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Studies on organic source of nutrients on yield attributes and productivity of finger millet in finger millet-groundnut cropping sequence

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Abstract
A field experiment was conducted at research and demonstration block of Research Institute on Organic Farming, UAS, GKVK, Bengaluru during *kharif* 2021 and 2022 to study the effect of organic sources on yield attributes and productivity of finger millet in finger millet-groundnut cropping sequence. The experiment was laid out in randomized block design with factorial concept and replicated thrice. The experiment consists of 12 treatment combinations of two levels of N equivalent and six organic sources along with absolute control and UAS-B package. The experimental soil was red sandy loam having medium organic carbon (0.63%), N (294.3 kg ha^{-1}), P_2O_5 (27.9 kg ha^{-1}) and K_2O (236.5 kg ha^{-1}). The experimental results indicated that application of bio-compost at 150% N equivalent resulted in significantly higher number of productive tillers per hill (7.29), number of fingers per earhead (8.44), finger length (11.48 cm) cearhead length (12.03 cm), grain yield (3459 kg ha^{-1}) and straw yield of finger millet (5842 kg ha^{-1}) followed by application of poultry manure at 150% N equivalent and found significantly superior over other treatments in the studies. However, UAS (B) package *i.e.,* 50:40:37.5 kg N: P_2O_5: K_2O ha^{-1} recorded significantly higher number of productive tillers per hill (7.35), number of fingers per earhead (8.56), finger length (11.77 cm) earhead length (12.13 cm), grain yield (3493 kg ha^{-1}) and straw yield of finger millet (5942 kg ha^{-1}) and was on par with application of bio-compost at 150% N equivalent.

Keywords: Organic sources, bio-compost, UAS-B package, cropping sequence

Introduction

Finger millet (*Eleusine coracana* L. Gaertin), also known as kurrakan millet, koracan millet, ragi, or nachni in India, and by various names such as African millet, rapoko (South Africa), and dagusa (Ethiopia), is a crucial rainfed crop cultivated extensively in the dry tracts of red soil in Southern Karnataka despite resource constraints. This millet is grown primarily for grain and fodder across diverse agroclimatic conditions. In India, finger millet is cultivated in Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Jharkhand, Maharashtra, and Uttarakhand, covering a total area of 11.19 lakh hectares. Karnataka stands out as the largest producer with 7.80 lakh hectares under cultivation, yielding an annual production of 13.60 lakh tonnes and achieving a productivity of 1740 kg ha^{-1} (Anon., 2022) [2]. The finger millet-groundnut cropping system offers numerous benefits, including enhanced soil fertility, increased availability of soil organic carbon, nitrogen, and phosphorus, suppression of weeds through smothering effects, higher production per unit area, improved land use efficiency, and reduced runoff and soil erosion. Additionally, incorporating legumes sustains soil fertility for non-legume cereals, thereby boosting overall system productivity and returns. Over the years, health of Indian soils has deteriorated rustling in declining of organic carbon, soil biodiversity and soil physico-chemical properties and build up multi nutrient deficiencies over a larger area due to reduction in addition of organic manures, imbalanced use of fertilizers and monocropping. It is reported that plant nutrient removal from soils by different crops annually is 10-12 million tonnes higher than addition from various sources, resulting negative nutrient balance. Considering these disadvantages and escalation of fertilizer costs there is a paradigm shift from inorganic to organic farming. To sustain soil health addition of organic matter as source of nutrients is pivotal and, in such situation, organic agriculture plays vital role in Indian farming. Organic agriculture is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and livestock feed additives. To the maximum extent possible, organic farming system relies on crop rotations, crop residues, animal manures, legumes, green manures, on-farm organic wastes and aspects of biological pest control to maintain soil productivity and health. Keep these points in view, the investigating was carried out at UAS, GKVK, Bengaluru to study the influence of organic sources on growth and yield of finger millet in finger millet-groundnut cropping sequence.

Materials and Methods

Experimental details

A field experiment was conducted at research and demonstration block of Research Institute on Organic Farming (RIOF), Gandhi Krishi Vignan Kendra (GKVK), University of Agricultural Sciences, Bangalore. It is situated in Eastern Dry Zone of Karnataka at latitude of 13° 09’ North, longitude of 77º 57’ East and an altitude of 924 m above mean sea level (MSL). Studies were conducted to know the influence of organic sources on growth and yield of finger millet during *kharif* 2021 and to asses the residual effect on growth and yield of groundnut during summer 2022 and same sequence was followed during *kharif* 2022 and summer 2023. The experiment consists of 12 treatment combinations of two levels of N equivalent (N_1: 100% N equivalent; N_2; 150% N equivalent) and six organic sources (F_1: FYM; F_2: Bio-compost; F_3: Urban compost; F_4: Vermicompost; F_5: Poultry manure (pre-cured); F_6: Jeevamrutha) along with control and UAS-B package was laid out in randomized block design with factorial concept and replicated thrice. The experimental soil was red sandy loam having medium organic carbon content (0.63%), N (294.3 kg ha^{-1}), P_2O_5 (27.9 kg ha^{-1}) and K_2O (236.5 kg ha^{-1}) content.

Climatic conditions prevailed during the experimentation

The meteorological data pertaining to monthly total rainfall, maximum and minimum temperature, relative humidity, bright sunshine hours and potential evapotranspiration recorded during the cropping period of 2021-22 and 2022-23 are presented in Fig. 1 to 2.

Normal climatic conditions experimental site

The meteorological data pertaining to monthly total rainfall, mean maximum and minimum temperature, relative humidity, bright sunshine hours, wind speed and evaporation of experimental site were recorded and furnished in Fig. 1 to 2. The normal annual rainfall of the station for 49 years (1972-2020) was 941.1 mm. Finger millet was sown from the month of August and harvested in the month of December 2021-22 and groundnut was taken up after harvest of finger millet in the month of February and harvested in the month of June 2022-23. Meteorological data was recorded during crop growth period in both the years. Major portion of rainfall was received during August, September and October (130 mm, 194 mm and 167.8 mm, respectively). The mean monthly maximum air temperature ranged between 26.3 °C to 33.6 °C and monthly minimum air temperature ranged between 13.5 °C to 21.1 °C. The highest mean monthly temperature was recorded during April (33.6 °C) and it was followed in the months of May and March (32.9 and 32.6 °C, respectively). The mean monthly relative humidity ranged from 55.5 percent in March to 89 percent in August. The mean monthly bright sunshine hours were maximum during February (9.60) followed by March (9.30). The potential evapotranspiration ranged between 3.1 to 5.1 mm. The highest PET was in April (5.1 mm) and lowest in January (3.1 mm).

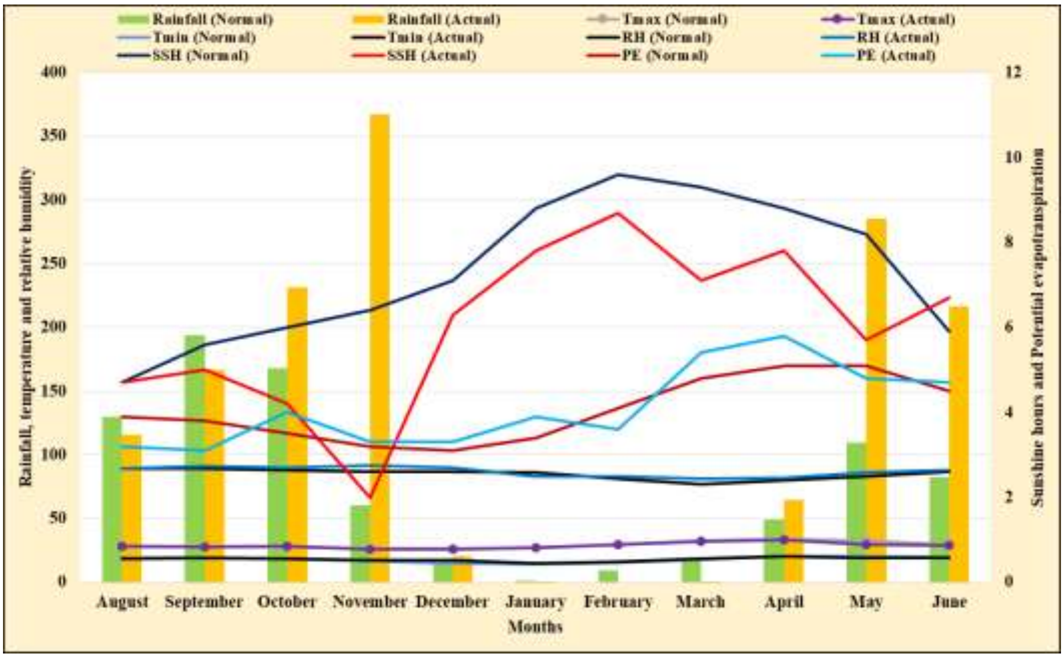

Fig 1: Meteorological data of the experimental area during 2021-22 at GKVK, UAS, Bangalore

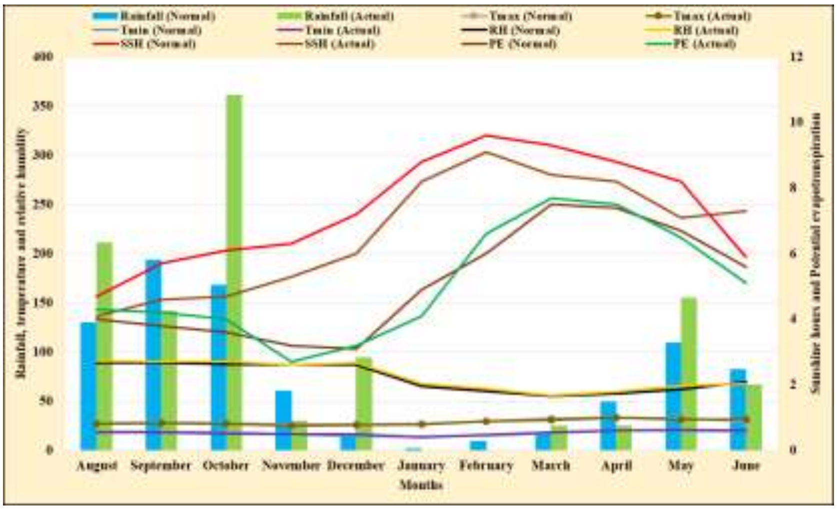

Fig 2: Meteorological data of the experimental area during 2022-23 at GKVK, UAS, Bangalor

Actual climatic conditions of experimental site

Actual total rainfall during the crop growth period in 2021-22 and 2022-23 was 1469.4 mm and 1110.4 mm, respectively as against the normal rainfall received in both years of cropping sequence (834.6 mm). The mean maximum temperature ranged from 25.9 to 33.5 °C in 2021-22 and 25.2 to 33.3 °C in 2022-23. While the minimum temperature ranged from 14.8 to 20.1 °C in 2021-22 and 13.5 to 21.1 °C in 2022-23. The higher relative humidity was 92 percent in 2021-22 (November) and 91 percent in 2022-23 (August). The maximum actual sunshine hours were observed in the month of February (8.7 and 9.1 hr day^{-1} during 2021-22 and 2022-23, respectively). The maximum potential evapotranspiration was observed in the month of April during 2021-22 (5.8 mm) and March (7.7 mm) during 2022-23.

Finger millet variety ML-365 was sown with spacing of 30 cm × 10 cm and followed agronomic practices for cultivating the crop. Nutrient sources *viz.*, bio-compost, poultry manure vermicompost, urban compost, FYM and jeevamrutha were applied on N equivalent basis after analyzing the nutrient content. 50 percent N equivalent jeevamrutha was added as a basal application remaining 25 percent at tillering stage and 25 percent at flowering stage. 7.5 t FYM ha^{-1} was applied for all the treatments as per package of practice. Groundnut (Kadiri Lepakshi) crop was sown after harvest of finger millet at a spacing of 30 cm × 15 cm without application of organic nutrient sources.

Biometric observations on yield parameters were recorded randomly on selected five plants at harvest in net plot. Data related to yield was recorded at the time of harvest of the crop. Based on the observations, data were subjected to statistical analysis as per the procedure outline by Gomez and Gomez (1984) [4]. To know the effect of individual factors and to compare treatment combinations with control treatments, statistical procedure of factorial randomized complete block design was followed, respectively.

Results and Discussion

Days to 50 percent ear heads emergence

Days to fifty percent ear head emergence in finger millet (Table 1) was found to be non-significant due to influence of organic sources in finger millet-groundnut cropping sequence. The interaction effect between organic sources and nitrogen levels was determined to be statistically non-significant in relation to the days required for fifty percent of the heads to emerge.

Table 1: Days to 50 percent ear heads emergence of finger millet as influenced by organic sources of nutrients in finger millet-groundnut cropping sequence

Treatments	Days to 50% ear heads emergence		
	I	II	Pooled
Nitrogen equivalents (N)			
N_1	46.64	48.73	47.68
N_2	46.36	48.44	47.40
F test	NS	NS	NS
S. Em ±	-	-	-
C.D. (p=0.05)	-	-	-
Organic sources (F)			
F_1	46.64	48.73	47.69
F_2	46.09	48.16	47.12
F_3	46.56	48.65	47.61
F_4	46.51	48.60	47.56
F_5	46.37	48.45	47.41
F_6	46.82	48.92	47.87
F test	NS	NS	NS
S. Em ±	-	-	-
C.D. (p=0.05)	-	-	-
Interaction (N x F)			
N_1F_1	46.47	48.55	47.51
N_1F_2	46.43	48.51	47.47
N_1F_3	46.74	48.83	47.78
N_1F_4	46.66	48.75	47.70
N_1F_5	46.66	48.75	47.70
N_1F_6	46.87	48.97	47.92
N_2F_1	46.82	48.92	47.87
N_2F_2	45.74	47.80	46.77
N_2F_3	46.39	48.48	47.43
N_2F_4	46.37	48.45	47.41
N_2F_5	46.07	48.14	47.11
N_2F_6	46.77	48.87	47.82
F test	NS	NS	NS
S. Em ±	-	-	-
C.D. (p=0.05)	-	-	-
Control	46.73	48.83	47.78
RDF	45.53	47.58	46.56
F test	NS	NS	NS
S. Em ±	-	-	-
C.D. (p=0.05)	-	-	-

Note: **N_1:** 100 percent N equivalent; **N_2:** 150 percent N equivalent; **F_1:** Farm Yard Manure; **F_2:** Bio compost; **F_3:** Urban compost; **F_4:** Vermicompost; **F_5:** Poultry manure (pre-cured); **F_6:** Jeevamrutha; Control; RDF (50:40:37.5 kg N: P_2O_5: K_2O ha^{-1}); I: *Kharif* 2021; II: *Kharif* 2022

Yield attributes and yield of finger millet

The yield parameters *viz*., number of productive tillers, number of fingers per earhead, finger length (cm), earhead length (cm), 1000 grain weight (g), grain yield (kg ha^{-1}) and straw yield (kg ha^{-1}) of finger millet as influenced by organic sources in finger millet-groundnut cropping sequence are presented in Table 2 to 4.

Number of productive tillers $hill^{-1}$ and number of fingers $earhead^{-1}$

The data on number of productive tillers per hill and number of fingers per earhead of finger millet as influenced by organic sources in finger millet-groundnut cropping sequence are presented in Table 2. Number of productive tillers per hill and number of fingers per earhead differed significantly. Maximum number of productive tillers per hill and number of fingers per earhead was recorded with the application of 150% N equivalent (6.54 and 6.99, respectively) as compared to 100% N equivalent (6.05 and 6.21, respectively). The application of organic sources significantly influenced the variation in the number of productive tillers per hill and the number of fingers per earhead in finger millet. Application of biocompost recorded higher number of productive tillers per hill and the number of fingers per earhead (6.73 and 7.37, respectively) followed by poultry manure (6.40 and 6.77, respectively), vermicompost (6.26 and 6.49, respectively) and was found to be superior over other treatments. Lower number of productive tillers per hill and the number of fingers per earhead of finger millet was recorded with the application of farm yard manure plots (6.02 and 6.27, respectively).

The interaction between nitrogen equivalent levels and organic sources was found to be significant for number of productive tillers per hill and the number of fingers per earhead in finger millet. Application of bio-compost at 150% N equivalent resulted in significantly higher number of productive tillers per hill and the number of fingers per earhead (7.29 and 8.44, respectively) as compared to other treatments and was on par with UAS (B) package *i.e.*, 50:40:37.5 kg N: P_2O_5: K_2O ha^{-1} (7.35 and 8.56, respectively). Whereas, lower number of productive tillers per hill and the number of fingers per earhead was observed in control plots (4.57 and 5.48, respectively).

Table 2: Number of productive tillers and number of fingers $earhead^{-1}$ of finger millet as influenced by organic sources of nutrients in finger millet-groundnut cropping sequence

Treatments	Number of productive tillers			Number of fingers per earhead		
	I	II	Pooled	I	II	Pooled
Nitrogen equivalents (N)						
N_1	5.58	6.52	6.05	5.81	6.60	6.21
N_2	6.04	7.05	6.54	6.69	7.30	6.99
F test	*	*	*	*	*	*
S. Em ±	0.05	0.06	0.06	0.13	0.11	0.12
C.D. (p=0.05)	0.16	0.17	0.16	0.39	0.31	0.35
Organic sources (F)						
F_1	5.55	6.49	6.02	5.90	6.64	6.27
F_2	6.23	7.23	6.73	7.10	7.64	7.37
F_3	5.73	6.70	6.21	6.02	6.74	6.38
F_4	5.76	6.77	6.26	6.12	6.86	6.49
F_5	5.91	6.89	6.40	6.41	7.13	6.77
F_6	5.66	6.64	6.15	5.94	6.69	6.32
F test	*	*	*	*	*	*
S. Em ±	0.09	0.10	0.10	0.23	0.19	0.20
C.D. (p=0.05)	0.28	0.30	0.28	0.67	0.54	0.60
Interaction (N x F)						
N_1F_1	5.34	6.26	5.80	5.68	6.49	6.08
N_1F_2	5.70	6.64	6.17	5.91	6.69	6.30
N_1F_3	5.59	6.55	6.07	5.81	6.57	6.19
N_1F_4	5.63	6.58	6.11	5.85	6.64	6.24
N_1F_5	5.68	6.61	6.15	5.88	6.68	6.28
N_1F_6	5.51	6.48	6.00	5.73	6.55	6.14
N_2F_1	5.76	6.72	6.24	6.12	6.79	6.45
N_2F_2	6.76	7.81	7.29	8.28	8.59	8.44
N_2F_3	5.86	6.84	6.35	6.23	6.90	6.57
N_2F_4	5.89	6.95	6.42	6.38	7.08	6.73
N_2F_5	6.14	7.17	6.66	6.95	7.58	7.27
N_2F_6	5.81	6.79	6.30	6.15	6.82	6.49
F test	*	*	*	*	*	*
S. Em ±	0.13	0.14	0.14	0.32	0.26	0.29
C.D. (p=0.05)	0.39	0.42	0.40	0.95	0.77	0.85
Control	4.11	5.04	4.57	5.11	5.86	5.48
RDF	6.77	7.93	7.35	8.31	8.81	8.56
F test	*	*	*	*	*	*
S. Em ±	0.22	0.25	0.24	0.36	0.31	0.33
C.D. (p=0.05)	0.64	0.74	0.69	1.04	0.90	0.96

Note: **N_1:** 100 percent N equivalent; **N_2:** 150 percent N equivalent; **F_1:** Farm Yard Manure; **F_2:** Bio compost; **F_3:** Urban compost; **F_4:** Vermicompost; **F_5:** Poultry manure (pre-cured); **F_6:** Jeevamrutha; Control; RDF (50:40:37.5 kg N: P_2O_5: K_2O ha^{-1}); I: *Kharif* 2021; II: *Kharif* 2022

Finger length (cm), earhead length (cm) and test weight (g)

The data on finger length, earhead length and test weight of finger millet at harvest as influenced by organic sources in a finger millet-groundnut cropping sequence are presented in Tables 3. Finger length and earhead length of finger millet varied significantly between nitrogen equivalent levels and higher finger length and earhead length was observed with the application of organic sources at 150% N equivalent (9.87 and 10.32 cm, respectively) than 100% N equivalent (8.98 and 9.50 cm, respectively). Among organic sources, application of bio-compost resulted in significantly higher finger length and earhead length (10.29 and 10.83 cm, respectively) followed by poultry manure (9.59 and 9.90 cm, respectively), vermicompost (9.29 and 9.82 cm, respectively), urban compost (9.20 and 9.73 cm, respectively), jeevamrutha (9.15 and 9.65 cm, respectively) and lower finger length and earhead length was recorded in farm yard manure applied plots (9.03 and 9.53 cm, respectively).

Interaction effect between nitrogen equivalents and organic sources found to be significant. Application of bio-compost at 150% N equivalent recorded significantly higher finger length and earhead length (11.48 and 12.03 cm, respectively), which was on par with UAS (B) package *i.e.*, 50:40:37.5 kg N: P_2O_5: K_2O ha^{-1} (11.77 and 12.13 cm, respectively). Whereas, lower finger length and earhead length was observed in control plots (8.21 and 8.67 cm, respectively). This could be attributed to greater accumulation of dry matter and efficient allocation of assimilates to the crop's reproductive organs, which is a consequence of having nutrients available at the time when the crop's physiological requirements align.

Test weight in finger millet was found to be non-significant for nitrogen equivalents, organic sources and interaction effect between nitrogen equivalents and organic sources due to influence of organic sources in finger millet-groundnut cropping sequence (Table 3).

Table 11: Finger length, earhead length and test weight of finger millet as influenced by organic sources of nutrients in finger millet-groundnut cropping sequence

Treatments	Finger length (cm)			Earhead length (cm)			1000 grain weight (g)		
	I	II	Pooled	I	II	Pooled	I	II	Pooled
Nitrogen equivalents (N)									
N_1	8.68	9.28	8.98	9.37	9.64	9.50	3.04	3.27	3.15
N_2	9.62	10.12	9.87	10.16	10.47	10.32	3.12	3.35	3.23
F test	*	*	*	*	*	*	NS	NS	NS
S. Em ±	0.14	0.12	0.13	0.14	0.12	0.13	-	-	-
C.D. (p=0.05)	0.42	0.36	0.38	0.40	0.36	0.38	-	-	-
Organic sources (F)									
F_1	8.71	9.35	9.03	9.38	9.69	9.53	3.03	3.27	3.15
F_2	10.08	10.49	10.29	10.68	10.97	10.83	3.13	3.36	3.24
F_3	8.92	9.47	9.20	9.57	9.88	9.73	3.07	3.29	3.18
F_4	9.02	9.57	9.29	9.68	9.97	9.82	3.08	3.31	3.20
F_5	9.34	9.84	9.59	9.78	10.02	9.90	3.12	3.33	3.23
F_6	8.84	9.45	9.15	9.49	9.80	9.65	3.04	3.28	3.16
F test	*	*	*	*	*	*	NS	NS	NS
S. Em ±	0.25	0.21	0.23	0.24	0.21	0.22	-	-	-
C.D. (p=0.05)	0.73	0.62	0.67	0.70	0.62	0.65	-	-	-
Interaction (N x F)									
N_1F_1	8.40	9.09	8.75	9.10	9.48	9.29	2.99	3.23	3.11
N_1F_2	8.81	9.39	9.10	9.49	9.76	9.63	3.07	3.31	3.19
N_1F_3	8.71	9.27	8.99	9.40	9.65	9.52	3.05	3.26	3.16
N_1F_4	8.74	9.29	9.02	9.44	9.68	9.56	3.06	3.27	3.16
N_1F_5	8.80	9.35	9.08	9.46	9.71	9.58	3.07	3.29	3.18
N_1F_6	8.63	9.25	8.94	9.32	9.55	9.43	3.01	3.25	3.13
N_2F_1	9.02	9.60	9.31	9.65	9.91	9.78	3.08	3.31	3.19
N_2F_2	11.36	11.59	11.48	11.88	12.19	12.03	3.19	3.41	3.30
N_2F_3	9.14	9.67	9.40	9.75	10.11	9.93	3.09	3.32	3.21
N_2F_4	9.29	9.85	9.57	9.91	10.26	10.09	3.11	3.36	3.23
N_2F_5	9.88	10.33	10.10	10.10	10.33	10.22	3.17	3.38	3.27
N_2F_6	9.06	9.65	9.36	9.67	10.04	9.86	3.07	3.31	3.19
F test	*	*	*	*	*	*	NS	NS	NS
S. Em ±	0.35	0.30	0.32	0.34	0.30	0.32	-	-	-
C.D. (p=0.05)	1.03	0.88	0.94	0.99	0.88	0.93	-	-	-
T_{13}	7.85	8.58	8.21	8.50	8.84	8.67	2.90	3.13	3.01
T_{14}	11.73	11.81	11.77	11.90	12.36	12.13	3.23	3.47	3.35
F test	*	*	*	*	*	*	NS	NS	NS
S. Em ±	0.43	0.31	0.32	0.42	0.39	0.40	-	-	-
C.D. (p=0.05)	1.24	0.91	0.94	1.22	1.12	1.16	-	-	-

Note: N_1: 100 percent N equivalent; **N_2:** 150 percent N equivalent; **F_1:** Farm Yard Manure; **F_2:** Bio compost; **F_3:** Urban compost; **F_4:** Vermicompost; **F_5:** Poultry manure (pre-cured); **F_6:** Jeevamrutha; Control; RDF (50:40:37.5 kg N: P_2O_5: K_2O ha^{-1}); I: *Kharif* 2021; II: *Kharif* 2022

Grain yield and straw yield of finger millet

Grain and straw yield of finger millet (Table 4) differed significantly due to influence of organic sources in finger millet-groundnut cropping sequence. Higher grain and straw yield of finger millet were produced with the application of 150% N equivalent (2954 and 5124 kg ha^{-1}, respectively) and lower yield was observed in 100% N equivalent plots (2488 and 4361 kg ha^{-1}, respectively). Among organic sources, application of bio-compost obtained higher grain and straw yield (3005 and 5291 kg ha^{-1}, respectively) followed by poultry manure (2818 and 4899 kg ha^{-1}, respectively), vermicompost (2716 and 4826 kg ha^{-1}, respectively), urban compost (2664 and 4663 kg ha^{-1}, respectively) and jeevamrutha (2595 and 4493 kg ha^{-1}, respectively). However, lower grain and straw yield were registered in farm yard manure applied plots (2520 and 4285 kg ha^{-1}, respectively). Interaction effect between nitrogen equivalents and organic sources differed significantly. Application of bio-compost at 150% N equivalent (3459 and 5842 kg ha^{-1}, respectively) recorded higher grain and straw yield and was on par with UAS (B) package *i.e.*, 50:40:37.5 kg N: P_2O_5: K_2O ha^{-1} (3493 and 5942 kg ha^{-1}, respectively). Whereas, lower grain and straw yield were recorded in control plots (1555 and 2269 kg ha^{-1}, respectively). The results are in line with Ananda and Sharanappa (2017) [1]. The increase in yield is mainly attributed to higher yield parameters such as, higher number of productive tillers, earhead length, finger length and test weight. Higher growth and yield parameters could be attributed to availability of nutrients from organic manure, which is very essential for plant growth and development (Boraiah *et al*., 2017) [3]. The lower grain yield due to reduced availability of nutrients for the crop during early growth stages (vegetative period) and thus the crop might have starved of nutrients during later stage (reproductive stage), which might have affected the grain and straw yield (Urkurkar *et al.*, 2010) [6]. The increase in straw yield could be attributed to increase in plant height, number of leaves, leaf area, leaf area index and total dry matter production. The results are in conformity with the findings of Subbaiah and Kumaraswamy (1996) [5].

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Table 4: Grain yield and straw yield of fingermillet as influenced by organic sources in fingermillet-groundnut cropping sequence

Treatments	Grain yield (kg ha^{-1})			Straw yield (kg ha^{-1})		
	I	II	Pooled	I	II	Pooled
Nitrogen equivalent levels (N)						
N_1	2452	2524	2488	4294	4428	4361
N_2	2909	2993	2951	5051	5197	5124
F test	*	*	*	*	*	*
S. Em ±	37	36	36	70	65	66
C.D. (p=0.05)	108	105	106	206	191	194
Organic sources (F)						
F_1	2483	2557	2520	4206	4365	4285
F_2	2964	3045	3005	5216	5365	5291
F_3	2623	2704	2664	4607	4718	4663
F_4	2680	2753	2716	4763	4888	4826
F_5	2776	2859	2818	4832	4967	4899
F_6	2557	2634	2595	4411	4574	4493
F test	*	*	*	*	*	*
S. Em ±	64	62	63	122	113	114
C.D. (p=0.05)	186	181	184	357	330	336
Interaction (N x F)						
N_1F_1	2360	2432	2396	3567	3733	3650
N_1F_2	2513	2587	2550	4665	4813	4739
N_1F_3	2462	2537	2499	4309	4396	4353
N_1F_4	2488	2558	2523	4604	4707	4655
N_1F_5	2499	2569	2534	4658	4776	4717
N_1F_6	2388	2464	2426	3960	4145	4053
N_2F_1	2605	2683	2644	4845	4996	4921
N_2F_2	3415	3504	3459	5767	5918	5842
N_2F_3	2784	2871	2828	4905	5040	4973
N_2F_4	2871	2948	2909	4923	5069	4996
N_2F_5	3054	3150	3102	5007	5158	5082
N_2F_6	2725	2803	2764	4862	5004	4933
F test	*	*	*	*	*	*
S. Em ±	90	88	89	172	159	162
C.D. (p=0.05)	264	257	260	505	467	475
Control	1514	1595	1555	2202	2337	2269
RDF	3451	3535	3493	5883	6001	5942
F test	*	*	*	*	*	*
S. Em ±	95	93	93	177	163	166
C.D. (p=0.05)	276	270	272	515	474	484

Note: N_1: 100 percent N equivalent; **N_2:** 150 percent N equivalent; **F_1:** Farm Yard Manure; **F_2:** Bio compost; **F_3:** Urban compost; **F_4:** Vermicompost; **F_5:** Poultry manure (pre-cured); **F_6:** Jeevamrutha; Control; RDF (50:40:37.5 kg N: P_2O_5: K_2O ha^{-1}); I: *Kharif* 2021; II: *Kharif* 2022

Conclusion

In this study, the influence of various organic nutrient sources on the growth and yield of finger millet in a finger millet-groundnut cropping sequence was thoroughly investigated over two consecutive cropping seasons (Kharif 2021 and 2022). The experimental results provide valuable insights into the effectiveness of different organic amendments in enhancing the productivity of finger millet under red sandy loam soil conditions at the Research Institute on Organic Farming, UAS, GKVK, Bengaluru.

The findings revealed that among the various treatments tested, the application of bio-compost at 150% N equivalent significantly improved several yield attributes and productivity parameters of finger millet. This treatment resulted in higher numbers of productive tillers per hill, greater number of fingers per earhead, longer finger and earhead lengths, and ultimately, higher grain and straw yields compared to other treatments. Specifically, bio-compost at 150% N equivalent recorded 7.29 productive tillers per hill, 8.44 fingers per earhead, 11.48 cm finger length, 12.03 cm earhead length, 3459 kg ha^{-1} grain yield, and 5842 kg ha^{-1} straw yield. These results highlight the potential of bio-compost as an effective organic nutrient source for enhancing finger millet productivity in a sustainable manner.

Furthermore, the UAS (B) package, which included balanced nutrient application (50:40:37.5 kg N: P_2O_5: K_2O ha^{-1}), also demonstrated comparable performance to bio-compost at 150% N equivalent across various yield parameters. This package recorded 7.35 productive tillers per hill, 8.56 fingers per earhead, 11.77 cm finger length, 12.13 cm earhead length, 3493 kg ha^{-1} grain yield, and 5942 kg ha^{-1} straw yield, underscoring its effectiveness in optimizing finger millet growth and yield.

Overall, the study underscores the importance of organic nutrient management in sustaining soil health and enhancing crop productivity, particularly in rainfed agriculture systems like the finger millet-groundnut cropping sequence. Adoption of bio-compost and balanced nutrient packages like UAS (B) can serve as viable strategies for improving finger millet yields while promoting soil fertility and sustainability in agricultural practices.

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