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CO(Te) 7 - A high yielding Tenai variety

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Abstract : The tenai culture TNAU 196 is a derivative of the cross involving CO 5 x ISE 248 and was developed in the Department of Millets, Tamil Nadu Agricultural University, Coimbatore. It is a high tillering variety maturing in 85-90 days. The crop can be grown under rainfed conditions during *kharif* and *rabi* seasons and also suitable for *summer* season under irrigated condition wherever such condition exists. The panicle is long measuring 29 cm with densely packed grains. The grain is bold with attractive yellow colour. Extensive trials conducted from 2000 to 2004 in the Millet Breeding Station, other research stations of TNAU and farmers' holdings revealed its high yield potential and wide adaptability. It is capable of giving a mean grain yield of 1855 kg/ha while the National check SIA 326 has recorded 1477 kg/ha. In these trials, the local check CO 6 recorded 1554 kg/ha of grain yield. As compared to checks, TNAU 196 has registered an increase of 25.6 per cent over SIA 326 and 19.37 per cent over CO 6 in respect of grain yield. It is suitable for rainfed condition. In addition to higher yield potential, this culture also shows good grain quality with higher protein content of 13.62 per cent and calcium content of 0.35 per cent than the variety CO 6 in which protein and calcium contents were 11.62 per cent and 0.33 per cent respectively. In view of the high grain yield, grain quality and resistance to rust the culture TNAU 196 was released as new variety CO 7 for Tamil Nadu state during 2005.

Key words : Tenai, Foxtail millet, TNAU 196, CO (Te) 7

Introduction

Finger millet (*Setaria italica (L.)* Beauv) or tenai is cultivated as dryland crop under marginal and submarginal lands of tropical and subtropical Asia and temperate Europian countries. It was probably domesticated in eastern Asia and known to Chinese as early as 2700 BC. In India the crop is grown over an area of around 5 lakh hectare in Andhra Pradesh, Karnataka, Tamil Nadu, Rajasthan, Uttar Pradesh, Gujarat and North eastern states with an annual production of 2.9 lakh tones and productivity of 600 kg/ha. In Tamil Nadu it is grown over an area of around 3000 hectare.

The foxtail millet is comparable to rice or wheat in nutritive value. It is utilized both as food and fodder. Dehusking, debraning and polishing of grains is done by traditional and improved milling machinery. Dehusked grain can be cooked and consumed with pulses and vegetables. Its flour can be used for tasty preparations viz., porridge, pittu, chapatti, bread, cake and biscuit. The grain is widely used as livestock and poultry feed. The oil recovery from the bran ranges from 7-11 per cent which can be used in soap and paint industry. The oil can also be easily refined and bleached to render to edible (Narasimha Rao *et al* 1997). Therefore, development of a high yielding tenai variety with short duration and drought tolerance will play a major role in increasing the production and productivity of tenai crop. With this objective, breeding work was initiated and a new high yielding CO(Te) 7 variety was developed.

Materials and Methods

The tenai culture TNAU 196 was evolved at the Department of Millets, Tamil Nadu Agricultural

Table 1. Performance of TNAU 196 in Station trials

S.No.	Year	Grain yield (kg/ha)		Fodder yield (kg/ha)	
		TNAU 196	CO 6	TNAU 196	CO 6
1.	*Kharif* 1996	3590	3220	6200	5100
2.	*Rabi* 1996	2330	2120	5150	4800
3.	*Kharif* 1997	3306	3200	6350	5600
4.	*Rabi* 1997	2855	2550	5900	4700
5.	*Kharif* 1998	3490	2450	5400	4500
4.	*Rabi* 1998	2670	2040	5100	3300
	Mean	3040	2597	5683	4666
	% increase over CO 6	17.10		21.80	

Table 2. Performance of TNAU 196 in Multi Location trials

S.No.	Location	Grain yield (kg/ha)	
		TNAU 196	CO 6
	***Rabi* 2000-2001**		
1.	Coimbatore	3700	3200
2.	Kovilpatti	2100	1850
3.	Paiyur	3950	3250
4.	Yethapur	1750	1400
5.	Virinjipuram	1890	1600
6.	Bhavanisagar	2600	2150
	Mean	2665	2241
	***Kharif* 2001**		
1.	Coimbatore	3250	2600
2.	Kovilpatti	2450	2100
3.	Paiyur	3500	3010
4.	Yethapur	1900	1650
5.	Kalavai	1850	1600
6.	Virinjipuram	1193	880
7.	Bhavanisagar	2700	2736
	Mean	2406	2082
	***Rabi* 2001-2002**		
1.	Coimbatore	2600	2050
2.	Kovilpatti	834	987
3.	Paiyur	2159	1485
4.	Yethapur	1540	1250
5.	Kalavai	3400	3200
6.	Virinjipuram	2200	1810
7.	Bhavanisagar	3200	2800
	Mean	2276	1940
	Overall mean	2438	2080
	% increase over CO 6	17.21	

Table 3. Performance of TNAU 196 in ART (District wise mean)

S.No.	Location	No. of trials	TNAU 196	CO 6
I	**Tenai 2/99 - 2000**			
1.	Coimbatore	1	1567	1110
2.	Dharmapuri	1	1800	1525
3.	Erode	4	1193	1193
4.	Thiruvannamalai	2	615	605
5.	Karur	4	606	585
6.	Madurai	4	943	916
	Mean		1120	989
	% increase over CO 6		13	
II	**Tenai 2/2001 - 2002**			
7.	Coimbatore	1	440	420
8.	Thiruvannamalai	3	572	530
9.	Theni	4	906	797
10.	Erode	3	1034	941
11.	Cuddalore	2	1900	1860
12.	Karur	2	1540	1475
13.	Dharmapuri	4	802	771
	Mean		1025	969
	% increase over CO 6		6.0	
III	**Tenai 2/2002 - 2003**			
14.	Erode	2	1675	1568
15.	Namakkal	4	2050	1850
16.	Karur	2	770	731
17.	Theni	3	1139	991
	Mean		1501	1361
	% increase over CO 6		10.1	
	Total	46		
	Overall mean		1172	1070
	Overall % increase over CO 6		9.6	

Table 4. Performance of Tenai TNAU 196 in On Farm Trials 2003 - 04

S.No.	Location	Grain yield (kg/ha)	
		TNAU 196	CO 6
1.	**Villapuram**		
	Kallakurichy (20)	2350	1830
	Sankarapuram (10)	2410	1920
	Mean	2370	1860
2.	**Coimbatore**		
	Coimbatore	2240	1670
	Tirupur	2180	1560
	Mean	2216	1626
	Overall mean	2293	1743
	% increase over check	31.6	–

Table 5. Nutritional and cooking quality of TNAU 196

a. Nutritional Quality characters

S.No.	Particulars	TNAU 196	CO 6
1.	Crude protein (%)	13.62	11.62
2.	Crude Fat (%)	4.0	3.9
3.	Crude fibre (%)	34.0	31.0
4.	Ca (%)	0.35	0.33
5.	β-carotene (mg/g)	0.157	0.138

University, Coimbatore. The crosses were made between CO 5 and ISE 248. The elite plants were selected from F_2 onwards, evaluated for their sustained performance and homozygosity and the culture TNAU 196 was identified as the best. The culture TNAU 196 was evaluated in Millet Breeding Station, Coimbatore starting from 1996 to 1998, multilocation trails during 2000-2002, Adaptive Research trials during 1999-2004. Thus, a total of 135 trials was conducted. Besides, the reaction of the cultures was also scored against important pest and diseases and grain qualities as per the standard procedure (Anonymous, 2004).

Results and Discussion

The evaluation trial report of the tenai culture TNAU 196 from the station trial at Millet Breeding Station, Coimbatore is presented in Table 1. The culture TNAU 196 was tested in Station trails from 1996 to 1998. It has recorded an average grain yield of 3040 kg/ha and fodder yield of 5683 kg/ha which is 17.1 and 21.8 per cent increased yield over CO 6 respectively. Similarly under multilocation trials during 2000-2002, this culture recorded 2438 kg/ha of grain yield which is 17.2 per cent increase over the check CO 6 (Table 2). In Adaptive Research Trials (Table 3) from 1999 to 2003, this culture recorded 1172 kg/ha of grain yield which is 9.6 per cent increase over the check CO 6 (1070 kg/ha). When the culture TNAU 196 was tested in Onfarm trials (Table 4) in farmers' holdings at various districts of Tamil Nadu, recorded an average grain yield of 2293 kg/ha while the check CO 6 gave an average grain yield of 1743 kg/ha. This is 31.6 per cent increase over the check. Under All India Coordinated programme for small millets during 2001 - 2004 at all the zones of India the culture TNAU 196 has recorded an average grain yield of 1776 kg/ha where as the national check SIA 326 1477 kg/ha which is 20.2 per cent increase over the national check.

Nutritional and cooking quality

In addition to higher yield potential this culture TNAU 196 possess grain qualities (Table 5) with higher protein content of 13.62 per cent and calcium content of 0.35 per cent than the check variety CO 6 in which the protein and calcium contents are 11.62 and 0.33 per cent respectively.

Reaction to pests and diseases

The tenai culture TNAU 196 recorded moderate resistance reaction (Table 6) for leaf blast (Grade 1) and rust (Grade 2) and completely resistant to brown spot (Grade 0). There was no major pest in tenai. Eventhen the damage caused by leaf

Table 6. Reaction to major diseases - resistance score

S.No.	Disease incidence	TNAU 196	CO 6 (check)	PS 4 (check)	SIA 326 (check)
1.	Leaf blast	1	2	1	3
2.	Brown spot	0	2	1	3
3.	Rust	2	2	1	3

Table 7. Reaction to major pests - resistance score

S.No.	Pest infestation	TNAU 196	CO 6 (check)	SIA 326 (check)
1.	Leaf scrapping beetle	2	3	2
2.	Army worm	3	4	2

Table 8. Distinguishing Morphological Characters

S.No.	Character	TNAU 196	
		Range	Mean
1.	Days to 50% flowering	53 - 58	55
2.	Plant height (cm)	115 - 130	120
3.	No. of basel tillers	6 - 9	120
4.	Flag leaf length (cm)	30.5 - 40.6	35.9
5.	Flag leaf width (cm)	0.8 - 2.4	1.6
6.	Peduncle length (cm)	13.5 - 18.2	15.5
7.	Ear length (cm)	25.6 - 33.9	29
8.	Panicle excertion	Full excertion	
9.	Days to maturity (days)	85 - 90	88
10.	Grain yield per plant (g)	10.0 - 16.0	12.0
11.	Thousand grain weight (g)	2.8 - 3.0	3.4
12.	Plant pigmentation at flowering	Green to purple	
13.	Leaf colour	Green to purple	
14.	Blade pubescence	Intermediate	
15.	Sheath pubescence	Glabrous	
16.	Degree of lodging at maturity	Non lodging	
17.	Senescence	Remain non senescent	
18.	Inflorescence lobes	Short primaries	
19.	Inflorescence bristles	Very short	
20.	Lobe compactness	Compact	
21.	Inflorescence shape	Cylindrical	
22.	Inflorescence compactness	Compact	
23.	Fruit colour	Yellow	
24.	Grain shape	Round	
25.	Apical sterility in panicle	Absent	

scrapping beetle and armyworm was less when compared with the check CO 6 (Table 7).

Morphological characters

The tenai culture TNAU 196 matures in 85-90 days and attains 50 per cent flowering after 53-59 days of sowing. It has erect plant type with 115-130 cm height. The leaves and inflorescence at anthesis show green to purple pigmentation. The panicle is long, cylindrical and compact with yellow round grain. The thousand grain weight is 2.8-3.0g (Table 8).

Considering the superior performance of the culture TNAU 196 over check variety (Table 9) and based on the above desirable features, it was released as CO(Te) 7 tenai by the Tamil Nadu Agricultural University, Coimbatore during 2005 for the small millet growing tracts of Tamil Nadu.

Table 9. Overall performance of Tenai TNAU 196

S.No.	Name of the trial	No. of trials	Grain yield (kg/ha)			Fodder yield (kg/ha)		
			TNAU 196	CO 6	SIA 326	TNAU 196	CO 6	SIA 326
1.	Research station trials (1996-1998)	6	3040	2596	–	5383	4666	–
2.	Multilocation trials (2000-2002)	20	2438	2080	–	–	–	–
3.	Adaptive research trials (1999-2004)	46	1185	1081	–	–	–	–
4.	On farm trials (2003 - 04)	35	2293	1743	–	–	–	–
5.	All India Coordinated trials (2001-2004)							
	FIVT	7	2102	–	1789	5700	–	4300
	FAVT	10	1615	1465	1156	4600	4700	4300
	FAVT	1	1612	1531	1487	4500	4200	4500
	Overall mean	135	1855	1554	1477	5138	4633	4322
	% Increase over CO 6		19.37			10.9		
	% Increase over SIA 326		25.6			18.9		

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