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Effect of spacings and nutrient levels on yield and economics of finger millet (*Eleusine coracana* L.)

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Abstract

A field experiment was conducted at Agronomy farm, College of Agriculture, Nagpur (M.S.), India. The experiment was laid out in factorial randomized block design with three replications. The treatments consisted of three spacings viz., S_1 – 30 x 10 cm, S_2 – 45 x 5 cm and S_3 – 30-60 x 10 cm, and three nutrient levels viz., F_1 – 25:20:00 kg, F_2 – 30:20:00 kg and F_3 – 35:20:00 kg N:P:K ha⁻¹. The soil of the experimental site was clayey in texture, slightly alkaline in reaction (pH – 7.7), low in available nitrogen (271.62 kg ha⁻¹), medium in available phosphorous (22.18 kg ha⁻¹) and high in available potassium (384.15 kg ha⁻¹). Result of the experiment revealed that among different spacings, the yield attributes were significantly higher with the paired row spacing of 30-60 x 10 cm. However, grain, straw and biological yield and gross monetary returns, net monetary returns and B:C ratio were significantly higher with the spacing of 45 x 5 cm. Among nutrient levels, application of 35:20:00 kg N:P:K ha⁻¹ recorded more length of panicle, panicle weight, grain and straw yield plant⁻¹, grain, straw and biological yield and gross monetary returns, net monetary returns and B:C ratio. Interaction effect between fertilizer level and spacing was found non-significant in all the parameters.

Keywords: Finger millet, spacings, nutrient levels, yield attributes, yield

Introduction

Eleusine coracana, commonly known as finger millet or African millet, is one of the most widely cultivated millets and ranks fourth in importance after sorghum, pearl millet and foxtail millet. In India, finger millet is popularly known as ragi and is referred to by different regional names such as Nachani (Hindi and Marathi), Kezhvaragu (Tamil), Ularly (Telugu) and Mandia (Oriya) (Chandra *et al.* 2016) ^[2].

Finger millet is an important crop for ensuring food and nutritional security in semi-arid regions and is well adapted to a wide range of environments, from the high Himalayan hills to the coastal plains. It produces both nutritious grain and palatable straw for livestock and is recognized for its strong climate resilience. Nutritional composition of finger millet per 100gm is; phosphorus (130–283 mg), potassium (430–490 mg), magnesium (78–201 mg), calcium (162–398 mg), sodium (49 mg), zinc (2.3 mg), iron (3.3–14.39 mg), manganese (17.61–48.43 mg) and copper (0.47 mg) (Rai and Reddy, 2024).

Recently awareness on small millets has been increased. The year 2023 was also declared as the international years of millets by the United Nations General Assembly [UNGA]. This declaration also paved way for the researchers around the globe to conduct various research on small millet. This announcement also opened the way to raise public awareness about the nutritional and health benefits of these millets.

Despite its nutritional and agronomic importance, the productivity of finger millet remains comparatively low, mainly due to inadequate crop management, poor plant establishment, imbalanced nutrient application and inappropriate plant geometry. Among the various agronomic practices, spacing plays a critical role in determining plant population, canopy development, light interception, nutrient utilization and ultimately yield. Optimum spacing provides sufficient space for individual plants to develop their root and shoot systems, whereas excessively close spacing may increase competition among plants for light, moisture and nutrients. Conversely, wider spacing may reduce plant population and result in inefficient utilization of available land.

Hence, standardization of suitable spacing is essential for achieving higher productivity and better resource-use efficiency.

Materials and Methods

A field trial was conducted at the P.G. Research farm, College of Agriculture, Nagpur, during *khari* 2025 to study the effect of spacings and fertilizer levels on finger millet. The soil of the experimental site was clayey in texture, slightly alkaline in reaction (pH = 7.7), low in available nitrogen (271.62 kg ha⁻¹), medium in available phosphorous (22.18 kg ha⁻¹) and high in available potassium (384.15 kg ha⁻¹). The experiment was laid out in factorial randomized block design with three replications. The nine treatment combinations, consisted of three spacings viz., S₁ – 30 x 10 cm, S₂ – 45 x 5 cm and S₃ – 30-60 x 10 cm, and three nutrient levels viz., F₁ – 25:20:00 kg, F₂ – 30:20:00 kg and F₃ – 35:20:00 kg N:P:K ha⁻¹. Finger millet variety PDKV Adishree was sown at varied spacings and full dose of phosphorous along with 50% nitrogen was applied as basal and remaining 50% was applied as top dressing as per treatments. During the crop growth period (June-November) total rainfall received was 1217 mm, data pertaining to yield attributes were recorded from randomly selected five plants from each net plot. Cost of cultivation was worked out with help of prevailing market prices of finger millet. The data was statistically analysed with standard method outlined for randomized block design (Gomez and Gomez, 1984) [3]. Statistically significance was tested by F- value at 0.05% level of probability and critical difference was worked out wherever the effect was significant.

Results and Discussion

Yield attributes

Effect of Spacing

Spacing had a significant effect on yield attributes. Highest length of panicle, panicle weight, grain yield plant⁻¹ and straw yield plant⁻¹ were obtained with the spacing of 30-60 x 10 cm (S₃), followed by 30 x 10 cm (S₁). The above aspects were lowest in closer spacing of 45 x 5 cm (S₂). This might be due to better carbohydrates synthesis and its efficient translocation from source to sink under wider spacing. Similar results were also reported by Hebbal *et al.* (2018) [4].

Effect of Nutrient levels

Significantly higher yield attributes viz., highest length of panicle, grain yield plant⁻¹ and straw yield plant⁻¹ were recorded under the nutrient level of 35:20:00 kg N: P: K ha⁻¹ (F₃), followed by 30:20:00 kg N: P: K ha⁻¹ (F₂), which was at par with the treatment receiving 25:20:00 kg N:P:K ha⁻¹ (F₁). This might have resulted from higher availability of nutrients to the crop, particularly nitrogen, which might have boosted plant growth and photosynthetic efficiency. Adequate nutrient supply likely promoted greater production and translocation of assimilates towards the development of longer panicle, resulting in higher length of panicle, panicle weight, grain yield plant⁻¹ and straw yield plant⁻¹. Similar observations have been documented by Anitha *et al.* (2020) [1].

Table 1: Yield attributes of finger millet as influenced by spacing and nutrient levels

Treatment	Length of panicle (cm)	Weight of panicle (g)	Grain weight plant ⁻¹ (g)	Straw weight plant ⁻¹ (g)
A. Spacings				
S ₁ - (30 x 10 cm ²)	10.52	1.75	4.05	11.26
S ₂ - (45 x 5 cm ²)	10.11	1.66	3.48	10.74
S ₃ - (30-60 x 10 cm ²)	11.32	2.09	4.38	11.80
S.E. (m) ±	0.09	0.05	0.12	0.09
C.D. at 5%	0.27	0.15	0.35	0.26
B. Nutrient Levels (kg N: P: K ha⁻¹)				
F ₁ - 25:20:00	10.22	1.65	3.68	10.80
F ₂ - 30:20:00	10.71	1.83	3.80	11.25
F ₃ - 35:20:00	11.01	2.02	4.42	11.76
S.E. (m) ±	0.09	0.05	0.12	0.09
C.D. at 5%	0.27	0.15	0.35	0.26
C. Interaction (S x F)				
S.E. (m) ±	0.16	0.09	0.20	0.15
C.D. at 5%	NS	NS	NS	NS
GM	10.65	1.83	3.97	11.27

Yield

Effect of spacing

Greater grain, straw and biological yield was obtained from closer spacing of 45 x 5 cm (S₂), followed by 30 x 10 cm (S₁). The lowest grain and straw yield were obtained from the crop under paired row spacing of 30-60 x 10 cm (S₃). Although wider spacings gave improved performance of yield attributing characters, it cannot outperform overall grain and straw yield per unit area obtained with close spaced crop at 45 x 5 cm (S₂). This spacing might be optimum for potential growth and development with the sufficient availability of space and other resources such as moisture, sunlight and nutrient for this crop. Similar findings were also reported by Hebbal *et al.* (2018) [4].

Effect of Nutrient levels

Application of 35:20:00 kg N:P:K ha⁻¹ (F₃) to finger millet resulted into significantly highest grain, straw and biological

yield, followed by application of 30:20:00 kg N:P:K ha⁻¹ (F₂) which was at par with fertilizer dose of 25:20:00 kg N:P:K ha⁻¹ (F₁). The higher yield obtained may be due to increased fertilizer application which enhanced the availability and uptake of essential nutrients, which might have improved the metabolic activities and overall growth of the crop. Adequate nutrient supply promoted vigorous vegetative growth, efficient photosynthetic activity and better translocation of assimilates from source to sink. The results obtained in the present study are consistent with the findings of Triveni *et al.* (2018) [8].

Economics

Effect of spacings

Higher gross monetary returns, net monetary returns and B:C ratio were obtained with closer spacing of 45 x 5 cm (S₂), followed by 30 x 10 cm (S₁). The lowest economic returns were obtained with wider spacing of 30-60 x 10 cm (S₃). Increment in

gross monetary returns, net monetary returns and B:C ratio was due to significant increase in the economic yield of finger millet. Similar findings were also reported by Sanjay *et al.* (2021) [5] and Yadav and Singh (2023) [9].

Effect of nutrient levels

Data pertaining to economics of finger millet showed that gross monetary returns, net monetary returns and B:C ratio were higher

in response to more fertilizer application. Among the different nutrient levels, application of 35:20:00 kg N:P:K ha⁻¹ (F₃) recorded significantly higher net returns followed by nutrient level of 30:20:00 kg N:P:K ha⁻¹ (F₂). The lower gross monetary returns, net monetary returns and B:C ratio was obtained with lower fertilizer level of 25:20:00 kg N:P:K ha⁻¹ (F₁) which could be attributed to the decreased grain yield. Similar observations have been documented by Thakur *et al.* (2019) [7].

Table 2: Yield and economics of finger millet as influenced by spacing and nutrient levels

Treatment	Yield (Kg ha ⁻¹)		Biological yield (Kg ha ⁻¹)	Harvest index (%)	Gross monetary returns (Rs. ha ⁻¹)	Net monetary returns (Rs. ha ⁻¹)	B:C ratio
	Grain	Straw					
A. Spacings							
S ₁ - (30 x 10 cm ²)	1334	2785	4119	32.39	77391	55443	3.52
S ₂ - (45 x 5 cm ²)	1494	2893	4388	34.05	86678	64490	3.9
S ₃ - (30-60 x 10 cm ²)	1283	2695	3977	32.24	74395	52687	3.42
S.E. (m) ±	30	20	34	-	1693	1693	-
C.D. at 5%	88	60	101	-	5076	5076	-
B. Nutrient levels (Kg N: P: K ha ⁻¹)							
F ₁ - 25:20:00	1324	2742	4066	32.55	76780	54888	3.5
F ₂ - 30:20:00	1356	2776	4131	32.82	78603	56662	3.58
F ₃ - 35:20:00	1432	2855	4288	33.4	83082	61070	3.77
S.E. (m) ±	29	20	34	-	1693	1693	-
C.D. at 5%	88	60	101	-	5076	5076	-
C. Interaction (S x F)							
S.E. (m) ±	51	34	58	-	2933	2933	-
C.D. at 5%	NS	NS	NS	-	NS	NS	NS
GM	1370	2791	4161	32.93	79488	57540	3.62

Interaction effect

Yield attributes, yield and economics were not influenced by the interaction effect of spacings and nutrient levels of finger millet (Table 1 and 2).

Conclusion

Crop sown with spacing of 30-60 x 10 cm (S₃) resulted in higher values for yield attributes viz., length of panicle, panicle weight, grain yield plant⁻¹ and straw yield plant⁻¹. Whereas, grain, straw and biological yield and gross monetary returns, net monetary returns and B:C ratio were obtained higher with closer spacing of 45 x 10 cm (S₂). With respect to nutrient levels, application of 35:20:00 kg N: P: K ha⁻¹ (F₃) recorded higher yield attributes, yield and net returns.

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References

- Anitha KV, Chikkaramappa T, Basavaraja PK, Prakash NB, Murali K, Boraiah B. Effect of different levels of fertilizers on productivity and nutrient dynamics of brown top millet. *Int Res J Pure Appl Chem.* 2020;21(24):308-320.
- Chandra D, Chandra S, Pallavi, Sharma AK. Review of finger millet (*Eleusine coracana* (L.) Gaertn): a power house of health benefiting nutrients. *Food Sci Hum Wellness.* 2016;5(3):149-155.
- Gomez KA, Gomez AA. Statistical procedure for agricultural research. New York: John Wiley and Sons; 1984. p. 357-423.
- Hebbal N, Ramachandrappa BK, Mudalairiyappa, Thimmegouda MN. Yield and economics of finger millet with establishment methods under different planting geometry and nutrient source. *Indian J Dry Land Agric Res Dev.* 2018;33(1):54-58.
- Sanjay KJ, Singh V, Tiwari D, George SG, Padachala S. Effect of spacing and age of seedling on growth and yield of finger millet (*Eleusine coracana* L.). *Biol Forum Int J.* 2021;13(1):585-589.
- Shukla S, Gautam TS, Singh S, Patel S, Rathiy PS. Little millet (*Panicum sumatrense*) response to different fertility levels and seed rates under rainfed condition of Chhattisgarh. *Pharma Innov J.* 2023;12(12):3944-3946.
- Thakur AK, Kumar P, Netam PS. Effect of different nitrogen levels and plant geometry in relation to growth characters and yield of brown top millet (*Brachiaria ramosa* L.) at Bastar Plateau zone of Chhattisgarh. *Int J Curr Microbiol Appl Sci.* 2019;8(2):2789-2794.
- Triveni U, Sandhya Rani Y, Patro TSSK, Anuradha N, Divya M. Fertilizer responsiveness of short duration improved finger millet genotypes to different levels of NPK fertilizers. *Indian J Agric Res.* 2018;52(1):97-100.
- Yadav BB, Singh R. Effect of spacing and potassium levels on yield and economics of foxtail millet (*Setaria italica* L.). *Int J Environ Clim Change.* 2023;13(3):41-46.