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Full Length Research Article

INFLUENCE OF ORGANIC AMENDMENTS AND GROWTH REGULATORS ON YIELD ASPECTS OF FRENCH MARIGOLD (*TAGETUS PATULA* L.)

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ABSTRACT

Field experiment was undertaken during 2014-2015 to find out the influence of different organic inputs and growth regulators on yield and quality of french marigold (*Tagetus patula* L.) cv. Sindhamani, in a farmer's field at Sivapuri near Annamalainagar, Tamil Nadu. Various organic inputs and growth regulators including panchakavya 2 per cent, vermiwash 1: 5 dilution, humic acid 0.02 per cent, gibberellic acid 300 ppm, triacontanol 250 ppm were applied and yield and quality characters were studied at different stages of crop growth. The treatment with gibberellic acid @ 300 ppm + panchakavya @ 3 per cent recorded maximum number of flowers per plant, flower yield per plant, single and ten flower weight, flower diameter and number of petals per flower compared to other treatments. The gibberellic acid @ 300 ppm + vermiwash 1:5 dilution were considered as the next best level in terms of, yield characters of the french marigold.

Key Words: French marigold, organic inputs, growth regulator, yield, dry matter.

INTRODUCTION

Marigold, a member of the genus *Tagetus* of the family Asteraceae is one of the important flowering annuals, cultivated commercially in India for use as bedding plant, loose flower for making garlands, wreath, religious offering, colour pigments, insect and nematode repellants and as nutrient supplement for poultry feed and cut flower purposes. Marigold gained popularity among gardeners and flower dealers on account of its easy culture and wide spectrum of attractive colours, shape, size and good keeping quality. There are four species of marigold that are typically used in horticulture and among them french marigold is smaller and more graceful. Marigold is one of the most important species grown commercially for loose flowers in different parts of India especially in the tropical and subtropical regions. It is used in landscape gardening due to its variable height and colour of flower. It is ideal for rockery, edging, hanging baskets and window boxes. In recent times, the flowers are also used for extraction of natural colouring materials used for cosmetic and food colouring (Ashraf *et al*., 2005). Carotenoids in marigold have emerged as poultry feed mix for improving egg yolk pigmentation and its production. Lutein a major component of carotenoid is having therapeutic values. Panchakavya, a bio promoter with a combination of five products obtained from the cow, which includes cow dung, cow's urine, milk, curd and ghee has the potential to play the role of promoting growth and providing immunity in plant system. It enhances the quality and shelf life of vegetables and flowers (Palani Kumar, 2006). Vermiwash, a collection of excretory produce and mucas secretion of earthworms along with micronutrient and organic molecules, is a very useful foliar spray. Its importance as fertilizer and micronutrient in crop plants have been widely reported (Paithankar*et al*., 2004). Humic acid influences plant growth through modifying the physiology of plants and by improving the physical, chemical and biological properties of the soil (Stevenson, 1994). Plant growth regulators, such as gibberellic acid when applied exogenously, influence various aspects of plant development and biosynthesis of its important components (Kewalan and Pandey, 1998). The use of gibberellic acid for boosting the growth and vigor of various horticultural plants have been well documented (Gul*et al*., 2006). Triacontanol, a photosynthetic enhancer had been found to increase photosynthesis, reduce photorespiration and promoted growth and yield of several horticultural crops (Muralidharan *et al*., 2002). The use of organic inputs is one of the modern techniques to increase the yield in flower crops. Hence, it becomes imperative to identify suitable organic inputs and growth regulators to get higher yield in french marigold.

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MATERIALS AND METHODS

The present investigation entitled, "Influence of organic inputs and growth regulators on yield and quality of french marigold (*Tagetus patula* L.)", was carried out during 2014-2015 in a farmer's field at Sivapuri, located at 3 km from Annamalainagar, Tamil Nadu.The seedlings of french marigold (*Tagetus patula* L.) cv. Sinthamani were obtained from Hosur, Tamil Nadu. The soil texture of the experimental area was sandy loam with a pH of 7.6 and EC of 0.77 m mhos cm. The experiment was laid out in a randomized block design (RBD) replicated thrice. Three different growth regulators with two concentrations each and three organic inputs with control formed 12 treatments viz., gibberellic acid @ 300 ppm (T_1), panchakavya @ 3 per cent (T_2), vermiwash 1:5 dilution (T_3), triacontanol @ 250 ppm (T_4), humic acid @ 0.02 per cent (T_5), gibberellic acid @ 300 ppm + panchakavya @ 3 per cent (T_6), gibberellic acid @ 300 ppm + vermiwash 1:5 dilution (T_7), gibberellic acid @ 300 ppm + humic acid @ 0.02 per cent (T_8), triacontanol @ 250 ppm + panchakavya @ 3 per cent (T_9), triacontanol @ 250 ppm + vermiwash 1:5

Table 1. Effect of organic inputs and growth regulators on number of flowers per plant and flower yield per plant (g) in french marigold

Treatments	Number of flowers per plant	Flower yield per plant (g)
T_1 – Gibberellic acid @ 300 ppm	22.55	150.63
T_2 – Panchakavya @ 3 %	15.31	128.27
T_3 – Vermiwash 1: 5 dilution	14.38	113.37
T_4 – Triacontanol @ 250 ppm	16.03	133.06
T_5 – Humic acid @ 0.02 %	13.42	102.74
T_6 – Gibberellic acid @ 300 ppm + Panchakavya @ 3 %	29.29	179.43
T_7 – Gibberellic acid @ 300 ppm + Vermiwash 1: 5 dilution	27.16	168.01
T_8 – Gibberellic acid @ 300 ppm + Humic acid @ 0.02 %	24.77	160.53
T_9 – Triacontanol @ 250 ppm + Panchakavya @ 3 %	19.65	148.32
T_{10} – Triacontanol @ 250 ppm + Vermiwash 1: 5 dilution	17.32	142.71
T_{11} – Triacontanol @ 250 ppm + Humic acid @ 0.02 %	17.02	138.28
T_{12} – Absolute control	13.82	93.71
SE.d	0.54	2.71
C.D. (p=0.05)	1.13	5.62

Table 2. Effect of organic inputs and growth regulators on single and ten flower weight (g) in french marigold

Treatments	Single flower weight (g)	Ten flower weight (g)
T_1 – Gibberellic acid @ 300 ppm	1.45	15.58
T_2 – Panchakavya @ 3 %	0.97	9.68
T_3 – Vermiwash 1: 5 dilution	0.91	9.14
T_4 – Triacontanol @ 250 ppm	1.02	10.15
T_5 – Humic acid @ 0.02 %	0.85	8.51
T_6 – Gibberellic acid @ 300 ppm + Panchakavya @ 3 %	2.23	23.93
T_7 – Gibberellic acid @ 300 ppm + Vermiwash 1: 5 dilution	1.90	19.25
T_8 – Gibberellic acid @ 300 ppm + Humic acid @ 0.02 %	1.64	17.27
T_9 – Triacontanol @ 250 ppm + Panchakavya @ 3 %	1.40	14.08
T_{10} – Triacontanol @ 250 ppm + Vermiwash 1: 5 dilution	1.33	13.23
T_{11} – Triacontanol @ 250 ppm + Humic acid @ 0.02 %	1.12	11.15
T_{12} – Absolute control	0.05	0.49
SE.d	0.08	0.54
C.D. (p=0.05)	0.16	1.11

Table 3. Effect of organic inputs and growth regulators on flower diameter (cm) in french marigold

Treatments	Flower diameter (cm)
T_1 – Gibberellic acid @ 300 ppm	5.02
T_2 – Panchakavya @ 3 %	3.91
T_3 – Vermiwash 1: 5 dilution	3.74
T_4 – Triacontanol @ 250 ppm	4.08
T_5 – Humic acid @ 0.02 %	3.51
T_6 – Gibberellic acid @ 300 ppm + Panchakavya @ 3 %	6.25
T_7 – Gibberellic acid @ 300 ppm + Vermiwash 1: 5 dilution	5.46
T_8 – Gibberellic acid @ 300 ppm + Humic acid @ 0.02 %	5.34
T_9 – Triacontanol @ 250 ppm + Panchakavya @ 3 %	4.72
T_{10} – Triacontanol @ 250 ppm + Vermiwash 1: 5 dilution	4.42
T_{11} – Triacontanol @ 250 ppm + Humic acid @ 0.02 %	4.23
T_{12} – Absolute control	3.15
SE.d	0.32
C.D. (p=0.05)	0.67

dilution (T_{10}), triacontanol @ 250 ppm + humic acid @ 0.02 per cent (T_{11}) and absolute control (T_{12}).The field was prepared by thorough ploughing and well decomposed farm yard manure was applied at the rate of 25 tonnes per hectare and plots of 1.5 m x 0.9 m dimension were formed. Thirty days old healthy uniform seedlings were transplanted in the main field. Two seedlings were planted per hill and later on thinned out to one. All cultural practices were adopted as recommended.

RESULTS AND DISCUSSION

Yield is a complex phenomenon which is being influenced by various yield components. Organic inputs and growth regulators have shown to play an important role on the yield components of french marigold.

In the present study, highest number of flowers and highest flower yield per plant were recorded in the treatment of gibberellic acid along with panchakavya (T_6). The enhancement in number of flower per plant (29.29) and yield per plant (179.43 g) might be due to the production of greater vegetative growth which had accumulated carbohydrate for proper flower bud differentiation (Table 1). The result was in close conformity with Sunitha *et al*. (2007) and Mithilesh Kumar *et al*. (2014). Vermiwash application would have helped in producing increased number of flowers due to the presence of phosphates, chloride as potassium, sodium, magnesium, sulphur, iron and ammonia. Further, the presence of all the salts in soluble from would have diffused into plant system through the stomatal opening thus influencing the partitioning capacity of plants which in turn might have increased the yield. The complementary effect of gibberellic

acid and panchakavya might have resulted in highest flower yield. The findings of Natarajan *et al*. (1981), Ramesh Kumar and Gill (1983) in *Jasminum sambac*, Waheeduzzama (2004) in anthurium, Rajeswari*et al*. (2006) in chrysanthemum are in agreement with the results of the present study. The single (2.23 g) and ten flower weight (213.93 g) was also the highest in treatment of gibberellic acid along with panchakavya (Table 2). The higher flower yield is a manifestation of other yield contributing character like weight of flower (ten flower weight). The increased flower weight due to gibberellic acid in combination with panchakavya might be due to its complementary effect (Table 2). Similar results have been reported by Shivaprakash*et al*. (2011) in marigold and Chitra and Patil (2007) in china aster. The highest flower diameter (6.25 cm) was recorded in the treatment of gibberellic acid along with panchakavya (Table 3). The increment in flower diameter might be due to enhanced cell division and cell enlargement, promotion of protein synthesis coupled with higher dry matter (Dalai *et al*., 2009). Similarresult was also reported by Tyagi and Kumar (2006) and Mithilesh Kumar *et al*. (2014). The enlargement of flower size is caused by drawing photosynthates to the flower as a consequence of intensification of sink. This might be the reason for increased flower life due to the spray of higher concentration of panchakavya along with inorganic fertilizer.

Conclusion

It could be concluded that treatment of gibberellic acid @ 300 ppm along with panchakavya @ 3 per cent foliar spray was adjudged as the best treatment for enhancing the flower yield of french marigold.

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