken up to study the influence of different levels of fertigation and sources of nutrients in marigold cv. Pusa Narangi gainda.

Materials and Methods

The experiment was conducted during the year 2016 -17 to study the effect of levels of fertigation on flowering and storage life of marigold grown under open conditions at Floricultural Research Station, Rajendranagar, Hyderabad. The experiment site was red sandy loam soil with a pH of 7.38 and EC 0.33. The experiment was laid out in Randomized Block Design (RBD) comprising seven treatments with three replications and RDF of 90:90:75 kg NPK ha⁻¹. The treatments consists of T₁: 75% of RDF with Water soluble fertilizers (WSF), T₂: 100% of RDF with WSF, T₃: 125% of RDF with WSF, T₄: 75% of RDF as WSF + 25 % of RDF as straight fertilizers (SF), T₅: 50% of RDF as WSF + 50% of RDF as SF, T₆: 25% of RDF as WSF + 75% of RDF as SF, T₇: 100% of RDF as SF (control). At last ploughing 20 tonnes of Farm yard manure and 422 kilo grams of Single super phosphate (75% RDF) were applied as basal, along with this each 2 kilo grams of *Azospirillum*, 2.5 kilograms of *Pseudomonas fluorescens* and *Phospho bacteria* were mixed with 50 kg of FYM per hectare and were applied uniformly for all the treatments.

The drip irrigation system and venturi injector fertigation unit were installed as per the experimental layout and treatment plan. Twenty five days old healthy and uniform seedlings of cv. Pusa Narangi gainda were transplanted in the main field in double row system of planting at four leaf stage with a spacing of 60 cm between the rows and 30 cm between the plants. Water soluble fertilizers and straight fertilizers were applied as per the treatment combinations. Fertigation was given twice a week as per the plant growth stage. Observations were recorded on flower parameters and storage life of marigold flowers in different treatments. The data collected were subjected to statistical analysis as per Panse and Sukhatme (1978).

Results and Discussion

The data pertaining to the flowering and storage life of marigold cv. Pusa Narangi Gainda are presented in tables 1 and 2 respectively.

The application of different levels of fertigation in water soluble and straight fertilizers differed non-significantly in plant spread during initial stages of plant growth (in both directions E-W and N-S). This might be due to various levels of fertigation had no significant influence on growth and development at early stages of plant growth. On contrary, Palanisamy *et al.*, (2015) in gerbera and Vasudevan *et al.*, (2014) in rose reported significant differences in plant spread under different fertigation levels.

The results indicated that there was no significant difference in stem girth of marigold under different levels of fertigation at first flower bud appearance stage. This concurs with the results of a study conducted by Henny (1999) who observed non significant difference at initial stages in anthurium plants.

The results revealed that the fertigation at various concentrations had significant influence on flowering duration of marigold. The duration of flowering in marigold was enhanced with the application of 75 per cent of RDF using WSF and recorded the maximum flowering duration of 45.74 days and minimum duration of flowering (33.68 days) was recorded with 125 per cent of RDF using WSF. This might be due to nutrient levels that are above optimum level did not improve the plant growth and in addition excessive nutrients can cause adverse effects on plant growth (Manian *et al.*, 2006). This result supports earlier findings of Vijay Kumar *et al.*, (2010) and Thamara *et al.*, (2010) in china aster who reported earlier significant difference in duration of flowering with different levels of fertigation.

The analysis of the data showed that statistically there was significant influence on number of flower pickings month⁻¹ of marigold cv. Pusa Narangi Gaiinda. The maximum flower pickings month⁻¹ (5.10) was recorded with the application of 75 per cent of RDF as WSF followed by 25 per cent of RDF as WSF + 75 per cent of RDF as SF (5.06). This attributes might be due to continuous and optimal supply of nutrients increases nutrient uptake of plant resulted in better growth in terms of number of branches, increased number of flowers which in general have significant positive correlation with number of pickings. The results of the present study are in conformity with Thumar *et al.*, (2013), Kapadiya *et al.*, (2007) and Naik *et al.*, (2008) in marigold.

Significant difference was recorded among treatments on flower yield plot⁻¹ and flower yield ha⁻¹ of marigold. The maximum flower yield plot⁻¹ (23.37 kg) and flower yield ha⁻¹ (14.42 t) were obtained with 75 per cent of RDF with WSF might be due to the continuous supply of optimum dose of water

soluble fertilizers in available form through fertigation at critical stages of plant growth leads to higher uptake and better translocation of assimilates from source to sink which in turn increased the yield. This finding is in accordance with the findings of Gopinath and Chandra Shekar (2009) in carnation and Shrikant *et al.*, (2014) in gerbera.

Increase of shelf life of marigold flowers enables the storage of flowers for a length of time during the surplus production in the market and is also feasible for the long distance transportation. Application of 75 per cent of RDF using WSF was recorded significantly maximum shelf life of flowers (3.59 days) while the minimum shelf life of flowers (2.50 days) was recorded (T₂) in 100 per cent of RDF using WSF in room conditions. The increase in level of fertigation decreased the shelf life of flowers in marigold. According to Anuradha *et al.*, (1990) this results might be due to higher dose of nitrogen keeps the flower soft and succulent in texture which resulted in higher and faster respiration and dehydration. Similar observations were earlier reported by Ganesh *et al.*, (2014) in chrysanthemum and Vijay kumar *et al.*, (2010) in China aster.

In ambient room conditions, shelf life of marigold flower in polyethylene cover was increased significantly with various concentrations of fertigation. The flowers from the treatment 75 per cent of RDF using WSF recorded maximum shelf life of PE packed flowers (5.25 days) and it was on par with the treatment 25 per cent of RDF as WSF + 75 per cent of RDF as SF (4.83 days). Maintenance of maximum freshness in flowers in this case might be due to higher levels of moisture content. Due to maintenance of appreciable levels of moisture, the enzymes peroxidase and catalase remained highly active thus delaying the aging of flowers (Tanner *et al.*, 2001) (Fig. 1 and 2).

Table.1 Effect of levels of fertigation on growth and flowering characters of marigold cv. Pusa Narangi Gaiinda

Treatments	Plant spread (cm)		Stem girth (mm)	Flowering duration (day)	No. of pickings per month
	(E-W)	(N – S)			
T ₁ : 75% of RDF using WSF	41.00	11.52	8.41	45.74	5.10
T ₂ : 100% of RDF using WSF	36.27	9.97	7.55	34.20	4.37
T ₃ : 125% of RDF using WSF	36.82	10.62	7.49	33.68	4.31
T ₄ : 75% of RDF as WSF + 25 % of RDF as SF	37.13	10.32	7.81	34.67	4.37
T ₅ : 50% of RDF as WSF + 50% of RDF as SF	39.90	10.65	7.53	34.50	4.35
T ₆ : 25% of RDF as WSF + 75% of RDF as SF	38.10	11.21	8.27	44.50	5.06
T ₇ : 100% straight fertilizers (Control)	37.43	10.60	8.08	43.82	4.93
S.Em ±	1.57	0.46	0.07	0.84	0.02
CD (P= 0.05)	N.S.	N.S.	0.21	2.61	0.06

RDF- Recommended Dose of Fertilizers, SF- Straight Fertilizers, WSF- Water soluble fertilizers
 RDF - 90:90:75 kg NPK ha⁻¹

Table.2 Influence of levels of fertigation on flower yield and shelf life of marigold cv. Pusa Narangi Gaiinda

Treatments	Flower yield (kg plot ⁻¹)	Flower yield (t ha ⁻¹)	Shelf life of loose flowers (day)	Shelf life of flowers in PE cover (day)
T ₁ : 75% of RDF using WSF	23.37	14.42	3.59	5.25
T ₂ : 100% of RDF using WSF	20.74	12.80	2.50	4.02
T ₃ : 125% of RDF using WSF	19.37	11.96	2.51	4.20
T ₄ : 75% of RDF as WSF + 25 % of RDF as SF	20.63	12.73	2.72	4.07
T ₅ : 50% of RDF as WSF + 50% of RDF as SF	20.69	12.77	2.56	4.01
T ₆ : 25% of RDF as WSF + 75% of RDF as SF	22.84	14.28	3.36	4.83
T ₇ : 100% straight fertilizers (Control)	22.82	14.23	3.11	4.35
S.Em ±	0.25	0.07	0.07	0.19
CD (P= 0.05)	0.78	0.20	0.21	0.59

RDF- Recommended Dose of Fertilizers, SF- Straight Fertilizers, WSF- Water soluble fertilizers, PE- Polyethylene
 RDF - 90:90:75 kg NPK ha⁻¹

Fig.1 Effect of different levels of fertigation on shelf life of marigold flower (day) at ambient room conditions

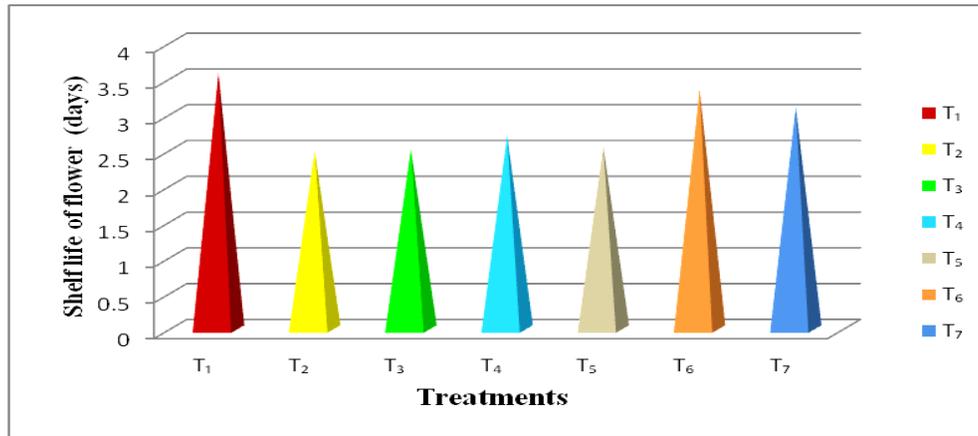
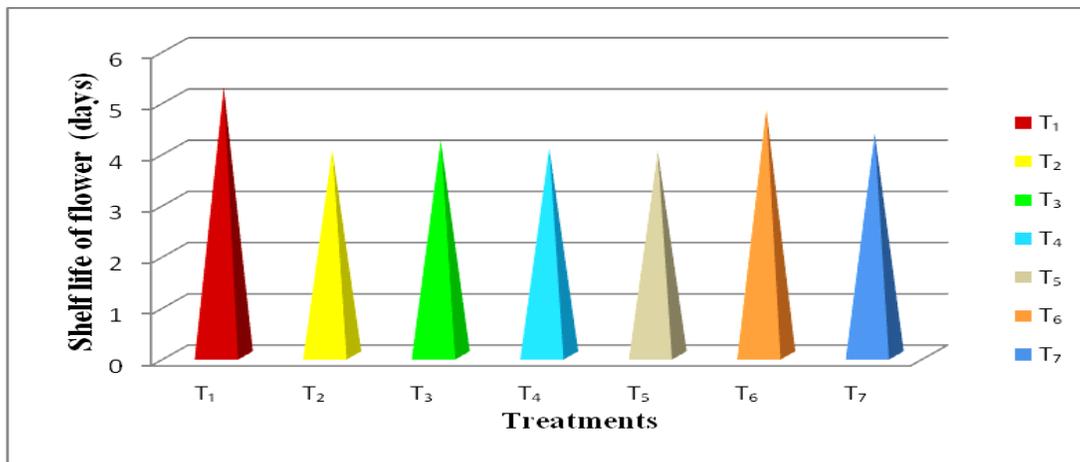


Fig.2 Effect of different levels of fertigation on shelf life of marigold flower packed in polyethylene cover at ambient room conditions (day)



*T₁ - 75% of RDF using WSF, T₂ - 100% of RDF using WSF, T₃ - 125% of RDF using WSF, T₄ - 75% of RDF as WSF + 25% of RDF as SF, T₅ - 50% of RDF as WSF + 50% of RDF as SF, T₆ - 25% of RDF as WSF + 75% of RDF as SF, T₇ - 100% of RDF as SF (control).

From the results of the present investigation, it can be inferred that the fertigation with 75 per cent of recommended dose of fertilizers with water soluble fertilizers proved to be most optimal dose for increasing yield and shelf life of marigold flowers grown during rabi season under Telangana conditions.

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