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**Sahaja Deva**
SMS (Crop Production), DAATTC, Darsi, Prakasam, Andhra Pradesh, India

**GMV Prasada Rao**
Programme Coordinator, Krishi Vigyan Kendra., Darsi, DAATTC, Darsi, Prakasam, Andhra Pradesh, India

**P Vinayalakshmi**
Ph.D. Scholar, Bapatla, DAATTC, Darsi, Prakasam, Andhra Pradesh, India

**Ch. Varaprasad Rao**
Senior Scientist, DAATTC, Darsi, Prakasam, Andhra Pradesh, India

**Correspondence**
**Sahaja Deva**
SMS (Crop Production), DAATTC, Darsi, Prakasam, Andhra Pradesh, India

# Assessment of improved varieties of foxtail millet in rainfed tracts of Prakasam district

**Sahaja Deva, GMV Prasada Rao, P Vinayalakshmi and Ch. Varaprasad Rao**

**Abstract**
On farm trials on assessment of improved varieties of foxtail millet was conducted in farmers fields of Prakasam district under rainfed areas in 2.0 ha each from *Kharif* of 2016-17 to 2018-19 by Krishi Vigyan Kendra, Darsi, Prakasam dt of Andhra Pradesh to evaluate the performance of improved varieties of foxtail millet in rainfed tracts of the district. The results showed that improved varieties (SiA 3156, SiA 3088 (suryanandi), SiA 3085) recorded higher yield and C: B ratio over local variety (srilakshmi). Among improved varieties SiA 3156 recorded higher yield with mean of 16.3q $ha^{-1}$and C: B ratio of 1:2.8followed by SiA 3088 (suryanandi) and SiA 3085.

**Keywords:** Foxtail millet, yield, economics, varieties

## Introduction
Millets offer nutritional security and there is a need for promoting millets as they are highly nutritious. Millets are rich in protein, fibre, iron, minerals, B-complex vitamins and calcium. Consumption of millets reduces risk of heart disease, protects from diabetes, improves digestive system, lowers the risk of cancer, detoxifies the body, increases immunity in respiratory health, increases energy levels and improves muscular and neural systems and are protective against several degenerative diseases such as metabolic syndrome and Parkinson's disease (Manach *et al*., 2005; Scalbert *et al*., 2005; Chandrasekara and Shahidi, 2012) [3, 6, 2]. The most widely grown millets are finger millet, proso millet and foxtail millet especially wherever annual rainfall is below 350 mm, perhaps no other cereal crop can be grown under such moisture stress. Five-yearly analysis of data indicates a steady decline in the area of small millets from 7.56 m ha during 1951-55 to 0.5 m ha during 2017-18 (Annual Progress Report: 2018-19, ICAR-AICRP on Small Millets, Bengaluru). Whereas, Prakasam dt is the drought prone area and oflate receiving less rainfall. Under such conditions millets are important alternate to the farming community. During 1970s prakasam was a traditional millet growing area. Lifestyle changes, distribution of rice through schemes and availability of NSP canal water led to reduction in millets area in the dist. However monsoon failure, drought occurrence in prakasam district and increased awareness on health resulted on shift to of late millets again. Area under minor millets was 2684 ha during 2018-19, Whereas, foxtail millet was grown in 500 ha during 2018-19. Foxtail millet is the major millet growing in prakasamdt. The local varieties of foxtail millet grown by farmers are low yielders and are less tolerant to drought. In order to overcome this, on farm trial on improved varieties of foxtail millet which are drought tolerant and high yielders was conducted to introduce the crop in the district.

**Table 1:** Salient features of improved and check varieties of foxtail millet

| Variety | Maturity (days) | Av. Yield (Q $ha^{-1}$) | Special features |
|---|---|---|---|
| SiA 3156 | 85-90 | 20-25 | Highly responsive to nitrogenous fertilizers |
| SiA 3088 (suryanandi) | 80-85 | 20-30 | Non-lodging, early duration, suitable for double cropping. |
| SiA 3085 | 80-85 | 20-30 | Resistant to blast and downey mildew. |
| Srilakshmi (Check) | 80-85 | 20-23 | -- |

## Materials and Methods
**1. Place of study:** Lakkavaram, Thallur mandal (2016-17), Sanduvaripalem, Kanigiri mandaland East Veerayapalem, Darsi mandal (2017-18), Katuvaripalem, Podili mandal (2018-19)

**2. Area:** 2.0 ha each year
**3. No. of farmers:** 5 farmers each year
**4. Design:** On farm trials in farmers fields
**5. Treatments**
**T1:** SiA 3156
**T2:** SiA 3085
**T3:** SiA 3088 (Suryanandi)
**Check:** Srilakshmi
**6. Data recorded**
1. Plant height
2. Number of tillers/plant
3. Number of productive tillers/plant
4. Number of unproductive tillers/plant
5. Panicle length
6. Panicle weight
7. Test weight

Economics was calculated as shown below:

**Cost of cultivation (Rs. ha$^{-1}$)**
Cost of cultivation (₹ ha$^{-1}$) was calculated considering the prevailing charges of agricultural operations and market price of inputs involved.

**Gross returns (Rs. ha$^{-1}$)**
Gross returns were obtained by converting the harvest into monetary terms at the prevailing market rate during the course of studies.

Gross return (₹ ha$^{-1}$) = (Seed yield x price)

**Net returns (Rs.ha$^{-1}$)**
Net returns were obtained by deducting cost of cultivation from grossreturn.
Net returns (₹ ha$^{-1}$) = Gross return (₹ ha$^{-1}$) - Cost of cultivation (₹ ha$^{-1}$)

**Cost: benefit ratio**
The benefit: cost ratio was calculated by dividing gross returns by cost of cultivation.

$$\text{Cost: benefit ratio} = \frac{\text{Gross returns (₹ ha}^{-1}\text{)}}{\text{cost of cultivation (₹ ha}^{-1}\text{)}}$$

**Results and Discussion**
Total rainfall received was 234.4 mm during 2016-17, 316.2 mm during 2017-18 and 151.1 mm during 2018-19.

**Growth attributes**
Perusal of the data presented in the table 2 revealed that growth parameters were non significantly higher in treatments compared to control. Plant height and number of tillers/plant were higher in SiA 3088 (suryanandi) variety. Whereas, number of productive tillers/plant were higher in SiA 3156.

**Table 2:** Growth attributes of improved and check varieties of foxtail millet (pooled data)

| Treatments | Plant height (cm) | Number of tillers/plant | Number of productive tillers/plant | Number of unproductive tillers/plant |
|---|---|---|---|---|
| SiA 3156* | 110.0 | 7.0 | 6.2 | 0.8 |
| SiA 3085* | 111.0 | 7.0 | 5.0 | 2.0 |
| SiA 3088 ((Suryanandi)* | 114.4 | 7.4 | 5.4 | 2.0 |
| Check (Srilakshmi)* | 105.0 | 6.5 | 5.0 | 1.5 |
| S/NS | NS | NS | NS | NS |

*Mean of 5 farmers

**Yield attributes**
Perusal of the data presented in the table 3 revealed that in treatment plots, panicle length and panicle weight were significantly higher than in control (farmers practice) *i.e.* 15.8 cm and 6.5 g, respectively. Among improved varieties panicle length was higher in SiA 3156 (20.3 cm) followed by SiA 3088 ((Suryanandi) (18.6 cm). Whereas, the lowest panicle length was in SiA 3085 (16.9 cm). Panicle weight in SiA 3156, SiA 3085 and SiA 3088 (suryanandi) was 10.1, 7.9 and 8.5 g, respectively.

**Table 3:** Yield attributes of improved and check varieties of foxtail millet (pooled data)

| Treatments | Panicle length (cm) | Panicle weight (g) | Test weight (g) |
|---|---|---|---|
| SiA 3156* | 20.3 | 10.1 | 3.0 |
| SiA 3085* | 16.9 | 7.9 | 3.0 |
| SiA 3088 ((Suryanandi)* | 18.6 | 8.5 | 3.0 |
| Check (Srilakshmi)* | 15.8 | 6.5 | 2.9 |
| S/NS | S | S | NS |

*Mean of 5 farmers

**Grain yield**
Grain yield was significantly higher in improved varieties compared to check variety during 2016-17, 2017-18 and 2018-19 (Table 4). Among improved varieties highest mean yield was under SiA 3156 with 16.3 q ha$^{-1}$ followed by suryanandi which was 14.7q ha$^{-1}$. Check variety (srilakshmi) recorded mean yield of 13.6q ha$^{-1}$. Per cent increase in yield in SiA 3156 was 13.2. Higher yield under SiA 3156 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 [4].

**Table 4:** Grain yield of improved and check varieties of foxtail millet (q ha$^{-1}$)

| Treatments | 2016-17 | Per cent increase in yield over check | 2017-18 | Per cent increase in yield over check | 2018-19 | Per cent increase in yield over check | Pooled mean | Per cent increase in yield over check |
|---|---|---|---|---|---|---|---|---|
| SiA 3156* | 16.0 | 14.3 | 17.8 | 16.3 | 15.0 | 8.7 | 16.3 | 13.2 |
| SiA 3085* | 14.7 | 5.0 | 15.5 | 1.3 | 14.0 | 1.4 | 14.7 | 2.1 |
| SiA 3088 ((Suryanandi)* | 15.4 | 10.0 | 16.3 | 6.5 | 14.8 | 7.2 | 15.5 | 7.6 |
| Check (Srilakshmi)* | 13.3 | | 15.3 | | 12.1 | | 13.6 | |
| | S | S | S | S | S | | S | S |

## Correlation between yield parameters and yield

Positive correlation between panicle length and panicle weight, test weight, yield; positive correlation between panicle weight and test weight, yield and positive correlation between test weight and yield confirms the beneficial effect of yield parameters on yield of foxtail millet (Table 5).

**Table 5:** Correlation between yield parameters and yield of foxtail millet

| | Panicle length (cm) | Panicle weight (g) | Test weight (g) | Yield (Q/ha) |
|---|---|---|---|---|
| Panicle length (cm) | 1 | | | |
| Panicle weight (g) | 0.981* | 1 | | |
| Test weight (g) | 0.713* | 0.779* | 1 | |
| Yield (Q/ha) | 0.998* | 0.972* | 0.671* | 1 |

Significant at (p=0.05), 12 df=0.433

## Economics

Table 6 a and 6 b revealed that higher gross returns, net returns and C: B ratio was under SiA 3156 followed by SiA 3088 (suryanandi). Mean Gross returns of SiA 3156 was 48056 Rs ha$^{-1}$. Mean net returns of SiA 3156 was 30044 Rs ha$^{-1}$. Mean C: B ration of SiA 3156 was 1:2.8.

**Table 6 a:** Economics of improved and check varieties of foxtail millet

| Treatments | Cost of cultivation (Rs ha$^{-1}$) | | | | Gross returns (Rs ha$^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| SiA 3156* | 21000 | 11033 | 22000 | 18011 | 56000 | 35667 | 52500 | 48056 |
| SiA 3085* | 21000 | 11033 | 22000 | 18011 | 51450 | 31000 | 49000 | 43817 |
| SiA 3088 ((Suryanandi)* | 21000 | 11033 | 22000 | 18011 | 53900 | 32667 | 51625 | 46064 |
| Check (Srilakshmi)* | 22000 | 11100 | 22000 | 18367 | 46550 | 30660 | 45500 | 40903 |
| S/NS | NS | NS | NS | NS | S | S | S | S |

**Table 6 b:** Economics of improved and check varieties of foxtail millet

| Treatments | Net returns (Rs ha$^{-1}$) | | | | C: B ratio | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016-17 | 2017-18 | 2018-19 | Pooled mean | 2016-17 | 2017-18 | 2018-19 | Pooled mean |
| SiA 3156* | 35000 | 24633 | 30500 | 30044 | 1:2.7 | 1:3.2 | 1:2.4 | 1:2.8 |
| SiA 3085* | 30450 | 19967 | 27000 | 25806 | 1:2.5 | 1:2.8 | 1:2.3 | 1:2.5 |
| SiA 3088 ((Suryanandi)* | 32900 | 21633 | 29625 | 28053 | 1:2.6 | 1:3.0 | 1:2.4 | 1:2.7 |
| Check (Srilakshmi)* | 27000 | 19560 | 23500 | 23353 | 1:2.3 | 1:2.7 | 1:2.1 | 1:2.4 |
| S/NS | S | S | S | S | S | S | S | S |


**Fig 1:** Improved and check varieties of foxtail millet


**Fig 2:** Panicles of best improved variety SiA 3156 and check variety srilakshmi

## Conclusion

Improved varieties performed well and gave higher yield in farmers fields in prakasam district. Among improved varieties SiA 3156 recorded higher yield, net returns and C: B ratio during three years followed by SiA 3088 (suryanandi).

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