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EFFECT OF *GHANJEEVAMRUT* AND *JEEVAMRUT* ON GROWTH, FLOWERING AND SEED YIELD OF *Dimorphotheca pluvialis*

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ABSTRACT

An experiment was carried out on "Effect of *ghanjeevamrut* and *jeevamrut* on growth, flowering and seed yield of *Dimorphotheca pluvialis*" at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Mehsana Gujarat, India during *Rabi* season 2024-25. The experiment was laid out in randomized block design with three replications. Total ten treatments were evaluated in the present study. Application of *Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha (T_{10}) gave superior results on growth parameters such as maximum plant height at 90 DAT (62.99 cm), number of primary branches at 90 DAT (26.03), plant spread (N-S) at 90 DAT (52.85 cm) and plant spread (E-W) at 90 DAT (47.15 cm) and flowering parameters such as longevity of intact flowers (9.31 days) and number of flowers per plant (214.53). Same treatment showed positive response for seed yielding parameters such as highest seed yield per plant (33.73 g), seed yield per plot (246.28 g) and seed yield per ha (15.20 q) as compared to the other treatments. Based on economics, among all the treatments maximum benefit cost ratio (4.71) was recorded with *Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha (T10).
***Keywords*:** Dimorphotheca, *Ghanjeevamrut, Jeevamrut* and seed production

Introduction

Floriculture is a branch of horticulture that focuses on cultivating flowering and ornamental plants. Annual flowering plants play a pivotal role in modern landscape design owing to their vibrant colours, diverse forms, extended blooming periods and ability to provide instant visual impact. These ornamental species are extensively utilized in public gardens, urban green spaces, residential landscapes, roadside plantings and seasonal floral displays to enhance aesthetic appeal and improve environmental quality. The ease of cultivation, rapid establishment, and adaptability to different climatic conditions make them indispensable components of sustainable ornamental horticulture. In recent decades, it has emerged as a profitable agribusiness with the increasing demand for annual flowers in landscaping. Annuals are seed-propagated herbaceous plants that complete their life cycle within one growing season. Widely used in landscaping, they enhance gardens, beds, pots, hanging baskets and borders (Love *et al*., 2009). Based on their growing season, annuals are classified as winter, summer or rainy season types (Singh and Sisodia, 2017). Among the diverse annual ornamental species, *Dimorphotheca sinuata* L. has gained considerable attention due to its profuse flowering habit, attractive daisy-like blooms and wide range of flower colour.

Dimorphotheca also known as Cape marigold or African daisy or Star of the Veldt is a half-hardy winter annual belonging to the family Asteraceae and native to South Africa. It is taxonomically distinct from true marigolds (*Tagetes spp*.) It is a widely cultivated ornamental species valued for its large, brightly coloured capitula borne on slender peduncles. The genus name originates from the Greek words di (two), morpho (form), and theca (case), denoting the presence of two morphologically distinct fruit types produced by the ray and disc florets. Disc florets possess a tubular, five-lobed corolla exhibiting colour variation from bright yellow to deep purple, whereas ray florets bear a single ligulate petal, typically white with a bluish to reddish-purple basal zone. Flowers, measuring 3–4 cm in diameter, occur in white, yellow, rose, or salmon shades. It has excellent performance under cool and semi-arid conditions. The species is valued for its drought tolerance, low maintenance requirements and suitability for use in flower beds, borders, rock gardens, containers and mass plantings. Despite its considerable landscape potential, scientific information regarding the optimization of cultural practices, growth regulation, flowering behaviour and seed production under diverse agro-climatic conditions remains limited, necessitating further research to maximize its ornamental value and commercial utilization.

Bio enhancers are used as soil conditioners which create environment for microbial growth in the soil of the rooting media and to make the soil healthy for plant growth. *Jeevamruta* word comprises of two words: '*Jeevan*', which means life and 'Amrit' means nectar. *Jeevamruta* is highly nutritious organic manure made from cow products. *Jeevamruta* is acidic in nature (4.93) and a good source of macro and micro-nutrients *viz*., N (1.97%), P_2O_5 (0.172%), K_2O (0.29%), Mn (47 ppm) and Cu (50 ppm) (Kumar *et al*., 2021). It is interesting to record that these can be prepared at the farm with some infrastructure facilities and hands on training. The five products of cow (dung, urine, milk, ghee and curd) are used in different organic systems. Organisms (bacteria and moulds) improve the soil structure, soil aeration, soil water-holding capacity and water infiltration by solubilizing the complex organic substrates into simple forms and make it available to the plants, resulting in increased productivity. It adds organic matter to the soil. Soil microorganisms play an active role in replenishing soil fertility, as they involve in the recycling of nutrients like carbon and nitrogen, which are required for plant growth. *Jeevamruta* used in agricultural and horticultural crops which increases the yield and quality, develops tolerance to environmental stress, increases nutrient uptake from soil, without adverse impact on soil health. *Ghanjeevamrut* is the solid form of *jeevamrut* and serves as a natural fertilizer. It represents an improved, cost of effective preparation that enriches the soil with beneficial microorganisms. The microbial diversity found in cow dung plays a crucial role as it can alter soil nutrient profiles through processes such as solubilization, chelation, mineralization and oxidation or reduction (Aiysha and Latif, 2019). This natural preparation stimulates the activity of N fixers, P solubilizers and other beneficial microorganisms which are useful to plants. Looking in view the potentiality of dimorphotheca in landscaping.

With the increasing demand for sustainable landscaping and eco-friendly ornamental production systems, there is a growing need to enhance the quality and seed yield of annual flowers using organic and low-cost inputs. Bioenhancers such as *Jeevamrut* and *Ghanjeevamrut*, which are rich in beneficial microorganisms and plant growth-promoting substances, offer a promising alternative to synthetic inputs for improving soil health, flower quality, and seed productivity. However, information on its response to indigenous bioenhancers remains limited. Therefore, systematic research is essential to evaluate their effectiveness in *Dimorphotheca* cultivation and to develop sustainable production practices for the ornamental sector.

Materials and Methods

A field experiment on *Dimrophotheca* was conducted at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Mehsana, Gujarat during *Rabi* season 2024-25. The experiment was laid out in Randomized Block Design which consisted of total ten treatments *viz.* Control (NPK @ 150:100:100 kg/ha) (T_1), *Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 500 l/ha (T_2), *Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1000 l/ha (T_3), *Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1500 l/ha (T_4), *Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 500 l/ha (T_5), *Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1000 l/ha (T_6), *Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1500 l/ha (T_7), *Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 500 l/ha (T_8), *Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1000 l/ha (T_9) and *Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha (T_{10}). The treatments were replicated thrice. Thirty plots were made with the dimension of 2.4 m × 2.25 m with each plot having twenty plants. The seedlings were planted at distance of 60 cm × 45 cm The experimental soil was loamy sand with good drainage condition. In control treatment, 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 (DAP) and murate of potash (MOP), respectively and remaining half dose of nitrogen 30 days after transplanting by ring method. *Ghanjeevamrut* was applied as per treatment at the time of transplanting as basal dose and *Jeevamrut* was drenched as per treatment at 20, 40 and 60 DAT. Observations for various vegetative, flowering and seed production were recorded and the data was analysed analyzed by a procedure appropriate to the design of the experiment as described by Panse and Sukhatme (1978).

Results and Discussion

Growth parameters

The mean data on growth parameters such as maximum plant height at 90 DAT, number of primary branches 90 DAT, plant spread (N-S) at 90 DAT and plant spread (E-W) at 90 DAT are depicted in Table 1.

Plant height at 90 DAT (cm)

The mean data presented in table 1. showed significant influence of different treatments on plant height at 90 DAT (62.99 cm). The maximum plant height at 90 was recorded in treatment T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was at par with T_9 and T_8. These findings are in support to the results of Singh *et al.* (2015) in marigold and Khanna *et al.* (2016) in china aster. *Jeevamrut* has phytohormones like IAA, GA_3 and cytokinins. GA_3 induces both cell elongation and division that dramatically stimulates internodes elongation which results in increase in plant height. (Praveen *et al.*, 2021).

Number of primary branches 90 DAT

The number of primary branches at 90 days after transplanting varied significantly among the *Ghanjeevamrut* and *Jeevamrut* treatments. Significantly maximum number of primary branches (26.03) were found with T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was at par with T_9 and T_8 respectively. The possible reason for increase in number of branches might be that *jeevamrut* significantly increased root geometry, nutrient access and supply, resulting in the development of sound and healthy rhizosphere. Another cause might be increased nutrient uptake, photosynthesis, source sink relationship besides excellent biochemical activities. *Jeevamrut* a strong promoter of natural farming. It is a rich bio-formulation contains consortia of beneficial microbes (Singh *et al.* 2015).

Plant spread (N-S) and (E-W) at 90 DAT

Data in Table 1 revealed that effect of *ghanjeevamrut* and *jeevamrut* on maximum plant spread (N-S) (52.85 cm) and (E-W) (47.15 cm) was observed in the treatment T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was statistically at par with the treatments T_9 and T_8 at 90 DAT respectively. The increase in plant spread with the application of *jeevamrut* might be due to improved microbial population in the soil which is mainly due to their constituents such as cow dung, cow urine, legume flour and jaggery containing both macro and essential micro nutrients, many vitamins, essential amino acids, growth promoting substances like indole acetic acid (IAA), gibberlic acid (GA) and beneficial microorganisms. (Choudhary *et al*., 2021). Our results are in agreement with the Singh *et al*., (2015) who observed maximum plant spread with application of 5% *jeevamrurt* in marigold.

Longevity of intact flower (days)

Data in table 2 revealed that maximum longevity of intact flower (9.31 days) was obtained with the T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was statistically at par with the treatment T_9 respectively. It might be due to availability of nutrients and beneficial substances and microbial consortia supplied nitrogen which was fixed by *Azotobacter*. The increased availability of nutrients increased longevity and nutrient uptake by plant and also helps in great development of water conducting tissues as reported by Singh *et al.* (2015) in French marigold.

Number of flowers per plant

The number of flowers per plant as influenced by various treatments are shown in table 2. The maximum number of flowers per plant (214.53) was obtained with the T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was found at par with T_9 and T_1 treatments. The minimum number of flowers per plant (181.73) was recorded under T_2 (*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 500 l/ha).

The considerable numbers of flowers under natural farming system could be attributed to the nutrients N (0.16%), P_2O_5 (0.02%) and K_2O (0.123%) that are present in *Jeevamrut* being assimilated. Similar finding was also reported by Pathania (2019) in China aster.

Seed yield per plant (g)

Among the different treatment, significantly maximum seed yield per plant (33.73 g) was obtained with the treatment T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was found at par with $T_{9,}$ T_8 and T_1 treatments.

Seed yield per plot (kg)

Among the different treatment, significantly maximum flower yield per plot (246.28 g) was obtained with the T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was found at par with $T_{9,}$ T_8 and T_1 treatments.

Seed yield per hectare (q)

Among the different treatment, significantly maximum flower yield per hectare (15.20 kg) was obtained with the T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was found at par with

T_9, T_8 and T_1 treatments. The advantageous outcomes of *Jeevamrut* have also been elucidated by Devakumar *et al*. (2008). They described the higher seed yield to the huge load of beneficial and viable microorganisms especially bacteria, fungi and actinomycetes present in *Jeevamrut* which might have enriched the soil biomass with various essential nutrients and growth promoters. Subsequently, there was increased availability and uptake of requisite nutrients by the plants that eventually augmented the growth, flowering, better seed setting, formation of more seeds and higher seed yield. The increase in seed yield per plot might also be attributed to the formation of more seeded capsules as well as more number of seeds per capsule leading to increase in seed yield per plant. Another reason for increase in seed yield would be increased nutrient uptake, more photosynthesis and better source-sink relationship. Similar finding were reported by Manjunatha *et al*. (2009) in sunflower, Gore and Sreenivasa (2011) in *Jeevamrit* and could be attributed to the fact that growth-promoting substances in *Jeevamrit* produced more number of flowers per plant, which ultimately resulted in more seed yield.

Microbial count (CFU/g)

The data in Table 2 revealed that the effect of *ghanjeevamrut* and *jeevamrut* on microbial count (CFU/g) was found significant. Maximum microbial count (159.33×10^6 CFU/g of soil) was recorded with T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) which was found at par with T_9, T_8 and T_7 treatment. The minimum microbial count (138.00×10^6 CFU/g of soil) was recorded under T_1 control (NPK @ 150:100:100 kg/ha). Increase in microbial population might be due to the application of liquid organic manures at different levels which in turn provides more nutrients for the soil microorganism's multiplication (Devakumar *et al.,* 2018). J*eevamruta* is rich source of beneficial microorganisms and nutrients which helps the plant growth. These organisms (bacteria and moulds) improve the soil health by solubilising the complex organic substrates in to simple forms and make it available to the plant, resulting in increased productivity (Pathak *et al.,* 2010). Sreenivasa *et al*., 2011 also reported that liquid manures contain micronutrients in addition to different microflora especially nitrogen fixers and phosphate solubilizers.

Table 1: Effect of *Ghanjeevamrut* and *Jeevamrut* on vegetative growth of *Dimorphotheca*

Tr. No.	Treatment details	Plant height at 90 DAT	Number of primary branches 90 DAT	plant spread (N-S) at 90 DAT	plant spread (N-S) at 120 DAT
T_1	Control (NPK @ 150:100:100 kg/ha)	56.10	23.00	48.31	43.46
T_2	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 500 l/ha	52.49	20.80	45.01	40.08
T_3	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1000 l/ha	52.81	21.20	46.15	41.35
T_4	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1500 l/ha	52.87	21.60	46.37	42.27
T_5	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 500 l/ha	54.07	22.00	47.13	42.49
T_6	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1000 l/ha	54.99	22.07	47.59	43.13
T_7	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1500 l/ha	56.01	22.73	48.27	43.27
T_8	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 500 l/ha	57.39	23.47	49.33	44.29
T_9	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1000 l/ha	59.17	24.60	50.72	45.89
T_{10}	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha	62.99	26.03	52.85	47.15
	S.Em. ±	1.99	0.91	1.43	1.22
	C.D. (P = 0.05)	5.91	2.70	4.26	3.63
	C.V. %	6.16	6.92	5.16	4.89

Table 2: Effect of *Ghanjeevamrut* and *Jeevamrut* on flowering, seed yield and bacterial count of *Dimorphotheca*

Tr. No.	Treatment details	Longevity of intact flower (days)	Number of flowers per plant	Seed yield per plant (g)	Seed yield per plot (kg)	Seed yield per ha. (q)	Microbial count (CFU/g)
T_1	Control (NPK @ 150:100:100 kg/ha)	8.49	199.53	29.03	211.60	13.06	138.33
T_2	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 500 l/ha	7.92	181.73	23.84	173.62	10.72	143.67
T_3	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1000 l/ha	8.01	185.53	24.88	191.78	11.84	145.33
T_4	*Ghanjeevamrut* @ 1 t/ha + *Jeevamrut* @ 1500 l/ha	8.17	189.33	26.17	196.64	12.14	146.00
T_5	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 500 l/ha	8.16	191.40	26.82	202.43	12.50	138.67

T_6	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1000 l/ha	8.27	194.80	27.18	205.31	12.67	139.00
T_7	*Ghanjeevamrut* @ 1.5 t/ha + *Jeevamrut* @ 1500 l/ha	8.40	197.13	28.04	207.17	12.79	139.33
T_8	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 500 l/ha	8.57	205.27	30.57	227.88	14.07	147.33
T_9	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1000 l/ha	8.85	209.40	32.33	234.54	14.48	147.67
T_{10}	*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha	9.31	214.53	33.73	246.28	15.20	147.67
	S.Em. ±	0.23	5.77	1.75	11.71	0.72	5.21
	C.D. (P = 0.05)	0.68	17.15	5.19	34.79	2.15	15.04
	C.V. %	4.68	5.08	10.71	9.67	9.67	6.10

Fig. 1 : General View of the experiment

Fig. 2 : Seed yield from various treatments

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 (5,32,000 Rs./ha), net income (4,18,972 Rs./ha) and benefit cost ratio (4.71) was observed with the application of T_{10} (*Ghanjeevamrut* @ 2 t/ha + *Jeevamrut* @ 1500 l/ha) as compared to other treatments.

Table 3: Effect of treatments on economics

Tr. No.	Yield/ha (q)	Total cost (Rs./ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	BCR
T_1	13.06	1,01,012	4,57,100	3,56,088	4.52
T_2	10.72	96,694	3,75,200	2,78,506	3.88
T_3	11.84	99,694	4,14,400	3,14,706	4.16
T_4	12.14	1,03,472	4,24,900	3,21,428	4.11
T_5	12.50	1,01,472	4,37,500	3,36,028	4.31
T_6	12.67	1,04,472	4,43,450	3,38,978	4.24
T_7	12.79	1,07,472	4,47,650	3,40,178	4.17
T_8	14.07	1,06,250	4,92,450	3,86,200	4.63
T_9	14.48	1,09,250	5,06,800	3,97,550	4.64
T_{10}	15.20	1,13,028	5,32,000	4,18,972	4.71

Conclusions

From research findings, it is concluded that application of *ghanjeevamrut* @ 2 t/ha + *jeevamrut* @ 1500 l/ha in *Dimorphotheca pluvialis* is beneficial for obtaining maximum plant growth, flowering, seed yield, higher returns as well as improving the microbial count of the soil.

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