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Effect of *Jeevamrut* on yield of African marigold (*Tagetes erecta* L.)

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Abstract
An experiment titled "Effect of *Jeevamrut* on yield of African marigold (*Tagetes erecta* L.)" was conducted during *Rabi* 2023 at the College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India. In this study Randomized Block Design was used a with three replications and evaluated sixteen treatments *i.e*. control (T_1), *Jeevamrut* drenching @ 500 l/ha (T_2), 750 l/ha (T_3), 1000 l/ha (T_4), 5% *Jeevamrut* foliar application (T_5), 10% (T_6), 15% (T_7), combinations of drenching and foliar application at various rates (T_8-T_{16}). The treatment T_{13} (*Jeevamrut* drenching @ 750 l/ha + 15% foliar application) showed superior results of yield parameters such as number of flowers per plant (82.33), flower yield per plant (528.49 g), flower yield per plot (5.57 kg) and flower yield per ha. (171.81 q)) as compared to the other treatments. Based on economics, among all the treatments maximum benefit cost ratio (2.38) was found with T_{13} (*Jeevamrut* drenching @ 750 l/ha + 15% *Jeevamrut* foliar application).

Keywords: RDF, *Jeevamrut*, marigold, yield

Introduction
Flowers are the best creation of the God which can be the reason of millions of smiles and happiness. Flower symbolizes beauty, purity, peace, love, passion and integrity. It is said that man born with the flowers, lives with the flowers and finally dies with the flowers. Floral ornaments, bouquets or flower arrangements also find a pride of place in social gatherings, birthday parties, welcoming a home coming friend or relative and honouring dignitaries. The state flower of Gujarat, marigold belongs to family Asteraceae occupies an important place in ornamental horticulture. The genus *Tagetes* has 33 species which includes *Tagetes erecta* (African marigold*), T. patula* (French marigold), *T. tenuifolia* (Signet marigold), *T. sarmentosa* (Climbing marigold*), T. lucida* (Sweetscented marigold), *T. filifolia* (Irish lace), *T. lacera, T. lemmoniand, T. minuta*, etc., (Rydberg, 1945) [7]. Among all of this most popular and commercially grown species are *T. erecta* and *T. patula* with their centre of origin at Mexico and South Africa, respectively. In India, marigold is one of the most important hardy flower crops which is commercially grown and used extensively on religious and social functions in different forms as well as in landscaping. The area under cultivation of marigold in Gujarat is 9732 ha with 90286 MT production and productivity 9.28 MT/ha (Anonymous, 2023) [1]. Marigold flowers and leaves are equally important from medicinal point of view. Leaves are extensively used against boils and carbuncles. A flavonoid "Patulitrin" is responsible for the antibacterial action of marigold (Rhama and Madhavan, 2011) [6].

Jeevamrut is one such natural amendment which can either replace or complement and reduce the use of chemical fertilizers and reclaim the sustainability of the soil and environment. It is prepared from cow dung, cow urine, pulse flour, jaggery and one handful of forest soil. Foliar application of *jeevamrut* also brings in some changes in the phylosphere microclimate. *Jeevamrut* enriches the soil with nutrients and increases the soil fertility. Soil application of *jeevamrut* create favourable conditions for the availability of nutrients by increasing pH in acidic soils and decreasing the pH in alkaline soils and maximizing nutrient availability at pH 6.5 to 7.8 (Kulkarni, 2019) [2]. *Jeevamrut* is considered as a miracle of natural farming as it is easy to

prepare, composed of macro and micro nutrients, presence of beneficial microorganisms like some bacteria, actinomycetes and some fungi (Reddy and Menon, 2021) [5]. *Jeevamrut* is acidic in nature (4.93) and good source of macro and micro nutrient *viz*., N (1.97%), P (0.172%), K (0.29%), Mn (47 ppm) and Cu (50 ppm) (Kumar *et al.,* 2021) [3]. This natural preparation stimulates the activity of N fixers, P solubilizers and other beneficial microorganisms which are useful to plants.

Materials and Methods

A field experiment on African marigold (var. Pusa Narangi Gainda) was conducted at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during *rabi* 2023-24. The experiment was laid out in Randomized Block Design with total sixteen treatments. The treatments contain Control (without *jeevamrut*) (T_1), *Jeevamrut* drenching @ 500 l/ha (T_2), *Jeevamrut* drenching @ 750 l/ha (T_3), *Jeevamrut* drenching @ 1000 l/ha (T_4), 5% *Jeevamrut* foliar application (T_5), 10% *Jeevamrut* foliar application (T_6), 15% *Jeevamrut* foliar application (T_7), *Jeevamrut* drenching @ 500 l/ha + 5% *Jeevamrut* foliar application (T_8), *Jeevamrut* drenching @ 500 l/ha + 10% *Jeevamrut* foliar application (T_9), *Jeevamrut* drenching @ 500 l/ha + 15% *Jeevamrut* foliar application (T_{10}), *Jeevamrut* drenching @ 750 l/ha + 5% *Jeevamrut* foliar application (T_{11}), *Jeevamrut* drenching @ 750 l/ha + 10% *Jeevamrut* foliar application (T_{12}), *Jeevamrut* drenching @ 750 l/ha + 15% *Jeevamrut* foliar application (T_{13}), *Jeevamrut* drenching @ 1000 l/ha + 5% *Jeevamrut* foliar application (T_{14}), *Jeevamrut* drenching @ 1000 l/ha + 10% *Jeevamrut* foliar application (T_{15}), *Jeevamrut* drenching @ 1000 l/ha + 15% *Jeevamrut* foliar application (T_{16}) replicated three times.

The experimental soil was loamy sand, with good drainage condition. The recommended dose of Farm Yard Manure @ 25 t/ha and fertilizer 250:100:100 kg/ha. Half quantity of nitrogen in the form of urea and whole quantity of phosphorous and potassium as basal dose given in the form of diammonium phosphate and murate of potash, respectively and remaining half dose of nitrogen 30 days after transplanting by ring method. Fourty eight plots were made with the dimension of 3.0 m x 2.7 m. The marking of lines were done with the help of markers set with 60, 45 cm distance on the field.

Results and Discussion

Yield parameters

The mean data on growth parameters such as maximum number of flower per plant, flower yield per plant (g), flower yield per plot (kg), flower yield per hectare (q) are depicted in Table 1 & 2.

Number of flower per plant

The number of flower per plant as influenced by various treatments are shown in table 1. The maximum number of flower per plant (82.33) was obtained with the T_{13} (*Jeevamrut* drenching @750 l/ha + 15% *Jeevamrut* foliar application). The minimum number of flower per plant (61.40) was recorded under T_1 control (without *jeevamrut*).

Flower yield per plant (g)

The mean data presented in table 1, reveals that among the different treatment, maximum flower yield per plant (528.49 g) was obtained with the T_{13} (*Jeevamrut* drenching @750 l/ha + 15% *Jeevamrut* foliar application). The minimum flower yield per plant (355.79 g) was recorded under T_1 control (without *jeevamrut*).

Flower yield per plot (kg)

The mean data presented in table 2. Among the different treatment, maximum flower yield per plot (5.57 kg) was obtained with the T_{13} (*Jeevamrut* drenching @750 l/ha + 15% *Jeevamrut* foliar application). The minimum flower yield per plot (3.95 kg) was recorded under T_1 control (without *jeevamrut*).

Flower yield per ha (q)

The mean data presented in table 2. Among the different treatment, maximum flower yield per hectare (171.81 q) was obtained with the T_{13} (*Jeevamrut* drenching @750 l/ha + 15% *Jeevamrut* foliar application). The minimum flower yield per hectare (121.80 q) was recorded under T_1 control (without *jeevamrut*).

Jeevamrut was the source of natural carbon, biomass, nitrogen, phosphorous, potassium and lot of other micronutrients required for the crops and it also contained heavy microbial load (Palekar, 2006) [8]. Due to active and rapid multiplication of bacteria, especially in the rhizosphere, creating favourable conditions for nitrogen fixation and phosphorus solubilisation at higher rates and making it available to the plants leading to more uptakes of nutrients and water. This in turn increases photosynthesis and enhances food accumulation and also diversion of photosynthates towards sinks resulting in better growth and subsequently higher number of flowers per plant and higher yield (Praveen *et al*. 2021) [4]. These results were also supported by Khandelwal *et al*. (2003) [9] in marigold and Karthiraj *et al*. (2008) [10] in china aster.

Table 1: Effect of *jeevamrut* on number of flowers per plant and flower yield per plant (g)

Tr. No.	Treatment details	Number of flowers per plant	Flower yield per plant (g)
T_1	Control (without *jeevamrut*)	61.40	355.79
T_2	*Jeevamrut* drenching @ 500 l/ha	63.53	369.13
T_3	*Jeevamrut* drenching @ 750 l/ha	63.60	371.79
T_4	*Jeevamrut* drenching @ 1000 l/ha	64.47	373.96
T_5	5% *Jeevamrut* foliar application	62.20	358.72
T_6	10% *Jeevamrut* foliar application	64.40	359.05
T_7	15% *Jeevamrut* foliar application	65.40	361.71
T_8	*Jeevamrut* drenching @ 500 l/ha + 5% *Jeevamrut* foliar application	66.33	375.17
T_9	*Jeevamrut* drenching @ 500 l/ha +10% *Jeevamrut* foliar application	66.40	390.77
T_{10}	*Jeevamrut* drenching @ 500 l/ha +15% *Jeevamrut* foliar application	67.33	368.50
T_{11}	*Jeevamrut* drenching @ 750 l/ha + 5% *Jeevamrut* foliar application	67.67	413.41
T_{12}	*Jeevamrut* drenching @ 750 l/ha + 10% *Jeevamrut* foliar application	67.80	431.08
T_{13}	*Jeevamrut* drenching @ 750 l/ha + 15% *Jeevamrut* foliar application	82.33	528.49

T_{14}	*Jeevamrut* drenching @ 1000 l/ha + 5% *Jeevamrut* foliar application	75.93	449.71
T_{15}	*Jeevamrut* drenching @ 1000 l/ha + 10% *Jeevamrut* foliar application	76.73	463.96
T_{16}	*Jeevamrut* drenching @ 1000 l/ha + 15% *Jeevamrut* foliar application	79.20	497.34
	S.Em. ±	3.95	25.64
	C.D. (P = 0.05)	11.42	74.06
	C.V.%	10.01	10.99

Table 2: Effect of *jeevamrut* on flower yield per plot (kg) and flower yield per ha. (q)

Tr. No.	Treatment details	Flower yield per plot (kg)	Flower yield per ha. (q)
T_1	Control (without *jeevamrut*)	3.95	121.81
T_2	*Jeevamrut* drenching @ 500 l/ha	4.35	134.36
T_3	*Jeevamrut* drenching @ 750 l/ha	4.38	135.19
T_4	*Jeevamrut* drenching @ 1000 l/ha	4.41	136.21
T_5	5% *Jeevamrut* foliar application	4.33	133.54
T_6	10% *Jeevamrut* foliar application	4.50	138.99
T_7	15% *Jeevamrut* foliar application	4.51	139.09
T_8	*Jeevamrut* drenching @ 500 l/ha + 5% *Jeevamrut* foliar application	4.52	139.51
T_9	*Jeevamrut* drenching @ 500 l/ha +10% *Jeevamrut* foliar application	4.65	143.62
T_{10}	*Jeevamrut* drenching @ 500 l/ha +15% *Jeevamrut* foliar application	4.68	144.55
T_{11}	*Jeevamrut* drenching @ 750 l/ha + 5% *Jeevamrut* foliar application	5.02	154.84
T_{12}	*Jeevamrut* drenching @ 750 l/ha + 10% *Jeevamrut* foliar application	5.06	156.17
T_{13}	*Jeevamrut* drenching @ 750 l/ha + 15% *Jeevamrut* foliar application	5.57	171.81
T_{14}	*Jeevamrut* drenching @ 1000 l/ha + 5% *Jeevamrut* foliar application	5.21	160.80
T_{15}	*Jeevamrut* drenching @ 1000 l/ha + 10% *Jeevamrut* foliar application	5.46	168.52
T_{16}	*Jeevamrut* drenching @ 1000 l/ha + 15% *Jeevamrut* foliar application	5.50	169.75
	S.Em. ±	0.30	9.39
	C.D. (P = 0.05)	0.88	27.13
	C.V.%	11.08	11.08

Economics

The details of economics *i.e.*, cost of cultivation, gross return, net return and BCR on data basis for different treatments have been calculated and presented in Table 3. From the economic point of view, highest gross income (3,43,621 ₹/ha), net income (1,99,213 ₹/ha) and benefit cost ratio (2.38) was observed with the application of T_{13} (*Jeevamrut* drenching @750 l/ha + 15% *Jeevamrut* foliar application) as compared to other treatments.

Table 3: Effect of treatments on economics

Tr. No.	Yield/hectare (q)	Gross return (₹/ha)	Total cost (₹/ha)	Net returns (₹/ha)	Benefit: cost ratio
T_1	121.81	2,43,621	1,34,395	1,09,226	1.81
T_2	134.36	2,68,724	1,38,520	1,30,204	1.94
T_3	135.19	2,70,370	1,40,583	1,29,787	1.92
T_4	136.21	2,72,428	1,42,645	1,29,783	1.91
T_5	133.54	2,67,078	1,35,670	1,31,408	1.97
T_6	138.99	2,77,984	1,36,945	1,41,039	2.03
T_7	139.09	2,78,189	1,38,220	1,39,969	2.01
T_8	139.51	2,79,012	1,39,795	1,39,217	2.00
T_9	143.62	2,87,243	1,41,070	1,46,173	2.04
T_{10}	144.55	2,89,095	1,42,345	1,46,750	2.03
T_{11}	154.84	3,09,671	1,41,858	1,67,813	2.18
T_{12}	156.17	3,12,346	1,43,133	1,69,213	2.18
T_{13}	171.81	3,43,621	1,44,408	1,99,213	2.38
T_{14}	160.80	3,21,605	1,43,920	1,77,685	2.23
T_{15}	168.52	3,37,037	1,45,195	1,91,842	2.32
T_{16}	169.75	3,39,506	1,46,470	1,93,036	2.32

Conclusion

From the result of the present experiment, it could be concluded that application of *jeevamrut* drenching @ 750 l/ha + 15% *jeevamrut* foliar application along with RDF (FYM: 25 t/ha and N:P:K: 250:100:100 kg/ha) is beneficial for obtaining maximum plant yield in African marigold.

References

1. Anonymous. Area-Production-Horticulture-2022-23; c2023. Available from: https://doh.gujarat.gov.in/horticulture-Census.htm. Accessed May 5, 2024.
2. Kulkarni SS. Production and microbial analysis of jeevamrutha for nitrogen fixers and phosphate solubilizers in the rural area from Maharashtra. J Agric Vet Sci. 2019;12(8):85-92.
3. Kumar A, Avasthe RK, Babu S, Singh R, Verma G, Gudade B, *et al*. Jeevamrut: A low cost organic liquid manure in organic farming for sustainable crop production. Kerala Karshakan E J. 2021;9:32-34.
4. Praveen TM, Patil SR, Patil BC, Seetharamu GK, Rudresh DL, Pavankumar P, *et al*. Influence of biostimulants on growth and yield of floribunda rose cv. Mirabel. J Pharmacogn Phytochem. 2021;10(1):2701-2705.
5. Reddy AVV, Menon S. A study on role of jeevamruth in

natural farming: a replacement for synthetic fertilizers. J Emerg Technol Innov Res. 2021;8(5):89-93.
6. Rhama S, Madhavan S. Antibacterial activity of flavenoi-patulitrin from the flowers of *Tagetes erecta* L. Int J Pharm Tech Res. 2011;3(3):1407-1409.
7. Rydberg PA. North American Flora. 1945;34:148-159.
8. Palekar S. Shoonya Bandavalada Naisargika Krushi. Bangalore: Swamy Anand, Agri Prakashana; c2006. p. 210-214.
9. Khandelwal SK, Jain NK, Singh P. Effect of growth retardants and pinching on growth and yield of African marigold (*Tagetes erecta* L.). J Ornamental Horticulture. 2003;6(3):271-273.
10. Karthiraj K, Patil RF, Vasmate SD, Digrase SS, Manolikar RR. Effect of bioenzyme on growth, flower yield and vase life of China aster. Asian J Horticulture. 2008;3(1):178-179.