E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(8): 439-441
Received: 02-05-2024
Accepted: 07-06-2024

Shruti Grace George
Ph.D., Scholar, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Vikram Singh
Professor, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Ekta Singh
Assistant Professor, Tantia University, Rajasthan, India

Corresponding Author:
Shruti Grace George
Ph.D., Scholar, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Effect of various establishment methods and solid and liquid organic manures on growth of finger millet (*Eleusine coracana* L.)

Shruti Grace George, Vikram Singh and Ekta Singh

DOI: https://doi.org/10.33545/2618060X.2024.v7.i8Sf.1291

Abstract
A field experiment was conducted in certified organic field SMOF, SHUATS during *Kharif* season (2021 and 2022) to study the impact of establishment methods, various solid and liquid organic manures on growth and yield of finger millet (*Eleusine coracana* L.). The experiment was carried out in split split plot design replicated thrice with 27 treatments. Treatments comprised of three establishment methods (Line sowing, Broadcasting and Transplanting), three solid organic supplements (100% FYM, 100% poultry manure and 100% vermicompost) each in combination with three different liquid organic supplements (3% panchagavya, 3% jeevamrutham and 3% vermiwash, respectively). All the individual factors had significantly influence on the growth characters of finger millet. The higher growth parameters at 80 DAS was significantly recorded among establishment methods in Transplanting, among solid organic manures in Poultry manure and among liquid organic manures in Vermiwash.

Keywords: Finger millet, organic manure, poultry manure, panchagavya, growth

Introduction
Today, the crop is ranked fourth globally in importance among the millets, after sorghum, pearl millet, and foxtail millet (Gupta *et al*., 2012) [3]. Finger millet occupies 12% of global millet area and is cultivated in more than 25 countries in Africa and Asia. On global basis, finger millet is cultivated over an area about 3.0 million ha with a production of 3.8 million tonnes and productivity of 1.3 q ha^{-1}. India alone contributes more than 50 per cent of the world production. Finger millet contributes an area of 1.27 million ha with average annual production 1.89 million tonnes with productivity 1490 kg/ha. Nutritionally, finger millet is primarily consumed as a porridge in Africa, but in South Asia as bread, soup, roti (flat bread), and to make beer. Interestingly, new food products made from finger millets are also becoming popular among younger people, including noodles, pasta, vermicelli, sweet products, snacks, and different bakery products. In some nutritional components, finger millet is a superior crop compared to some major cereal crops especially polished rice (Shobana *et al*., 2013) [6]. Among the other millets, finger millet has a high amount of calcium (0.38%), fiber (18%), phenolic compounds (0.3%-3%), and sulphur containing amino acids (Singh and Raghuvanshi, 2012) [7]. Finger millet also has high amounts of tryptophan, cysteine, methionine, and total aromatic amino acids compared to the other cereals, and thus is an important crop in poor nations to alleviate malnutrition. As a result, unlike many crops grown by subsistence farmers, finger millet remains highly valued in traditional production systems, especially for its nutrient benefits to pregnant women and children for whom it is used as a weaning food (Verma and Patel, 2013) [9].
Organic agriculture faces the challenge and defiance in the present day pollution immersed environs. Soil, which is the source of about 90% of our food, is the key component in any agro-ecosystem. Degradation creeps with the disability of survival of flora and fauna. Any constraint, if approached appropriately, can pave way to the formation and building up of agro-eco-systems, which can restore balance in the various cycle of water, nutrition, etc., (Abraham and Elamathi 2005) [1].

The application of organic manure *viz*., FYM, Vermicompost and poultry manure may serve the source of macro and micro nutrient and complexing agent. Organic manure addition in the soil is not only acts as a source of nutrient, but also influences their availability. Organic farming practices are gaining importance as farmers realized benefits in terms of soil fertility, soil health and sustainable productivity. Most of the research on organic production of finger millet was applied with utilization of FYM, green manures, compost, neem cake, etc. Less number of researches was done on the effect of liquid organic manures like panchagavya, jeevamrutham, beejamrutham alone or together with solid organic manures in finger millet Organic liquid formulations like jeevamrutha and panchakavya helps for quik build-up of soil fertility through enhanced activity of microflora and fauna (Yogananda *et al.*, 2019) [11]. These have the properties of both fertilizer and biopesticide and play a key role in promoting growth and immunity to the plant system. Any combination that reduce the dependence on chemical fertilizers and other resources can go an extended way in maintain the soil fertility as well as the financial conditions of the farming community. Hence, the experiment was carried out with an objective to find out the effect of solid and liquid organic supplements on growth and yield of transplanted finger millet.

Material and Methods

A research trial was conducted at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) during *kharif* season of 2021 and 2022 finger millet sown by broadcasting, line sowing and transplanting with spacing of 30 cm x 10 cm. The location is situated at 25.57o N latitude, 87.19o E longitude and at an altitude of 98 m above mean sea level. In broadcasting method of establishment, seeds and fertilizers were dispersed randomly in the experimental plot. In line sowing method, seeds were sown directly and application of fertilizers were done in rows with a definite spacing of 30 cm x 10 cm. Whereas, in transplanting method, 18 days old seedlings were transplanted with a definite row to row and plant to plant pattern of 30 cm x 10 cm with 2 seedlings each. For this, one raised nursery beds were prepared and seeds were sown on beds in a row, so that seedlings can be uprooted easily at the time of transplanting. As it is a rainfed crop, no irrigation is needed but after transplanting two irrigations with alternate days were given for better crop establishment. Manually two hand weedings were done at 25 and 50 DAS/DAT with 'khurpi'. At every 20 days interval, observations such as plant height, number of total tillers/plant, Leaf Area Index (LAI) and dry weight. Solid organic manures *viz.* Framyard manure, Poutry manure and Vermicpompost were applied to fulfil the nitrogen requirement. Liquid manures- Vermiwash, Jeevamrutha and Panchgavya were applied to Finger millet crop at an interval of every 20 days after sowing. Necessary aftercare operations were followed as per the recommendations. No major pest and disease incidences were noticed during crop growth. Experimental data collected was subjected to statistical analysis by adopting Fisher's method of Analysis of Variance (ANOVA) as outlined by Gomez and Gomez (1984). Critical Difference (CD) values were calculated whenever the 'F' test was found significant at 5 per cent level.

Result and Discussion

Effect of Establishment method

At 80 DAS significantly higher plant height was observed in Transplanting recording 91.82, 91.18 and 91.51 cm in both the years and pooled. The reason behind this is because of vigorous growth attained when new roots developed after the transplanting shock. Besides transplanting, varietal selection also attributed the plant height. Similar results were reported by Nandini and Sridhara (2019) [5]. Similarly, in number of tillers significantly superior data was recorded in (3.38, 3.69 and 3.53 tiller/plant). There was significant effect of establishment method on Leaf area Index which recorded 4.29, 3.97 and 4.14 in both the years and pooled. Even though Establishment method recorded no significant effect in Crop growth rate in first year, maximum CGR was recoded in Transplanting. Further, in second year and pooled significantly higher CGR was recorded in Transplanting having 3.82 and 3.89 g/m^2/day respectively. Also, it was observed that direct sowing recorded statistical parity with Transplanting in second year and pooled. Similarly, in RGR it was observed that in second year and pooled significantly higher data was recorded due to the effect of Establishment methods having 0.042 and 0.039 g/g/day respectively.

Effect of solid organic manure

At 80 DAS significantly higher plant height of 84.177 and 83.98 cm were recorded in first year and pooled respectively in Poultry manure, and FYM and VC were statistically at par with PM. However, in the second year significantly highest plant height was recorded in VC (84.47 cm), both FYM and PM had statistical parity with it. The increase in the plant height may be due to increased nitrogen availability with poultry manure incorporation in the soil which helped continuous slow release of nutrients providing a better crop growth.

There was no significant effect of solid organic manure on number of tillers in first year and pooled. However, in second year Poultry manure recorded significantly higher number of tillers having 3.31 tiller/plant, and both Farm yard manure and Vermicompost were statistically at par with it. Mirza *et al*., (2005) reported that productive tillers were increased by the application of organic manure further, in LAI and Relative Growth Rate in the duration of 60- 80 DAS there was no significant effect of solid organic manure in both the years and pooled. Significantly higher Crop Growth Rate was recorded in second year in Vermicompost having 57.69 g/m^2/day. Poultry manure recorded statistical parity with it. This might be due to higher macro and micro nutrient content of the poultry manure which enables continuous slow and steady release of nutrients which might have helped in better tillering and subsequently better crop growth rate.

Effect of Liquid organic manure

Significantly higher plant height in both the years and pooled was recorded in Panchgavya 84.57, 84.30 and 84.44 cm. However, in first and second year both Jeevamrut and Vermiwash recorded statistical parity with Panchgavya. The easy transfer of nutrients through foliar spray of Panchgavya might be the reason for enhancement of growth attributes (Yadav and Lourduraj, 2006) [10]. Further the number of tillers in second year and pooled were recorded significantly highest in Panchgavya 3.30 and 3.31 respectively. In both second year and pooled Vermiwash was statistically at par with Panchgavya. While, in second year it was recorded significantly highest in Vermiwash. Panchgavya recorded statistical parity with Vermiwash. Similarly, in 80 DAS only pooled recorded significantly highest LAI in Vermiwash (3.89) and both Panchgavya and Jeevamrut were statistically at par with Vermiwash whereas both first year and pooled recorded non-significant effect on LAI. During the duration of 60-80 DAS

(62.21, 63.86 and 63.03 g/m^2/day) Panchgavya recorded significantly highest CGR. Increases in crop growth rate are largely produced through an increase in leaf area index and by an increase in radiation use efficiency (dry matter produced per unit of either incident radiation or intercepted radiation). Similar results were reported by Lawlor (1995) [4] and Camara *et al*. (2003) [2]. In the duration of 60-80 DAS both first and second year had no significant effect on RGR, however, in pooled significantly highest RGR was recorded in Jeevamrut, while both Panchgavya and Vermiwash recorded statistical parity with it.

Table 1: Effect of establishment methods, solid and liquid organic manure on growth parameters of finger millet

Treatments	80 DAS														
	Plant height			No. of tillers			LAI			CGR 60-80 DAS			RGR 60-80 DAS		
	2021	2022	pooled	2021	2022	pooled	2021	2022	pooled	2021	2022	pooled	2021	2022	pooled
Establishment methods															
Direct sowing	80.80	80.53	80.67	2.98	3.07	3.23	3.822	3.62	3.72	3.851	3.59	3.72	0.034	0.033	0.033
Broadcasting	75.90	75.96	75.93	2.55	2.79	2.67	3.363	3.27	3.32	3.466	3.26	3.36	0.035	0.034	0.034
Transplanting	91.82	91.18	91.51	3.38	3.69	3.53	4.297	3.97	4.14	3.964	3.82	3.89	0.036	0.042	0.039
F-test	S	S	S	S	S	S	S	S	S	NS	S	S	NS	S	S
SEm±	1.633	0.99	1.24	0.06	0.04	0.05	0.035	0.05	0.03	0.082	0.08	0.07	0.001	0.001	0.001
CD (P=0.05)	9.938	6.00	7.55	0.36	0.23	0.29	0.211	0.33	0.41	-	0.45	0.35	-	0.009	0.003
Solid organic manure															
FYM	80.94	79.41	80.18	3.178	3.11	3.14	3.789	3.51	3.65	48.717	45.09	46.90	0.036	0.035	0.036
PM	84.17	83.79	83.98	3.25	3.31	3.28	3.848	3.69	3.77	54.080	52.50	53.21	0.033	0.035	0.034
VC	83.41	84.47	83.94	3.289	3.19	3.24	3.846	3.67	3.76	49.858	57.69	53.77	0.035	0.039	0.037
F-test	S	S	S	NS	S	NS	NS	NS	NS	NS	S	NS	NS	NS	NS
SEm±	1.633	0.99	1.24	0.060	0.04	0.05	0.035	0.05	0.03	1.670	1.07	1.06	0.001	0.001	0.001
CD (P=0.05)	7.227	9.41	6.07	-	0.12	-	-	-	-	-	6.27	-	-	-	-
Liquid organic manure															
Panchgavya	84.57	84.30	84.44	3.319	3.30	3.31	3.851	3.59	3.72	62.210	63.86	63.03	0.035	0.037	0.036
Jeevamrut	80.74	80.29	80.52	2.96	3.01	3.06	3.666	3.46	3.56	44.592	48.13	46.36	0.036	0.038	0.037
Vermiwash	83.21	83.09	83.15	3.363	3.24	3.30	3.964	3.82	3.89	45.853	43.29	44.57	0.034	0.034	0.034
F-test	S	S	S	S	S	S	NS	NS	S	S	S	S	NS	NS	S
SEm±	0.884	0.76	0.58	0.066	0.05	0.04	0.082	0.08	0.07	1.828	1.79	1.26	0.001	0.001	0.001
CD (P=0.05)	4.658	4.02	3.06	0.346	0.28	0.20	-	-	0.35	9.63	9.45	6.66	-	-	0.004

FYM- Farmyard manure, PM- poultry manure, VC- Vermicompost

Conclusion

At 80 DAS among establishment methods in Transplanting, among solid organic manures Poultry manure and among liquid organic manures panchgavya recorded significantly higher growth parameters.

References

1. Abraham T, Elamathi S. Eco-organic farming. In: Trends in Organic Farming in India. Agrobios (India); c2005. p. 49-57.
2. Camara KM, Payne WA, Rasmussen PE. Long-term effects of tillage, nitrogen, and rainfall on winter wheat yields in the Pacific Northwest. Agronomy Journal. 2003;95:828-835.
3. Gupta N, Gupta AK, Gaur VS, Kumar A. Relationship of nitrogen use efficiency with the activities of enzymes involved in nitrogen uptake and assimilation of finger millet genotypes grown under different nitrogen inputs. The Scientific World Journal. 2012;2012:1-10.
4. Lawlor DW. Nitrate nutrition and temperature effects on wheat: a synthesis of plant growth and nitrogen uptake in relation to metabolic and physiological processes. Journal of Experimental Botany. 1995;39:329-343.
5. Nandini KM, Sridhara S. Response of growth, yield, and quality parameters of foxtail millet genotypes to different planting density. International Journal of Current Microbiology and Applied Sciences. 2019;8(2):1765-1773.
6. Shobana S, Krishnaswamy K, Sudha V, Malleshi NG, Anjana RM, Palaniappan L, Mohan V. Finger millet (*Eleusine coracana* L.): A review of its nutritional properties, processing, and plausible health benefits. Advances in Food and Nutrition Research. 2013;69:31-39.
7. Singh P, Raghuvanshi RS. Finger millet for food and nutritional security. African Journal of Food Science. 2012;6(4):77-84.
8. Velmurgan R, Mahendran PP. Molybdenum fertilization on nodulation, yield, and quality of green gram grown in the soils of southern agro-climatic zone of Tamil Nadu, India. Legume Research. 2015;38(6):798-803.
9. Verma V, Patel S. Value-added products from nutri-cereals: Finger millet (*Eleusine coracana*). Emirates Journal of Food and Agriculture. 2013;25:169-176.
10. Yadav BK, Lourduraj AC. Effect of organic manures and Panchagavya spray on yield attributes, yield, and economics of rice (*Oryza sativa* L.). Crop Research. 2006;31(1):1-5.
11. Yogananda SB, Devkumar N, Thimme Gowda P, Shruthi GK. Influence of bio-digester liquid and farmyard manure on growth and yield of rice (*Oryza sativa*) in Cauvery Command Area of Karnataka. Indian Journal of Agronomy. 2019;64(1):54-57.