



**INFLUENCE OF LIQUID FORMULATIONS - JEEVAMRUTHA AND
PANCHAGAVYA ON GROWTH AND YIELD ATTRIBUTES OF
TOMATO PLANT****BASAVARAJAPPA S H¹ AND LINGARAJU H G^{2*}**

- 1: Department of PG Studies and Research in Environmental Science, Kuvempu University, Shankaraghatta, Shivamogga, Karnataka, India
- 2: Department of Environmental Science, JSS Academy of Higher Education and Research, Mysuru, Karnataka – 570015, India

Corresponding Author: Dr. Lingaraju H G: E Mail: lingarajuhg@jssuni.edu.in*Received 25th May 2023; Revised 26th July 2023; Accepted 1st Sept. 2023; Available online 1st May 2024****<https://doi.org/10.31032/IJBPAS/2024/13.5.8044>****ABSTRACT**

Organic farming is becoming increasingly popular in modern agriculture. Organic agriculture is a method that focuses on ecosystem management rather than agricultural inputs from outside sources. It is implemented using a mix of environmentally friendly current technology that farmers embrace. This field research mainly focused on treatments of jeevamrutha and panchagavya with different concentration on growth and yield parameters as well as estimation of chlorophyll content. Cow-based liquid organic manure products, such as Panchagavya, Jeevamrutha, Beejamrutha, and eco-friendly organic preparations manufactured from cow products. The usage of liquid goods like Panchagavya and Jeevamrutha boosts crop growth, yield, and quality greatly. Cow dung, urine, milk, curd, ghee, gram flour, and jaggery are used to make these liquid organic solutions. In this study, Panchagavya and Jeevamrutha are used in different concentrations and different combinations. In this, there are nine different concentrations is used to treat the tomato plant. Jeevamrutha is used in four different concentrations such as T2 T3 T4 T5. similarly, Panchagavya used four concentrations like T6 T7 T8 T9. Fermentation makes locally accessible items more effective fertilisers. Panchagavya and jeevamrutha are collaborated in this research.

**Keywords: Jeevamrutha, Panchagavya, Beejamrutha, Chlorophyll, Organic manure,
Fermentation**

INTRODUCTION

Agricultural production was always the backbone of the Indian economy, and it continues to play a vital part in the country's development. Alternative agricultural approaches that are both environmentally and agriculturally friendly are becoming increasingly popular in the agricultural sector [1]. The current global situation emphasizes the significance of using ecologically friendly farming techniques to ensure long-term food production. Bio-fertilizers are becoming ever more unaffordable, to the point that small and marginal farmers cannot purchase them [2]. Organic farming techniques have gotten a lot of attention in the last decade since they're thought to be able to solve some of the problems that are plaguing the agriculture industry right now. Organic agriculture has the capacity to furnish advantages regarding environmental preservation, sustainability of non-renewable reserves and enhanced food condition [3].

Organic agriculture produces "Living Soil," which is rich in soil photosynthetic bacteria, such as bacteria, fungus, worms, and insects. It's a farming strategy that tries to develop the land and grow crops in such a method that biological wastes (crop remains, animal and agricultural wastes, aquatic wastes) and other biological resources are used to keep the soil alive and

healthy. Organic farming prioritizes the health of soil, plants, food, and the environment, in addition to crop output. To enhance soil quality and development organic soil matter, organic farmers utilize organic fertilizers inputs and management strategies such as cover farming and crop rotation. It's also a healthy and ecologically beneficial process of production that benefits small-scale farmers in specific [4].

In India, we have a lot of this organic material, and the extract from it may be used to improve the soil healthiness in aspects of physical, chemical, and organic qualities, which would help to get a decent yield. The usage of Panchagavya in India has been preserved in the "Vedas," which have defined the use of "Panchagavya" in agriculture. In organic farming, the efficiency and utility of certain cow products such as Panchagavya, Jeevamrutha, and composting, would boost crop plant biological efficiency and soil health. It will increase the production of crops while inhibiting the growth of others. Organic liquid solutions including Panchagavya, Beejamrutha, and Jeevamrutha help crops grow faster, yield more, and have greater quality. The basic ingredients of the organic liquid manure manufacture are cow dung and cow urine, depending on their nature [5].

Panchagavya refers to a combination of five products: cow dung, cow urine, ghee, milk, and curd. Each of the five components is known as Gavya, and the combination is known as Panchagavya. Panchagavya has a significant influence on the quality of fruit and vegetable yield. Panchagavya has been employed in India for centuries to protect plants against phytopathogens and increase production.

MATERIALS AND METHODS

Experiments were laid in the naturally ventilated garden at Department of Environmental Sciences, on the campus of Jagadguru Sri Shivarathreshwara Academy of Higher Education and Research, Mysuru district, Karnataka at latitude 12.3442188, longitude of 76.6518226. The purpose of the research was to determine how organic liquid formulations like jeevamrutha, and panchagavya combined to influence the growth and yield of tomato plants under drip irrigation condition. The study used a Factorial Randomized Complete Block Design (FRCBD) with three replications and nine treatments (**Table 1**).

Soil preparation is carried out prior to the planting of crops to help mix the soil and loosen it so that the roots can penetrate deep into it. The experimental land was prepared by ploughing twice with a mould board plough and then levelling with a harrow with the needed quantities of different organic manures based on nitrogen content applied

according to the treatment. To stimulate the development of various soil microorganisms, earthworms, and other organisms that enrich the soil with humus and other necessary nutrients.

Furthermore, the tomato seeds were sown in the seedling tray and the seeds were allowed to germinate for the period of 24 days. The treatments were imposed after 20 days with liquid manures such as Jeevamrutha and Panchagavya, it was manually applied to the plants root at intervals of 20, 40, 60, 80 DAS (Days After Sowing). Different growth parameters such as plant height (cm), number of leaves and branches, leaf area index, root length (cm), shoot length (cm), were measured to determine the influence of jeevamrutha and panchagavya application. Number of flowers and fruits (per plant), weight of fruits (kg), fruit length (cm), and fruit diameter (cm) were also measured as yield characteristics. Total chlorophyll concentration (g/ml), chlorophyll-a (g/ml), and chlorophyll-b (g/ml) were measured. At 30, 50, and 70 DAS, growth and yield observations were made. Soil was subjected to tests in order to identify its chemical qualities (**Table 2**).

Preparation of Jeevamrutha and its application

Jeevamrutha was made by combining 125 grams of cow dung, 50 milliliters of cow urine, and 25 grams of locally available

jaggery, 25 grams of flour and a handful of soil from the farm. All of this was mixed thoroughly in a 10-litre plastic drum and the capacity was increased to 2.5 liters by adding water. The mixture was stirred well twice a day in a clockwise direction in a plastic drum that was maintained in the shade with a moist cotton cloth. Jeevamrutha was fermented for 10 days before being manually treated to the root zone of tomato plants at 20, 40, 60, and 80 days after sowing (DAS).

Preparation of panchagavya and its application

In an open plastic container panchagavya solution was made by combining 1 kilo gram of cow dung, 100 grams of cow ghee, 600 milliliters of fresh cow urine, 500 milliliters of cow milk, and 500 milliliters of curd. On the first day, 1 kilo grams of cow dung was mixed with 100 grams of cow ghee and maintained for 3 days, after which 600 milliliters of cow urine, cow milk, and curd were added and the combination was stirred twice a day for 15 days. In addition, the solution is used on plants at regular intervals.

Estimation of chlorophyll content a and b

With respect to their concentration, 0.2grams of leaf sample was taken from each plant and crushed with pestle and mortar (T1, T2, T3, T4, T5, T6, T7, T8, T9), The ground leaves were soaked in a solution of 1 part 0.1 normal (N) ammonium

hydroxide to 10 parts 80 % acetone and made into a paste. The contents were centrifuged for 5 minutes at 5000rpm, the absorbance was taken at 645nm and 663nm, respectively. Readings were measured with a spectrophotometer to determine the chlorophyll 'a' and 'b' content values. The concentrations of chlorophyll a, chlorophyll b, and total chlorophyll were calculated.

The Following formula is used to estimate chlorophyll content estimation.

Chlorophyll a: $12.7(A_{663}) - 2.69(A_{645})$

Chlorophyll b: $22.9(A_{645}) - 4.68(A_{663})$

Total Chlorophyll: $20.2(A_{645}) - 8.02(A_{663})$

Analytical statistics

The experiment was carried out in nine treatments and the Mean SE data were calculated Using 21.0, a one-way ANOVA was used to compare the results. Standard deviation (SD) values were calculated whenever the mean difference is significant at 0.05 level.

RESULTS AND DISCUSSION

Growth parameters

Plant height: Jeevamrutha and panchagavya has resulted in enhanced growth characteristics at various levels of application (Table 3). At 30 DAS, treatment of panchagavya @ 100% (T9) resulted in considerably greater plant height, followed by T4 and T5 which showed same height (76 cm), whereas T8 at 50 DAS showed significantly lower plant height (71 cm) and higher at T9 (110 cm). At 70 DAS in T9 (121

cm @ 100% panchagavya), and control plants heights were not significantly different at 30 and 70 DAS (60 cm, 82cm).

Number of leaves: When compared to control (T1), there was a considerable increase in the number of leaves in jeevamrutha at 75% (T4), followed by other treatments which saw a gradual decrease in the number of leaves (control- 153.3, 167, 173.3 < panchagavya @ 25%- 163, 168.3, 170 < panchagavya @ 50 %- 171.3, 176.6, 178.3 < panchagavya @ 75 %- 182, 186.3, 188.3 < jeevamrutha @ 25 %- 183.3, 202.6, 212.6 < jeevamrutha @ 50 %- 228.3, 242, 268.3 < jeevamrutha @ 100 %- 270, 280, 283.3 < jeevamrutha @ 75 % 269, 288.3, 293.3 at 30, 50 and 70 DAS, respectively).

Number of branches: At 30, 50, and 70 DAS, the number of branches grew exponentially (T1) - 19, 23.3, 24.6; (T6)- 23, 23.6, 24.8; panchagavya, (T2) - 29, 32.6, 37; jeevamrutha, (T7) - 28, 32.6, 37; panchagavya, (T3) - 36.3, 38.3, 42; jeevamrutha, (T8)- 41.3, 48.3, 52; panchagavya (T4) - 47.66, 49.3, 53.6; jeevamrutha, (T9)- 57.66, 59.3, 63.6; panchagavya, (T5) - 56.33, 62.3, 65.3) respectively. In 70 DAS, (T5) jeevamrutha at 100% has the maximum number of branches, i.e. 65.3.

Leaf area index: Similarly, Jeevamrutha and panchagavya at 75% (T4 and T8) showed considerably higher leaf area index (2.46, 1.49, 2.53 and 2.11, 2.43, 2.60 at 30,

50, and 70 DAS), followed by Jeevamrutha at 100% (T5) and control (T1) had significantly lower leaf area index (0.59, 0.60, 0.63 and 1.78, 1.85, 1.86 at 30, 50 and 70 DAS).

Shoot length: Shoot length was increased significantly in various treatments (jeevamrutha @ 100 %- 21.76 cm, 23.04 cm, 27.06 cm < jeevamrutha @ 75 %- 28.17 cm, 29.81 cm, 34.73 cm < control 42.77 cm, 43.91 cm, 45.47 cm < jeevamrutha @ 25 %- 44.78 cm, 48.26 cm, 52.12 cm < jeevamrutha @ 50 %- 53.16 cm, 56.57 cm, 66.38 cm at 30, 50 and 70 DAS, respectively). Similarly, T8 (panchagavya @ 75%) had the longest shoot length of 56.57 cm, followed by (56.38 cm, 53.16 cm at 70 and 30 DAS) and T9 had the shortest shoot length of 28.17 cm at 30 DAS. (Panchagavya @ 100% - 29.81 cm, 34.73 cm at 50 and 70 DAS.)

Root length: The use of jeevamrutha at 100% resulted in considerably longer root length (30.2 cm) (Table 3). On the other hand, the maximum root length of tomato plant measured 28.2 cm among the varied concentrations of panchagavya (T8) at 90 DAS, whereas the control was 15.3 cm (T1). Found that applying jeevamrutha at 1500 L ha-1 resulted in significantly higher growth and yield parameters than it is to use 1000 and 500 L ha-1 (6). When compared to the other concentrations, the number of leaves identified as T4 exhibits 293.3 in 70 days increased in number of branches 65.3 in 70

days at T5. When compared to the other concentrations, using a liquid biofertilizer combination along with RDF resulted in greater growth and production of finger millet [7]. Similarly, many researches pointed out growth parameter of shoot length is enhanced, which boosted the nutrient content of soil, while panchagavya treatment had a substantial influence on the shoot length 56.57 cm (T8) in 50 days [8]. According to Iwuagwu *et al*, (2017) plants treated with T9 as a manure obtained a maximum height of 121 cm in 70 days, but plants treated with T1 (control) only reached 82 cm. T8, with a shoot length of 66.38 cm, was shown to be superior. When compared to the other concentrations, T1 indicates a significantly lower rate of growth among the treated plants. The number of leaves was greater in 293.3 cm in 50 days when the T4 concentration was higher. When compared to the control, the root length grew faster. After the treatment of jeevamrutha, considerably more nitrogen fixers were discovered. In organic liquid formulations like jeevamrutha and panchagavya, higher bacteria, fungus, actinomycetes-fixers, and P-solubilizers were discovered [9].

Yield Parameters

The yield parameter of different concentration treatment is showed (Table 4). T4 (jeevamrutha 75% at harvest) had a significantly greater number of fruits (34.66 fruit plant⁻¹) than T5 (30 fruit plant⁻¹),

whereas T1 (14.33 fruit plant⁻¹) had a significantly lower number of fruits (14.33 fruit plant⁻¹). In addition, when panchagavya of 25% was applied (22 fruit plant⁻¹), the results were shown to be lower. In terms of average fruit weight, the largest change between both the treatment was reported in T5, which was 3.85 kg, followed by T4- 2.85 kg, T2- 2.5 kg, and T8- 2.5 kg (3.5 kg) Treatment indicates that panchagavya has the greatest average fruit weight, at 75%. When compared to other concentrations of jeevamrutha application, T3-1.75 kg and T1- 1 kg shows a reduction in fruit weight. In comparison to T1, T5 (7.8 cm), T4 (7.0), and T3 (6.8) had much longer fruit lengths (4.2 cm). Fruit diameter grew by 75% when treatment differences increased in the (T3- 12.6 cm) jeevamrutha. (T4- 12.51 cm, T5- 11.3 cm) and lower in the T1 control group (8.4 cm).

Grain and Stover yield of foxtail millet was significantly influenced by the nutrient management practices through IOFS. The data revealed that maximum grain and Stover yield of was obtained with the application of jeevamrutha + mulching + IFS compost + vermicompost + panchagavya (1841 kg ha⁻¹ and 7066 kg ha⁻¹) which was significantly superior over all other treatments [10]. When compared to the control, Panchagavya considerably boosted yield characteristics and minimized diseases [11]. Panchagavya is also used to help with

crop establishment and health. The difference between the control and the treatment is statistically significant. According to Deva Kumar *et al.*, (2014) both jeevamrutha and panchagavya have increased the development of nitrogen fixers in locally accessible substrates including FYM, input into possible, composting, and digested biogas slurry [12]. Using liquid solutions like Panchagavya and Jeevamrutha boosts crop growth, production, and quality. With the application of 1000 liters of jeevamrutha and 7.5 percent panchagavya per hectare [13]. These experiments were conducted by Sutar *et al.*, (2019) and reported a marked increase in growth and yield characters such as number of pods per plant, length of pods, pod weight, number of seeds per pod, seed weight per plant, and 100 seed weight. The application of jeevamrutha along the Panchagavya influenced the total and effective number of nodules, as well as their fresh and dry weights. According to the findings, liquid organic formulations such as jeevamrutha and panchagavya are efficient in improving grain production in cowpea [6].

Chlorophyll Content

Total chlorophyll content in all treatments (Table 5) shows that chlorophyll 'a' concentration in T5 treatment is highest at 45 days (31.1894, 5.1429 $\mu\text{g/ml}$ at 45 and 90

DAS). Treatments containing jeevamrutha T4 had the lowest chlorophyll a level (9.081, 8.3628 $\mu\text{g/ml}$ at 45 and 90 DAS, respectively). Similarly, in compared to Control treatment, panchagavya T9 had the highest chlorophyll 'b' content (21.5082, 12.8052 $\mu\text{g/ml}$) at 45 and 90 DAS).

Similar studies have demonstrated that using jeev`amrutha in combination with other organic fertilizers improves the chlorophyll content of treated plants. In a study to see how organic manures affected the quality and biochemical features of strawberries, the plants treated with jeevamrutha had the maximum chlorophyll content [14]. Application of jeevamrutha resulting in better foliage with dark, green-colored leaves, according to the findings of a chilli study. This means that when chlorophyll levels are high, more photosynthates are produced, which improves photosynthate transfer to vegetative buds and fruits [15]. Plants treated with jeevamrutha had higher levels of chlorophyll 'a', 'b', and carotenoid, according to a study on sweet basil that was subjected to NaCl-induced salt stress and the influence of jeevamrutha on this factor. The organic liquid formulation jeevamrutha, according to the findings, is effective in helping plants in achieving optimal growth and advancement under NaCl-induced stress [16].

Table 1: Treatment details

Treatments	Details
T1	Control
T2	25% Jeevamrutha(25 ml jeevamrutha+ 75 ml water)
T3	50% Jeevamrutha(50 ml jeevamrutha+ 50 ml water)
T4	75% Jeevamrutha(75 ml jeevamrutha+ 35 ml water)
T5	100% Jeevamrutha(100 ml jeevamrutha)
T6	25% Panchagavya(25 ml panchagavya+ 75 ml water)
T7	50% Panchagavya(50 ml panchagavya+ 50 ml water)
T8	25% Panchagavya(75 ml panchagavya+ 25 ml water)
T9	100% Panchagavya(100 ml Panchagavya)

Table 2: Chemical Characteristics of the soil used in the study

Parameter (unit)	Value	Remarks
Moisture content (%)	-	-
pH	7.96	Alkaline
Electrical conductivity (EC- dsm^{-1})	0.360	General
Available nitrogen (N)Kg/acre	197.1	Medium
Phosphorous (P_2O_5)	21.3	Medium
Potassium (K) Kg/acre	44	Medium
Organic carbon (OC) %	0.51	Medium

Table 4: Effects of Jeevamrutha and panchagavya on yield parameters

Treatment	Number of Flowers (Per plant)	Number of fruits (Per plant)	Average Fruits weight (kg)	Average Fruit Length (kg)	Average fruit Diameter (in cm)
T ₁	17.66	14.33	1	4.2	8.4
T ₂	24.33	21	2.5	6.3	10.26
T ₃	22	18.66	1.75	6.8	12.67
T ₄	36.66	34.66	2.85	7.0	12.51
T ₅	32.66	30	3.85	7.8	11.3
T ₆	20.66	19.33	2	5.2	7.5
T ₇	24.66	22	2.2	5.8	9.6
T ₈	27.33	26.66	3.5	6.2	12.6
T ₉	34	33.33	3	6.8	10.3
S D	6.50	7.06	0.89	1.06	1.87
Mean	26.66	24.44	2.51	6.23	10.57

Table 5: Estimation of chlorophyll content

Treatments	Chlorophylla		Chlorophyllb		Totalchlorophyll	
	45days	Harvest	45days	Harvest	45days	Harvest
T1	19.09	8.05	29.45	6.11	18.75	2.58
T2	16.16	24.63	15.31	12.66	7.75	2.79
T3	9.08	8.36	13.90	7.40	8.83	3.57
T4	25.31	11.36	18.20	7.26	7.26	2.49
T5	31.18	5.14	12.81	4.21	0.83	1.91
T6	29.42	3.88	20.53	4.74	7.91	2.60
T7	28.60	4.11	15.12	3.93	3.61	2.00
T8	21.67	4.92	10.98	6.09	2.33	3.56
T9	27.68	21.74	21.50	12.80	9.29	3.84
SD	7.28	7.75	5.65	3.34	5.22	0.69
SE	2.42	2.58	1.88	1.11	1.74	0.23

Table 3: Impact of Jeevamrutha and Panchagavya on different growth parameters of Tomato plant

Treatment	Plant Height (in cm)			Number of Leaves			Number of Branches			Leaf Area Index			Shoot length (in cm)			Root length (in cm)
	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	90 DAS
T1	60	74	82	153.3	167	173.3	19	23.3	24.6	1.78	1.85	1.86	32.77	33.91	35.47	15.3
T2	52	78	88	183.3	202.6	212.6	29	32.6	37	2.10	2.17	2.19	44.78	48.26	42.12	23.1
T3	65	94	102	228.3	242	268.3	36.3	38.3	42	1.51	2.53	2.53	43.16	46.57	46.38	27.7
T4	76	92	101	269	288.3	293.3	47.66	49.3	53.6	2.46	1.49	2.50	48.17	49.81	44.73	21.9
T5	76	80	91	270	280	283.3	56.33	62.3	65.3	0.59	0.60	0.63	41.76	33.04	37.06	30.2
T6	50	87	98	163	168.3	170	23	23.6	24.8	1.75	1.86	1.88	42.77	43.91	45.47	22.8
T7	63	74	86	171.3	176.6	178.3	28	32.6	37	1.86	2.10	2.17	44.78	48.26	42.12	27.3
T8	62	71	82	182	186.3	188.3	41.3	48.3	52	2.11	2.43	2.60	53.16	56.57	56.38	28.2
T9	80	110	121	198.3	200	204.6	57.66	59.3	63.6	2.18	2.21	2.27	28.17	29.81	34.73	18.6
Sd	10.60	12.59	12.51	43.87	46.67	49.27	14.12	14.47	15.16	0.53	0.58	0.60	7.55	9.04	6.71	4.90
S. Em	3.53	4.19	4.17	14.62	15.55	16.42	4.70	4.82	5.05	0.17	0.19	0.20	2.51	3.01	2.23	-
F	14.36			0.30			0.49			0.44			0.05			-
S	NS			S			S			S			S			-

The mean difference is significant at the 0.05 level. NS- non-significant, S- significant

CONCLUSION

In this study, an organic manure such as jeevamrutha and panchagavya were prepared. Their efficiency on plant growth and yield was determined. Organic liquid manure boosts the growth and yield of tomato plants individually. Based on this research the effectiveness of different treatment concentrations on the plant growth as well as yield were observed and recorded accordingly. This implies that the plant best utilization of Panchagavya and Jeevamrutha resulted in higher nutritional levels and faster growth. Organic farming focuses on increasing the value of vegetable crops, enhancing soil health, and providing a cost-effective alternative to conventional agricultural methods. The application of this organic manure for farming purpose not only increases the plant growth and yield but also provides an alternative path for avoiding the excessive and uncontrollable use of chemical fertilizers which in turn poses the harmful effects on soil biota as well as human wellbeing. Since the raw materials required for the production of the aforementioned organic manure is economically feasible and ecofriendly the preparation of this manure will be cost-effective.

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