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On-farm Testing of Foxtail Millet Variety SiA-3223 (Renadu) in Semi-arid Regions of Andhra Pradesh

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ABSTRACT: On-farm testings were conducted to study the performance of foxtail millet variety SiA -3223 (Renadu) in *Kharif* season from 2020 and 2021 in Kurnool district of Andhra Pradesh. Ten demonstrations were conducted each year with three foxtail millet varieties SiA -3223 (TO_1), SIA-3156 (TO_2) and Prasad (TO_3). During two years of assessment, the pooled results revealed that the highest panicle length was observed in SiA-3223 variety (26.8 cm) followed by SiA-3156 (23.8cm) and Prasad (21.5cm) varieties. Highest test weight (3.6 gm) and seed yield (2369 kg/ha) also recorded in SiA-3223 variety when compared with SiA-3156 and Prasad varieties. The per cent increase in yield was 15.5 % and 45.3 % higher in SiA-3223 variety when compared with SiA-3156 and Prasad varieties respectively. The average highest net income (Rs. 30508/ha) and benefit cost ratio (3.16) was realized in SiA- 3223. The lowest net income (Rs. 16840/ha) and benefit cost ratio (2.20) was recorded in Prasad variety. Hence SiA-3223 (Renadu) variety is the high yielding improved variety when compared with other existing varieties.

Keywords: On-farm tesings, Foxtail millets, Renadu, Net Returns, Benefit cost Ration.

INTRODUCTION

Millets play a vital role in ensuring nutritional security, as they are packed with protein, fiber, iron, minerals, B-complex vitamins, and calcium. Their consumption has been linked to a range of health benefits, including reduced risk of heart disease, diabetes protection, improved digestive health, lower cancer risk, detoxification, enhanced immunity, increased energy levels, and improvements in muscular and neural systems. Studies such as those by Manach *et al.* (2005); Scalbert *et al.* (2005); Chandrasekara and Shahidi (2012) have highlighted these advantages.

Finger millet, proso millet, and foxtail millet are the most widely grown millets, particularly in regions with annual rainfall below 350 mm. However, there has been a concerning decline in the cultivation of small millets over the years. In Kurnool district of Andhra Pradesh, which is prone to drought and has experienced reduced rainfall, millets have become an important alternative for the farming community. While the area under millet cultivation decreased due to lifestyle changes, rice distribution schemes, and the availability of canal water, recent shifts in climate patterns and increased health awareness have led to a renewed interest in millets.

During the 1970s, Kurnool district was a traditional millet-growing area, but changes in agricultural practices reduced millet cultivation. In kurnool the area under foxtail millet is 1632 ha with 3350 Mt of production in 2023 and productivity of 950 kg/ha (Anon., 2022). Despite facing challenges such as monsoon failure and drought, there has been a recent resurgence in millet cultivation in the district. Foxtail millet, in particular, is the major millet grown in Kurnool district, with local varieties being low-yielding and less tolerant to drought.

To address these challenges, on-farm testings have been conducted by Krishi Vigyan Kendra Banavsi to introduce improved varieties of foxtail millet that are both drought-tolerant and high-yielding. This initiative aims to overcome the limitations of traditional varieties and enhance the resilience of millet cultivation in the district.

The overall promotion of millets in areas like kurnool, coupled with efforts to introduce improved varieties, is crucial for the well-being of both farmers and consumers. Creating awareness, providing training, and offering support in terms of resources can further encourage the sustainable cultivation of millets in drought-prone regions.

MATERIALS AND METHODS

On-farm testings were conducted at four blocks (Pattikonda, Kodumuru, Adoni and Yemmiganur) in the western part of Kurnool district, Andhra Pradesh to disseminate the high yielding foxtail millet varieties. These testings were conducted at ten locations during *kharif* season of two consecutive years (2020 and 2021). The size of each OFT plot was 0.2 ha. Scientific interventions like improved varieties, seed treatment, integrated nutrient management, integrated pest management and integrated disease management practices were practiced in the demonstrated fields. The improved foxtail millet SiA-3223 (Renadu) was

selected for these on-farm testings and distributed as critical input to the beneficiary farmers. The salient features of foxtail millet varieties were given in the Table 1.

The on-farm testing was conducted to study the performance of improved varieties under recommended management practices in terms of its yield and cost economics. The improved SiA-3223 (Renadu) variety was compared with popular variety SiA-3156 and locally available prasad (check) variety. Apart from demonstrations, training programmes were also conducted to the farmers on integrated crop management practices. During two years of assessment the observations such as panicle length (cm), test weight (g), yield (kgha^{-1}), net returns and benefit cost ratio were recorded.

The results obtained during two years were analyzed using appropriate statistical tools *viz.*, mean, standard deviation, and the results were concluded at the respective levels of significances between means ($p < 0.05$). The mean values of panicle length, test weight and yield were calculated in 2020, 2021 and pooled data of three years. The technology gap, extension gap and technology index were calculated for SiA-3223 variety compared to locally grown variety as per Samui *et al.* (2000).

Technology gap = Potential yield – demonstration yield

Extension gap = Demonstration yield - farmers practice yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

Table 1: Salient features of foxtail millet varieties.

Sr. No.	Variety	Duration (Days)	Year of notification	Potential Yield kg ha^{-1}	Specific features
1.	SiA-3223	85-90	2020	2700-3200	High seed and fodder yield, cream white seeds, tolerant to blast and downy mildew
2.	SiA-3156	85-90	2012	2000-2500	High yielding, tolerant to blast and downy mildew
3	Prasad	80-85	1982	2000-2500	Locally adopted high yielding, variety

RESULT AND DISCUSSIONS

Yield attributes: During 2020 the average highest panicle length (26.4 cm) and test weight (3.7 gm) was recorded in SiA-3223 followed by SiA-3156 (23.1 cm and 2.8 gm). The average lowest panicle length (21.3 cm) and test weight (2.2 gm) recorded in local variety. Similar trend was followed in the year 2021 in case of panicle length and test weight. During 2020, an average yield of 2367 Kg ha^{-1} was recorded with SiA-3223 and it was 16.4 %, 41.3 % higher than SiA-3156 (2032 kg ha^{-1}) and Prasad variety (1675 kg ha^{-1}) respectively. During 2021, an average yield of 2371 kg ha^{-1} was recorded with SiA-3223 and it was 14.5 %, 43.6 % higher than SiA-3156 (2070 kg ha^{-1} and Prasad variety (1650 kg ha^{-1}) respectively (Table 2).

The pooled results of two consecutive years (2020 and 2021) revealed that significantly highest panicle length (26.8 cm) test weight (3.6 gm) and high seed yield (2369 kg ha^{-1}) was recorded in SiA-3223 followed by SiA-3156 and Prasad variety, since the p-value was less than 0.05 in both the years as well as in pooled analysis (Table 2). Higher yield under SiA 3223 was due to higher panicle weight and test weight and difference in yield (Grain and Stover) levels among the foxtail millet varieties might be attributed to their genetic potentiality to utilize and translocate photosynthates from source to sink. This results are supported with the findings of Ramyasri *et al.* (2018). Hence it was concluded that there is significant difference among the foxtail millet varieties with regard to yield in which improved varieties significantly produced more yield than that of farmers' practice.

The improved varieties had shown their superior performance over locally grown variety under demonstrations conducted at farmer's field. Among the three improved varieties of foxtail millet, the SiA-3223 was proven its superiority in terms of yield over other varieties. These results are in accordance with Deva *et al*. (2019).

Cost economics: The highest net returns and benefit cost ratio was realized significantly highest in SiA-3223 followed by SiA-3156 and Prasad variety in both the years 2020 and 2021. The average higher net income (30508 Rs ha^{-1}) and benefit cost ratio (3.16) was realized in new improved SiA-3223 variety. The average lower net income (16841 Rs ha^{-1}) and benefit cost ratio (2.2) was recorded in farmers' variety (Table 4). The highest net returns and benefit cost ratio in SiA-3223 variety is due to lowest incidence of pest and diseases, resistant drought and highest yields. Similar findings were reported by Deva *et al*. (2019) with SiA-3156 variety.

Gap analysis: In addition to cost economics, other parameters like technology gap, extension gap and technology index were calculated for the demonstration with SiA-3223 variety alone as it shown significant advantage over other varieties (Table 4). The technology gap of demonstrated field (SiA-3223) was 833 kg ha^{-1} and 829 kg ha^{-1} during 2020 and 2021 respectively. This technology gap may be due to different management practices followed and different level of soil fertility present in the demonstrated fields. The Extension gap of 692 kg ha^{-1} and 721 kg ha $^{-1}$ was recorded during 2020 and 2021 respectively, this extension gap describes the need of create awareness among the farming community by implementing various extension programmes. An average technology index of 26.03% was observed with SiA-3223 demonstration fields during two consecutive years. Lower the technology index value indicates the feasibility of improved technology. The similar results were reported by Jayalakshmi *et al.* (2022); Singh *et al.* (2020) in chickpea crop at different states of India.

Table 2: Performance of foxtail millet varieties in 2020, 2021 and pooled.

Particulars	Panicle length (cm)			Test weight (gm)			Seed Yield kg ha^{-1}		
	2020	2021	pooled	2019	2020	pooled	2020	2021	pooled
SIA-3223 (TO_1)	26.4	27.2	26.8	3.7	3.5	3.6	2367	2371	2369
SIA-3156 (TO_2)	23.1	24.4	23.75	2.8	2.5	2.65	2032	2070	2051
Prasad (TO_3)	21.3	21.8	21.55	2.2	2.1	2.15	1675	1650	1630
SD for varieties									
SIA-3223	0.31	1.52	0.915	0.52	0.43	0.475	170.44	174.38	172.41
SIA-3156	0.33	2.84	1.585	0.14	0.24	0.19	50.28	71.23	60.755
Prasad	1.11	1.61	1.36	0.37	0.35	0.36	80.57	84.93	82.75
t-Value	3.34	3.30	3.35	3.32	3.34	3.32	3.32	3.35	3.36
p-value	0.004*	0.001*	0.002*	0.004*	0.000*	0.001*	0.002*	0.002*	0.003*

*Significantly difference at 0.05 % probability

Table 3: Economics of foxtail millet varieties in 2020, 2021 and pooled.

Years	2020			2021			Pooled		
Varieties	**Gross Returns Rs ha^{-1}**	**Net Returns Rs ha^{-1}**	**BC Ratio**	**Gross Returns Rs ha^{-1}**	**Net Returns Rs ha^{-1}**	**BC Ratio**	**Gross Returns Rs ha^{-1}**	**Net Returns Rs ha^{-1}**	**BC Ratio**
SIA-3223 (TO_1)	44967	28467	2.73	45049	32549	3.60	45008	30508	3.16
SIA-3156 (TO_2)	38616	22116	2.34	39334	26834	3.15	38975	24475	2.74
Prasad (TO_3)	31341	14841	1.90	31341	18841	2.51	31341	16841	2.20

Table 4: Gap analysis of SiA-3223 variety in 2020, 2021 and pooled.

Gap analysis	Technology gap kg ha^{-1}	Extension gap kg ha^{-1}	Extension index
Years			
2019	833	692	26.03
2020	829	721	25.91
Pooled	831	739	25.97

Improved and Check varieties of Foxtail millet varieties

Panicles of best improved variety SiA 3223, SiA 3156 and check variety Prasad

CONCLUSIONS

The improved fox millet variety SiA-3223 released from RARS, Nandyal have shown better performance than locally grown variety. Among the three cultivars, SiA-3223 variety is a high yielding variety which has tolerance to disease and gained attention of many farmers. It can be recommended as the best alternative to local varieties. The beneficiary farmers are playing a major role in transfer of technology to the neighbouring farmers. The OFTs has shown greater impact on the adoption of high yielding improved varieties and adjoining farmers are adopting new varieties as well as other technology interventions.

FUTURE SCOPE

In order to meet the nation's food and nutrition needs while ensuring the sustainable use of natural resources, the farming systems of today must be more resilient and diversified, which is why millets will always play a part. These can benefit the general health of the community in addition to providing farmers with a source of revenue. The demand for millets and their value-added products will increase millet production and consumption in India, which will have a long-term effect on the industry.

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