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RESPONSE OF FOXTAIL MILLET (*Setaria italica* L.) VARIETIES TO DIFFERENT LEVELS OF NITROGEN

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ABSTRACT

A field experiment was conducted during *kharif,* 2014 at S.V. Agricultural College Farm, Tirupati with four foxtail millet varieties (SiA 3088, SiA 3085, SiA 3156 and Srilaxmi) in combination with three nitrogen levels (0, 25, 50 kg N ha^{-1}). The results revealed that SiA 3085 recorded higher stature of growth, yield attributes and yield. The above parameters were at their lower level with SiA 3088 variety. Application of 50 kg N ha^{-1} markedly improved the growth and yield while, they were found to be at their lower with no nitrogen application. The results concluded that the foxtail millet variety SiA 3085 with the application of 50 kg N ha^{-1} was profitable to the farmers in sandy loam soils of Southern Agro-Climatic Zone of Andhra Pradesh.

KEYWORDS: Economics, Foxtail millet, Nitrogen, Varieties, Yield.

INTRODUCTION

Foxtail millet (*Setaria italica* L.) is one of the oldest cultivated small millets for food and fodder. It is known for its drought tolerance (Cheng and Liu, 2003) and can withstand severe moisture stress and also suited to wide range of soil conditions. It has an excellent nutritional profile and is miles ahead of rice and wheat in terms of protein, fiber, minerals and vitamins. It is rich in dietary fibre (6.7%), protein (11 %), and low in fat (4 %). Unlike rice, foxtail millet releases glucose steadily without affecting the metabolism of the human body. As the consumption of foxtail millet is increasing day by day particularly by the people suffering with diabetes, there is an increasing demand for foxtail millet. The yield potential of foxtail millet is very low because of inadequate application of fertilizers, conventional cultivation of low yielding cultivars and lack of good management practices. The common belief that foxtail millet may not respond profitably to applied nutrients does not hold good under suitable management practices.

Application of fertilizers has become essential for high yielding varieties of foxtail millet to realize their maximum yield potential.

Recent studies of Basavarajappa *et al*. (2002), Rathore and Sharma (2004) and Hasan *et al*. (2013) indicated that there was a good response of foxtail millet to varied levels of nitrogen under rainfed conditions. Hence, promising foxtail millet varieties were tested for their response to nitrogen levels to evaluate their yield potentiality.

MATERIAL AND METHODS

A field experiment was carried out during *kharif*, 2014 at S.V. Agricultural College Farm, Tirupati. The experimental soil was sandy loam in texture, neutral in reaction (pH 6.9), low in organic carbon (0.43 per cent) and available nitrogen (188.0 kg ha^{-1}), high in available phosphorus (44.2 kg ha^{-1}) and medium in potassium (170.2 kg ha^{-1}). The experiment was laidout in a randomised block design with factorial concept with twelve treatment combinations and replicated thrice. The treatment combinations comprised of four varieties (SiA 3088, SiA 3085, SiA 3156 and Srilaxmi) and three nitrogen levels (0, 25 and 50 kg N ha^{-1}). The crop was sown in lines at 20 cm apart by adopting all the standard package of practices as per the recommendation of Acharya N.G. Agricultural University, except the imposed treatments. A basal dose of 30 kg P_2O_5 and 20 kg K_2O was applied uniformly to all the treatments. The scheduled nitrogen was applied in two equal splits *viz.,* first half at the time of sowing as basal and remaining half as top dressing at 30 DAS. All the varieties of foxtail millet were sown on 15th July, 2015. The time of harvesting varied from 75 days to 100 days after sowing, depending upon the varietal duration.

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RESULTS AND DISCUSSION

Performance of varieties

Among the four varieties evaluated, the taller plants were produced by the variety SiA 3156 followed by SiA 3085, without any significant difference between them. While, the shorter plants were produced by SiA 3088. Maximum leaf area index and dry matter production were recorded with the variety SiA 3085, which was however comparable with that of SiA 3156 variety. The lower values of these growth parameters viz., plant height, leaf area index and dry matter production were registered with the variety SiA 3088. The total number of tillers m^{-2} were not significantly influenced by the different varieties (Table 1).

Number of panicles m^{-2} at harvest was found to be non significant with the choice of variety. The other yield attributing characters viz., panicle length, weight of the panicle, number of filled grains $panicle^{-1}$ and thousand grain weight were significantly influenced by the varieties. The variety, SiA 3085 resulted in higher values of number of filled grains $panicle^{-1}$, weight of the panicle, thousand grain weight, which was statistically at par with that of the variety SiA 3156. However, the panicle length of SiA 3085 variety was significantly higher than other varieties tried. The lowest values of these yield attributes were produced with SiA 3088 variety (Table 1).

The variety SiA 3085 produced the highest grain and straw yield, which was however comparable with that of SiA 3156, while they were at their lowest with SiA 3088 variety (Table 1). Difference in yields among the varieties can be attributed to their genetic potentiality to utilize and translocate photosynthates from source to sink. Superiority of variety SiA 3085 in producing higher plant height, number of tillers per plant, leaf area has resulted in higher dry matter accumulation, which has contributed to more yield attributes and was reflected in higher yields. The results were in conformity with the findings of Saini and Negi (1996), Munirathnam *et al.* (2006).

The highest benefit-cost ratio was recorded with SiA 3085 followed by SiA 3156. While, the lowest benefit-cost ratio was recorded with SiA 3088 variety. Nitrogen uptake was also highest with the variety SiA 3085, which was however comparable with that of variety SiA 3156. SiA 3088 registered the lowest uptake of nitrogen. The differential rooting pattern of varieties might have resulted in a difference in nitrogen uptake. SiA 3085 could be efficient in exploring the nutrients exhaustively from the soil (Table 1).

Effect of nitrogen

The highest expression of all the growth parameters and yield attributes were observed with the application of 50 kg N ha^{-1}. While all these parameters were at their lowest value with no nitrogen application (Table 1).

Significant increase in grain and straw yields were observed with increase in nitrogen level from 0 to 50 kg N ha^{-1}. The benefit-cost ratio was also found maximum at 50 kg N ha^{-1} (Table 1).

The highest grain yield was obtained with the application of nitrogen @ 50 kg N ha^{-1}, which was significantly higher than nitrogen application @ 25 kg N ha^{1}. The increase in yield with 50 kg N ha^{-1} was upto 30 per cent than 25 kg N ha^{-1}. This might be attributed to better availability and uptake of nitrogen which inturn lead to efficient metabolism and higher biomass accrual and efficient translocation of photosynthates from source to sink. The increase in sink capacity resulted in improved yield attributes and consequently enhanced the grain yield of foxtail millet. The above results are in conformity with the findings of Kalaghatagi *et al*. (2000), Hasan *et al*. (2013).

The highest uptake of nitrogen by the crop was observed with the application of 50 kg N ha^{-1}, which was significantly higher than with 25 kg N ha^{-1} and no nitrogen application. The increase in dry matter yield with higher dose of nitrogen application has led to the higher uptake of nitrogen by plants. Incremental doses of nitrogen might have resulted in its increased absorption from the soil (Table 1). The present investigation confirms the documented evidence of Naik *et al.* (1995) and Basavarajappa *et al*. (2002). The highest benefit-cost ratio was obtained with the application of nitrogen @ 50 kg N ha^{-1}.

Interaction between varieties and nitrogen levels was found non-significant with respect to any of the observation made on foxtail millet.

The gradual increase in grain yield and straw yield was observed in all the varieties with increasing levels of nitrogen, but the incremental increase was comparatively higher with variety SiA 3085, which indicated its suitability for cultivation with 50 kg N ha^{-1} application. The above combination also maintained high monetary returns thus satisfying the sustainability criterion.

Table 1. Performance of foxtail millet as influenced by varieties and nitrogen levels

Treatments	Plant height (cm)	Leaf area index	Number of tillers m^{-2}	Drymatter production (kg ha^{-1})	Number of panicles m^{-2}	Length of the panicle (cm)	Weight of the panicle (g)	Number of filled grains $panicle^{-1}$	1000-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	B : C ratio	N uptake (kg ha^{-1})
Varieties													
SiA 3088	79.9	1.61	73	2848	66.3	11.9	3.81	821	2.75	1001	1772	1.51	25.9
SiA 3085	91.3	1.82	76	3153	67.0	14.4	4.53	965	2.86	1141	1956	1.72	31.5
SiA 3156	93.7	1.80	76	3135	65.9	13.6	4.43	932	2.83	1106	1943	1.67	30.7
Srilaxmi	89.8	1.68	75	2970	66.6	12.7	4.09	859	2.79	1022	1823	1.55	28.2
CD(P=0.05)	3.7	0.05	NS	159	NS	0.6	0.28	51	0.03	77	124	0.11	1.6
Nitrogen levels (kg ha^{-1})													
0	66.4	0.85	58	2058	53.3	7.33	1.60	536	2.73	730	1257	1.14	17.1
25	93.9	1.77	76	2956	68.5	14.0	4.07	909	2.80	1075	1789	1.63	29.6
50	105.6	2.56	92	4069	77.5	18.1	6.60	1239	2.89	1398	2574	2.07	40.6
CD(P=0.05)	3.2	0.05	2	138	2.7	0.5	0.25	44	0.29	67	108	0.10	1.4
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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