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Yield assessment of finger millet variety Shreeratna through front line demonstration

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Abstract

Finger millet (*Eleusine coracana* L.), commonly known as ragi is an important crop used for food, forage and industrial products. Finger millet has a wide ecological and geographical adaptability and resilience to various agro-climatic adversities. Additionally, as it requires low external input it is highly suitable for drought conditions and marginal lands. The front line demonstration (FLD) of the high-yielding variety (HYV) of finger millet, Shreeratna, was conducted in the villages of Gopinathpur and Banapur, located in the Patrapur block of Ganjam district. This study was carried out with participation from 10 farmers using a cluster approach over the kharif seasons of 2024 and 2025, facilitated by the Krishi Vigyan Kendra, Ganjam-II, Berhampur, Odisha. Key observations focused on both growth and yield parameters, with comprehensive economic analyses conducted throughout the project. Upon completion, the final seed yield was recorded, with gross returns calculated based on market prices prevailing at the time. The study indicated that the HYV Shreeratna achieved an impressive average yield of 22.6 quintals per hectare ($q\ ha^{-1}$), significantly outpacing that of the traditional variety Budha Mandia, which yielded an average of 11.68 $q\ ha^{-1}$. Notably, the HYV Shreeratna variety, optimized through appropriate nutrient application and plant protection measures, yielded 86.6% more than what was achieved using traditional farming methods. The findings of this study suggest that the existing local variety of finger millet can effectively be replaced by the HYV Shreeratna, as it is well-suited for the area's rainfed farming conditions, thereby promising higher productivity and better economic returns for the farmers involved. By conducting front-line demonstrations on millet in large scale in farmers field will increase in the income level of farmers and improve the livelihood condition of the farming community.

Keywords: Drought, finger millet, FLD, yield

Introduction

Finger millet (*Eleusine coracana* L.) is a small millet primarily grown in the semi-arid and tropical regions of Asia and Africa, belonging to the Poaceae family. It is esteemed for its high nutritional value, making it a critical source of food in these areas. Its adaptability to marginal environments and resilience to climate variability further enhance its importance, particularly in India, where it is commonly referred to as ragi. This grain plays a crucial role in food and nutritional security, especially in rainfed and hilly regions, catering to the needs of populations relying on stable agricultural outputs despite challenging conditions.

Finger millet, a highly nutritious grain, boasts an impressive profile rich in carbohydrates, dietary fiber, calcium, and iron. It is also a good source of essential amino acids, particularly methionine and tryptophan, which are often lacking in other cereal grains. This grain's low glycemic index and gluten-free characteristics make it particularly beneficial for those with diabetes and celiac disease, enhancing its role in health-conscious diets. From an agronomic perspective, finger millet is notable for its strong drought tolerance and efficient water use. It can thrive in impoverished soils while requiring minimal inputs, positioning it as a vital crop for sustainable agriculture and climate-resilient farming systems, essential for adapting to changing environmental conditions.

In light of the increasing popularity of finger millet, KVK Ganjam-II Berhampur conducted an evaluation of growth and yield parameters of a promising high-yielding variety. The study aimed to demonstrate the suitability of this new variety as a substitute for the traditional Budha mandia in the prevailing farming conditions. Through Front Line Demonstration, the initiative

seeks to enhance productivity while addressing the needs of local farmers.

Materials and Methods

The study was conducted through the front line demonstration during the Kharif seasons of 2024 and 2025 in Gopinathpur and Banapur village of Patrapur block of Ganjam district in the east and southeastern coastal plain zone of odisha state with an objective to evaluate the performance of the high-yielding finger millet variety Shreeratna. The experimental site was situated at 19° 16' 17.626" N latitude and 84° 44' 13.326" E longitude, with an average elevation of 26 meters above sea level. The region experiences a specific climate, with average rainfall of 1276.2 mm during the study period (June to September). The mean maximum and minimum temperatures observed were 39°C and 18.9°C respectively. The soil of the experimental site is slightly acidic in reaction (pH, 5.6), sandy loam texture with organic carbon content 0.46%, low in nitrogen 142.5 kg ha⁻¹, low in phosphorus 14.1 kg ha⁻¹, and medium in potassium 151.4 kg ha⁻¹ contents. The tested high-yielding variety Shreeratna (OUAT Kalinga Ragi 1) is having maturity duration of 110 days and potential yield of 20.7 q ha⁻¹ with moderate resistance to leaf, neck, and finger blasts and brown spots. Local variety *Budha Mandia* the traditional popular variety has 105 days duration, drought tolerant was taken as local check. The field observations were conducted both on a demonstration

plot and on farmers' plots, focusing on various agricultural parameters. Key measurements included plant height, the number of fingers per plant, finger length, the number of fingers per ear, 1000-seed weight, and seed yield, all recorded at the maturity stage. Additionally, gross returns were calculated in terms of rupees per hectare (₹ ha⁻¹), based on the prevailing market prices of the produce. Harvest index, is the relationship between economic yield and biological yield. (Gardner *et al.* (1985). It was calculated by using the following formula

Harvest index (%) = $\frac{\text{Economic yield}}{\text{Biological yield}} \times 100$

Results and Discussion

Front line demonstrations are taken to assess the yield potential of a technology in farmers' fields. In the study, both *Budha mandia* and Shreeratna varieties were taken in adjacent plots of both villages. *Budha mandia* was demonstrated with traditional cultivation practices e.g. more seed rate (15 kg/ha), no seed treatment, broadcasting, manual weeding at 45 DAS with Blanket 45 kg DAP application per ha where as in the demonstrated technologies, besides Shreeratna HYV, other important cultivation practices like proper seed rate, seed treatment with Azospirillum and PSM, line sowing, proper fertilizer and weed managements were taken as indicated in Table.1

Table 1: Comparison between farmers' practice and demonstrated technologies.

Sl. No.	Particulars	Farmers practice	Tested Technology
1	Variety	Budha Mandia	Shreeratna
2	Seed rate	15 kg ha ⁻¹	10 kg ha ⁻¹
3	Seed treatment	No seed treatment	Azospirillum and PSM @ 25 g kg ⁻¹ seed
4	Method of Sowing	Broadcasting	Line sowing with spacing 20 x 10 cm
5	Fertilizer application	Use of DAP	NPK 60:20:20 kg ha ⁻¹ (three splits of Nitrogen)
6	Weed management	Manual weeding at 40- 50 DAS.	Pre-emergence application of Oxyfluorfen @ 37.5 g a.i. ha ⁻¹ + one hand weeding.

The table presents a comparison between the traditional farmer’s practice and the improved (tested) technology for finger millet cultivation. It highlights the differences in crop management practices adopted under each approach. Under farmer’s practice, local variety *Budha Mandia* was used with a higher seed rate (15 kg ha⁻¹), broadcasting method of sowing, and no seed treatment. Fertilizer application was imbalanced (use of only DAP) and weed management was limited to one manual weeding at 40–50 DAS.In contrast, the

tested technology involved improved variety *Shreeratna*, lower seed rate (10 kg ha⁻¹) with line sowing at 20 × 10 cm spacing, and seed treatment with *Azospirillum* and *PSM* biofertilizers for better germination and nutrient uptake. Balanced nutrient management was followed with NPK @ 60:20:20 kg ha⁻¹, applied in three nitrogen splits. Weed control was more effective through pre-emergence application of Oxyfluorfen (37.5 g a.i. ha⁻¹) followed by one hand weeding.

Table 2: Effect of different treatments on growth and yield parameters (pooled data of 2 years)

Treatments	Plant height (cm)	No. of effective tillers hill ⁻¹	No. of fingers ear ⁻¹	1000 grain wt. (g)	Grain yield (q ha ⁻¹)
Shreeratna	85.8	5.5	6	3.2	22.5
Budha mandia	78.9	3.2	4.87	2.47	11.68
SEm (±)	0.40	0.27	0.31	0.07	0.45
CD at 5%	1.3	0.85	0.98	0.22	1.40

Table 2 indicates the growth and yield attributes of finger millet as influenced by different varieties are presented in Table 1. The data revealed that the improved variety Shreeratna exhibited superior performance over the local variety Budha Mandia for all growth and yield parameters. Shreeratna recorded significantly higher plant height (85.8 cm), number of effective tillers per hill (5.5), number of fingers per ear (6.0), and 1000-grain weight (3.2 g) as compared to Budha Mandia, which recorded 78.9 cm, 3.2, 4.87, and 2.47 g respectively. The grain yield of Shreeratna (22.5 q ha⁻¹) was almost double that of Budha Mandia (11.68 q ha⁻¹), indicating its higher productivity

potential. The differences between the two varieties were statistically significant at the 5% level, as confirmed by the calculated SEm (±) and CD (5%) values. The superior performance of Shreeratna could be attributed to its better tillering ability, more number of fingers per ear, and higher test weight, which collectively contributed to greater grain yield. These findings suggest that Shreeratna is a promising variety suitable for cultivation under rainfed conditions for enhancing productivity and profitability of finger millet.It shows the tested variety is yielding about 50% more than the local one. It corroborates the findings of (Dash *et al* 2021) ^[4].

Table 3: Economics of the assessed varieties (Average pooled data over 2 years)

Treatments	Cost of cultivation (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C	Harvest index
Shreeratna	28,400	56,227	27,827	1.9	27.41
Budha mandia	21,200	37,528	16,328	1.7	19.8

The economic analysis of finger millet cultivation (Table 3) indicated that the improved variety Shreeratna was more remunerative than the local variety Budha Mandia. The cost of cultivation was slightly higher in Shreeratna (₹28,400 ha⁻¹) compared to Budha Mandia (₹21,200 ha⁻¹) due to the adoption of improved production practices. However, the gross return obtained from Shreeratna (₹56,227 ha⁻¹) was considerably higher than that of Budha Mandia (₹37,528 ha⁻¹), resulting in a greater net return (₹27,827 ha⁻¹) and a superior B:C ratio of 1.9 against 1.7. The harvest index was also higher in Shreeratna (27.41%) than in Budha Mandia (19.8%), indicating better efficiency in partitioning of biomass towards grain yield. The results clearly establish that cultivation of Shreeratna under improved management practices enhances both productivity and profitability of finger millet production under rainfed conditions.

Conclusion

The present study revealed that the improved finger millet variety Shreeratna performed significantly better than the local variety Budha Mandia in terms of growth, yield attributes, and economic returns. Shreeratna recorded higher plant height, effective tillers per hill, number of fingers per ear, test weight, and grain yield, resulting in nearly double productivity over Budha Mandia. The improved agronomic practices line sowing, balanced nutrient management, and integrated weed control contributed to enhanced crop performance. Economic analysis further demonstrated that Shreeratna achieved a higher net return (₹27,827 ha⁻¹) and B:C ratio (1.9), indicating greater profitability and resource efficiency. Hence, the adoption of Shreeratna under improved management practices can be recommended for rainfed areas to enhance finger millet productivity, profitability, and sustainability.

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