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Performance of Blast and Drought Tolerant Finger Millet Variety ML-365 under Front Line Demonstrations in Tumkur, Karnataka

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A B S T R A C T

Frontline demonstrations were conducted in farmers' fields of Tumkur district of Karnataka, India during *kharif* 2016 to 2018 to create awareness among the farmers and demonstrate the improved production technologies in finger millet. The integrated crop management practices including cultivation of drought and blast tolerant finger millet variety ML 365, integrated nutrient management, integrated pest and disease management practices were demonstrated and compared with the existing farmers practice followed in Finger millet cultivation. Results showed that demonstration of finger millet variety ML 365 with integrated crop management practices recorded higher grain yield of 23.61q/ha and farmers practice recorded lower yield of 18.46 q/ha. Adoption of integrated crop management practices increased the grain yield of finger millet to the tune of 28.16 per cent compared to farmers practice. Farmers earned higher net income of Rs.34661/ha through the demonstration and Rs.21428/ha with farmers practice. Besides, farmers realized higher benefit cost ratio (2.66) through the demonstration compared to farmer's practice (2.10). Thus, the frontline demonstration of improved variety 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 improved 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 Tumkur 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). 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 inhibitory factors.

Regular consumption of whole grain of 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, antiinflammatory, antitumerogenic, 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 1,85,000 hectares in Tumkur District. About 90 per cent of the area under Finger millet is being cultivated under rainfed condition during *kharif* season. 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. Besides moisture stress, lack of knowledge on the availability of drought tolerant varieties, non adoption of improved cultivation practices, prevalence of nutrient deficiency, pest and disease incidence also lowers the finger millet productivity.

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 and blast tolerant variety with the improved package of practices in comparison with the existing farmers practice in the farmers' holdings of Tumkur district during *kharif* 2016-2018 under rainfed condition. Demonstration was conducted in 25ha area in three villages involving 50 farmers. 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 GPU 28 was grown with the existing farm-ers 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.

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 (q/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 indicated that demonstration of drought and blast tolerant finger millet variety ML 365 with integrated crop management practices recorded the higher plant population (35.5/m2), plant height (75.0 cm) and higher number of tillers per plant (4.55). Lower plant population (28.5/m2), plant height (64.5 cm) and number of tillers per plant (2.5) were recorded in farmers practice (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 integrated crop management practices recorded higher average grain yield of 23.61q/ha (Table 3). Farmers practice recorded lower average grain yield of 18.46q/ha. Adoption of improved practices increased the yield of finger millet to the tune of 28.16 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 8 per cent in the farmers practice.

Table.1 Technological interventions followed in finger millet cultivation under FLD

Sl.No.	Technological interventions	Existing Farmers practice	Improved practices demonstrated through frontline demonstration
1	Farming situation	Rainfed	Rainfed
2	Variety	Cultivation of GPU 28	Cultivation of ML 365
3	Time of sowing	First week of August	First week of August
4	Method of sowing	Broadcasting of seeds and thinning operation was not followed	Broadcasting of seeds and spacing of 30 x 10 cm was followed by thinning and gap filling operation
5	Seed treatment practice	Not followed	Seed treatment with *Trichoderma*@ 10g/kg followed by biofertilizers *viz*., *Azospirillum* and *Phospho bacteria* each @ 25g/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 and Zinc sulphate @ 12kg and Boran 5kg/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 followed

Table.2 Growth parameters of finger millet varieties GPU 28 and ML 365 under FLD

Treatments	Plant population at harvest (No./m2)	Plant height (cm)	Number of tiller per plant	Days to 50% flowering
Farmers practice (GPU 28)	28.5	64.50	2.50	65
Demonstration of improved practices (ML 365)	35.5	75.0	4.55	70

Table.3 Yield performance of finger millet varieties ML 365 and GPU 28 under FLD

Year	Name of the Block/Village	No. of Farmer	Area (ha)	Yield (q/ha)		% change in yield
				ML-365	GPU-28	
2016	Shivaramanahally, Tiptur Tq	25	10	22.50	17.40	29.31
2017	Guddenahally, Tiptur Tq	10	5	26.85	21.50	24.88
2018	Doddamadure, Kunigal Tq	25	10	21.50	16.50	30.30
Mean	-			23.61	18.46	28.16

Table.4 Cost economics of economics of finger millet varieties GPU 28 and ML 365 under FLD

Year	Economics of Demonstration variety ML-365 (Rs./ha)				Economics of Economics of check variety GPU-28 (Rs./ha)			
	Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return	Net Return	BCR
2016	27214	54478	27264	2.36	27357	41543	14186	1.90
2017	21200	59070	37870	2.97	20550	47300	26750	2.30
2018	23500	62350	38850	2.65	22500	47850	23350	2.12
Mean	23971	58632	34661	2.66	23469	45564	21428	2.10

The data on economic indicators indicated that, the cost of production was higher in demonstration (Rs. 23971/ha) and lower in farmers practice (Rs. 23464/ha) (Table 4). Farmers earned the net income of about Rs.34661/ha through the cultivation of ML 365 variety with integrated crop management practices and Rs.21428/ha with farmers practice. On an average Rs. 13233/ha as additional income is attributed to the higher yield obtained in demonstration. Hence, farmers realized the higher benefit cost ratio (2.66) through the cultivation of ML 365 variety with integrated crop management practices compared to farmer's practice (2.10). 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.

Results of the demonstration revealed that cultivation of finger millet variety ML 365 with integrated 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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