Production performance of high yielding finger millet variety in Erode district of Tamil Nadu

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ABSTRACT

An attempt was made to identify suitable high yielding variety of finger millet (*Eleusine coracana*) for western zone of Tamil Nadu through on-farm trials in Erode district of Tamil Nadu during 2020-2021. The trials comprised high yielding finger millet variety ATL 1, seed treatment with biofertilizers and other integrated crop management practices. The variety ATL 1 had higher number of tillers per plant (8.3) as compared to ML 365 (7.8) and test weight per plant (3.16 g) as against 3.10 g in ML 365. Higher grain and fodder yield of 2,984 and 6,351 kg per ha respectively was also observed in ATL 1 as compared to 2,619 and 5,526 kg per ha respectively in ML 365. The average cost of cultivation of ATL 1 was Rs 25,190.00 per ha, whereas, it was Rs 27,050.00 per ha in farmers' practicing variety ML 365. The improved crop management practices and the high yielding variety recorded the higher net return of Rs 36,732.00 per ha as against Rs 27,949.00 per ha in farmers' practicing variety. Thus higher benefit-cost ratio of 2.46 was observed in ATL 1 variety in comparison to 2.04 in ML 365. There existed an extension gap 365 kg per ha between the improved variety ATL 1 and farmers' practicing variety ML 365 and the technology gap was of 116 kg per ha. The lower value of the technology index of 3.74 per cent showed the higher feasibility of the variety ATL 1 and adoption of improved package of practices.

Keywords: Finger millet; variety; ATL 1; ML 365; yield

INTRODUCTION

Finger millet, also known as ragi is the major staple food crop for the people of hilly region in Erode district of Tamil Nadu. The western Ghats region of Erode district is traditionally known for millet cultivation. The finger millet is predominantly cultivated in the rainfed region. Ragi is rich in carbohydrates, calcium, fibre, proteins and vitamins that contains slow releasing carbohydrates and provides continuous energy due to which it is being promoted as food for diabetics. The area under finger millet cultivation in India declined 54.6 per cent over the period of 70 years from from 1951 to 2020 (Hariprasanna et al 2022). The yield reduction has been observed due to the continuous cultivation of the same variety over the years and non-adoption of integrated crop management practices. The farmers are not aware of the recently released varieties from state and central agricultural universities and research stations. There is a need to improve the genetic yield potentiality and evolve new high-yielding varieties with heat and drought tolerance, suitable for ragi growing areas. Ragi is a staple food grain, however, its productivity is reducing as the years pass by. This may be due to many reasons such as lack of high yielding varieties, low soil fertility, scanty and untimely rainfall, prolonged dry spells etc thus making ragi cultivation less profitable. In order to increase the crop yields and enhance the farmers' income, development and introduction of new high yielding varieties are of utmost importance (Reddy et al 2020).

To overcome these issues, ICAR – MYRADA Krishi Vigyan Kendra, Perumal Nagar, district Erode, Tamil Nadu conducted on-farm testing to assess the production performance of a new high yielding variety ATL 1 released by Tamil Nadu Agricultural University along with integrated crop management practices during the year 2020-2021 in

10 selected farmers' fields at Bargur hills of Erode district, Tamil Nadu.

Ragi variety ATL 1 has 8-9 incurved fingers per earhead and 5-6 productive tillers per plant. It is endowed with special attributes like easy threshability, synchronized maturity and non-lodging growth habit. It is rich in protein (11.9%) and calcium (325 mg/100 g) with high flouring capacity (92%) and low residual weight (8%). It is moderately resistant to leaf, neck and finger blasts (Nirmalakumari et al 2022a).

Anon (2023) reported that little millet variety ATL 1 gave higher yield than the farmers' practice old traditional variety. The grains were superior in quality and had good market value. As continued efforts to sustain farm productivity and profitability, Tamil Nadu Agricultural University released small millet varieties Ragi ATL 1 and Varagu ATL 1 for rainfed and irrigated conditions to enhance the nutritional security and to adopt 'eat right food' (Anon 2021).

MATERIAL and METHODS

The present study was carried out in watershed-implemented area in Bargur region of western Ghats, Tamil Nadu during 2020-2021. Each trial was conducted in an area of 0.2 ha with ATL 1 variety and 0.2 ha with ML 365 variety as farmers' practicing variety. Improved crop management practices under the trials were taken as mentioned in Table 1. The selected progressive farmers were trained on all scientific finger millet cultivation aspects before starting of the trials. The trial fields were regularly monitored and periodically observed. At the time of harvest, yield data were collected.

Cost of cultivation, net income and benefit-cost ratio were worked out. The extension gap, technology gap and technology index were calculated using the formula as suggested by Samui et al (2000).

$$\text{Extension gap (q/ha)} = \text{Demonstration yield (q/ha)} - \text{Local variety yield (q/ha)}$$

$$\text{Technology gap (q/ha)} = \text{Potential yield of variety (q/ha)} - \text{Demonstration yield (q/ha)}$$

$$\text{Technology index (\%)} = \frac{\text{Potential yield of variety (q/ha)} - \text{Demonstration yield (q/ha)}}{\text{Potential yield of variety (q/ha)}} \times 100$$

RESULTS and DISCUSSION

Data given in Table 2 depict that the improved variety ATL 1 had higher number of tillers per plant (8.3) as compared to ML 365 (7.8). The test weight per plant was also higher in ATL 1 (3.16 g) as against 3.10 g in ML 365. Higher grain and fodder yield of 2,984 and 6,351 kg per ha respectively was also observed in ATL 1 as compared to 2,619 and 5,526 kg per ha respectively in ML 365. Thus 13.96 per cent grain yield advantage was observed in variety ATL 1 over ML 365. Similarly, the fodder yield was 14.98 per cent higher in ATL 1 over the farmers' practicing ML 365 variety.

The economic feasibility of the improved crop management practices over farmers' practice was calculated depending on the prevailing prices of inputs and output cost and the data are presented in Table 3. It was found that the average cost of cultivation of ATL 1 was Rs 25,190.00 per ha, whereas, it was Rs 27,050.00 per ha in farmers' practicing variety ML 365.

The improved crop management practices and the high yielding variety recorded the higher net return of Rs 36,732.00 per ha as against Rs 27,949.00 per ha in farmers' practicing variety. Thus higher benefit-cost ratio of 2.46 was observed in ATL 1 variety in comparison to 2.04 in ML 365.

The results indicated that the adoption of high yielding finger millet variety along with improved package of practices would enhance the finger millet production and economic returns in hilly region of Erode district, Tamil Nadu.

On the basis of data, extension gap, technology gap and technology index were calculated and the data are given in Table 4. There existed an extension gap 365 kg per ha between the improved variety ATL 1 and farmers' practicing variety ML 365 and the technology gap was of 116 kg per ha. The lower value of the technology index of 3.74 per cent shows the higher feasibility of the variety ATL 1 and adoption of improved package of practices.

Table 1. Improved crop management practices adopted in the trials

Component	Recommended improved practices
High yielding variety used	ATL 1: A high yielding variety released from Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during the year 2020
Seed treatment	Seeds treated with *Pseudomonas fluorescens* @ 10 g/kg seed followed seed treatment with 600 g/kg of *Azospirillum* and *Phosphobacteria* culture
Spacing	22.5 cm × 10 cm
Manures and fertilizers	12.5 tons FYM, 40:20:20 kg (N:P:K)/ha
Weeding	Hand weeding at 15 and 30 days after sowing
Irrigation	Mandatory irrigation provided at the critical stage of crop growth like tillering and pre-flowering

Table 2. Effect of improved crop management practices on yield and yield attributes of finger millet

Farmer	Number of tillers /plant		Test weight (g) /plant		Grain yield (kg/ha)		Straw yield (kg/ha)	
	ATL 1	ML 365	ATL 1	ML 365	ATL 1	ML 365	ATL 1	ML 365
Farmer 1	9	8	3.18	3.12	3,080	2,675	5,660	5,640
Farmer 2	8	8	3.21	3.12	2,886	2,650	6,180	5,590
Farmer 3	8	7	3.18	3.09	2,954	2,620	6,320	5,530
Farmer 4	10	9	3.16	3.14	2,986	2,545	6,390	5,370
Farmer 5	7	8	3.14	3.08	3,045	2,620	6,520	5,530
Farmer 6	8	7	3.12	3.15	3,035	2,565	6,500	5,410
Farmer 7	9	8	3.14	3.12	2,890	2,585	6,250	5,460
Farmer 8	8	7	3.15	3.04	3,040	2,700	6,550	5,700
Farmer 9	8	8	3.16	3.08	2,984	2,650	6,840	5,590
Farmer 10	8	8	3.18	3.06	2,940	2,580	6,300	5,440
Average	8.3	7.8	3.16	3.10	2,984	2,619	6,351	5,526

Table 3. Cost of cultivation, gross return, net return and benefit-cost ratio of finger millet production as influenced by improved crop management practices

Variety	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	Benefit-cost ratio
ATL 1	25,190.00	61,922.00	36,732.00	2.46
ML 365	27,050.00	54,999.00	27,949.00	2.04

Table 4. Extension gap, technology gap and technology index as recorded under the demonstrations

Component	Yield (kg/ha)	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
ML 365	2,619			
ATL 1	2,984	365	116	3.74
Potential yield	3,100			

Nirmalakumari et al (2022a) recorded an average yield of 3,008 kg per ha in 269 trials on ATL 1 variety conducted during 2012 to 2020 and the yield was 13.3, 16.2 and 17.1 per cent higher than the checks CO 15 (2,656 kg/ha), Paiyur 2 (2,588 kg/ha) and GPU 28 (2,569 kg/ha) respectively. It gave an average yield of 3,183 kg per ha in the station trials, 2,317 kg per ha in multi-location trials and 3,004 kg per ha in adaptive research trials conducted by Department of Agriculture and 3,061 kg per ha in ARTs conducted by the Krishi Vigyan Kendra. The mean straw yield of ATL 1 was 4,990 kg was ha, which was 13.7 per cent higher over the CO 15, 17.6 per cent over Paiyur 2 and 20.5 per cent over GPU 28.

Nirmalakumari (2022b) reported that in view of the superior performances of the culture TNPsc 176 over the checks TNAU 86 and CO 3, it was released as ATL 1. It has 10-15 productive tillers per plant and non-shattering grains on the panicle. It matured in 105-110 days and recorded 2,506 and 4,394 kg per ha of grain and straw yield respectively. The yield was observed to be 12.5 and 13.8 per cent higher in terms of grain and 15.5 and 13.0 per cent higher in terms of straw over the check varieties CO3 and TNAU 86 respectively. In view of the superior performance and desirable attributes viz easy threshability, synchronized maturity, non-lodging growth habit, bold and attractive light brown-coloured grains with good nutritional and cooking qualities, the varagu culture TNPsc 176 was released as ATL 1 during the year 2021, for cultivation in Ariyalur, Cuddalore, Dharmapuri, Madurai, Perambalur, Pudukottai, Salem, Vellore, Villupuram and Virudhunagar districts of Tamil Nadu.

Geetha et al (2010) reported that a high yielding long duration ragi culture DPI 20030 was developed at Regional Research Station, Paiyur and released as Paiyur 2 during 2008 at state level. It is a derivative of the cross involving VL 145 x Selection 10. It yields on an average 2,527 kg per ha of grain and 4200 kg per ha of straw under rainfed conditions. Besides high yield, compact incurved fingers, uniform maturity, non-lodging nature and moderate protein content (7.2%) are its added advantages. The 1,000-grain weight of this culture is 2.9 g as compared to 2.71 g of GPU 28. This culture recorded a grain yield of 2,527 kg per ha which was 14.6 per cent higher over the check GPU 28 (2,206 kg/ha) and 6.6 per over the check Paiyur 1 (2,371 kg/ha) in station trials and farmers' fields. It recorded a grain yield of 2,312 kg per ha which was 9.36 per cent higher over the check GPU 28 (2,114 kg/ha) and 10.62 per cent over the check Paiyur 1 (2,090 kg/ha) in on-farm trials conducted during kharif seassn 2006 at 40 locations. It has given the yield of 2,535 kg per ha which was 4.67 per cent increase over the national check PR 202 (2,422 kg/ha).

Thus it can be concluded that the adoption of high yielding finger millet variety ATL 1 along with improved crop management practices performed better than the existing farmers' practicing variety ML 365 and can be recommended for cultivation in the hilly region of Erode district of Tamil Nadu.

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