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Impact of Frontline Demonstrations on Finger Millet in Tribal Areas of Dharmapuri District of Tamil Nadu, India

M. A. Vennila[1*], M. Sangeetha[1], R. Thangadurai[1] and P. S. Shanmugam[2]

[1]ICAR ICAR-Krishi Vigyan Kendra, Dharmapuri, Tamil Nadu Agricultural University, Tamil Nadu, India
[2]Department of Pulses, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore – 641 003, Tamil Nadu, India

**Corresponding author*

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A B S T R A C T

Demonstration was conducted in the Vathalmalai tribal farmers' holdings of Dharmapuri district, Tamil Nadu, India during *kharif* 2016 to create awareness among the tribal farmers and to showcase the improved production technologies in finger millet. The Improved Crop Management practices viz., promotion of drought tolerant, high yielding and short duration finger millet variety ML 365, integrated nutrient management, integrated pest and disease management technologies were demonstrated and compared with the farmers practice followed by tribal farmers in finger millet cultivation. Results indicated that demonstration of finger millet variety ML 365 with Improved Crop Management practices recorded higher grain yield of 2140 kg/ ha and farmers practice recorded lower yield of 1720 kg/ha. Adoption of Improved Crop Management practices increased the grain yield of finger millet to the tune of 24.42 per cent compared to farmers practice. Farmers earned higher net income of Rs.20700 /ha through the demonstration and Rs.12650/ha with farmers practice. Besides, farmers realized higher benefit cost ratio (1.76) through the demonstration compared to farmers practice (1.58). Thus, the demonstration of improved variety ML 365 with crop management practices increased the grain yield and net income of the farmers growing finger millet under rainfed condition. In the present study, potential of the new variety and technologies were demonstrated systematically and scientifically in the farmers field along with farmers practice for further adoption by farming community in large scale.

Introduction

Finger millet (*Eleusine coracana* L. Gaertn) is one of the important millets grown extensively in Dharmapuri District. It is a hardy crop, has good adaption to wide range of environment especially heat, drought, marginal and degraded soils (Okalebo *et al.*, 1991). Finger millet is the principal food grain of the rural population in India, especially in South India. It is very nutritious with respect to minerals, dietary fiber and essential amino acids. Amongst cereals, Ragi provides highest level of calcium including

antioxidants and phytochemicals. The total dietary fiber of finger millet grain is relatively higher than that of most of other cereal grains, which helps to control blood glucose levels in diabetic patients. It is usually converted into flour and a variety of preparations. Several methods of processing of ragi have been developed to make the final product more attractive in flavour, appearance, taste, and consistency (Patel et.al., 2016) It is mainly grown for its grains and it is highly nutritious. Its grains contain carbohydrate (65-75%), protein (5-8%), dietary fibre (15-20%), minerals (2.5-3.5%) and vitamins (Chethan and Malleshi, 2007). It is superior to rice and wheat, in respect of crude fibre, amino acids and minerals like calcium (344 mg/100g) and potassium (408 mg/100g). It also contains anti nutrients such as phytates, polyphenols, tannins and trypsin inhibito finger millet and its products helps in managing diabetes and its complications by regulation of glucose homeostasis and prevention of dyslipideamia. It also gives protection against the risk of cardiovascular disease, gastrointestinal cancers and other health issues. It has health beneficial effects, such as anti-diabetic, anti-diarrheal, antiulcer, anti-inflammatory, anti-tumerogenic, atherosclerogenic effects, antioxidant and antimicrobial properties (Devi *et al.,* 2014). Hence, there is a great demand for improving finger millet production.

Finger millet is being cultivated in an area of about 28,500 hectares in Dharmapuri District and out of which about 1200 ha under Vathalmalai tribal area. About 80 per cent of the area under Finger millet is being cultivated under rainfed condition during *kharif* season in Vathalmalai tribal area. Finger millet is mainly cultivated under rainfed condition with little management in Vathalmalai Tribal areas of Morappur block. Now a days, the area under finger millet cultivation is shrinking especially under tribal areas because of lower yield and usage of old traditional and low yielding varieties used for cultivation. The productivity is very low when compared to state average and only 50 per cent of the state average is being realised in Morappur block due to lack of knowledge on high yielding drought tolerant varieties and non-adoption of improved cultivation practices, prevalence of nutrient deficiency, pest and disease incidence also lowers the finger millet productivity. In addition to that under rainfed condition, farmers facing the problem of moisture stress at various crop growth stages thereby experiencing low yield and crop loss to some extent.

Hence, the productivity of finger millet might be increased by growing suitable variety along with improved crop management practices. Similar studies on crop yield increase by adoption of improved crop management practices were reported by Subhashree *et al.,* (2017) in Finger millet; Sharma *et al.,* (2016) and Singh (2017) in Wheat; Jat and Gupta (2015) in Pearl millet; Meena *et al.,* (2014) in Maize. Considering the above facts, a frontline demonstration was proposed and conducted in the farmers' holdings to demonstrate the improved package of practices for higher productivity in finger millet under rainfed condition.

Materials and Methods

Frontline demonstration was conducted to demonstrate the potential of the drought tolerant, short duration variety with the improved package of practices in comparison with the existing farmers practice in the Vathalmalai tribal farmers' holdings of Dharmapuri district during *kharif* 2016 under rainfed condition. Vathalmalai hill is geographically perched at a height of 1090 metres (3600 ft) above mean sea level with predominantly tribal population engaged in the cultivation of ragi, sorghum, samai, avarai and silver oak. Higher prevalence of

illiteracy, remoteness of the location, adoption of conventional practices in agriculture and meagre exposure to technological progress were the main constraints in enhancing the productivity of millets.

Demonstration was conducted in 10 locations spread over in 7 villages viz., Palsilambu, Periyur, Chinnangadu, Kotlangadu, Mannanguli, Ondriyangadu and Naickanur tribal villages of Dharmapuri District under the project funded by State Planning Commission under State Balanced Growth Fund (SBGF). The soils of the demonstration fields were collected and analysed for its initial soil nutrients status. The results showed that the soils were slightly alkaline in soil reaction, non saline, low in nitrogen, medium in phosphorus and potassium nutrient content.

Each demonstration was conducted in an area of 0.4 ha and with an adjacent area of 0.4 ha selected for farmers practice. In the demonstration, the improved practices including cultivation of finger millet variety ML 365, integrated nutrient management, integrated pest and disease management practices were demonstrated along with the farmers practice. Finger millet variety ML 365 was released from University of Agricultural Sciences, Bengaluru during 2008. It has 100-105 days duration, high yielding variety, tolerant to drought and blast disease. In farmers practice, finger millet variety local finger millet was grown with the existing farmers practices such as broadcasting of seeds, basal application of complex fertilizers, etc. The details on the technological interventions followed in the demonstration and farmers practice were given in Table 1. Before initiating the demonstration, the beneficiary farmers were trained in all the improved practices in finger millet cultivation and followed in the demonstrations. Demonstration field were periodically observed by the scientists of Krishi Vigyan Kendra, Dharmapuri and advisory recommendations given in Crop Production Guide 2012, Tamil Nadu Agricultural University were followed. At the time of harvest, the data on plant population (number), plant height (cm), number of tillers per plant (number), days taken for 50% flowering (number) and grain yield (kg/ha) of finger millet crop were recorded from both the demonstration and farmers practice. Based on the cost of inputs and market price of the produce, economic parameters such as net return (Rs/ha) and benefit cost ratio were worked out.

Results and Discussion

Results of the study revealed that demonstration of drought tolerant finger millet variety ML 365 with Improved Crop Management practices recorded the higher plant population (36.4/m2), plant height (76.8 cm) and higher number of tillers per plant (4.82). Lower plant population (25.2/m2), plant height (64.9 cm) and number of tillers per plant (2.46) were recorded in farmers practice during 2016 (Table 2).

The demonstrated variety attained maturity one week earlier than the existing local variety. Cultivation of drought tolerant finger millet variety ML 365 with Improved Crop Management practices recorded higher average grain yield of 2140 kg/ha (Table 3). Farmers practice recorded lower average grain yield of 1720 kg/ha. Adoption of improved practices increased the yield of finger millet to the tune of 24.42 per cent compared to the farmers practice under rainfed condition. The increased yield under demonstration might be due to the combined effect of high yielding, drought tolerant variety and adoption of improved crop management practices. The similar results of yield enhancement through front line demonstration of improved technologies has

been reported by Kumar *et al.*, (2010) in bajra; Solanki *et al.*, (2014) in maize and Anand Naik *et al.*, (2016) in sorghum. Besides, the incidence of blast disease was not reported in the demonstrated variety and it was 12 per cent in the farmers practice.

Table.1 Technological interventions followed in finger millet cultivation under demonstration and farmers practice in Dharmapuri district during 2016

Sl.No.	Technological Intervention	Farmers Practice	Improved production practices demonstrated through frontline demonstration
1.	Farming situation	Rainfed	Rainfed
2.	Variety	Cultivation of local variety	Cultivation of ML 365 variety
3.	Time of sowing	First week of August	First week of August
4.	Method of sowing	Broadcasting of seeds and thinning operation was not done	Broadcasting of seeds and spacing of 30X 10 cm followed by thinning and gap filling operation
5.	Seed treatment practice	Not followed	Seed treatment with *Pseudomonas fluorescens* @ 10 gm/ kg of seed followed by biofertilizers viz., Azospirillum and Phosphobacteria each @ 25 gm/ kg
6.	Nutrient Management	Basal application of 20:20:20 complex fertilizer @ 125 kg/ ha	Basal application of FYM @ 12.5 t/ha; Recommended dose of NPK @ 40:20:20 kg/ha; Soil application of TNAU millet micronutrient mixture @ 7.5 kg/ha
7.	Weed management	Not followed	One hand weeding on 25- 30 days after sowing
8.	IPDM Practices	No prophylactic or control measures for managing pests and diseases	Need based usage of plant protection chemicals and IDM practices for blast disease was followed

Table.2 Growth parameters of finger millet varieties local variety and ML 365 as influenced by farming practices

Treatments	Plant population at harvest (No./m2)	Plant height (cm)	Number of tiller per plant	Days to 50% flowering
Farmers practice (Local variety)	25.2	64.9	2.46	64
Demonstration of improved practices (ML 365)	36.4	76.8	4.82	70

Table.3 Yield and economics of finger millet varieties local and ML 365 as influenced by farming practices

Treatments	Grain yield (Kg/ ha)	Per cent yield increase over farmers practice	Gross cost (Rs./ ha)	Net Income (Rs./ ha)	Benefit Cost Ratio
Farmers practice (Local variety)	1720	-	21750	12650	1.58
Demonstration of improved practices (ML 365)	2140	24.42	24270	18530	1.76

The data on economic indicators indicated that, the cost of production was higher in demonstration (Rs. 24, 270/ha) and lower in farmers practice (Rs. 21, 750/ha) (Table 3). Farmers earned the net income of about Rs.18530/ha through the cultivation of ML 365 variety with Improved Crop Management practices and Rs.12, 650/ha with farmers practice. On an average Rs. 5880/ha as additional income is attributed to the higher yield obtained in demonstration. Hence, farmers realized the higher benefit cost ratio (1.76) through the cultivation of ML 365 variety with Improved Crop Management practices compared to farmers practice (1.58). It might be due to the higher grain yield recorded in demonstration compared to farmers practice. Similar results of increase in net income and benefit cost ratio due to adoption of improved technologies in the demonstrations were reported by Jat and Gupta (2015) in pearl millet; Dhaka *et al.,* (2010) in maize and Anand Naik *et al.*, (2016) in sorghum.

In conclusion the results of the demonstration revealed that cultivation of finger millet variety ML 365 with Improved Crop Management practices increased the yield and income of the farmers under rainfed condition. In addition, the introduced variety has satisfied the farmers preferences such as high tiller production, early maturity and tolerance to grain shattering or dusting. Hence, the farmers were convinced with the performance of the variety with regard to its yield potential and tolerance to biotic and abiotic stresses under rainfed condition.

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