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Research Article

A high green fodder yielding Cumbu Napier hybrid grass CO 6 suited for the states of Central and North Western Zones

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Abstract

A high yielding Cumbu Napier hybrid clone TNCN 1280 was evolved from an inter specific cross between fodder Cumbu CO 7 and Napier grass FD 459 at the Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore and identified for release as CO 6 for the states of Central and North Western Zone of India during 2019. The clone TNCN 1280 had registered a mean green fodder yield of 385.3t/ha than the check CO (BN) 5 (343 t/ha) in station trials conducted from 2013 to 2015 and the per cent increase over the check was 12.3. Under Multi Location Trial (2015 to 2018), TNCN 1280 recorded the green fodder yield of 386.4 t/ha with a yield advantage of 6.03 per over the check CO (BN) 5. Simultaneously the clone was evaluated under AICRP on FC&U trials from 2016-2018 and the clone TNCN 1280 recorded 13.6, 11.4 and 8.2 per cent higher green fodder yield than the national checks CO (BN) 5, CO 3 and NB 21, respectively in North Western Zone. Similarly in Central Zone also, TNCN 1280 registered a superior green fodder yield than the national checks namely CO (BN) 5 (18.8%), CO 3 (12.0%) and NB 21 (43.3%). For dry matter yield, TNCN 1280 out yielded the national checks CO (BN) 5 (11.7%), CO 3 (11.5%) and NB 21 (14.9%) in North Western Zone. The clone TNCN 1280 exhibited its superiority for crude protein yield against two national checks CO (BN) 5 (20.6%) and NB 21 (27.2%) in North Western Zone, and in Central Zone, it recorded 14.7, 9.3 and 19.4 per cent superiority over the national checks CO (BN) 5, CO 3 and NB 21, respectively. It is resistant to leaf blight and moderately resistant to leaf spot disease. It ranked first in North Western Zone and Central Zone for green fodder yield. Based on the overall performance of TNCN 1280, it was identified for release as Cumbu Napier hybrid grass CO 6 for the states of North Western Zone and Central Zone of India.

Key words

Cumbu Napier hybrid grass, green fodder yield, dry matter yield, Crude protein

INTRODUCTION

Cumbu Napier hybrid is an inter-specific hybrid between Cumbu (*Pennisetum glaucum*) and Napier grass (*P. purpureum* Schumach) which combines desirable traits such as palatability and faster growth from Cumbu with the deep root system, multi cut habit and robustness of Napier grass. It is widely distributed in sub-tropical regions of Asia, Africa, Southern Europe and America. In India, it is mainly cultivated in Punjab, Haryana, UP, Bihar, Madhya Pradesh, Odisha, Gujarat, West Bengal, Assam, Andhra Pradesh, Kerala and Tamil Nadu.

The hybrid grass grows throughout the year in the tropics. It tolerates pH ranging from 5 to 8. The hybrid grass is superior in quality to Napier grass and contains about 10.2 per cent crude protein and 30.5 per cent crude fibre. The stems are succulent, leaves are large and green, the sheaths are softer and the margins less serrated and hence the herbage is palatable. It is less fibrous and more acceptable. The hybrid grass once planted supplies fodder continuously and regularly for a minimum period of three years. The cost of production is almost half that

of single-cut crops. The production per unit area and time are approximately double than of conventional fodders. It is a triploid grass, so does not produce any seeds. It produces more number of tillers and leaves. It grows fast and produces more herbage (Forage Crops varieties, IGFRI, 2011).

To meet the current level of livestock production and its annual growth in population, the deficit in all components of fodder, dry crop residues and feed has to be met either from increasing productivity/ utilizing untapped feed resources or increasing land area. Further, land allocation to green fodder cultivation has been limited to 8.4 m. ha (4.50 %) and usually did not exceed five per cent of the gross cropped area. About 90 per cent of the milk is produced by small and marginal farmers and landless agricultural labourers. The low productivity of milch animals is mainly due to a chronic shortage of feed and fodder coupled with a poor quality especially during the lean period. At present, the country faces a net deficit of 35.6 per cent green fodder, 10.95 per cent dry crop residues and 44 per cent concentrate feed ingredients (Vision document 2050, ICAR-IGFRI, Jhansi)

Enhancing the availability of nutritious green fodder throughout the year and getting higher continuous milk is the national objective being envisaged by the Government of India. The only solution bridging the gap between the

demand and supply of green fodder lies in maximizing the fodder production in space and time, by identifying new forage resources and increasing the fodder production within the existing farming system.

MATERIAL AND METHODS

Hybridization between fodder Cumbu and Napier grass was made during 2010 at New area farm, Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. The objective of the programme was to develop high yielding Cumbu Napier hybrid grass for green fodder yield and quality. Promising clones possessing desirable characters which contribute towards high biomass, high leaf stem ratio and succulent stem were selected from the F_1 generation. These clones were evaluated at various stages for their yield, quality and sustained performance. As a result, an elite clone TNCN 1280 was identified and evaluated with the check CO (BN) 5 under station trials from 2013 to 2015. The clone TNCN 1280 was evaluated at nine locations under Multi Location Trials from 2015 to 2018. It was nominated for AICRP on Forage crops and Utilization for conducting All India Coordinated varietal trial from 2016 to 2018. The nominated clones have been multiplied and the trial was conducted with three replications in RBD design. All biometric observations have been recorded from 2016 to 2018 in AICRP trials.

Table 1. Mean performance of Cumbu Napier hybrid grass TNCN 1280 for Green fodder yield (t/ha) in station trials and in MLT

S. No.	Trials	Number of Trials	TNCN 1280	CO (BN) 5	% increase over CO (BN) 5
1.	Research Station Trials (2013-15)	2	385.3	343.00	12.3
2.	Multi Location Trials (2015-18)	15	386.4	364.40	6.03
	Overall Mean		385.85	353.70	9.08

RESULTS AND DISCUSSION

The Cumbu Napier hybrid clone TNCN 1280 along with the check CO (BN) 5 was evaluated under station trials from 2013 to 2015 for green fodder yield. The clone, TNCN 1280 had recorded the highest green fodder yield of 385.3 t/ha as compared to the check CO (BN) 5 (343 t/ha). The per cent increase in green fodder yield (GFY) over check CO (BN) 5 was 12.3. Under Multi Location Trial, the clone TNCN 1280 recorded a green fodder yield of 386.4 t/ha over the check CO (BN) 5 which was a 6.03 per cent green fodder yield increase over the check CO (BN) 5 (Table 1).

In the AICRP trials, TNCN 1280 had ranked first at North Western Zone and Central Zone for green fodder yield, dry matter yield and crude protein content (Anonymous 2016, Annual Report, AICRP on FC & U, 2016-18).

In North Western Zone, TNCN 1280 recorded the highest

green fodder yield (81.2 t/ha), than the national checks, CO (BN) 5 (71.45 t/ha), CO 3 (72.92 t/ha) and NB 21 (75.06 t/ha) and the per cent increase over the national checks was 13.6, 11.4 and 8.2 per cent respectively. Similarly in Central Zone also, TNCN 1280 registered a higher green fodder yield (130.49 q/ha) than the national checks CO (BN) 5 (109.85 t/ha), CO 3 (116.55 t/ha) and NB 21 (91.03 t/ha) and the per cent increases over the national checks was 18.8, 12.0 and 43.3 per cent, respectively (Table 2). Further, it was superior in terms of dry matter yield (17.75 q/ha) which was an 11.7, 11.5% and 14.9 per cent increase over the national checks CO (BN) 5, CO 3 and NB 21, respectively in the North Western Zone. The dry matter yield of 25.99 t/ha and it is 17.3 per cent over the national check NB 21 in the Central Zone (Table 2). Higher dry matter content in forage crops assumes significance as it is the portion of feed that contains the nutrients: energy, protein, fibre, vitamins and minerals required for the growth and development of livestock.

Table 2. Performance of Cumbu Napier hybrid grass TNCN 1280 for GFY (t/ha) and DMY (t/ha) under coordinated trials of AICRP

Particulars	Year	NORTH WESTERN ZONE									CENTRAL ZONE						
		No. of locations	TNCN 1280	National checks			Qualifying varieties			Number of locations	TNCN 1280	National checks			Qualifying varieties		
				CO (BN) 5	CO 3	NB 21	BNH 14	BNH 11	BNH 22			CO (BN) 5	CO 3	NB 21	BNH 11	PBN 351	BNH 12
Mean GFY (t/ha)	2016	02	96.58	79.81	96.07	100.99	114.59	113.91	119.40	05	139.10	127.55	117.79	89.12	125.29	126.87	113.77
	2017	03	56.45	53.02	50.86	52.13	54.63	55.32	51.70	07	157.00	132.65	148.20	123.43	168.27	172.95	164.26
	2018	02	90.57	81.51	71.82	72.07	84.04	73.70	70.34	05	95.37	69.35	83.65	60.56	116.83	91.47	98.19
Grand Mean			81.20	71.45	72.92	75.06	84.42	80.97	80.48		130.49	109.85	116.55	91.03	136.80	130.43	125.41
% increase over the Grand Mean				13.6	11.4	8.2	-3.8	0.3	0.9			18.8	12.0	43.3	-4.6	0.0	4.1
All India rank	2016		1	5	8	9	2	3	6		1	5	8	9	3	4	7
	2017		4	7	5	9	5	2	8		4	7	5	9	2	1	3
	2018		1	4	8	7	3	6	9		3	8	6	9	1	4	2
Mean DMY (t/ha)	2016	02	23.82	19.76	22.14	21.48	28.91	25.97	29.95	05	25.42	27.20	25.44	20.35	24.23	28.95	23.92
	2017	03	13.13	13.06	11.29	11.54	13.02	12.89	12.36	07	36.44	33.77	32.37	32.33	41.42	38.80	35.00
	2018	02	16.31	14.86	14.31	13.34	15.94	15.01	12.91	05	16.11	14.06	17.17	13.79	25.29	22.86	19.33
Grand Mean			17.75	15.89	15.92	15.45	19.29	17.96	18.41		25.99	25.01	25.00	22.16	30.31	30.20	26.08
% increase over the Grand Mean				11.7	11.5	14.9	-8.0	-1.1	-3.6			3.9	4.0	17.3	-14.3	-13.9	-0.4
All India rank	2016		2	4	7	9	1	6	5		2	4	7	9	6	3	8
	2017		4	5	8	9	6	1	3		4	5	8	9	1	2	7
	2018		7	8	5	9	2	1	6		7	8	5	9	8	1	4

Table 3. Performance of CO 6 for Crude protein yield (q/ha) and Crude protein percentage under coordinated trials of AICRP over three years

Particulars	Year	NORTH WESTERN ZONE									CENTRAL ZONE						
		No. of locations	TNCN 1280	National checks			Qualifying varieties			No. of locations	TNCN 1280	National checks			Qualifying varieties		
				CO (BN) 5	CO 3	NB 21	BNH 14	BNH 11	BNH 22			CO (BN) 5	CO 3	NB 21	BNH 11	PBN 351	BNH 12
Mean Crude Protein Yield (q/ha)	2016	01	29.9	18.4	31.7	22.2	35.9	24.4	33.2	06	14.1	12.6	12.7	9.5	12.7	12.7	11.5
	2017	01	5.6	4.4	4.7	4.6	4.8	5.0	3.1	06	26.4	23.6	22.2	24.2	30.2	28.6	25.8
	2018	01	12.6	17.1	15.1	11.0	14.7	12.2	13.8	05	12.1	9.7	13.3	10.4	18.7	16.6	13.7
Grand Mean			16.0	13.3	17.2	12.6	18.5	13.9	15.4		16.0	13.3	17.2	12.6	13.9	13.6	15.4
% increase over the Grand Mean				20.6	-6.6	27.2	-13.2	15.6	-4.0			14.7	9.3	19.4	-14.6	-9.0	3.1
All India rank	2016		2	6	5	9	1	7	3		2	6	5	9	7	4	8
	2017		4	6	8	7	3	1	8		4	6	8	7	1	2	5
	2018		6	8	4	7	3	1	8		6	8	4	7	1	2	5
Mean Crude Protein (%)	2016	02	10.1	9.1	11.4	9.3	10.3	9.6	9.5	05	7.7	7.9	7.9	7.7	8.0	7.8	8.0
	2017	01	5.1	4.7	5.4	5.0	5.0	4.9	4.4	06	7.0	7.2	7.2	7.4	7.1	7.1	7.4
	2018	01	6.0	8.6	8.4	6.3	7.0	6.6	7.7	06	7.7	7.5	7.5	7.7	7.7	7.5	7.8
Grand Mean			7.1	7.5	8.4	6.9	7.4	7.0	7.2		7.5	7.5	7.5	7.6	7.6	7.5	7.7
% increase over the Grand Mean				-5.5	-15.8	2.6	-4.9	0.5	-2.1			-1.1	-0.5	-1.7	-1.5	-0.1	-3.5
All India rank	2016		3	4	3	5	1	5	4		3	4	3	5	5	4	2
	2017		3	2	3	4	1	4	6		3	2	3	4	4	5	2
	2018		3	4	2	1	3	3	4		3	4	2	1	3	3	3

Table 4. Location wise disease resistance of TNCN 1280 under co-ordinated trials of AICRP (FC) at Rahuri and Palampur

Name of the Trial	Year	Disease	TNCN 1280		CO 3		CO (BN) 5		NB 21	
			Scoring	Reaction	Scoring	Reaction	Scoring	Reaction	Scoring	Reaction
VTBN	2016	Leaf blight	2.00	R	2.33	MR	1.33	R	2.33	MR
2015	2018	Leaf spot	3.00	MR	1.00	R	1.00	R	1.00	R

Table 5. General botanical description of Cumbu Napier hybrid grass TNCN 1280

1.	Name of the variety	Cumbu Napier Hybrid grass TNCN 1280 as CO 6
	Common name	Cumbu Napier Hybrid
	Botanical name	Interspecific hybrid between Fodder Cumbu CO 7 (<i>Pennisetum glaucum</i>) and Napier grass FD 459 (<i>P. purpureum</i> Schumach).
	Family status	Poaceae
2.	Growth habit	Robust Tillering perennial grass
3.	Foliage	High leafy (300-350 leaves/clump); long and broad leaves (100-110 cm long and 4.0-5.0 cm width). Leaf colour: Medium green Shape: Lanceolate Texture: Soft Leaf sheath: Glabrous Leaf margin: Slightly serrated
4.	Flower colour	Light yellow
5.	Days to 50% flowering	Does not arise
6.	Days to 50% maturity	Does not arise
7.	Days to maturity	First cut on 75-80 days after planting and subsequent cuttings at 45 days interval. Being perennial, can remain in the field for 3-4 years.
8.	Panicle colour	Light yellow
9.	Inflorescence length	25-30 cm (Bristled)
10.	Number of seeds/ spikelet	Does not arise since propagated through stem cuttings/ rooted slips
11.	1000-seed weight	Does not arise because of triploid nature
12.	Seed colour	Does not arise
13.	Seed shape and size	Does not arise

**Field view of Cumbu Napier hybrid grass TNCN 1280**

TNCN 1280 exhibited its superiority for crude protein yield against two national checks CO (BN) 5 (20.6 %) and NB 21 (27.2 %) in North Western Zone. In Central Zone, TNCN 1280 recorded 14.7, 9.3 and 19.4 per cent superiority over the national checks CO (BN) 5, CO 3 and NB 21, respectively in All India Coordinated trials over three years (**Table 3**). For crude protein content, TNCN 1280 registered the highest crude protein content of 7.1 and 7.5 per cent in the North western Zone and Central Zone respectively. The hybrid grass TNCN 1280 is moderately resistant to leaf blight and moderately resistant to leaf spot disease (**Table 4**).

TNCN 1280 registered higher green fodder yield in all the trials conducted such as Station trials (2013 to 2015), MLT (2015 to 2018) and AICRP trials (2016 to 2018). The general botanical description of the Cumbu Napier hybrid grass CO 6 is shown in **Table 5**. Considering the performance of TNCN 1280 for green fodder yield, in Central and North Western Zones comprising the States of Punjab, Haryana, Rajasthan, Maharashtra, Gujarat, Uttar Pradesh, Madhya Pradesh and Chhattisgarh, it was proposed and identified for released as Cumbu Napier hybrid grass CO6.

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