



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(3): 330-334
Received: 24-11-2025
Accepted: 29-01-2026

Ankita Jat
M.Sc. Scholar, Department of
Agronomy, College of Agriculture,
Bhilwara, Rajasthan, India

Ramavtar
Assistant Professor, Department of
Agronomy, College of Agriculture,
Bhilwara, Rajasthan, India

JK Balyan
Assistant Professor, Department of
Agronomy, College of Agriculture,
Bhilwara, Rajasthan, India

RK Sharma
Professor, Department of Soil
Science and Agricultural
Chemistry, College of Agriculture,
Bhilwara, Rajasthan, India

Kavita Yadav
M.Sc. Scholar, Department of
Agronomy, College of Agriculture,
Bhilwara, Rajasthan, India

Corresponding Author:
Ankita Jat
M.Sc. Scholar, Department of
Agronomy, College of Agriculture,
Bhilwara, Rajasthan, India

Synergistic influence of Jeevamrutha and Panchagavya on growth dynamics of Foxtail millet (*Setaria italica* L.) under natural farming conditions

Ankita Jat, Ramavtar, JK Balyan, RK Sharma and Kavita Yadav

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i3e.5130>

Abstract

A field experiment was conducted during the Kharif season of 2024 at the Instructional Farm, College of Agriculture, Bhilwara, Rajasthan, to evaluate the influence of Jeevamrutha and Panchagavya on the growth attributes of foxtail millet (*Setaria italica* L.) under natural farming conditions. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications comprising fifteen treatment combinations. The treatments included three levels of Jeevamrutha viz., J₀ (control), J₁ (500 L ha⁻¹) and J₂ (1000 L ha⁻¹) applied as soil drenching at sowing, 30 and 60 days after sowing (DAS), and five levels of Panchagavya viz., P₀ (water spray), P₁ (1.5%), P₂ (3%), P₃ (4.5%) and P₄ (6%) applied as foliar spray at 25, 50 and 75 DAS. The results revealed that the combined application of Jeevamrutha and Panchagavya significantly enhanced the growth performance of foxtail millet. Among the treatment combinations, J₂P₄ (Jeevamrutha @ 1000 L ha⁻¹ + Panchagavya 6%) recorded the highest plant height, leaf area index, dry matter accumulation and number of tillers m⁻² along with reduced days to 50% flowering. The improvement in growth parameters may be attributed to enhanced microbial activity, improved nutrient mineralization and the presence of growth-promoting substances in these organic formulations, which collectively stimulated physiological and metabolic activities in the crop. The findings of the present investigation suggest that the combined application of Jeevamrutha and Panchagavya can serve as an effective and environmentally sustainable nutrient management strategy for improving the growth and productivity of foxtail millet under natural farming systems.

Keywords: Foxtail millet, Jeevamrutha, panchagavya, natural farming, organic nutrient management, growth parameters

Introduction

Foxtail millet (*Setaria italica* L.) is one of the earliest domesticated cereal crops and ranks second among millets after pearl millet in terms of global production (Reddy *et al.*, 2006)^[17]. The crop plays an important role in ensuring food and nutritional security, particularly in arid and semi-arid regions where climatic conditions are often unfavorable for the cultivation of major cereals. Foxtail millet is widely cultivated across several Asian and African countries and serves as a staple food for many smallholder and resource-poor farming communities. In India, the crop is mainly grown under rainfed conditions in states such as Andhra Pradesh, Karnataka, Telangana, Tamil Nadu, Uttar Pradesh and Rajasthan. Its short duration, low water requirement and adaptability to marginal soils make it highly suitable for cultivation in drought-prone and climate-vulnerable regions (Saleh *et al.*, 2013)^[19].

Foxtail millet is highly valued for its superior nutritional composition compared with many other cereal crops. The grain contains considerable amounts of protein, dietary fibre and essential minerals that contribute to human health and nutrition. On average, 100 g of foxtail millet grain contains about 12.3 g protein, 4.3 g fat, 60.9 g carbohydrates and nearly 8 g dietary fibre along with essential minerals such as calcium, iron and phosphorus. The grain also provides approximately 323-350 kcal of energy, making it a valuable dietary component. Moreover, the low glycemic index of foxtail millet makes it particularly suitable for diabetic and health-conscious consumers (Taylor *et al.*, 2006; Goron and Raizada, 2015)^[25, 7]. In recent years, the

crop has gained increasing attention due to its potential use in value-added products such as biscuits, porridge, noodles and traditional foods, which has enhanced its economic importance in both rural and urban markets (Rai *et al.*, 2018) [16].

Despite its adaptability and nutritional benefits, the productivity of foxtail millet in India remains relatively low compared to its yield potential. This yield gap is mainly attributed to poor soil fertility, nutrient deficiencies and cultivation under marginal environments with minimal input management (Bhattacharyya *et al.*, 2015) [2]. Among the essential plant nutrients, nitrogen and phosphorus play a vital role in crop growth and grain formation. Conventionally, these nutrients are supplied through chemical fertilizers to achieve higher crop productivity. However, the continuous and excessive use of inorganic fertilizers has resulted in deterioration of soil health, imbalance of soil nutrients and reduction in soil microbial diversity, which ultimately affect long-term agricultural sustainability (Tilman *et al.*, 2002) [26]. In order to reduce dependency on synthetic fertilizers and improve soil health, increasing emphasis is being placed on organic and biological nutrient sources in sustainable farming systems. Among various organic inputs, cow-based formulations such as Jeevamrutha and Panchagavya have gained considerable importance in natural farming practices (Sutar *et al.*, 2018) [24]. Jeevamrutha is a fermented liquid formulation prepared from cow dung, cow urine, jaggery, pulse flour and water. It acts primarily as a soil microbial stimulant and promotes the rapid multiplication of beneficial microorganisms in the soil. These microorganisms enhance the decomposition of organic matter and improve nutrient mineralization, thereby increasing nutrient availability to plants and improving soil fertility (Devakumar *et al.*, 2014) [6]. Panchagavya, another important cow-based formulation, is prepared from five products obtained from indigenous cows, namely milk, curd, ghee, urine and dung. It is commonly applied as a foliar spray and functions as a natural bio-stimulant. Panchagavya contains several essential nutrients, beneficial microorganisms and naturally occurring plant growth regulators that stimulate physiological processes such as chlorophyll synthesis, root growth, flowering and fruit development (Natarajan, 2002; Boraiah, 2013) [13, 3]. The combined application of Jeevamrutha as a soil amendment and Panchagavya as a foliar spray has been reported to enhance plant growth, nutrient uptake efficiency and crop productivity in several agricultural crops.

Although these organic formulations are widely promoted in natural farming systems, scientific information regarding their effectiveness in foxtail millet production is still limited. Therefore, systematic evaluation of Jeevamrutha and Panchagavya under field conditions is necessary to understand their role in improving crop growth and productivity. Keeping these aspects in view, the present study was undertaken to evaluate the effect of Jeevamrutha and Panchagavya on growth, yield attributes and productivity of foxtail millet under natural farming conditions and to identify an economically viable and environmentally sustainable nutrient management strategy.

Materials and Methods

A field experiment was conducted during the Kharif 2024 season at the Instructional Farm, College of Agriculture, Bhilwara (Rajasthan). The experimental soil (0-15 cm depth) was clay-loam in texture, alkaline in reaction (pH 7.82), medium in organic carbon (0.59%) and available nitrogen (309.42 kg ha⁻¹), medium in available phosphorus (22.58 kg ha⁻¹) and high in available potassium (379.26 kg ha⁻¹). The experiment was laid out in a Factorial Randomized Block Design (FRBD) with

three replications comprising 15 treatment combinations. Treatments consisted of three levels of Jeevamrutha: J₀ (control), J₁ (500 L ha⁻¹) and J₂ (1000 L ha⁻¹), applied as soil drenching at sowing, 30 and 60 DAS; and five levels of Panchagavya: P₀ (water spray), P₁ (1.5%), P₂ (3%), P₃ (4.5%) and P₄ (6%), applied as foliar spray at 25, 50 and 75 DAS. Foxtail millet (*Setaria italica* L.) variety 'SIA-3085' was sown at a spacing of 30 cm × 10 cm using a seed rate of 8-10 kg ha⁻¹ at a depth of 3-4 cm. The gross and net plot sizes were 15.75 m² and 12.0 m², respectively. All other agronomic practices were followed uniformly across treatments. Data were analyzed using analysis of variance (ANOVA) appropriate for FRBD at 5% level of significance.

Results and Discussion

Growth Parameters

The growth attributes of foxtail millet were significantly influenced by the application of different levels of Jeevamrutha and Panchagavya during the course of the experiment. Among the treatment combinations, the treatment J₂P₄ (Jeevamrutha @ 1000 L ha⁻¹ applied at sowing, 30 DAS and 60 DAS + Panchagavya 6% foliar spray at 25, 50 and 75 DAS) recorded superior performance with respect to plant height, leaf area index, dry matter accumulation, number of tillers m⁻² and minimum days taken to 50% flowering. The improvement in these growth parameters might be attributed to the enhanced availability of nutrients and stimulation of beneficial microbial activity in the soil due to the application of Jeevamrutha. Jeevamrutha is known to contain substantial quantities of essential macro and micronutrients along with growth-promoting substances, which collectively improve plant metabolic activities and promote vigorous crop growth. Similar findings were reported by Kasbe *et al.* (2009) [10] and Amareswari and Sujathamma (2014) [11], who observed that the application of Jeevamrutha significantly enhances microbial activity and nutrient availability, thereby promoting plant growth and development.

The increase in plant height and other growth parameters might also be due to the combined effect of Jeevamrutha and Panchagavya, which supply readily available nutrients through organic formulations and stimulate physiological processes within the plant system. Jeevamrutha contains essential plant nutrients such as nitrogen, phosphorus, potassium, zinc, along with enzymes and beneficial microorganisms that promote cell elongation, cell division and rapid vegetative growth. These organic inputs also enhance soil biological activity and improve nutrient mineralization, resulting in better nutrient uptake by plants. Similar results were reported by Devakumar *et al.* (2010) [5], who highlighted the role of Jeevamrutha in stimulating microbial populations and improving soil fertility status.

The positive response of plant height and vegetative growth to Panchagavya application might be attributed to the presence of growth regulators, micronutrients and beneficial microorganisms in the formulation. Panchagavya is known to contain naturally occurring plant growth promoters such as auxins and gibberellins which stimulate cell division and elongation, ultimately leading to enhanced plant growth. Priya *et al.* (2019) [15] reported that the foliar application of Panchagavya significantly increased plant height in tomato, with the highest growth recorded at 3% Panchagavya concentration. Similarly, Patil *et al.* (2019) [14] also reported a marked increase in plant height and vegetative growth due to Panchagavya application in vegetable crops.

The observed improvement in growth attributes could also be

due to the enhanced availability of nitrogenous compounds from organic sources, which increase foliage development and photosynthetic efficiency of plants. Adequate supply of major nutrients such as nitrogen, phosphorus and potassium regulates physiological processes and improves morphological characteristics of crops. Nitrogen plays a key role in protein synthesis and formation of chlorophyll, thereby promoting vegetative growth and leaf area expansion. These findings are in agreement with the observations of Singh *et al.* (2018) [21] and Sutar *et al.* (2018) [24], who reported that organic liquid formulations like Jeevamrutha and Panchagavya enhance nutrient uptake and improve crop growth performance.

The results of the present investigation are also supported by earlier findings of Harish (2009) [8], Mohapatra *et al.* (2013) [12] in broccoli and Shree *et al.* (2014) [20] in cauliflower, who reported that integrated organic nutrient sources significantly improve plant height, leaf area development and biomass accumulation. Nitrogen, being an essential constituent of amino acids, nucleic acids and several co-enzymes, plays a crucial role in cell enlargement and cell division, thereby contributing to improved plant growth.

Furthermore, the increased plant height observed in the present study may also be attributed to the presence of growth-promoting substances in Jeevamrutha, which enhance root

development and facilitate efficient absorption and translocation of nutrients and water within the plant system. Improved root growth leads to better nutrient uptake and overall plant vigor. Similar observations were reported by Boroujerdnia and Ansari (2007) [4] and Safiullah *et al.* (2018) [18], who emphasized the importance of balanced nutrient supply in promoting plant growth and biomass production.

Studies conducted by Singh *et al.* (2015) [22] in broccoli also revealed similar improvements in plant height and vegetative growth due to enhanced nitrogen availability, which promotes synthesis of proteins and carbohydrates in plants. The improved availability of phosphorus further contributes to energy transfer and metabolic activities, while potassium plays an essential role in carbohydrate metabolism, enzyme activation and efficient water use. Consequently, the availability of these nutrients improves plant height, dry matter accumulation, leaf area index and number of tillers. Similar observations regarding the beneficial role of organic formulations in enhancing plant growth and physiological efficiency have also been reported by Devakumar *et al.* (2014) [6] and Vibha and Lingaraju (2020) [27]. Thus, the combined application of Jeevamrutha and Panchagavya under natural farming conditions significantly enhanced the growth performance of foxtail millet by improving soil fertility, microbial activity and nutrient availability.

Table 1: Effect of Jeevamrutha and Panchagavya on plant height of Foxtail Millet

Treatments	Plant height (cm)		
	At 25 DAS	At 50 DAS	At harvest
A. Levels of Jeevamrutha (Soil application at the time of sowing, 30 and 60 DAS)			
J ₀ : Control	39.74	66.92	107.46
J ₁ : 500 lit/ha	40.81	92.87	151.83
J ₂ : 1000 lit/ha	43.02	103.96	163.93
SEm (±)	1.02	1.72	3.58
C.D. ($P \leq 0.05$)	NS	4.99	10.38
B. Levels of Panchgavya (Foliar spray at 25, 50 and 75 DAS)			
P ₀ : Water spray (Control)	39.75	70.12	112.52
P ₁ : 1.5% Panchgavya	40.60	81.15	131.58
P ₂ : 3% Panchgavya	41.37	89.84	144.05
P ₃ : 4.5% Panchgavya	41.49	98.80	157.33
P ₄ : 6% Panchgavya	42.74	99.69	159.91
SEm (±)	1.25	1.93	4.01
C.D. ($P \leq 0.05$)	NS	5.58	11.61
Interaction (J × P)	NS	S	S

Table 2: Effect of Jeevamrutha and Panchgavya on Leaf area index at 50, 75 DAS of Foxtail Millet under natural farming conditions

Treatments	Leaf area index	
	At 50 DAS	At 75 DAS
A. Levels of Jeevamrutha (Soil application at the time of sowing, 30 and 60 DAS)		
J ₀ : Control	13.13	20.10
J ₁ : 500 lit/ha	17.11	26.82
J ₂ : 1000 lit/ha	19.67	29.79
SEm (±)	0.43	0.53
C.D. ($P \leq 0.05$)	1.25	1.53
B. Levels of Panchgavya (Foliar spray at 25, 50 and 75 DAS)		
P ₀ : Water spray (Control)	13.59	20.87
P ₁ : 1.5% Panchgavya	14.91	22.48
P ₂ : 3% Panchgavya	17.04	26.12
P ₃ : 4.5% Panchgavya	18.64	28.88
P ₄ : 6% Panchgavya	18.80	29.59
SEm (±)	0.48	0.59
C.D. ($P \leq 0.05$)	1.40	1.71
Interaction (J × P)	8.81	9.48

Table 3: Effect of Jeevamrutha and Panchgavya on dry matter accumulation at 25, 50 DAS and at harvest of Foxtail Millet under natural farming conditions

Treatments	Dry matter accumulation (g per plant)		
	At 25 DAS	At 50 DAS	At harvest
A. Levels of Jeevamrutha (Soil application at the time of sowing, 30 and 60 DAS)			
J ₀ : Control	1.78	4.13	5.33
J ₁ : 500 lit/ha	1.83	5.46	7.27
J ₂ : 1000 lit/ha	1.93	6.16	7.71
SEm (±)	0.05	0.13	0.17
C.D. ($P \leq 0.05$)	NS	0.38	0.50
B. Levels of Panchgavya (Foliar spray at 25, 50 and 75 DAS)			
P ₀ : Water spray (Control)	1.78	4.28	5.53
P ₁ : 1.5% Panchgavya	1.82	4.82	6.18
P ₂ : 3% Panchgavya	1.86	5.36	6.92
P ₃ : 4.5% Panchgavya	1.86	5.82	7.48
P ₄ : 6% Panchgavya	1.92	5.95	7.65
SEm (±)	0.05	0.15	0.19
C.D. ($P \leq 0.05$)	NS	0.43	0.56
Interaction (J × P)	NS	S	S

Table 3a: Interaction effect of levels of Jeevamrutha and Panchgavya (Foliar spray at 25, 50 and 75 DAS) on dry matter accumulation (g plant⁻¹) at 25, 50 DAS and harvesting of foxtail millet.

Treatments	Dry matter accumulation at (g plant ⁻¹)								
	25 DAS			50 DAS			At harvest		
	J ₀	J ₁	J ₂	J ₀	J ₁	J ₂	J ₀	J ₁	J ₂
P ₀	1.80	1.92	1.64	3.63	4.75	4.47	4.68	6.36	5.54
P ₁	1.78	1.97	1.72	3.74	5.45	5.27	4.89	7.31	6.63
P ₂	1.76	1.96	1.85	4.13	5.96	6.00	5.33	7.91	7.52
P ₃	1.78	1.97	1.84	4.55	6.45	6.46	5.85	8.52	8.07
P ₄	1.80	1.34	2.62	4.60	4.67	8.59	5.91	6.24	10.80
SEm ±	0.10			0.30			0.38		
CD (0.05)	NS			0.28			1.12		

Table 4: Effect of Jeevamrutha and Panchgavya on the number of tillers m⁻² and days to 50% flowering of Foxtail Millet under natural farming conditions.

Treatments	Number of tillers m ⁻²	Days to 50% flowering
A. Levels of Jeevamrutha (Soil application at the time of sowing, 30 and 60 DAS)		
J ₀ : Control	12.45	46.68
J ₁ : 500 lit/ha	15.88	42.83
J ₂ : 1000 lit/ha	16.69	40.17
SEm (±)	0.31	1.08
C.D. (P ≤ 0.05)	0.90	3.13
B. Levels of Panchgavya (Foliar spray at 25, 50 and 75 DAS)		
P ₀ : Water spray (Control)	12.80	46.42
P ₁ : 1.5% Panchgavya	14.14	45.60
P ₂ : 3% Panchgavya	15.27	43.39
P ₃ : 4.5% Panchgavya	16.26	40.54
P ₄ : 6% Panchgavya	16.57	39.89
SEm (±)	0.35	1.21
C.D. (P ≤ 0.05)	1.01	3.50
Interaction (J × P)	S	S

Table 4a: Interaction effect of levels of Jeevamrutha and Panchgavya (Foliar spray at 25, 50 and 75 DAS) on number of tillers at harvesting of foxtail millet.

Treatments	Number of tillers		
	J ₀	J ₁	J ₂
P ₀	11.30	14.26	12.83
P ₁	11.67	15.97	14.77
P ₂	12.44	17.02	16.34
P ₃	13.36	18.11	17.33
P ₄	13.48	14.06	22.18
SEm ±	0.69		
CD (0.05)	2.02		

References

1. Amareswari PU, Sujathamma P. Jeevamrutha as an alternative to chemical fertilizers in rice production. *Agricultural Science Digest*. 2014;34(3):240-242.
2. Bhattacharyya R, Kundu S, Pandey SC, Singh KP, Gupta HS. Tillage and irrigation effects on crop yields and soil properties under the rice-wheat system in the Indian Himalayas. *Soil and Tillage Research*. 2015;149:145-153.
3. Boraiah B. Effect of Panchagavya on growth and yield of vegetable crops under organic farming systems. 2013.
4. Boroujerdnia M, Ansari NA. Effect of different levels of nitrogen fertilizer on growth and yield of wheat. *Pakistan Journal of Biological Sciences*. 2007;10(3):414-417.
5. Devakumar N, Rao GGE, Shubha S, Imrankhan, Nagaraj. Activities of organic farming research centre on organic farming. Bangalore: University of Agricultural Sciences; 2010. p. 1-10.
6. Devakumar N, Shubha S, Gowda SB, Rao GGE. Microbial analytical studies of traditional organic preparations Beejamrutha and Jeevamrutha. In: *Building Organic Bridges*, Thuenen Report No. 20. 2014. p. 639-642.
7. Goron TL, Raizada MN. Genetic diversity and genomic resources available for the small millet crops to accelerate a New Green Revolution. *Frontiers in Plant Science*. 2015;6:157.
8. Harish KV. Effect of integrated nutrient management on growth and yield of vegetable crops. Bangalore: University of Agricultural Sciences; 2009.
9. Kannaujiya AK, Singh A, Yadav B. Effect of Panchagavya and Jeevamrutha on growth and yield of chilli (*Capsicum annuum* L.). *Journal of Advances in Biology and Biotechnology*. 2025;28(2):862-868.
10. Kasbe SS, Joshi SM, Bhaskar SU. Characterization of farmer's jeevamrutha formulations with respect to aerobic rice. *Journal of Soils and Crops*. 2009;19(2):344-348.
11. Kumar A. Effect of FYM, Jeevamrutha and Panchagavya on growth and yield of French bean (*Phaseolus vulgaris* L.). *Annals of Agricultural Research*. 2025;46(2):189-193.
12. Mohapatra S, *et al.* Effect of organic nutrient sources on growth and yield of broccoli (*Brassica oleracea* var. *italica*). *Vegetable Science*. 2013;40(1):84-86.
13. Natarajan K. Panchagavya - A manual. Goa: Other India Press; 2002.
14. Patil SL, *et al.* Influence of Panchagavya on growth and yield of crops under organic farming. *Journal of Pharmacognosy and Phytochemistry*. 2019;8(4):1234-1237.
15. Priya RS, *et al.* Effect of Panchagavya on growth and yield of tomato (*Solanum lycopersicum* L.). *International Journal of Chemical Studies*. 2019;7(3):2143-2146.
16. Rai KN, Gowda CLL, Reddy BVS, Sehgal S. Millets for nutritional security in India. *Indian Journal of Genetics*. 2018;78(3):365-374.
17. Reddy VG, Upadhyaya HD, Gowda CLL, Singh S. Characterization of foxtail millet germplasm collections for morphological traits. *Crop Science*. 2006;46:228-234.
18. Safiullah K, *et al.* Effect of organic fertilizers on growth and yield of cereal crops. *International Journal of Agronomy and Agricultural Research*. 2018;12(2):20-27.
19. Saleh ASM, Zhang Q, Chen J, Shen Q. Millet grains: Nutritional quality, processing and potential health benefits. *Comprehensive Reviews in Food Science and Food Safety*. 2013;12:281-295.
20. Shree S, *et al.* Integrated nutrient management in cauliflower. *Asian Journal of Horticulture*. 2014;9(1):150-154.
21. Singh AS, Ramteke PW, Paul A, David AA, Shukla PK, Lal EP. Influence of Jeevamrutha on seed germination of *Ocimum basilicum* under NaCl salinity stress. *Journal of Pharmacognosy and Phytochemistry*. 2018;7(2):705-707.
22. Singh R, *et al.* Integrated nutrient management in broccoli for improved growth and yield. *Indian Journal of Agricultural Sciences*. 2015;85(4):523-527.
23. Sugumaran MP, Akila S, Porkodi G, Kalaichelvi K. Potential of Panchagavya and Jeevamruth for sustainable organic farming in India. *Journal of Eco-friendly Agriculture*. 2024.
24. Sutar R, Sujith GM, Devakumar N. Growth and yield of cowpea as influenced by Panchagavya and Jeevamrutha. *Legume Research*. 2018;42(6):824-828.
25. Taylor JRN, Schober TJ, Bean SR. Novel food and non-

- food uses for sorghum and millets. *Journal of Cereal Science*. 2006;44:252-271.
26. Tilman D, Cassman KG, Matson PA, Naylor R, Polasky S. Agricultural sustainability and intensive production practices. *Nature*. 2002;418:671-677.
27. Vibha G, Lingaraju HG. Jeevamrutha: Organic liquid formulation for sustainable agriculture practices. *Journal of Science and Technology*. 2020;5(5):135-139.
28. Vishnuvardhan CH, Rai PK. Standardization of pre-sowing treatments with Panchagavya and Jeevamrutha in cowpea. *Seed Research*. 2024;52(1):58-62.