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Anushka P Sonawane
PG Student, Agronomy Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krushi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Renuka H Shinde
Associate Professor of Agronomy, Agronomy Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krushi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Yogesh G Ban
Junior Breeder, AICRP on Small Millets, ZARS, Kolhapur, Maharashtra, India

Tulshidas S Kadam
PG Student, Agronomy Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krushi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Corresponding Author:
Anushka P Sonawane
PG Student, Agronomy Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krushi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Effect of nutrient sources and organic liquids on growth attributes, yield and economics of production of finger millet (*Eleusine coracana* L.)

Anushka P Sonawane, Renuka H Shinde, Yogesh G Ban and Tulshidas S Kadam

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Abstract
The investigation aims to explore how different organic and inorganic sources impacts the growth attributes and economics of the production of finger millet. This experiment was conducted during *kharif* 2022 at research farm, Agronomy section, RCSM College of Agriculture, Kolhapur. The experiment was laid out in a randomised block design comprising thirteen treatments replicated three times. Among the various doses of fertilizer along with various organic nutrient inputs treatment T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* recorded highest values such as plant height at harvest was recorded (97.8 cm), dry matter accumulation $plant^{-1}$ (78.8 g), number of tillers (3.04 tillers $plant^{-1}$). Application of T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* recorded the highest grain yield (22.8 q ha^{-1}) and straw yield (30.4 q ha^{-1}). As per the economic studies treatment T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, have recorded maximum cost of cultivation (67869 $Rs.ha^{-1}$), gross monetary returns (90044 $Rs.ha^{-1}$), and net returns (22175 $Rs.ha^{-1}$). Nevertheless treatment 100% RDF +5% *Panchagavya* recorded maximum benefit cost ratio. From this investigation it was concluded that application of T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* found to derive maximum gross returns as well as highest growth attributes.

Keywords: Finger millet, growth attributes, *Jeevamrut, Panchagavya*, vermicompost

Introduction
Finger Millet, commonly known as "*ragi*," derives its name from the Sanskrit word "*Rajika*." Finger Millet is cultivated in more than 25 countries, particularly in arid and semi-arid regions. In the context of millet production in India, finger millet holds a prominent position among farmers due to its extensive cultivation. Its remarkable resilience and capacity to thrive in adverse climatic and poor soil conditions make it a dependable and profitable crop. In India, finger millet is grown over an area of 1.19 million hectares, resulting in a production of 1.98 million tonnes, with an average productivity of 1661 kg per hectare. Karnataka leads in both area and production, accounting for 56.21% and 59.52%, followed by Tamil Nadu (9.94% and 18.27%), Uttarakhand (9.40% and 7.76%), and Maharashtra (10.56% and 7.16%), respectively (www.indiastat.com). The global increase in awareness regarding organic food has led to a simultaneous rise in organic agriculture. To effectively manage nutrients in organic farming, farmers commonly employ practices like *jeevamrut, panchagavya*, vermicompost, and farm yard manure (FYM). Finger Millet, already highly nutritious, can benefit even more from these organic formulations. Farm yard manure with nutrient content 0.5% N, 0.2% P, 0.5% K and to maximize the output and soil productivity it can be used in conjunction with chemical fertilizers. Vermicompost rich in nitrogen 1.5-2%, phosphorous 1.25% potassium 1-1.5% (Sinha, 2004) [10], consequently soil nutrient status and structure is improved. Organic formulations such as *jeevamrut* supplies 1.48% Nitrogen, 0.28% Phosphorous, 0.32% Potassium and *Panchagavya* supplies 0.06% nitrogen, 0.03% phosphorous, 0.04% potassium along with plant growth hormones that influences plant growth and yield. These organic nutrient sources influences healthy crop stand and maintains soil fertility.

Above organic formulations can be made on farm itself so that the expenditure on composts and fertilizer can be minimized. Organic nutrient sources, and liquid formulations if used along with the recommended fertilizer dose then the production and productivity of Finger Millet will surely increase. By keeping this aim a field experiment was conducted entitled "Response of Finger Millet (*Eleusine coracana* L.) to Nutrient Sources and Organic Liquids". During *kharif* 2022 at Agronomy field of RCSM college of Agriculture, Kolhapur.

Materials and Methods

A field experiment was conducted during *kharif* 2022 at research farm, Agronomy section, RCSM College of Agriculture, Kolhapur. It is located on 16° 41' N latitude, 74° 14' longitude. The experimental site was fairly uniform and levelled. The experimental field's soil was characterized as clay loam in texture, with medium available nitrogen (320.5 kg ha¹), high available phosphorus (31 kg ha¹), moderately high available potassium (250 kg ha¹), alkaline pH (8.00), EC (0.28 d Sm"), and medium organic carbon (0.58%). Transplanting of finger millet (*Phule kasari*) was done on 18th July 2022 with the spacing of 30 x 10 cm², and the harvesting was completed by 1st November 2022. Prior to transplanting FYM and Vermicompost were applied to soil as per treatments. The gross and net plot sizes were 4.50 m x 4.20 m and 3.60 m x 3.10 m, respectively. The experiment followed a randomized block design, comprising thirteen treatments with three replications. These thirteen treatments were as follows: T_1: Absolute Control, T_2: 100% GRDF (60:30:30 kg NPK ha $^{-1}$)+ FYM @ 5 t, T_3: 100% RDF (60:30:30 kg NPK ha $^{-1}$), T_4: 100% RDF + Vermicompost @ 2.5 t ha^{-1}, T_5: 100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*, T_6: 100% RDF + Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, T_7: 100% RDF + 5% *Panchagavya*, T_8: 100% RDF + 10% *Jeevamrut*, T_9: 75% RDF + Vermicompost @ 2.5 t ha^{-1}, T_{10}: 75% RDF + Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*, T_{11}: 75% RDF + Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, T_{12}: 75% RDF+ 5% *Panchagavya*, T_{13}: 75% RDF +10% *Jeevamrut.* Observations were recorded periodically at an interval of fifteen days. The data obtained by the investigation then subjected to Statistical analysis as per the standard procedure by using the techniques of analysis of variance and test of significance was carried out as given by Panse and Sukhatme (1985) [11]. In the tabular data C.D values have been given for the comparison only where 'F' test was significant. The statistical analysis was carried out by computer.

Table 1: Effect of nutrient sources and organic liquids on growth attributes of finger millet

Treatments	Plant height (cm)			Dry matter accumulation plant^{-1}(g)			Tillers plant^{-1}
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	At harvest
Absolute Control	32.75	45.66	73.96	4.05	15.71	43.50	1.50
100%GRDF (60:30:30 kg NPK ha $^{-1}$)+ FYM @ 5 t	41.34	64.78	92.00	5.51	21.96	51.94	2.10
100% RDF (60:30:30 kg NPK ha $^{-1}$)	41.56	65.72	92.74	5.11	21.23	51.62	1.96
100% RDF + Vermicompost @ 2.5 t ha^{-1}	44.99	68.76	98.94	8.23	24.21	54.60	2.63
100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	44.42	68.43	99.66	8.48	25.12	55.15	2.82
100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	46.13	69.88	100.86	9.18	28.03	59.47	3.04
100% RDF +5% *Panchagavya*	40.86	64.78	90.67	6.61	22.54	52.21	2.20
100% RDF + 10% *Jeevamrut*	40.17	64.38	88.39	6.20	22.04	52.06	2.13
75% RDF + Vermicompost @ 2.5 t ha^{-1}	41.82	65.90	94.23	7.07	22.90	52.41	2.31
75% RDF + Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	42.99	66.61	98.94	7.45	23.45	52.86	2.37
75% RDF + Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	42.31	67.30	98.29	7.89	23.94	53.03	2.40
75% RDF + 5% *Panchagavya*	41.44	64.08	86.39	5.03	20.88	50.61	1.92
75% RDF +10% *Jeevamrut*	40.91	64.00	85.32	4.71	19.93	49.30	1.80
S.Em±	2.02	3.43	4.4	0.42	1.64	1.96	0.17
C.D.@ 5%	5.91	10.07	12.9	1.23	4.81	5.75	0.51
General Mean	41.6	64.6	92.33	6.57	22.4	52.21	2.24

Results and Discussion

Growth attributes

Plant height

The data related to growth attributes is presented in Table. 1. The plant height showed significant influence by the application of various organic and inorganic inputs. The growth rate was slow until 30 DAT, then rapidly increased until 90 DAT before slowing down, indicating that the main growth period occurred between 30 to 90 DAT. The highest plant height at harvest (97.8 cm) was achieved with T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, which was comparable to the plant height achieved with T_5: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 5% *Panchagavya* and T_4: 100% RDF + Vermicompost @ 2.5 t ha^{-} at 60, 90 DAT, and harvest. This increment can be attributed to the inputs involved in the treatment which are rich in nitrogen content.

Dry matter accumulation

Dry matter accumulation was significantly influenced by various treatments, however a progressive increment is observed at various intervals. Summarily mean dry matter accumulation plant^{-1} at 15 DAT and at harvest was recorded 3.08 g and 67.5 g respectively. Thereafter, at harvest treatment T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, recorded highest dry matter accumulation plant^{-1} (78.8 g) and treatment T_5: 100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya* (72.3 g) and treatment T_4: 100% RDF + Vermicompost @ 2.5 t ha^{-1} (71.4 g) were remain at par. Growth produces an increase in dry matter when plant is actively photosynthesizing. The nutrient availability is abundant because the inputs are rich in nitrogen along with the organic liquid formulation which provides the growth promoting hormones that improves the dry matter accumulation by plant. Similar results were obtained by Raghuvaran Singh *et al.* 2020 [12], Harika. *et al.* (2018) [13].

Number of tillers per plant

The mean number of tillers having developed earhead was recorded 2.24 at harvest. Treatment T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* have shown significantly higher number of tillers per plant (3.04 tillers plant^{-1}) however treatment T_5: 100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya* (2.82 tillers plant^{-1}) and treatment T_4: 100%

RDF + Vermicompost @ 2.5 t ha^{-1} (2.63 tillers plant^{-1}) have shown statistically at par results. The optimum availability of nitrogen and growth promoting substances provided by organic formulations have contributed to the significant tiller production by plant. Above findings are in accordance with Raghuvaran Singh *et al.* (2020) [12], Harika. *et al.* (2018) [13].

Table 1: Mean grain and straw yield of finger millet as influenced by the various treatments

Treatments		Yield (q ha^{-1})	
		Grain	Straw
T_1	Absolute Control	9.66	17.40
T_2	100% GRDF (60:30:30 kg NPK ha $^{-1}$)+ FYM @ 5 t	14.80	22.10
T_3	100% RDF (60:30:30 kg NPK ha $^{-1}$)	14.30	23.50
T_4	100% RDF + Vermicompost @ 2.5 t ha^{-1}	20.30	28.60
T_5	100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	21.40	29.80
T_6	100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	22.80	30.40
T_7	100% RDF +5% *Panchagavya*	16.30	25.80
T_8	100% RDF + 10% *Jeevamrut*	16.05	24.30
T_9	75% RDF + Vermicompost @ 2.5 t ha^{-1}	17.40	26.40
T_{10}	75% RDF + Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	18.20	27.03
T_{11}	75% RDF + Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	18.80	27.80
T_{12}	75% RDF + 5% *Panchagavya*	13.29	22.01
T_{13}	75% RDF +10% *Jeevamrut*	12.99	20.55
S.Em±		0.95	1.3
CD @5%		2.79	3.8
General Mean		16.6	25.05

Grain and straw yield

The data in respect with yield is presented in Table 2. This data revels that the mean grain yield of finger millet obtained was 16.6 q ha^{-1} and Straw yield obtained was 25.05 q ha^{-1}. Among all thirteen treatment application of T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* have recorded the highest grain yield (22.8 q ha^{-1}) and straw yield (30.4 q ha^{-1}) as the inputs of this treatments are rich in nitrogen which leads to a better crop growth sink assimilation. However T_5 100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya* and T_4 100% RDF + Vermicompost @ 2.5 t ha^{-1} statistically at par with T_6. 10% Jeevamrut and optimum nutrient supply from vermicompost and 100% RDF. This results in greater nutrient availability in the soil and better nutrient uptake due to improved root penetration, ultimately leading to better nutrient absorption. Treatment T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*, have recorded maximum cost of cultivation (67869 Rs.ha^{-1}), gross monetary returns (90044 Rs.ha^{-1}), and net returns (22175 Rs.ha^{-1}). Nevertheless treatment T_7: 100% RDF +5% *Panchagavya* recorded maximum benefit cost ratio.

Table 2: Effect of nutrient sources and organic liquids on economics of production of finger millet Economics

Treatments		Cost of Cultivation (Rs.ha^{-1})	Gross returns (Rs.ha^{-1})	Net returns (Rs.ha^{-1})	Benefit: Cost ratio
T_1	Absolute Control	28800	34465	5665	1.20
T_2	100%GRDF (60:30:30 kg NPK ha^{-1})+ FYM @ 5 t	47269	51042	3773	1.08
T_3	100% RDF (60:30:30 kg NPK ha^{-1})	36369	50249	13879	1.38
T_4	100% RDF + Vermicompost @ 2.5 t ha^{-1}	62269	71555	9286	1.15
T_5	100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	65869	85928	20059	1.15
T_6	100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	67869	90044	22175	1.29
T_7	100% RDF +5% *Panchagavya*	39969	58580	18610	1.47
T_8	100% RDF + 10% *Jeevamrut*	41969	52662	10693	1.25
T_9	75% RDF + Vermicompost @ 2.5 t ha^{-1}	61175	61455	280	1.00
T_{10}	75% RDF + Vermicompost @ 2.5 t ha^{-1} + 5% *Panchagavya*	64775	66125	1350	1.02
T_{11}	75% RDF + Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut*	66445	67853	1408	1.02
T_{12}	75% RDF + 5% *Panchagavya*	38875	49605	10730	1.28
T_{13}	75% RDF +10% *Jeevamrut*	40875	48536	7661	1.18
General Mean		50963.7	60622.9	9659.1	1.19

Conclusion

It is concluded that application of T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* gives better crop growth attributes which leads to the increment in yield. Application of T_6: 100% RDF+ Vermicompost @ 2.5 t ha^{-1}+ 10% *Jeevamrut* is suitable for deriving maximum gross and net returns even if B:C ratio is comparatively less as it involves maximum investment of inputs. Whereas treatment 100% RDF + 5% *Panchagavya* having higher B:C ratio but potentially lower gross and net returns as it involves less input investment. Based on the criteria of higher gross and net returns treatment 100% RDF+ Vermicompost @ 2.5 t ha^{-1} + 10% *jeevamrut* was found better to adopt.

References

1. Ananda MR, Sharanappa, Murthy KKN. Impact of organic nutrient management on productivity, nutrient uptake and economics of finger millet in groundnut (*Arachis hypogaea* L.) - Finger Millet (*Eleusine coracana* L.) cropping system. Int J Curr Microbiol App Sci. 2018;7(11):1000-1008.
2. Aravind SA, Kumar S, Hemalatha M, Paramasivan M. Influence of organic supplements on growth and yield of finger millet (*Eleusine coracana* L.). J Pharmacogn Phytochem. 2020;9(3):1564-1567.

3. Deshmukh GM. Studies on effect of FYM, lime, NP fertilizer and boron on yield nutrient uptake and quality of nagli (*Eleusine coracana* L.) [M.Sc (Agri) thesis]. K.K.V., Dapoli, M.S. India; c2007.
4. Gajbhiye PN, Nigade RD, Bulbule AV. Sustaining soil fertility and yields of finger millet (*Eleusine coracana* L.) through balanced fertilization in entisols. Int J Res Agric Sci. 2017;4(2):2348-3997.
5. Nigade RD, More SM. Performance of finger millet varieties to different levels of fertilizer on yield of and soil properties in sub montane zone of Maharashtra. Int J Agric Sci. 2013;9(1):256-259.
6. Nigade RD, Gajbhiye PN, More SM. Integrated nutrient management studies in finger millet (*Eleusine coracana* L.). Crop Res. 2014;48(1, 2 & 3):27-31.
7. Singh R, Singh R, Khan W. Response of organic liquid manures and biofertilizers on growth and yield of finger millet (*Eleusine coracana* L.). Int J Curr Microbiol App Sci. 2021;10(03):1427-1432.
8. Mahapatra SS, Sunitha N, Reddi Ramu Y, Prasanthi A. Efficacy of different organic nutrient management practices on growth and yield of finger millet. Society of Agricultural Scientists, S.V Agricultural College, Tirupati. Acharya N.G. Ranga Agricultural University Andhra Pradesh, India; c2016.
9. Ullasa S, Pradeep, Shrikantha CD, Sridhara S, Ganapathi S. Effect of different organic nutrient management practices on growth, yield and economics of finger millet (*Eleusine coracana*). Int J Farm Sci. 2017;7(2):10-14.
10. Sinha S, Yoon Y, Amy G, Yoon J. Determining the effectiveness of conventional and alternative coagulants through effective characterization schemes. Chemosphere. 2004 Dec 1;57(9):1115-1122.
11. Panse VG, Sukhatme PV. Stlltistical MelhodsJor Agricultural Workers. Indian Council of Agricultural Research, New Delhi; c1985.
12. Singh N, Tang Y, Zhang Z, Zheng C. COVID-19 waste management: Effective and successful measures in Wuhan, China. Resources, conservation, and recycling. 2020 Dec;163:105071.
13. Rahmadika S, Ramdania DR, Harika M. Security analysis on the decentralized energy trading system using blockchain technology. Journal Online Informatika. 2018 Jun 30;3(1):44-47.