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Effect of different sowing windows and line spacings on yield and economics of foxtail millet during *rabi* season

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Abstract
A field experiment entitled "Performance of foxtail millet under different sowing windows and line spacing during *rabi* season" was conducted at Agronomy farm, College of Agriculture, Nagpur during *rabi* season of 2021-22. Foxtail millet var. SiA-3222 was grown on clay soil, medium in nitrogen, low in phosphorous and very high in potassium having pH 7.7. The experiment was laid out in Factorial Randomized Block Design with nine treatment combinations, replicated thrice. The treatments were consisted of three sowing windows *viz;* 42nd, 44th, and 46th Meteorological Week and three line spacings *viz*; 30, 45 and 60 cm. Yield attributing characters *viz;* length of panicle, grain weight plant^{-1} and 1000 grain weight along with grain and straw yield ha^{-1} were highest when the crop sown during 42nd MW. All above mentioned yield attributing characters were also higher in 60 cm line spacing but grain and straw yield ha^{-1} were highest in the line spacing 30 cm. The gross and net monitory returns and B: C ratio of foxtail millet were significantly higher in early sowing during 42nd MW and in closer line spacing of 30 cm.

Keywords: Foxtail millet**,** sowing window, spacing, grain yield, economics

Introduction
Foxtail millet is the third largest millet crop after pearl millet and finger millet, cultivated for food in semi-arid tropics of Asia and as forage in Europe, North America, Australia, and North Africa. In India, it is cultivated over an area of 6.2 lakh ha. with total production of about 4.5 lakh tones with a productivity of 655 kg ha^{-1} during 2018-19. Among this, share of Maharashtra is 13.5% of area and 10.35% of production (Anonymous, 2019) [1]. Optimum planting time is the chief factor influencing vegetative growth and ultimately the grain production in foxtail millet. Usually it is cultivated as kharif crop. However, in Kolhapur region of M. S. and in Telangana State, it is cultivated as rabi crop. Hence, in order to check its feasibility to be grown as rabi crop by the rainfed farmers of Nagpur region and to find out the most optimum time for rabi sowing, three sowing windows were tried as delay in sowing causes early maturity resulting into drastic reduction in yield compared to timely sowing which has a longer growth duration that consequently provides an opportunity to accumulate more biomass (Nandini and Sridhara, 2019) [7]. Planting density one of the most important factors affecting the foxtail millet yields. Higher number of plants per unit area increases the competition between the plants for resources like moisture, light, nutrients, and space whereas under low plant population, these resources are not completely utilized. Hence finding out its optimum planting spacing was felt necessary.

Materials and Methods
The experimental soil was medium black, uniform and levelled. Meteorological data presented in Table 3 indicated that the mean maximum temperature ranged from 29.5 °C to 33.6 °C and the mean minimum temperature ranged from 8.3 °C to 23.3 °C and received total rainfall of 27.6 in three rainy days (2nd MW) during the crop growth period. Mean relative humidity recorded in the morning and evening ranged from 30-83% and 23-63%, respectively. Mean bright sunshine hours and wind speed ranged from 4.9 to 12.5 hours and 1.5 to 3.3 km hour^{-1}, respectively. The experiment was laid out in factorial randomized block design (FRBD) with nine treatment combinations of three sowing windows (42nd MW-D_1, 44th MW-D2 and 46th MW-D_3) and three line spacings (30 cm-S_1, 45 cm-S_2 and 60 cm-S_3) and replicated thrice. Plant to plant spacing was 10 cm, same for all treatments.

Results and Discussion

A. Yield attributes and yield

Effect of sowing window

Significantly higher length of panicle, grain weight plant^{-1}, 1000 grain weight and grain and straw yield ha^{-1} were obtained from the crop sown during 42nd MW (D_1) which was followed by 44th MW (D_2) and the lowest performance in above aspects was recorded in the crop sown during 46th MW (D_3). Whereas, in case of number of effective tillers plant^{-1}, 1000 grain weight and straw yield ha^{-1}, 44th MW (D_2) was at par with 42nd MW (D_3). Early sown crop during *rabi* (42nd MW) might have received favourable atmospheric conditions required for potential growth of the crop. As a result, the yield attributing factors *viz.* number of effective tillers plant^{-1}, length of panicle and 1000 grains weight might have also improved. This could be the reason for higher grain and straw yield with early sowing compared to later sowings. Similar results were also reported by Chouhan *et al.* (2015) [2], Detroja *et al.* (2018) [3] and Mubeena *et al.* (2019) [6].

Table 1: Yield attributes, yield and harvest index of foxtail millate as influence by sowing window and line spacing

Treatments	Mean number of effective tillers plant^{-1}	Length of panicle (cm)	Grain weight plant^{-1} (g)	1000 grain weight (g)	Yield (kg ha^{-1})		Harvest Index (%)
					Grain	Straw	
A. Sowing windows							
D_1- 42nd MW	3.12	16.6	6.70	3.53	1392	2039	40.58
D_2-44th MW	2.80	15.5	6.32	3.51	1266	1956	38.94
D_3 -46th MW	2.19	14.8	5.65	3.45	1096	1755	38.44
SE(m)±	0.12	0.07	0.10	0.01	38	74	-
CD at 5%	0.36	0.21	0.31	0.03	114	222	-
B. Line spacing							
S_1- 30 cm	1.87	15.2	5.22	3.39	1539	2330	39.72
S_2- 45 cm	2.87	15.8	6.12	3.51	1225	1864	39.31
S_3-60 cm	3.33	16.1	7.33	3.58	991	1556	38.94
SE(m)±	0.12	0.07	0.10	0.01	38	74	-
CD at 5%	0.36	0.21	0.31	0.03	114	222	-
C. Interaction (D×S)							
SE(m)±	0.21	0.12	0.18	0.02	65.64	128.1	-
CD at 5%	NS	NS	NS	NS	NS	NS	-
GM	2.70	15.8	6.23	3.50	1252	1917	39.32

Effect of line spacing

Significantly highest length of panicle, grain weight plant^{-1}, 1000 grain weight were recorded under 60 cm line spacing (S_3) followed by 45 cm (S_2). The above aspects were lowest in closer line spacing of 30 cm (S_1). Line spacing of 30 cm (S_1) produced highest grain and straw yield ha^{-1} followed by 45 cm (S_2). The lowest grain and straw yield ha^{-1} were obtained from the crop under wider line spacing of 60 cm (S_3). Although wider line spacing gave improved performance of yield attributing characters, it cannot supersede overall grain and straw yield per unit area obtained with closer spaced crop. Line spacing of 30 cm might be optimum for potential growth and development with the sufficient availability of space and other resources such as moisture, sunlight, nutrient, etc for this crop. However, lower grain and straw yield obtained from wider line spacing of 45 and 60 cm might be due to inefficient utilization of available resources by the crop for its growth and development. This leads to lower biomass production per unit area resulting in lower grain and straw yield. Similar results were also reported by Maas *et al.* (2007) [5], Suhaibani *et al.* (2011) [8] and Isah *et al.* (2017) [4].

Table 2: Economics of foxtail millet crop as influenced by various treatments

Treatments	Gross monetary returns (Rs. ha^{-1})	Cost of Cultivation	Net monetary returns (Rs. ha^{-1})	B:C ratio
A. Sowing dates				
D_1 - 42ndMW	48747	20010	28737	2.43
D_2 -44thMW	44337	20010	24327	2.21
D_3 -46thMW	38363	20010	18353	1.91
SE(m)±	1326	-	1326	-
CDat5%	3976	-	3976	-
B. Line spacing				
S_1- 30 cm	53865	20010	33855	2.69
S_2- 45 cm	42898	19710	23188	2.14
S_3-60 cm	34685	19410	15275	1.73
SE(m)±	1326	-	1326	-
CDat5%	3976	-	3976	-
C. Interaction(D×S)				
SE(m)±	2297	-	2297	-
CDat5%	NS	-	NS	-
GM	43816	19860	24940	2.19

(Market price of foxtail millet = Rs 35 kg^{-1})

Interaction effect
Interaction between sowing window and line spacing was non-significant.

B. Economics
Significantly highest gross and net monetary returns and highest B:C ratio were recorded by the sowing window of 42nd MW (D_1). It was followed by 44th MW. Sowing in 46th MW recorded the lowest gross, net monetary returns and B:C ratio. Among the different line spacings gross, net monetary returns and B:C ratio were highest in 30 cm. It was followed by the line spacing of 45 cm whereas the lowest gross, net monetary returns were recorded with 60 cm line spacing. The interaction effect was absent. Similar results were also reported by Nandini and Sridhara. (2019) [7].

Conclusion
Sowing window of 42nd MW resulted in higher yield of foxtail millet compared to later sowing windows during *rabi* season. Line spacing of 60 cm gave higher yield attributes than closer line spacings, but 30 cm line spacing recorded higher grain and straw yield hectare^{-1}. Sowing window of 42nd MW gave highest gross monetary returns, net monetary returns and B:C ratio among all the sowing windows and among different line spacings, 30 cm line spacing resulted in highest gross and net monetary returns and B:C ratio.

References
1. Anonymous. Agriculture Statistics at a glance, Ministry of Agriculture and Farmers Welfare, Government of India; c2019.
2. Chouhan M, Gudadhe NN, Kumar D, Kumawat AK, Kumar R. Transplanting dates and nitrogen levels influences on growth, yield attributes and yield of summer pearl millet. The Bioscan. 2015;10(3):1295-1298.
3. Detroja AC, Bhuva HM, Choudhary NN, Patel PR, Kikani. Production potential of improved pearl millet cultivars under staggered sowing in rainfed areas of Western India. Int. J Environ. Sci.: Nat. Res. 2018;12(4):0119-0122.
4. Isah S, Ahmed HG, Noma SS, Gbanguba AU. Effect of variety and intra row spacing on the performance of pearl millet in Sokoto, North-Western Nigeria. Int. Res. J Agric. Sci. And Tech. 2017;1(1):1-5.
5. Mass AL, Hannaand WW, Mullinix BG. Planting date and row spacing affects grain yield and height of pearl millet Tift grain102 in the South-eastern coastal plain of the United States. Int. Res. J Agric. Sci. and Tech. 2007;5(1):1-4.
6. Mubeena P, Halepyati AS, Chittapur BM. Effect of date of sowing and nutrient uptake and yield of foxtail millet. Int. J. Bio-resource and Stress Management. 201910(1):092-095.
7. Nandini KM, Sridhara S. Response of growth, yield and quality parameters of foxtail millet genotypes to different planting density. Int. J Curr. Microbiol. App. Sci. 2019;8(2):1765-1773.
8. Suhaibani NA. Better forage and grain yield quality of pearl millet under different irrigation water supplies and plant densities. World Applied Sci. 2011;15(8):1136-1143.