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Research Article

Proso millet national variety TNAU 202

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Abstract
A superior Proso millet culture, TNAU 202, was bred at the Department of Millets, CPBG, Tamil Nadu Agricultural University, Coimbatore and tested throughout the country for three years (2008 to 2010). Being a profusely tillering, short duration (73 days) culture with better culm strength, it is best suited for the drylands of India. It is a derivative of the cross involving PV 1453 x GPUP 16. It yields on average, 1872 kg/ha of grain and 3700 kg/ha of straw during *kharif* season. The panicle is loose and branched with more number of grains. The grains are medium bold with desirable grain and cooking qualities. Since it is a short duration crop, it is very well suited for contingency planting. It recorded an increased grain yield of 26.23 and 15.06 per cent over qualifying varieties TNAU 196 and TNAU 201, respectively in All India Coordinated Trials. It recorded 19.16 per cent increased yield over the check TNAU 145, 15.34 per cent over TNAU 151, 31.09 per cent over GPUP 21 and 7.10 per cent as compared to the K1. Hence, TNAU 202 was released for cultivation in different states of the country in the year 2011.

Key words
Proso millet, TNAU 202, grain yield, national variety.

INTRODUCTION

Proso millet or proso (*Panicum miliaceum* L.) is one of the ancient crops under cultivation. It has been reported to be under cultivation in China from 5000 BC, from where it spread to India, Eurasia and Eastern Europe (La´gler *et al*., 2005). It is very hardy and is suitable for cultivation in unfavourable conditions. Botanically, proso millet is an annual grass, growing to a height of about 100 cm. The panicle produces seeds of 2-3 mm size which are variously coloured from cream, yellow, orange-red to brown. The grains are highly nutritious with 14.4 per cnet protein (Raghavendra Rao *et al*., 2011) and essential amino acids.

Currently, it is cultivated in India and the CIS countries (former USSR) (Gopalreddy *et al*.,2007), Afghanistan, Syria, Turkey, Iraq, Iran and Romania (Martin *et al*., 1976). It is suitable for both tropical and sub-tropical conditions and can be grown at higher elevations of up to 2700 feet (Hussain Sahib, 1997). It is highly adapted to different soil and climatic conditions. It also has the capacity to efficiently convert water to dry matter and grain yield (Theisen *et al*., 1978, Hulse *et al*., 1980). The high water use efficiency of the crop is attributed to the short growth period rather than its drought tolerance capacity (Arnon, 1972; Baltensperger, 2002) and is admired for growing as an emergency crop in late seasons (Yegna Narayan Aiyer,1958). In India, it is cultivated in Tamil Nadu, Orissa, Maharashtra, Karnataka, Andhra Pradesh, Bihar, and Madhya Pradesh with a total area of more than five lakh hectares (Haider, 1997 and Nirmalakumari *et al.,* 2008). In Tamil Nadu, Salem, Villupuram and Vellore is the major proso millet growing districts with a total area of 1000 ha with average productivity of 800 kg/ha.

Since this crop is best suited for contingency planning, the development of an early maturing, high yielding, nutritionally rich drought tolerant variety is essential to ensure nutritional security in the dry land, hill area and

tribal farmers. Hence, a breeding work was initiated and a new high yielding national variety, TNAU 202, was developed

MATERIALS AND METHODS

The proso millet variety TNAU 202 was evolved at the Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. It is a selection from the cross PV 1453 x GPUP 16. Superior single plants with desirable yield contributing features were selected from F_2 to F_5 generation. In the F_5 generation, superior high yielding homozygous progenies were selected and were evaluated for their consistent performance and homozygosity, and the culture TNAU 202 was identified as the best. It was evaluated in replicated trials along with yield checks at the Millet Breeding Station, Coimbatore from 2003 - 2008, in On-farm trials at 79 locations and All India Coordinated Trials from 2008 to 2011 in various parts of the country under ICAR AICSMIP. The reaction of the culture against important pests and diseases was also studied.

Table 1. Performance of Proso millet variety TNAU 202 (2003-2010)

Sl. No	Trial	No. of trials	Grain yield (kg/ha)		Straw yield (kg/ha)	
			TNAU 202	CO (PV) 5	TNAU 202	CO (PV) 5
1	Station trials (2003 – 2007)	9	**3157**	2485	5570	4380
2	On farm trials (2008 – 2010)	79	**2635**	2115	5010	4152
Total number of trials		88				
	Mean of 88 trials		2896	2300	5290	4266
	Per cent increase over CO (PV) 5		25.9	--	24.0	--

Table 2. Performance of Proso millet variety TNAU 202 in AICRP trials (2008-2011)

Particulars	Year	Number of trials	Proposed Variety	Qualifying Varieties		Checks			
			TNAU 202	TNAU 196	TNAU 201	TNAU 145	TNAU 151	GPUP 21	K1
Mean Yield across zones (q/ha)	2008-09	6	20.35	21.08	19.58	-	-	17.91	17.43
	2009-10	4	20.26	10.99	13.90	15.04	18.23	10.29	-
	2010-11	7	15.55	12.44	15.34	16.39	14.27	14.65	-
	Mean		18.72	14.83	16.27	15.71	16.23	14.28	17.43
Per cent increase over the check and qualifying varieties	2008-09			-3.46	3.93	-	-	13.62	16.75
	2009-10			84.3	45.75	34.70	11.13	96.89	-
	2010-11			25.0	1.37	-5.13	8.97	6.14	-
	Mean			35.28	17.02	14.79	10.05	38.88	16.75
All India Rank	2008-09		2	1	4	-	-	6	7
	2009-10		1	7	5	4	2	9	-
	2010-11		5	9	6	4	8	7	-
Frequency in top group	2008-09		4/6	2/6	2/6	NA	NA	1/6	-
	2009-10		3/4	-	-	1/4	4/4	1/4	NA
	2010-11		3/7	1/7	2/7	4/7	-	-	NA

RESULTS AND DISCUSSION

In the station trial (**Table 1**), the culture TNAU 202, recorded an average grain yield of 3157 kg/ha and straw yield of 5570 kg /ha while the check CO (PV) 5 recorded 2485 kg/ha and 4380 kg/ha respectively. On testing the culture in OFT for three years in 79 locations, it was observed to record an average yield of 2635 kg/ha which was a 24.58 per cent increase over CO (PV) 5, the check variety (**Table 1**). In All India Coordinated trials, the culture was evaluated from 2008 to 2011 in 17 trials laid out in five states *viz.,* Andhra Pradesh, Bihar, Karnataka, Maharashtra and Tamil Nadu. The average yield recorded by the culture was 1872 kg/ha which was a 26.23 and 15.06 per cent increase over TNAU 196 and TNAU

201 (qualifying checks) and 19.16, 15.34, 31.09 and 7.40 per cent increase over the national checks TNAU 145, TNAU 151, GPUP 21 and K 1, respectively (**Table 2**). It also recorded consistently better performance compared to the qualifying varieties and checks in all the states (**Table 3**). Proso millet TNAU 202 is tolerant of shoot fly and resistant to rust and brown spot diseases (**Table 4**). The proso millet variety TNAU 202 completes 50 per cent flowering in 39 days, while the checks TNAU 145, TNAU 151, GPUP 21 and K 1 flowered in 48, 46, 42 and 39 days, respectively. The variety matured in 73 days while the checks TNAU 145, TNAU 151, GPUP 21 and K 1 matured in 79, 78, 75 and 71 days, respectively It has an upright plant type growing to a height of 75.0 cm and is profusely tillering, producing eight tillers on an average. The panicles are large and branched. It has bold and golden yellow colored grains, with a 1000 grain weight of 3.6 g (**Table 5 and Plate 1**).

Table 3. Performance of TNAU 202 in different states (grain yield q/ha) (2008 – 2011)

State	Proposed variety	Qualifying variety		Check			
	TNAU 202	TNAU 196	TNAU 201	TNAU 145	TNAU 151	GPUP 21	K 1
Andhra Pradesh	18.30	19.91	17.74	14.12	13.27	15.73	27.04
Bihar	11.89	11.14	15.37	17.13	10.88	15.28	12.35
Karnataka	13.67	10.07	9.90	13.76	11.54	11.47	12.99
Maharashtra	5.47	4.09	5.26	4.85	4.96	5.34	4.94
Tamil Nadu	42.88	32.44	37.0	31.95	38.65	28.78	34.31
Overall mean (17 trials)	18.44	15.53	17.05	16.36	15.86	15.32	18.33
Percentage increase of TNAU 202 over		**18.73**	**8.15**	**12.71**	**16.27**	**20.35**	**0.60**

Plate 1. Field view of Proso millet TNAU 202

Table 4. Reaction of Proso millet variety TNAU 202 to major pest and diseases

Sl.No	Pest / Disease	TNAU 202	TNAU 196*	TNAU 201*	TNAU 145**	TNAU 151**	GPUP 21**	K1**
Pests								
1	Shoot fly (%)	50.56	47.50	53.48	85.00	83.35	52.71	54.81
Diseases								
1	Rust (Grade)	0.44	0.73	0.81	0.50	1.00	0.67	0.00
2	Brown spot (grade)	0.00	0.22	0.34	0.17	0.80	0.34	0.00
3	Leaf blight (grade)	5.0	4.0	5.0	4.0	4.0	5.0	-
4	Leaf blight severity (%)	65.50	36.80	48.00	37.60	32.80	41.60	-

* Qualifying varieties , ** National Checks

Table 5. Salient features of Proso millet variety TNAU 202

S.No.	Character	TNAU 202	
		Range	Mean
1.	Days to 50% flowering	36-41	39.0
2.	Days to maturity	72-75	73
3.	Plant height (cm)	64-98	75.0
4.	No. of productive tillers	5-11	8
5	Leaf of flag length (cm)	15-30	22.5
6.	Width of flag leaf (cm)	0.75 – 1.34	0.85
7.	Length of peduncle (cm)	7.0 – 9.5	8.0
8.	Panicle exertion (cm)	3.5 – 6.5	5.0
9.	Length of inflorescence (cm)	22.5 – 28.5	25.5
10.	Grain yield per plant (g)	7.8 – 15.6	9.5
11.	Straw yield per plant (g)	10.0 – 23.0	12.5
12.	Harvest index	0.28 – 0.34	0.32
13.	1000 grain weight (g)	3.0 – 3.8	3.6
14.	Plant habit	Erect	
15.	Plant pigmentation at flowering	Green	
16.	Blade pubescence	Medium	
17.	Sheath pubescence	Medium	
18.	Degree of lodging at maturity	Slight	
19.	Senescence	Partial drying at maturity	
20.	Inflorescence compactness	Open and loose	
21.	Fruit colour	Yellow	
22.	Grain shape	Oval	
23.	Seed size	Medium bold	
24	Milling percentage	76.8	

Based on the above superior performances of the culture TNAU 202 over the qualifying varieties (TNAU 196 and TNAU 201) and national checks (TNAU 145, TNAU 151, GPUP 21 and K 1), it was released as a national variety, by the All India Coordinated Small Millets Improvement Project in the year 2011 for cultivation in India.

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