

Demonstration by new Finger millet Variety ATL 1 to Improve the Productivity in Villupuram District of Tamil Nadu

ABSTRACT

~~Cultivation of newly released variety has potential to increase the productivity and needs to be promoted and popularized. In this regard,~~ the present study was carried out at farmer's field by introducing new high yielding Finger millet variety ATL1 to increase the productivity. The ATL 1, drought tolerant finger millet variety was released by Tamil Nadu Agricultural University during 2021. A total of fifteen, field demonstrations were conducted by using newly released finger millet variety (ATL 1) at farmer's field organized by Krishi Vigyan Kendra, Villupuram, Tamil Nadu during *Kharif* 2023. The farmers cultivating variety Co 15 was used as the check variety (farmer's practice). An average yield of 1,470 kg.ha⁻¹ was recorded in ATL 1 demonstration plots which was 9.67 % increase over the farmers cultivating variety Co 15 (1340 kg.ha⁻¹). The farmers were obtained additional revenue of Rs. 9,650 ha⁻¹ from ATL1 demonstrations. In this regard, one training on improved production technologies for millets cultivation was organized at KVK, Villupuram (Tindivanam) to improve the productivity of finger millet through demonstrations.

INTRODUCTION

Finger millet (*Eleusine coracana* (L.) Gaertn) is a domesticated crop of African origin and it is spread throughout the world. It is also known as Ragi, Korakan, or Dagusain in India. ~~Even though the wild progenitor species (*Eleusine africana*) is well recognized, this species was first domesticated in Africa [1].~~ Ecologically, it is thought to originate from a highland region as a crop and is frequently planted in hilly regions [2]. The crop is grown in a wide range of challenging environmental situations. Finger millet blessing for vast arid and semi-arid regions because it can be cultivated on low-fertility soils [3]. Finger millet is clearly regarded as a staple food and it is used as animal feed (straw) in industrialized countries and as food (grains) in underdeveloped countries [4]. ~~It is a major crop of semi arid and arid~~

Comment [A1]: Please mention the serial no. as per guideline of the journal

Comment [A2]: Reference ?

~~regions and developing nations of Asia and Africa [5].~~ Finger millet is the fourth most produced millet in the world, behind Sorghum (*Sorghum bicolor*), Pearl millet (*Pennisetum glaucum*), and Foxtail millet (*Setaria italica*) [6]. Millet grains are rich in vitamins, iron, carbohydrates, calcium, potassium, zinc, phosphorus, magnesium, and major amino acids, they are also nutritionally superior to rice and wheat [7].

~~The majority of finger millet is grown in semi-arid tropical regions of Asia and Africa.~~ India is the major producer of finger millet, contributing nearly 60% of the global production [8]. The southern states of India are where finger millet is primarily grown in Asia, and these regions have ideal growing conditions. India produces 1.70 million tonnes of finger millet, which is grown over 1.07 million hectares' area [9]. The states Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Telangana, Uttarakhand, Jharkhand, Madhya Pradesh, and Haryana are the important finger millet producers. In addition to being utilized for direct human consumption, finger millet has a wide range of other uses, including animal feed, distilleries, and food processing for value-added goods [10]. Traditionally, the farmers in Western Ghats region of Tamil Nadu are cultivating finger millet as one of the predominant crop in their land. The problem is compounded by the fact that the majority of the farmers in the rainfed regions are lack of awareness on new and high yielding varieties, resource poor with low risk bearing capacity and they are generally do not apply recommended practices. The productivity of finger millet per unit area could be increased by adopting improved crop management practices and suitable varieties [11]. Hence to overcome the problems of the farmers, demonstrations were laid out to introduce and demonstrate the production potential of new finger millet variety with improved package of practices in the farmers' holdings of Villupuram District of Tamil Nadu.

2. MATERIALS AND METHODS

2.1 Experimental Materials and Site

The new drought tolerant finger millet variety ATL 1 was used as the experimental materials in the present study. A total of 15 field demonstrations were conducted at farmers holdings in Villupuram District, Tamil Nadu, India during *kharif* 2023 by new finger millet variety (ATL 1) along with check variety Co15 (farmer's practice). The soil type of the experimental plots was clay loam with pH 7.0- 7.5 and low

in organic carbon and total N content. The soil in available P_2O_5 and K_2O was medium. The climatic conditions of the research locations are tropical. The maximum temperature recorded was $38.5^\circ C$ in the month of June 2023 while the minimum temperature recorded was $22.1^\circ C$ during September 2023. Average rainfall of the region is 1000-1100 mm per annum and relative humidity ranges from 45-85 per cent. The number of rainy days during the cropping period was 35 days. The maximum rainy days (11 days) were recorded in September 2023.

Comment [A3]: Please mention the source of data collection

2.2 Experimental Layout and Crop Monitoring

The finger millet variety (ATL 1) seeds were distributed to identified farmers at free of cost for one acre. The farmers are advised to raise the new variety (ATL 1) along with ruling finger millet variety Co15 as check. The selected farmers were trained for TNAU Improved production technologies through training programme funded by NICRA Project, and organized by ICAR, Krishi Vigyan Kendra, Villupuram (TN), during 2023. The seeds of the selected varieties were sown on the nurseries and seedlings (on 22nd to 27th days old seedling) were transplanted to main field. Spacing was followed in 15×10 cm for both the varieties. All the agronomic and plant protection measures were followed in all the demonstrations and control plots uniformly by monitoring the frequent visit. The observations were recorded on number of productive tillers per plant and grain yield per hectare (kgs). For data collection, ten to fifteen representative plants were selected randomly in each demonstration plots in all the farmers' field for ATL 1 as well as check variety Co 15. All the collected data were statistically analyzed by statistical method described by Pansi and Suckatme [12].

RESULTS AND DISCUSSION

Comment [A4]: Please mention the serial no. of this section as per guide line of the journal

The results of the all the 15 demonstrations and check plots were presented in Table 1. The performance of finger millet variety ATL 1 at farmer's field with comparison to the farmers cultivating variety Co 15 (check variety) was recorded periodically. The

data on number of productive tillers per plant revealed that, it was ranged from 12.44 to 16.96. The average of number of tillers in ATL 1 demonstrations was 14.85 and in case of check variety (Co 15) was 13.95. The tillering potential of the variety directly contributes to grain yield. Number of tillers in finger millet was already reported by [13, 14]. Regarding the grain yield, in ATL 1 demonstration fields, the maximum grain yield was 1685 kg ha⁻¹ recorded in farmer's field and minimum yield 1295 kg ha⁻¹ was recorded in Farmer 7. The average grain yield of all demonstration of ATL 1 was 1470 kg ha⁻¹ at farmers field and for Co 15, it was 1340 kg ha⁻¹. It was 9.67% increase over the check variety (farmers practice). These outcomes are somewhat comparable to [15]. The grain yield on finger millet was already reported in their research paper by [14].

The farmers obtained additional revenue of Rs. 9650 ha⁻¹ when compared to farmers practice (check variety Co 15) it was mainly due to new varietal introduction by demonstration (Table 2). The additional yield and income is due to the NICRA project by providing critical inputs (seeds, bio fertilizers, PPFM, potash solubilizing bacteria and along with improved production technologies (farm advices related to season, selection of variety, optimum seed rate, nutrient management and plant protection measures). Similar kind of front line demonstrations in rice was already reported by Mohammad Hashim *et al.* [16, 17]. The ATL 1 finger millet variety produced higher yield over the check variety (Co 15) in all the demonstrations, indicated that showing persistent performance in different locations, the ATL 1 was easily adopted to new environments and had high stability over the locations of Tamil Nadu. Any new variety giving stable performance in different locations was good shine for farming community.

CONCLUSION

Varieties with inbuilt resistant/ tolerant to the existing abiotic strains are the added advantage for stress management strategies. Introduction of drought tolerance finger millet variety ATL 1 along with suitable improved innovative interventions through NICRA projects in rural areas, will play a significant role in improving the productivity, profitability and sustainability of millet cultivation in Tamil Nadu.

Comment [A5]: Please mention the serial no. of this section as per guide line of the journal

Comment [A6]: Why the variety ALT-1? Please mention the advantages of ALT-1 over other. Please rewrite the conclusion

REFERENCES

1. Chandra D, Chandra S, Sharma AK. Review of Finger millet (*Eleusine coracana* (L.) Gaertn): A powerhouse of health benefiting nutrients. *Food Science and Human Wellness*. 2016; 5:149-155.
2. Upadhyaya HD, Gowda CL, Reddy VG. Morphological diversity in finger millet germplasm introduced from Southern and Eastern Africa. *J. SAT Agricultural Res.* 2007; 3(1): 1-3.
3. Gull A, Jan R, Nayik GA, Prasad K, Kumar P. Significance of finger millet in nutrition, health and value-added products: A review. *Magnesium (mg)*. 2014; 130(32):120.
4. Antony Ceasar S, Maharajan T, Ajeesh Krishna TP, Ramakrishnan M, Victor Roch G, Satish L, *et al.* Finger millet [*Eleusine coracana* (L.) Gaertn.] Improvement: Current status and future interventions of whole genome sequence. *Frontiers in Plant Science*. 2018; 9:1054.
5. Krishna TA, Maharajan T, Roch GV, Ramakrishnan M, Ceasar SA, Ignacimuthu S. Hybridization and hybrid detection through molecular markers in finger millet [*Eleusine coracana* (L.) Gaertn.]. *J. Crop Improvement*. 2020; 34(3): 335-355.
6. Maharajan T, Ceasar SA, Krishna TP, Ignacimuthu S. Phosphate supply influenced the growth, yield and expression of PHT1 family phosphate transporters in seven millets. *Planta*. 2019; 250(5):1433-1448.
7. Saleh AS, Zhang Q, Chen J, Shen Q. Millet grains: Nutritional quality, processing, and potential health benefits. *Comprehensive Reviews in Food Science and Food Safety*. 2013;12:281-295.
8. Shukla K, Srivastava S. Quality characteristics of finger millet based baby food preparation as affected by its varieties and processing techniques. *J Functional Environ. Bot.* 2011; 1(1):77-84.
9. Sugarcane Statistics-India, 2022. <https://www.statista.com>
10. Sakamma S, Umesh KB, Girish MR, Ravi SC, Satishkumar M, Bellundagi V. Finger millet (*Eleusine coracana* L. Gaertn.) production system: Status, potential, constraints and implications for improving small farmer's welfare. *The J. Agric. Sci.* 2018;10(1):162-179.

Comment [A7]: The author is suggested to follow the authors guideline to write the reference section and make it uniform.

Comment [A8]: Please use abbreviated form

Comment [A9]: Please use abbreviated form

Comment [A10]: Please use abbreviated form

Comment [A11]: Please use abbreviated form

11. Ranawat Y, Ram H, Sisodia SS, Panjabi NK. Adoption of improved Maize cultivation practices by Trained and untrained farmers of KVK, Udaipur, Rajasthan, J. Extension Edu. 2011. 19(1); 144-147.
12. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. ICAR, New Delhi.1985.
13. SaravanakumarS. Productivity Enhancement in Finger millet through Frontline Demonstrations in Erode District of Tamilnadu. *Indian Journal of Hill Farming*. 2018. 31(1): 146-148.
14. GuntamuklaMukesh, Masina Sairam, Sagar Maitra, DinkarJagannath Gaikwad, Narasupalli Anuradha, Upasana Sahoo and Subhajit Pal.Performance Evaluation of Different Finger Millet (*Eleusine coracana* L. Gaertn.) Cultivars for Growth, productivity and Nutrient Quality of Grains under Hot and Sub-humid Region of Odisha. *Int. J. Experimental Res. Review*. 2024; 39: 01-14.
15. Kejiya P, Vajantha B, Naidu MVS, Nagavani AV. Soil Fertility and Yield of Finger Millet (*Eleusine coracana* L.) as Influenced by Phosphorus Management Practices in Sandy Loam Soils. 2023;35(19): 1984-1991,
16. Mohammad Hashim, Singh KK, Narendra Kumar, Man Mohan Deo, Dileep Singh, Mukund Kumar. Impact of Front Line Demonstrations in Improving Rice Productivity and Profitability in Jaunpur District of Uttar Pradesh, India. *J. Experiment. Agric. International*. 2023; 45(11): 74-82.
17. Ganapathy S, Nageswari K, Jayakumar J, Veeramani P. Evaluation of CO 52 Rice Variety for Enhanced Productivity in Cuddalore District of Tamil Nadu, India. *Inter. J. Plant & Soil Sci*. 2024; 36(8): 432-36.

Comment [A12]: Please use abbreviated form

Table 1. Performance of finger millet Variety ATL 1 and check under field demonstrations

S. No	Farmers Name & Address	No. of tillers / Plant			Grain yield (kg/ha)		
		ATL 1	Check	%	Yield	Check	%

				increase	kg/ha		increase
1.	Raji, Puliyanur	15.02	13.49	11.30	1495	1350	10.74
2.	Ravi, Puliyanur	13.75	13.35	3.00	1400	1330	5.26
3.	Balaji, Puliyanur	12.79	12.05	6.14	1350	1270	6.30
4.	Irusammal, Naduvanandhal	14.52	13.30	9.18	1440	1350	6.67
5.	Dhatchanamoorthis, Naduvanandhal	16.96	15.48	9.56	1610	1440	11.81
6.	Murugan. R, Naduvanandhal	14.55	13.05	11.49	1495	1360	9.93
7.	Rajamanikkam, Naduvanandhal	12.44	11.90	4.54	1295	1200	7.92
8.	Dharmaraj, Naduvanandhal	15.05	13.50	11.52	1450	1310	10.69
9.	Elumalai, Puliyanur	16.30	15.29	6.61	1570	1370	14.60
10.	Gopi sreenivasan, Puliyanur	15.70	14.74	6.52	1450	1320	9.85
11.	Muralitharan, Puliyanur	13.68	13.25	3.21	1315	1210	8.68
12.	Kalpana, Puliyanur	16.70	14.59	14.50	1685	1510	11.59
13.	Sathish, Puliyanur	15.80	14.85	6.43	1590	1470	8.16
14.	Ganesan, Puliyanur	16.75	15.09	11.04	1390	1270	9.45
15.	Govindan, Naduvanandhal	16.28	15.34	6.13	1510	1340	12.69
	Grand Mean	14.8	13.95	8.14	1470	1340	9.67
	CD (0=0.5%)	2.02	1.52	-	198.25	185.32	-
	CV (%)	6.24	5.07	-	6.29	6.07	-

Table 2. Difference between demonstrations and farmer's practice related to yield and Net income

Treatments/ Intervention	Seed yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C ratio	Additional Income (Rs.)
Improved Variety –(ATL 1 + Improved Production technologies)	1470	34500	68150	33650	2.04	9,650

Check – Co 15 (Farmer's practice)	1340	37100	61100	24000	1.64	-
--------------------------------------	------	-------	-------	-------	------	---

UNDER PEER REVIEW