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Effect of crop geometry on yield attributes and yield of foxtail millet (*Setaria italica* L.)

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Abstract
Field experiment was conducted during *rabi* 2023 – 2024 at agronomy farm section, college of agriculture, Nagpur entitled [Effect of crop geometry on yield attributes and yield of foxtail millet (*Setaria italica* L.)]. The experiment was laid out in randomized block design with factor with three replications. The treatment includes eleven crop geometry *viz*., 45 cm x 5 cm, 30 cm x 5 cm, 22.5 cm x 5 cm, 45 cm x 10 cm, 30 cm x 10 cm, 22.5 cm x 10 cm, 30 cm x 5 cm paired row, 30 cm x 10 cm paired row, 22.5 cm x 5 cm paired row, 22.5 cm x 10 cm paired row, 30 cm x 15 cm. Among the crop geometry 22.5 cm x 10 cm recorded higher yields (grain: 2304 kg ha^{-1} and stover: 4567 kg ha^{-1} and biological yield: 6871 kg ha^{-1}) and nutrient uptake of foxtail millet.

Keywords: Foxtail millet, crop geometry, yield and yield attributes

Introduction
Millets exhibit unique characteristics amongst cereals, which are small seeded grasses that are hardy and grow well in dry zones as rainfed crops under marginal conditions of soil fertility and moisture. Under the changing scenario of global warming and climate change, cultivation of ecologically sound and hardy millets may be a wise alternative for optimum output with food and nutritional security (Wang *et al*., 2018) [10]. Foxtail millet is one of the fastest growing crops and it is also known for their fast maturity, high storability and the ability to grow on poor soils. Foxtail millet is known as the Italian miller or germen millet.

Foxtail millet ranks second in the world millet production and continues to play a vital role in world agriculture, giving food to millions of people dependant on poor or marginal soils in southern Europe and in temperate, subtropical and tropical Asia (Hariprasanna, 2016) [4]. In India, foxtail millet is mostly cultivated in Tamil Nadu, Karnataka and Andhra Pradesh, contributing about 79 per cent of the total area (Munirathnam *et al.*, 2006) [8]. In India 9.1 m ha areas is under foxtail millet cultivation with production of 7.3 mt and productivity of 780 kg ha^{-1} (Monisha *et al*., 2019) [7]. Its grain contains 12.3 per cent protein, 4.7 per cent fat, 60.6 per cent carbohydrate, 3.2 per cent ash and mineral nutrients (Singh *et al.*, 2003). Foxtail millet is high in iron and calcium and has a low phytic acid content (Sampat *et al.*, 1990) [9].

Foxtail millet is cultivated in low fertile dryland soils and is merely supplemented with N and P, ignoring the requirement of K due to soil, natively rich in potassium. The ideal plant geometry can assure healthy and uniform stand in the main field and ensure higher productivity. When the plant density exceeds an optimum level, competition among plants for light above ground and nutrients below ground becomes severe (Bayala *et al.*, 2002) [1]. It is therefore necessary to optimize the density of plants per unit area under appropriate spacing to obtain maximum yield. It is also necessary to address the importance of plant density with respect to soil fertility.

Materials and Methods
Field experiment was conducted during *rabi* 2023 – 2024 at agronomy farm section, college of agriculture, Nagpur to study the Effect of crop geometry on yield attributes and yield of foxtail millet (*Setaria italica* L.). The experiment was laid out in Randomized Block Design with three

replications. The treatment includes eleven crop geometry *viz*., 45 cm x 5 cm, 30 cm x 5 cm 22.5 cm x 5 cm, 45 cm x 10 cm, 30 cm x 10 cm, 22.5 cm x 10 cm, 30 cm x 5 cm paired row, 30 cm x 10 cm paired row, 22.5 cm x 5 cm paired row, 22.5 cm x 10 cm paired row, 30 cm x 15 cm. The plot size was 3.6 m × 4.0 m. In accordance with the treatments, the seeds were sown in the corresponding plots during second week of November 2023. The well prepared area was treated with the recommended dose of fertilizer. The data on various characters studied during the investigation were statistically analyzed as suggested by Gomez and Gomez (1984) [2].

Results and Discussion

1. Panicle length (cm)

Treatment with spacing at 22.5 cm × 10 cm recorded highest length of panicle followed by spacing 30 cm x 5 cm which was at par to each other. Significance reduction in the length of panicle was observed with increasing in row spacing. Similar result found with Gowada *et al*. (2021) [3].

2. Grain weight (g plant^{-1})

Spacing of 45 cm x 10 cm resulted more grains (34.50 g plant^{-1}) followed by spacing of 30 cm x 10 cm paired row spacing (33 g plant^{-1}). In wide spacing the plant population is less resulted in to the better utilization of nutrients, water leads to the highest grain weight (g plant^{-1}) Similar results were recorded by Lokesh *et at*. (2023) [6] with foxtail millet.

3. Test weight (g)

The test weight was non significantly influenced by the different row spacing. Test weight is a genotypic character which cannot be influenced by spacing Similar findings were reported by Gowada *et al*. (2021) [3] with finger millet.

4. Grain yield (kg ha^{-1})

Spacing of 22.5 cm x 10 cm resulted in statistically significant more grain yield (2304 kg ha^{-1}) of foxtail millet followed by spacing of 30 cm x 5 cm row spacing (2231 kg ha^{-1}). The enhanced grain production gained from closer row and plant spacing was mostly attributable to increased plant population per unit area. However, reduced grain yield obtained with wider line and plant spacing could be attributed to the less number of plants and poor use of available resources for growth and development. This reduces biomass output per unit area, resulting in a decreased grain yield Matching results have been reported by Jyothi *et al*. (2021) [5] with foxtail millet.

5. Stover yield (kg ha^{-1})

Spacing of 22.5 cm x 10 cm resulted in significantly higher stover yield over all other treatments (4567 kg ha^{-1}) which was at par with spacing of 30 cm x 5 cm row spacing (4453 kg ha^{-1}) The similar outcomes were reported by Jyothi *et al*. (2021) [5] with foxtail millet.

6. Biological yield (kg ha^{-1})

Spacing of 22.5 cm x 10 cm resulted in significantly superior biological yield kg ha^{-1} overall spacings but found at par with spacing of 30 cm x 5 cm. Plants in narrow spacing can more efficiently use light, water and nutrients because they grow higher, the root systems of closely spaced plants can interact beneficially, improving nutrient uptake.

7. Harvest index

Harvest index was higher with spacing of 22.5 cm x 10 cm (33.54) followed by 30 cm x 5 cm where as spacing 22.5 cm x 5 cm recorded the lowest harvest index (29.45)

Table 1: Effect of crop geometry on yield attributes and yield of foxtail millet

Treatments		Yield and yield attributes						
		Panicle Length (cm)	Grain weight (plant^{-1}g)	Test weight (g)	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (kg ha^{-1})
T_1	45 cm x 5 cm	17.34	29.33	2.61	1861	4001	5862	31.74
T_2	30 cm x 5 cm	18.91	27.00	2.60	2231	4453	6684	33.37
T_3	22.5 cm x 5 cm	16.23	25.00	2.54	1384	3195	4699	29.45
T_4	45 cm x 10 cm	16.79	34.50	2.76	1702	3821	5524	30.99
T_5	30 cm x 10 cm	18.18	31.67	2.65	2085	4317	6403	32.56
T_6	22.5 cm x 10 cm	20.15	30.53	2.62	2304	4567	6871	33.54
T_7	30 cm x 5 cm Paired row	16.12	28.83	2.61	1630	3782	5413	30.11
T_8	30 cm x 10 cm Paired row	16.07	33.00	2.68	1580	3678	5258	30.04
T_9	22.5 cm x 5 cm Paired row	15.67	26.33	2.57	1476	3490	4966	29.72
T_{10}	22.5 cm x 10 cm Paired row	16.18	31.00	2.63	1690	3873	5563	30.38
T_{11}	30 cm x 15 cm	15.94	32.00	2.66	1521	3594	5115	29.74
SE (m) ±		0.62	0.80	0.04	24	71	76	-
CD (P= 0.05)		1.84	2.35	NS	72	209	223	-
Mean		17.05	29.93	2.63	1769	3888	5669	-

Conclusion

Foxtail millet cultivated with spacing 22.5 cm x 10 cm produced significantly superior panicle length, grain yield kg ha^{-1}, stover yield kg ha^{-1}and biological yield kg ha^{-1} overall treatments which was at par with 30 cm x 5 cm. Harvest index was higher in the spacing 22.5 cm x 10 cm and lowest in 22.5 cm x 5 cm.

References

1. Bayala J, Teklehaimanot Z, Ouedraogo SJ. Millet production under pruned tree crowns in a parkland system in Burkina Faso. Agrofor Syst. 2002;54:203-214.
2. Gomez KA, Gomez AA. Statistical procedures for agricultural research. New York: John Wiley & Sons; c1984.
3. Gowda MAS, Singh R, Khan W. Effect of different spacing and nutrient sources on growth and yield of zaid finger millet. Int J Curr Microbiol Appl Sci. 2021;10(2):2907-2912.
4. Hariprasanna K. Nutritional importance and cultivation aspect. Indian Farming. 2016;73(01):47-49.
5. Jyothi NK, Sumathi V, Subramanyam D, Sudhakar P, Krishna TG, Karuna Sagar G. Productivity and profitability

of foxtail millet (*Setaria italica* L.) as influenced by varied agro techniques under Southern agro-climatic Zone of Andhra Pradesh. The Pharma Innovation J. 2021;10(7):907-911.
6. Lokesh T, Choudhary AA, Mairam NR. Effect of different sowing windows and line spacings on yield and economics of foxtail millet during rabi season. The Pharma Innovation J. 2023;12(2):1121-1123.
7. Monisha V, Rathinaswamy A, Mahendran PP, Kumutha K. Influence of integrated nutrient management on growth attributes and yield of foxtail millet in red soil. Int J Chem Stud. 2019;7(3):3536-3539.
8. Munirathnam P, Reddy AS, Sawadhkar SM. Evaluation of foxtail millet varieties under low fertility conditions. Agric Sci Digest. 2006;26(3):197-199.
9. Sampat RK. On some aspects of irrigation distribution in India. University of Wisconsin Press. 1990;66(4):448-63.
10. Wang J, Vanga SK, Saxena R, Orsat V, Raghavan VR. Effect of climate change on the yield of cereal crops: a review. Climate. 2018;6(2):41.