

## A high yielding Proso millet national variety TNAU 145

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**Abstract :** A high yielding and early maturing proso millet culture TNAU 145 was developed at the Department of Millets, Centre for Plant Breeding and genetics, Tamil Nadu Agricultural University, Coimbatore and released as TNAU 145 at national level. It is a derivative of the cross involving PV 1454 x TNAU 96. It yields on an average 1819 kg/ha of grain and 4600 kg/ha of straw under rainfed condition. The profusely tillering and non-lodging culture is highly suitable for drylands of India. The panicle is large and branched. The grains are bold and golden yellow in colour. Being a short duration variety of 70 days, it is the best choice for contingency planting. This variety has registered 31.52 and 24.93 per cent increased grain yield over the standard varieties K1 and GPUP 21 (National check) respectively, in a total of 157 trials which include station trials, multilocation trials, on farm trials and All India Coordinated trials.

**Key words :** Grain yield, tillers, panicle, trials, evaluation.

### Introduction

A member of sub-family Panicoideae of the family Poaceae, Proso millet (*Panicum miliaceum* L.) is widely cultivated as a cereal across India, Nepal, Western Burma, Sri Lanka, Pakistan and South East Asian countries. It is grown both in the tropics and sub-tropics and even at an altitude of 2700 feet above MSL (Hussain Sahib, 1997). The crop is hardy and provides reasonable harvest even in degraded soils under unfavourable weather conditions. Nutritionally the grains are comparable or even superior to major cereals. The grain protein is rich in essential amino acids. Presently proso millet is grown throughout India in more than half a million hectare with major areas being in the states of Karnataka, Andhra Pradesh, Tamil Nadu, Orissa, Bihar, Maharashtra and Madhya Pradesh. The crop is often sown with the onset of monsoon and is the first crop to be harvested in the season (Haider, 1997). Because of high tolerance to heat and

drought, proso millet is preferred for extreme soil and climatic conditions. In Tamil Nadu, proso millet is grown in 5000 ha with the productivity of 732 kg/ha at Salem, Namakkal, Villupuram, Dindigul and Erode districts. A high yielding, drought resistant and short duration strain is the long felt need of the dry land, hill area and tribal farmers of India.

### Materials and Methods

The proso millet variety TNAU 145 was evolved at Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore and released as TNAU 145 at national level. The cross was made between PV 1454 and TNAU 96. Elite plants with desirable characters which contribute towards high grain yield were selected from F<sub>2</sub> generation onwards. They were evaluated for their sustained performance, homozygosity and the culture TNAU 145 was identified as the best. The culture TNAU 145

**Table 1. Performance of Proso millet culture TNAU 145 at Millet Breeding Station, Coimbatore**

S.No.	Season/Year	Grain yield (kg/ha)		Straw (kg/ha)	
		TNAU 145	CO 4	TNAU 145	CO 4
1.	<i>Khariif</i> , 1999	2699	2308	8382	7860
2.	<i>Rabi</i> , 1999-2000	2490	2017	7996	7640
3.	<i>Khariif</i> , 2000	2872	2315	8716	8010
4.	<i>Rabi</i> , 2000-01	2814	2110	8410	7990
5.	<i>Khariif</i> , 2001	2510	1985	7936	6880
6.	<i>Rabi</i> , 2001-2002	2643	2007	8014	6960
	Mean of 6 trials	2671	2124	8242	7557
	Per cent increase over CO 4	25.77		9.06	

**Table 2. Performance of Proso millet culture TNAU 145 in Multi location trials (2001-2002)**

S.No.	Location	Grain yield (kg/ha)		Straw (kg/ha)	
		TNAU 145	CO 4	TNAU 145	CO 4
1.	Kovilpatti	1295	975	6524	5950
2.	Paiyur	1449	1098	6855	6130
3.	Yethapur	2836	1839	8277	7840
4.	Kalavai	2491	2018	8005	7713
5.	Virinjipuram	1731	1228	7818	7075
6.	Bhavanisagar	1794	1446	6964	6415
7.	Coimbatore	2841	2320	8751	8095
8.	Aruppukottai	2382	1785	6964	6020
9.	Ramanathapuram	1791	1235	6324	5870
10.	Vaigai dam	1966	1308	7111	6820
11.	Tiruchirappalli	1047	913	5942	5050
	Mean of 11 trials	1965.72	1470	7227.6	6634
	Per cent increase over CO 4	33.72		8.9	

**Table 3. Performance of Proso millet culture TNAU 145 in On Farm Trials (2004-2007)**

S.No.	District	Grain yield (kg/ha)		% inc. over CO 4	Straw yield (kg/ha)		% inc. over CO 4
		TNAU 145	CO 4		TNAU 145	CO 4	
1.	Coimbatore (30 trials)	2136	1903	12.2	6715	6281	6.9
2.	Erode (35 trials)	2443	2068	18.1	7031	6419	9.5
3.	Namakkal (25 trials)	2741	2327	17.8	5876	5462	7.5
4.	Salem (25 trials)	2811	2384	17.9	6263	5750	8.9
5.	Villupuram (25 trials)	2919	2171	34.4	6954	6185	12.4
Mean of 140 trials		2610	2170	20.3	6567.8	6019	9.1

**Table 4. Performance of Proso millet culture TNAU 145 in All India Coordinated Trials(2004-2007)**

State	Centres	Years	Proposed variety TNAU 145	Check		Qual. variety TNAU 143
				K1	GPUP 21	
Andhra Pradesh	Nandyal	2004-05	37.04	26.54	33.33	39.51
		2005-06	21.36	15.86	15.43	20.80
		2006-07	36.19	39.90	31.25	39.90
		Mean	31.53	27.43	26.67	33.40
Bihar	Dholi	2004-05	9.26	8.33	8.52	9.32
		2005-06	5.71	5.56	6.23	6.51
		Mean	7.50	6.95	7.38	8.0
Karnataka	Bangalore	2004-05	28.89	20.00	18.91	32.35
		2005-06	25.19	15.80	21.14	22.96
		2006-07	30.81	26.67	33.83	30.37
		Mean	28.30	20.82	24.63	28.56
	Hanumanamatti	2004-05	31.33	8.29	6.67	35.70
		2005-06	16.00	15.47	15.77	11.33
		2006-07	18.84	5.96	13.84	12.29
		Mean	22.10	9.91	12.10	19.80
	Hagari	2005-06	19.26	10.65	12.50	16.39
		2006-07	11.90	7.87	8.19	18.56
		Mean	15.58	9.26	10.34	17.48
	Mandya	2005-06	7.07	8.19	6.63	7.22
2006-07		16.89	19.81	15.41	9.07	
Mean		11.98	14.00	11.02	8.15	
State Overall mean			20.62	13.87	15.29	19.62

(Source : AICSMIP Annual Report 2004-05, 2005-06, 2006-07)

**Table 5. Disease reaction of Proso millet culture TNAU 145 (2004-2007)**

Disease	Item	Year of testing	Proposed variety TNAU 145	Checks	
				K1	GPUP 21
Rust (Grade)	Natural	2004-05	0.00	1.00	0.00
		2005-06	0.00	1.00	2.00
		2006-07	1.00	0.00	1.00
	ART	2004-05	1.00	2.00	2.00
		2005-06	0.00	1.00	1.00
		2006-07	0.00	2.00	1.50

The Proso millet culture TNAU 145 recorded relatively lesser incidence of rust when compared to checks.

**Table 6. Pest reaction of Proso millet culture TNAU 145 (2004-2007)**

Pests	Item	Year of testing	Proposed variety TNAU 145	Checks	
				K1	GPUP 21
Shoot fly incidence (%)	Natural	2004-05	2.5	4.5	5.0
		2005-06	3.0	4.0	7.0
		2006-07	2.0	4.0	5.0
	ART	2004-05	5.5	7.0	6.0
		2005-06	4.0	8.0	10.0
		2006-07	5.0	8.0	9.0
Dead heart symptom (%)	Natural	2004-05	8.6	11.3	7.8
		2005-06	9.7	8.6	13.1
		2006-07	6.2	9.2	9.2
	ART	2004-05	11.3	13.4	13.3
		2005-06	16.2	10.8	16.7
		2006-07	9.8	14.3	11.2

The Proso millet culture TNAU 145 recorded relatively lesser incidence of shootfly infection and dead heart symptom as compared to checks.

**Table 7. Nutritional and cooking quality of Proso millet culture TNAU 145.**

Quality characteristics	Items	Proposed variety (TNAU 145)	Check 1 (GPUP 21)	Check 2 (K1)
<b>Parameters</b>				
a) Nutritional Quality				
1.	Protein (g/100g)	12.8	12.5	12.4
2.	Carbohydrate (g/100g)	72.3	71.7	70.6
3.	Oil (g/100g)	3.6	3.4	3.0
4.	Crude fibre (g/100g)	7.1	7.3	7.4
5.	Minral matter (g/100g)	2.3	2.1	1.9
6.	Potassium (g/100g)	2.0	1.8	1.9
7.	PHosphorus (mg/100g)	209.0	205.0	200.0
8.	Calcium (mg/100g)	16.5	15.6	14.0
9.	Iron (mg/100g)	11.3	11.2	11.2
10.	b-carotene (ug/g)	115	110.0	106.3
11.	1000 grain weight (g)	3.6	3.3	2.9
12.	1000 grain volume (ml)	4.3	4.2	4.4
b) Cooking qualities				
1.	Water uptake (ml)	950	945	926
2.	Cooking time (min)	27	26	25
3.	Initial Volume (ml)	100	100	105
4.	Cooked volume (ml)	740	710	640
5.	Initial weight (g)	100	100	100
6.	Cooked weight (g)	725	700	592
c) Sensory evaluation score (1-10 score)				
1.	Colour & appearance	9.0	8.0	8.0
2.	Flavour	9.0	8.5	8.5
3.	Texture	9.0	8.0	7.0
4.	Taste	9.0	8.5	8.0
d) Fodder Characteristics				
1.	Dry matter (%)	21.43	20.56	19.50
2.	Crude Protein (%)	7.02	6.95	5.76
3.	Crude fibre (%)	9.53	20.68	24.34
4.	Potassium (%)	2.95	3.10	3.01
5.	Phosphorus (%)	0.18	0.15	0.14
6.	Miner matter (%)	2.15	2.00	1.85

Regarding grain quality characteristics, Proso millet culture TNAU 145 excels the check varieties and was found to be the best during cooking and sensory evaluation.

**Table 8. Morphological Characters of Proso millet culture TNAU 145**

S.No.	Character	TNAU 145	
		Range	Mean
1.	Days to 50% flowering	34-42	37.3
2.	Days to maturity	65-77	70.7
3.	Plant height (cm)	75-132	118.7
4.	Number of productive tillers	3-9	5.9
5.	Flag leaf length (cm)	18-33	28.6
6.	Flag leaf width (cm)	0.95-1.89	1.4
7.	Peduncle length (cm)	7.25-11.28	10.17
8.	Panicle exertion (cm)	4.35-9.88	5.67
9.	Length of inflorescence (cm)	22.56-39.21	33.76
10.	Grain yield per plant (g)	10.45-20.13	15.03
11.	Straw yield per plant (g)	20.67-42.01	30.33
12.	Harvest index	0.30-0.41	0.36
13.	1000 grain weight (g)	2.6-4.0	3.6
14.	Plant habit	Erect	
15.	Plant pigmentation at flowering	Green	
16.	Blade pubescence	Medium pubescent	
17.	Sheath pubescence	Medium pubescent	
18.	Degree of lodging at maturity	Slight	
19.	Senescence	Partial drying at maturity	
20.	Inflorescence comparactness	Large, open and draping	
21.	Fruit colour	Golden yellow	
22.	Grain shape	Oval	
23.	Seed size	Bold	

over the check respectively. In eleven multilocation trials the culture TNAU 145 recorded the grain yield of 1966 kg/ha and a straw yield of 7228 kg/ha which were 33.72 and 8.9 per cent increased grain and straw yield respectively over the check CO 4 (Table 2). On testing the culture in OFT for four years (2004-2007), it gave an average grain yield of 2610 kg/ha which is 20.3 per cent increase over the check CO 4 (Table 3). In All India Co-

ordinated Trials, the culture recorded a grain yield of 1819 kg/ha which is 31.5 and 24.9 per cent higher over the national checks K1 and GPUP 21 respectively (Table 4).

#### *Reaction to pests and diseases*

There were no major diseases and pest problems in this crop. Shootfly incidence was however noticed in some seasons (Table 5 and Table 6) during experimentation.

**Table 9. Overall performance of Proso millet culture TNAU 145**

S.No.	Name of the trial	No. of trials	Grain yield		Straw yield	
			TNAU 145	CO 4	TNAU 145	CO 4
1.	Station trials	6	2671	2124	8242	7557
2.	Multilocation trials	11	1966	1470	7228	6634
3.	On farm trials	140	2610	2170	6568	6019
4.	All India Coordinated trials	23	1819	--	4600	--
	<b>Total No. of trials</b>	<b>157</b>				
	Overall mean of 157 trials		2416	1921	7346	6121
	Per cent increase over CO 4		25.80		20.00	

*Grain quality*

This culture is rich in nutrients and having acceptable flavour and taste (Table 7).

*Morphological characters*

Proso millet variety, TNAU 145 attains 50 per cent flowering in 39-41 days after sowing and matures at 69-71 days after sowing. It has an erect plant habit with an average plant height of 119 cm. The panicle is open and large with bold grains which are oval in shape and golden yellow in colour (Table 8).

Considering the superior performance (Table 9) of the culture TNAU 145 over the check varieties CO 4, K 1 and GPUP 21, it was identified as a new variety by All India Coordinated programme on small millets and recommended for large scale cultivation in Tamil Nadu and Karnataka during 2007 by Central variety release committee.

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