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Kansagara UK
M. Sc. (Horti.) Floriculture & Landscape Architecture, ACH, NAU, Navsari, Gujarat, India

SA Aklade
Associate Professor (Horticulture), Polytechnic in Agriculture, NAU, Waghai, Dangs, Gujarat, India

BM Tandel
Professor (Fruit Science), ACH, Navsari Agricultural University, Navsari, Gujarat, India

SL Chawla
Professor (Floriculture), ACH, Navsari Agricultural University, Navsari, Gujarat, India

Kaswala AR
Professor (NRM), ACH, Navsari Agricultural University, Navsari, Gujarat, India

Corresponding Author:
SA Aklade
Associate Professor (Horticulture), Polytechnic in Agriculture, NAU, Waghai, Dangs, Gujarat, India

Effect of *Panchagavya* and *Jeevamrut* on growth and yield of african marigold (*Tagetes erecta* L.)

Kansagara UK, SA Aklade, BM Tandel, SL Chawla and Kaswala AR

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Abstract
The present investigation entitled "Effect of *panchagavya* and *jeevamrut* on growth and yield of African marigold (*Tagetes erecta* L.)" was carried out at Floriculture Research Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat during July to November, 2025. The experiment was laid out in randomized block design with three replications consisting of nine treatments *i.e.* T_1: 75% RDN + *Panchagavya* @ 4%, T_2: 75% RDN + *Panchagavya* @ 6%, T_3: 75% RDN + *Jeevamrut* @ 80 ml/m^2, T_4: 75% RDN + *Jeevamrut* @ 120 ml/m^2, T_5: 75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 80 ml/m^2, T_6: 75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 120 ml/m^2, T_7: 75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 80 ml/m^2, T_8: 75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2 and T_9: 100% RDN (Control). The foliar application of *Panchagavya* and drenching of *Jeevamrut* in soil was done at 30 and 50 DAT.
Among different levels of *Panchagavya* and *Jeevamrut* T_8 (75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2) showed maximum number of branches per plant (10.87), stem diameter (2.55 cm), plant spread in North-South (66.50 cm) and East-West direction (62.62 cm), duration of flowering (87.67 days), flower diameter (6.02 cm), number of flowers per plant (79.53), single flower weight (6.58 g), flower yield (385.26 g/plant, 7.66 kg/plot and 15.97 t/ha), flower longevity (25.87 days), shelf life of flowers (5.97 days) and leaf chlorophyll content (1.60 mg/g). Whereas, treatment T_4 (75% RDN + *Jeevamrut* @ 120 ml/m^2) recorded maximum plant height (111.57 cm) and soil viable bacterial count (53.33 × 10^6 cfu/g of soil), while, T_2 registered minimum days for 50% flowering (53.67 days).

Keywords: Marigold, *Panchagavya* and *Jeevamrut*

Introduction
African marigold (*Tagetes erecta* L.), belonging to the family Asteraceae (2n = 24), is one of the most important commercial ornamental flower crops cultivated in India. The crop is highly valued for its attractive, brightly colored flowers, profuse blooming habit, ease of cultivation, wide adaptability and hardy nature. African marigold has high consumer demand and occupies a prominent place in the floriculture industry. It's low cultivation cost and high economic returns make it particularly suitable for small and marginal farmers, earning it the popular title of "the poor man's crop." The flowers are mainly marketed as loose flowers and are extensively used for making garlands, floral decorations, religious offerings in temples, churches and during social, cultural and festive occasions. In addition, African marigold is widely utilized in landscape gardening, bedding, edging, pots, garden borders and window boxes, where its vibrant blooms enhance the aesthetic appeal of outdoor spaces.
The adoption of integrated nutrient management has become essential for sustaining soil health and enhancing crop productivity. The combined use of organic formulations with recommended chemical fertilizers not only improves the physical, chemical and biological properties of soil but also enhances nutrient use efficiency and crop productivity. Among the available organic inputs, *Panchagavya* and *Jeevamrut* are eco-friendly, economically viable and can be easily prepared by farmers. Therefore, these organic formulations were evaluated in the present investigation in combination with chemical fertilizers to assess their effect on the growth and yield of African marigold. *Panchagavya* is a traditional organic formulation prepared from cow dung, cow urine, milk, curd and ghee through a fermentation process. It is rich in essential nutrients and beneficial microorganisms, including lactic acid bacteria, yeast, actinomycetes and fungi, which promote plant growth, improve crop yield, enhance plant health and suppress pests and diseases.

Jeevamrut on other hand is an eco-friendly liquid bio-formulation prepared from cow dung, cow urine, jaggery, pulse flour and soil. It serves as a rich source of beneficial microorganisms, particularly nitrogen-fixing and phosphorus-solubilizing bacteria along with essential macro and micronutrients that improve soil fertility, stimulate microbial activity and enhance nutrient availability to plants. Its regular application helps maintain soil health and has also been reported to improve the post-harvest life of marigold flowers (Sharma, 2017) [12].

Materials and Methods

The present investigation was carried out at the Floriculture Research Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat during July to November, 2025. The experiment comprised nine treatments, *viz*., T_1: 75% RDN + *Panchagavya* @ 4%, T_2: 75% RDN + *Panchagavya* @ 6%, T_3: 75% RDN + *Jeevamrut* @ 80 ml/m², T_4: 75% RDN + *Jeevamrut* @ 120 ml/m², T_5: 75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 80 ml/m²; T_6: 75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 120 ml/m², T_7: 75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 80 ml/m², T_8: 75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m² and T_9: 100% RDN (Control). The experiment was laid out in a Randomized Block Design (RBD) with three replications. Healthy and uniform seedlings of African marigold at the 3-4 leaf stage were transplanted on ridge and furrow beds at a spacing of 60 cm × 40 cm, accommodating 42 plants per plot. *Panchagavya* was applied as a foliar spray, whereas *Jeevamrut* was applied as a soil drench at 30 and 50 days after transplanting (DAT) according to the treatment schedule. The observations were recorded on growth, flowering, yield and soil parameters which were statistically analysed using the Analysis of Variance (ANOVA) technique appropriate for an RBD, as described by Panse and Sukhatme (1985) [8].

Results

Effect on growth parameters

The data pertaining to growth parameters *viz.*, plant height, number of branches per plant, stem girth, plant spread and leaf chlorophyll content as recorded at 75 DAT have been presented in Table 1 and it is evident that the maximum plant height (111.57 cm) was recorded in treatment T_4 (75% RDN + *Jeevamrut* @ 120 ml/m²) which was found to be at par with T_3 (102.97 cm) and the minimum plant height (87.80 cm) was observed in T_2 (75% RDN + *Panchagavya* @ 6%). Further, among all the treatments, T_8 (75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2) produced significantly maximum number of branches per plant (10.87) followed by T_6 (10.53), T_7 (9.60) and T_5 (9.53), while the least number of branches per plant (7.93) were observed in treatment T_4. Treatment T_8 also recorded maximum stem diameter (2.55 cm) but was statistically on the same bar with treatment T_5, T_7, T_6 and T_2, whereas the minimum value (2.02 cm) was observed in treatment T_9 (Control-100% RDN). The significantly maximum plant spread in North-South (66.50 cm) as well as in East-West direction (62.62 cm) and leaf chlorophyll content (1.60 mg/g) was too recorded in treatment T_8 but was at par with T_7 and T_6 for plant spread and with T_6 and T_7 for chlorophyll content, while the minimum values were registered in T_9 (Control).

The increase in plant height under *Jeevamrut* treatments might be attributed to improved nutrient availability, enhanced microbial activity and the presence of growth-promoting substances. It also contains beneficial microorganisms that improve nutrient mineralization and uptake. These factors collectively promote cell division, cell elongation and vegetative growth, resulting in increased plant height as compared to rest of the treatments. Likewise, the increased in branch number, stem diameter, plant spread and chlorophyll content under *Jeevamrut* and *Panchagavya* treatments is driven by enhanced microbial activity and nutrient mineralization. *Jeevamrut* optimizes the rhizosphere environment, ensuring a sustained nutrient supply that drives cell division, cell elongation and vegetative growth. When combined with *Panchagavya*, its naturally occurring plant growth regulators specifically auxins, cytokinins and gibberellins reduce apical dominance and stimulate lateral bud development. This synergistic effect promotes horizontal canopy expansion, thicker stems and secondary branching. These findings align with similar growth improvements observed in marigold (Bunkar, 2020; Choudhary *et al*., 2021; Trivedi *et al*., 2022 and Kaushal *et al*., 2024) [6, 16], China aster (Hegde *et al*., 2023) [5], petunia (Sharma *et al*., 2023) [13], jasmine (Sendhilnathan *et al*., 2017), chrysanthemum (Syed, 2021) [14], rose (Rana, 2009 and Praveen *et al*., 2021) and gladiolus (Neha, 2024) [1, 2, 7, 9, 10, 11]

Effect on flowering and yield parameters

Different flowering and yield attributes were also affected significantly by different levels of *Panchagavya* and *Jeevamrut* treatments and the data is presented in Table 2. In present experiment, treatment T_2 (75% RDN + *Panchagavya* @ 6%) recorded the minimum number of days taken to 50 per cent flowering (53.67 days) which was found to be at par with T_1 (54.67 days), T_8 (58.00 days), T_7 (59.33 days), T_6 (60.33 days) and T_5 (60.67 days), whereas the maximum number of days (69.67 days) were observed in T_9 (100% RDN - Control). Further the significantly maximum duration of flowering (87.67 days), flower diameter (6.02 cm), number of flowers per plant (79.53), single flower weight (6.58 g), flower yield (385.26 g/plant, 7.66 kg/plot and 15.97 t/ha), flower longevity (25.87 days) and shelf life (5.97 days) was observed in treatment T_8 (75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2), however it was at par with T_2, T_7, T_1, T_4, T_6 and T_5 for duration of flowering, with T_5 for number of flowers per plant, with T_7 and T_6 for longevity, with T_4 and T_5 for shelf life. While the minimum values for all the above parameters were recorded under control treatment.

The reduction in days to 50% flowering under *Panchagavya* treatments is attributed to plant growth regulators like GA_3 and cytokinin's. These hormones accelerate the transition from the vegetative to the reproductive phase by altering meristematic activity and promoting early flower bud differentiation. These findings closely align with those reported by Bunkar (2020) [1] and Trivedi *et al*. (2022) [16] in marigold. The enhancement of flowering attributes including duration, diameter and yield per plant under combined *Panchagavya* and *Jeevamrut* treatments may be due to the continuous nutrient availability, elevated photosynthetic capacity and optimized source-to-sink carbohydrate translocation. Individually, *Panchagavya* supplies cytokinin's that delay leaf senescence to prolong

photosynthetic functionality while stimulating cellular division and elongation within developing floral tissues to maximize petal size. Concurrently, *Jeevamrut* enhances rhizospheric microbial activity and nutrient mineralization, fuelling vegetative vigour and branch proliferation. By suppressing apical dominance and promoting axillary bud development, this treatment combination multiplies primary and secondary branching sites, substantially increasing potential flower bud initiation points. These integrated physiological and microbial mechanisms may have ultimately drive superior floral growth and reproductive yield, corroborating the previous observations in marigold (Bunkar, 2020; Sharma, 2017 and Trivedi *et al*., 2022) [1, 12, 16], jasmine (Sendhilnathan *et al*., 2017) [11], chrysanthemum (Syed, 2021) [14], China aster (Hegde *et al*., 2023) [5] and rose (Trivedi and Kumar, 2015) [15]. Similarly, combined *Panchagavya* and *Jeevamrut* treatments extend flower longevity, improve shelf life and increase leaf chlorophyll content through a synergy of natural growth regulators and enhanced soil microbial activity. *Panchagavya* provides auxins and cytokinins that delay senescence, protect membranes and stimulate chlorophyll synthesis, while *Jeevamrut* accelerates nutrient mineralization and uptake. Together, these formulations may have optimized plant nutrition, elevate carbohydrate accumulation and maintain petal turgidity, thereby significantly delaying floral aging. The present results for improved vase life with enhanced flowering quality with the combined use of *Panchagavya* and *Jeevamrut* are on the line with the findings obtained by Harshavardhan *et al.* (2016) [4] in carnation, George (2012) [3] in gerbera and Trivedi and Kumar (2015) [15] in rose.

Table 1: Effect of *Panchagavya* and *Jeevamrut* on growth parameters of African marigold

Treatments		Plant height (cm)	No. of branches/plant	Stem diameter (cm)	Plant spread (cm)		Leaf chlorophyll content (mg/g)
					N-S	E-W	
T_1	75% RDN + *Panchagavya* @ 4%	100.13	8.80	2.20	56.47	51.06	1.31
T_2	75% RDN + *Panchagavya* @ 6%	87.80	8.93	2.30	57.71	55.84	1.34
T_3	75% RDN + *Jeevamrut* @ 80 ml/m^2	102.97	8.67	2.07	55.87	51.07	1.38
T_4	75% RDN + *Jeevamrut* @ 120 ml/m^2	111.57	7.93	2.04	56.13	54.93	1.41
T_5	75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 80 ml/m^2	96.23	9.53	2.51	57.40	58.77	1.43
T_6	75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 120 ml/m^2	100.63	10.53	2.35	62.77	59.50	1.50
T_7	75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 80 ml/m^2	97.40	9.60	2.45	64.83	59.90	1.48
T_8	75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2	98.03	10.87	2.55	66.50	62.62	1.60
T_9	100% RDN (Control)	93.60	8.73	2.02	52.90	51.93	1.28
SEm (±)		3.43	0.51	0.11	2.43	1.95	0.05
CD at 5%		10.37	1.55	0.34	7.35	5.89	0.16
CV (%)		6.02	9.55	8.68	7.15	6.01	6.66

Table 2: Effect of *Panchagavya* and *Jeevamrut* on flowering and yield parameters of African marigold

Treatments		Days to 50% flowering	Flowering duration (days)	No. of flowers per plant	Single flower weight (g)	Flower diameter (cm)	Flower yield			Flower longevity (days)	Flower shelf life (days)
							Per plant (g)	Per plot (kg)	Per ha (t)		
T_1	75% RDN + *Panchagavya* @ 4%	54.67	82.67	67.33	4.70	5.09	303.33	5.77	12.03	22.40	4.73
T_2	75% RDN + *Panchagavya* @ 6%	53.67	87.00	70.87	4.67	5.05	315.49	5.87	12.23	20.80	4.53
T_3	75% RDN + *Jeevamrut* @ 80 ml/m^2	62.00	77.33	65.13	4.75	5.25	266.16	5.26	10.96	21.00	5.13
T_4	75% RDN + *Jeevamrut* @ 120 ml/m^2	64.00	81.67	62.13	4.97	5.43	281.92	5.52	11.49	21.47	5.47
T_5	75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 80 ml/m^2	60.67	80.00	71.67	5.27	5.32	344.38	6.59	13.73	22.47	5.40
T_6	75% RDN + *Panchagavya* @ 4% + *Jeevamrut* @ 120 ml/m^2	60.33	81.67	60.73	5.23	5.18	333.24	6.32	13.16	23.53	5.07
T_7	75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 80 ml/m^2	59.33	84.00	61.53	5.39	5.30	339.25	6.73	14.03	24.27	5.10
T_8	75% RDN + *Panchagavya* @ 6% + *Jeevamrut* @ 120 ml/m^2	58.00	87.67	79.53	6.58	6.02	385.26	7.66	15.97	25.87	5.97
T_9	100% RDN (Control)	69.67	71.33	60.07	4.37	5.04	258.14	4.83	10.07	18.27	5.20
SEm (±)		2.57	3.01	2.94	0.21	0.19	10.89	0.25	0.52	0.96	0.23
CD at 5%		7.76	9.12	8.87	0.62	0.56	32.91	0.75	1.56	2.89	0.70
CV (%)		7.38	6.41	7.64	6.96	6.05	6.00	7.09	7.09	7.47	7.66

Conclusion

Based on the results obtained from the present investigation, it can be concluded that the application of 75% RDN along with *Panchagavya* @ 6% and *Jeevamrut* @ 120 ml/m^2 (T_8) proved to be the most effective treatment for improving most of the vegetative growth parameters, flowering and yield of African marigold. The treatment recorded superior performance in terms of number of branches, stem diameter, plant spread, leaf chlorophyll content, flowering duration, flower weight, number of flowers per plant, flower yield, flower longevity and shelf life.

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