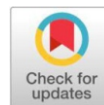


Original Research Article

Open Access

Impact of Bio-formulations from Diverse Cattle Breeds on the Phenology of Finger Millet: A Comparative Study



Arjun Singh^{*1}, Komal Sharma², Gourav Sudan², Bhim Singh³ and Rameshwar Kumar⁴

¹Department of Agronomy, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062, India

²Division of Soil Science and Agricultural Chemistry, Sher-e- Kashmir University of Agricultural Sciences and technology, Chatha, Jammu-180009, India

³Division of Agronomy, Sher-e- Kashmir University of Agricultural Sciences and technology, Chatha, Jammu-180009, India

⁴Department of Organic Agriculture and Natural Farming, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062, India

ABSTRACT

The present experiment was conducted during the kharif season of 2022 and 2023 at Zero Budget Natural Farm (ZBNF), Department of Organic Agriculture and Natural Farming, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur. The soil of the experimental field was silty clay loam, slightly acidic in nature (5.76), low in available nitrogen (230.5 kg/ha), and medium in available phosphorus (15.8 kg/ha) and potassium (220.6 kg/ha). The experiment was laid out in RBD design with 3 replications viz. Bio-formulations prepared with inputs of seven different cattle breeds viz. Indigenous cow (Pahari) lactating, Indigenous cow (Pahari) dry, Indigenous cow (Sahiwal) lactating, Indigenous cow (Sahiwal) dry, Exotic cow (Jersey) lactating, Exotic cow (Jersey) dry, Indigenous bull (Pahari). Results showed that the application of bio-formulations prepared from inputs of an Indigenous cow (Pahari) dry resulted in the least days to tillering, days to panicle initiation, and days to 50% anthesis of finger millet.

Keywords: Natural farming, bio-formulations, Finger millet, Cattle breeds, Jeevamrit, Beejamrit, Ghanjeevamrit.

Introduction

Finger millet a hardy and drought-resistant cereal grain holds a prominent place in the agricultural practices of many regions across Africa and Asia (8). Known for its small, nutrient-dense seeds, finger millet is a rich source of essential nutrients, including calcium, iron, and dietary fiber, making it a vital component of traditional diets (4). Its resilience to adverse climatic conditions, such as low rainfall and poor soil fertility, makes finger millet particularly important in areas vulnerable to food insecurity. Cultivated for thousands of years, finger millet has adapted well to various agroecological zones, often serving as a staple crop in subsistence farming systems. Moreover, the crop contributes to soil health and biodiversity, making it a key player in sustainable agricultural practices. As interest in climate-resilient crops continues to grow, finger millet's potential for enhancing food security and nutrition in the face of global challenges cannot be overstated (9). Natural farming inputs have gained significant attention as sustainable alternatives to synthetic fertilizers and pesticides (2), particularly in the cultivation of resilient crops like finger millet. As a staple in many regions, finger millet is known for its adaptability to harsh climates and nutritional value (7). The application of natural farming inputs can profoundly influence the phenological characteristics of finger millet, including germination rates, growth duration, flowering time, and grain

development. These inputs not only enhance soil health and biodiversity but also promote sustainable agricultural practices that align with ecological principles(6). Understanding how these natural inputs affect the phenological traits of finger millet is crucial for optimizing cultivation techniques, improving yield, and fostering food security in vulnerable communities. This study aims to explore the relationship between natural farming inputs and the phenological development of finger millet, providing insights that could lead to more resilient and productive farming systems.

Materials and Methods

The present experiment was conducted during the kharif season of 2022 and 2023 at Zero Budget Natural Farm (ZBNF), Department of Organic Agriculture and Natural Farming, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur. The site represents the mid-hills sub-humid zone of Himachal Pradesh. This zone extends from 651 meters to 1800 meters amsl, having a mild temperate climate, and occupies about 32 percent of the total geographical area and 37 percent of the cultivated area of the state. The experiment was laid out in RBD design with three replications. Bio-formulations prepared with inputs of seven different cattle breeds viz., Indigenous cow (Pahari) lactating, Indigenous cow (Pahari) dry, Indigenous cow (Sahiwal) lactating, Indigenous cow (Sahiwal) dry, Exotic cow (Jersey) lactating, Exotic cow (Jersey) dry and Indigenous bull (Pahari). The necessary ingredients for making ghanjeevamrit, beejamrit, and jeevamrit were procured, and then inputs were prepared using the dung, and urine from different cattle breeds. The data on various characters were statistically analyzed as suggested by (5).

*Corresponding Author: Arjun Singh

DOI: <https://doi.org/10.21276/AATCCReview.2025.13.03.481>

© 2025 by the authors. The license of AATCC Review. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Wherever statistical significance was observed critical difference (CD) @P=0.05% level of probability was worked out for comparison of mean data.

Result and Discussions

Days to tillering

A glance at Table 1 indicated that when bio-formulations prepared from the inputs of *Pahari* dry cow were applied the crop took the least days to till followed by the application of bio-formulations prepared from the inputs of *Pahari* lactating cow and *Pahari* bull during both the years of experimentation. However, a decrease in the number of days to tillering was observed in the second year as compared to the first year. The maximum number of days to tillering was recorded by the application of bio-formulations prepared from the inputs of a Jersey lactating cow.

Days to panicle initiation

Days to Panicle initiation were significantly affected by the application of bio-formulations prepared from the inputs of different cattle breeds. The significantly higher number of days to Panicle initiation was recorded by the application of bio-formulations prepared from the inputs of Jersey lactating cow. The least number of days to Panicle initiation was recorded by application of bio-formulations prepared from the inputs of Indigenous *Pahari* dry cow. This might be due to the increased population of the microbes due to the application of various bio-formulations (1) and higher nutrient content of the bio-formulations prepared from inputs of *Pahari* dry cow as compared to other cattle breeds (10).

Days to 50% anthesis

An inspection of data related to days to 50% anthesis of finger millet revealed that application of bio-formulations prepared from the inputs of Indigenous *Pahari* dry cow led to the least number of days being taken by the plant for 50% anthesis. The maximum number of days to 50% anthesis was recorded by the application of bio-formulations prepared from the inputs of a Jersey lactating cow. This may be attributed to the ability of natural farming components to increase the soil microbial population and provide essential plant nutrients in an adequate quantity (3).

Conclusion

Bio-formulations prepared from the inputs of Indigenous (*Pahari*) dry resulted in the least days to tillering, days to panicle initiation, and days to 50% anthesis. This early harvest can be particularly advantageous in crop growth by allowing plants to complete their life cycle before the onset of adverse conditions, such as drought or extreme temperatures. This can enhance resource utilization, improve yields, and reduce the risk of damage from late-season stresses, ultimately leading to more successful and resilient crop production. The study provides empirical evidence for the comparative efficacy of bio-formulations derived from diverse cattle breeds, particularly highlighting the potential of dry Indigenous (*Pahari*) cow-based inputs in promoting early growth stages of finger millet under natural farming conditions. This research adds value to the field of natural farming by emphasizing breed-specific effects on crop performance and supports the revival of Indigenous livestock resources in sustainable agriculture.

Table 1: Effect of bio-formulations prepared from different cattle breeds on phenological studies of finger millet

Bio- formulations prepared from	Days to tillering			Days to panicle initiation			Days to 50% anthesis		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
T ₁ Indigenous cow (<i>Pahari</i>) lactating	43.2	41.0	42.1	56.2	54.2	55.2	70.2	68.4	69.3
T ₂ Indigenous cow (<i>Pahari</i>) dry	42.0	40.0	41.0	53.4	51.4	52.4	68.2	65.2	66.7
T ₃ Indigenous cow (Sahiwal) lactating	48.5	47.2	47.8	60.7	58.7	59.7	74.8	72.7	73.8
T ₄ Indigenous cow (Sahiwal) dry	46.5	45.5	46.0	59.2	56.2	57.7	73.5	70.2	71.9
T ₅ Exotic cow (Jersey) lactating	51.2	49.2	50.2	64.2	61.9	63.1	77.8	74.6	76.2
T ₆ Exotic cow (Jersey) dry	50.0	48.2	49.1	63.4	59.1	61.3	75.7	73.8	74.8
T ₇ Indigenous bull (<i>Pahari</i>)	45.0	43.2	44.1	58.9	55.7	57.3	71.8	69.7	70.8
SE(m) ±	1.36	1.11		0.82	1.00		1.26	1.14	
LSD (P=0.05)	4.24	3.46		2.56	3.12		3.93	3.55	

Declaration of conflicting interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding statement

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethical approval and informed consent statement

Not applicable

Data availability statement

All data supporting the findings of this study are available in the paper

Acknowledgement

The authors sincerely acknowledge the Department of Organic Agriculture and Natural Farming, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, for providing the necessary facilities and support.

We also extend our gratitude to the technical staff and field workers at the Zero Budget Natural Farm for their assistance during the conduct of the experiment.

References

- BalpandeSS, GhodpageRM, RautMM, &KausadikarPH. (2013). Effect of manurial liquids on soil microbiota, productivity and economics of wheat. *Journal of Soils and Crops* 23: 226-230
- Bana RS,Dawar R, HaldharSM, Godara S, Singh A, Bamboriya SD, ... & Choudhary M. (2022). Natural farming: Is it safe to march ahead?. *Journal of Agriculture and Ecology*, 14, 1-11.
- Devakumar N, ShubhaS, Gowder SB, & Rao GGE. (2014). Microbial analytical studies of traditional organic preparations beejamrutha and jeevamrutha. *Building organic bridges*, 2, 639-642.

4. Devi PB, Vijayabharathi R, SathyabamaS, MalleshiNG, &Priyadarisini VB. (2014). Health benefits of finger millet (*Eleusine coracana* L.) polyphenols and dietary fiber: a review. *Journal of food science and technology*, 51, 1021-1040.
5. Gomez KA,Gomez AA.(1984) Statistical procedure for agricultural research (2nded.). John Wiley and Sons, New York.p 68
6. Naresh RK, Kumar M, Kumar S, ChowdharyU, Kumar Y, MahajanNC, ... & Tomar SS. (2018). Zero budget natural farming viable for small farmers to empower food and nutritional security and improve soil health: A review. *Journal of Pharmacognosy and Phytochemistry*, 7(2), 1104-1118.
7. Shobana S, Krishnaswamy K, Sudha V, Malleshi NG, AnjanaRM, Palaniappan L, & MohanV. (2013). Finger millet (Ragi, *Eleusine coracana* L.): a review of its nutritional properties, processing, and plausible health benefits. *Advances in food and nutrition research*, 69, 1-39.
8. Singh J, Rameshwar Katna G, Kumar R, Sharma GD, Upadhyay RG, ... & Jyoti. (2022). Performance of finger millet under organic and natural production systems.
9. Ullasa MY, Pradeep S, Shrikantha CD, &Sridhara S. (2017). Effect of different organic nutrient management practices on growth, yield and economics of finger millet, *Eleusine coracana* (L) Gaertn. *International Journal of Farm Sciences*, 7(2), 10-14.
10. Van Faassen HG, & Van Dijk H. (1987). Manure as a source of nitrogen and phosphorus in soils. In *Animal Manure on Grassland and Fodder Crops. Fertilizer or Waste? Proceedings of an International Symposium of the European Grassland Federation, Wageningen, The Netherlands, 31 August–3 September 1987* (pp. 27-45). Springer Netherlands.