



Research Article

A high yielding multicut fodder Sorghum CO 31

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Abstract

A high green fodder yielding and non seed shattering multicut fodder sorghum culture TNFS 0952 was developed at the Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore and released as Fodder sorghum CO 31 during 2014. It is a Gamma ray (400 Gy) mutant of multicut fodder sorghum variety CO (FS) 29. TNFS 0952 had registered exceedingly higher green fodder yield of 192 t/ha/yr against the check CO (FS) 29 (167 t/ha/yr). The per cent increase in green fodder yield over the check CO (FS) 29 was 14.9. In the station trials, it had registered a mean green fodder yield of 201 t/ha /yr as compared to check CO (FS) 29 (172.8 t/ha /yr) while the results obtained from on farm trials revealed that TNFS 0952 executed a mean green fodder yield of 183 t/ha /yr as against 161.2 t/ha /yr in CO (FS) 29. The per cent increase in green fodder yield over CO (FS) 29 was 16.3 and 13.5 respectively. The HCN content of TNFS 0952 was recorded to be 172 ppm after flowering as compared to CO (FS) 29 (185 ppm) which reduces the risk of HCN toxicity to the animals. TNFS 0952 recorded higher dry matter per cent (25.9) which contributed to higher dry matter yield (49.73 t/ha/yr). Reduced fibre content (19.80 %) confers increased digestibility and palatability. The seeds after physiological maturity in TNFS 0952 were found to be intact as compared to CO (FS) 29. Its non shattering behavior of seeds facilitate enhanced seed yield to the tune of 19.1 % than CO (FS) 29.

Key words:

Multicut fodder sorghum, green fodder, HCN, dry matter

Introduction

Fodder production is 'harbinger' of white revolution through less favoured areas. The scarcity of green fodder and grazing resources in the country has made the livestock to endure continuously with malnutrition resulting in their production potentiality at sub optimal level as compared to many developed nations. India is having the richest livestock population of 520 million heads, which is about 20 per cent of the world's livestock population. India supports 55, 16, 20 and 5 per cent of world's buffaloes, cattle, goats and sheep population, respectively. But, the country has only 4.4 per cent of the cultivated area under fodder crops with an annual total forage production of 833 m t (390 m t green and 443 m t dry). Whereas, the annual forage requirement is 1594 m t (1025 m t green and 569 m t dry) to cater to the existing livestock population.

The present feed and fodder resources of the country can meet only 48 per cent of the requirement, with a vast deficit of 61.1 per cent and 21.9 per cent of green and dry fodder, respectively. To overcome this deficit, dairy farmers resort to the enhanced use of costly concentrate feeds, which ultimately increases the cost of production. It is pertinent to note that out of the total cost of milk production, the feed cost alone accounts for 65 to 70 per cent. In Tamil Nadu,

the area under fodder crops is estimated at 1.72 lakh ha (Season and Crop Report, 2009-10) producing forage of 340 lakh tonnes annually as against the requirement of 486 lakh tonnes. The area under permanent pastures and other grazing land is 1.10 lakh ha only. Although, India stands first in milk production (127.9 m t) in the world (www.nddb.coop), the productivity per animal is far below compared to the developed countries, which is due to supply of inadequate quantity of quality fodder. The average yield per dairy cow per year in India is estimated to be 1,284 kg of liquid milk, while it is 6,212 kg in the European Union and 9,117 kg in the United States (www.faostat.fao.org).

In India, due to increased population pressure and competing demand for food crops, it is not possible to increase the area under fodder crops. The only way to bridge the large gap between supply and demand of fodder is to maximize the fodder production per unit area and unit time within the existing farming systems and utilizing marginal, sub marginal dry lands and problematic soils for developing feed and fodder resources.

Sorghum is one of the widely adopted forage crops due to its high yielding ability, better nutritive value and suitability for ratooning. It occupies maximum

area among different fodder crops (Grewal *et al.*, 2005). Sorghum fodder is suitable for silage and hay making. In India, fodder sorghum is grown in 2.6 m ha mainly in western UP, Haryana, Punjab, Rajasthan and Delhi and fulfills over two third of the fodder demand during *Kharif* season. Forage sorghum plant grows 6 to 12 ft tall and produces more dry matter tonnage than grain sorghum. Sorghum is fast-growing, warm weather annual that can provide plenty of feed in midsummer during lean period. Sorghum is best suited to warm, fertile soils whereas cool, wet soils limit its growth. The crop tolerates drought relatively well, though adequate fertility and soil moisture maximize sorghum yields. The plant becomes dormant in the absence of adequate water, but it does not wilt readily. Growth resumes when moisture conditions improve.

Multicut fodder sorghum is more advantageous in many ways such as high yield in short period, saving in terms of seed and land preparation. Therefore, it is very popular among the fodders (Grewal *et al.*, 2005). To fulfill this demand, a multicut fodder sorghum CO (FS) 29 was developed from TNAU, Coimbatore and released during 2001 for general cultivation in Tamil Nadu. It is obsessed with all desirable features except for the seed shattering behavior. The seeds after physiological maturity shatter completely from the rachis of the panicle which poses problem when the crop was allowed for seed multiplication.

Hence, attempts have been made at Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore through Mutation breeding using gamma rays to arrest the seed shattering behavior and as a high fodder yielding and non seed shattering multicut fodder sorghum CO 31 has been identified and released at state level during 2014. The performance and salient features of the new variety in comparison with the check variety are presented hereunder.

Material and Methods

It is a Gamma ray (400 Gy) mutant of multicut fodder sorghum variety CO (FS) 29. The detailed mutational breeding programme and method of evaluation on TNFS 0952 are shown in the Fig.1. The culture TNFS 0952 was found to be highly promising with regard to biomass coupled with non shattering habit. Being perennial, the culture was subjected to continuous evaluation in the station trials for three years from 2008-09 to 2010-11 for seed yield, green fodder yield and quality. Simultaneously, on farm trials numbering 83 were conducted in Coimbatore, Tirupur, Erode, Salem, Namakkal, Cuddalore,

Thiruvannamalai, Perambalur, Sivagangai, Thoothukudi, Virudhunagar, Dindigul and Theni districts from 2010-11 to 2012-13.

Results and Discussion

TNFS 0952 had registered remarkably higher green fodder yield of 192 t/ha/yr against the check CO (FS) 29 (167 t/ha/yr). The per cent increase in green fodder yield over the check CO (FS) 29 was 14.9 (Table 1). In the station trials, it had accomplished a mean green fodder yield of 201 t/ha/yr as compared to check CO (FS) 29 (172.8 t/ha/yr) while the results obtained from On Farm Trials revealed that TNFS 0952 executed a mean GFY of 183 t/ha/yr as against 161.2 t/ha/yr in CO (FS) 29. The per cent increase in GFY over CO (FS) 29 was 16.3 and 13.5 respectively. The most significant part of TNFS 0952 is that the seeds after physiological maturity found to be intact as compared to CO (FS) 29. Its non shattering behavior of seeds facilitate enhanced seed yield to the tune of 19.1 % than CO (FS) 29 (Table 2). The average seed yield of TNFS 0952 is 991 kg/ha/year as against 832 kg/ha/year in CO (FS) 29. Seeds can be harvested thrice in a year and fresh seeds have dormancy for a period of 45-60 days and hence should be used for sowing only after 60 days.

TNFS 0952 recorded highest crude protein percentage of 9.86 which resulted in higher crude protein yield (4.90 t/ha/yr) as compared to CO (FS) 29 (8.64 % and 3.41 t/ha/yr). Similarly, higher dry matter per cent in TNFS 0952 (25.9) contributed to higher dry matter yield (49.73 t/ha/yr). Reduced fibre content (19.80 %) confers increased digestibility and palatability. The HCN content of TNFS 0952 was recorded to be 172 ppm after flowering as compared to CO (FS) 29 (185 ppm) which reduces the risk of HCN toxicity to the animals. Nitrogen and Potassium contents are relatively higher in TNFS 0952 as compared to CO (FS) 29 (Table 3). As the length and breadth of leaves are higher as compared to the check, the leaf stem ratio is comparatively higher (Table 4). The colour of the seeds is characterized by dark purple as against black in CO (FS) 29.

Special features of TNFS 0952

- High tillering with broad leaves
- Enhanced seed yield due to intact seeds
- Low HCN (172 ppm) and crude fibre (19.8 %)
- High dry matter yield (49.73 t/ha/yr)
- Superior ratooning ability renders 6-7 harvests per year
- Highly palatable, preferred by milch cattle, goat and sheep



References

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Table 1. Mean green fodder yield of Multicut fodder sorghum TNFS 0952

Trials	No. of trials	Green fodder yield (t/ha/year)		% increase over CO (FS) 29
		TNFS 0952	CO (FS) 29	
Research Station Trial - 2008-09 to 2010-11	3	201.0	172.8	16.3
On Farm Trial - 2010-11 to 2012-13	83	183.0	161.2	13.5
Over all mean		192.0	167.0	14.9

Table 2. Mean seed yield of Multicut fodder sorghum TNFS 0952

Trials	No. of trials	Seed yield (t/ha/year)		% increase over CO (FS) 29
		TNFS 0952	CO (FS) 29	
Research Station Trial - 2008-09 to 2010-11	3	0.970	0.819	18.4
On Farm Trial - 2010-11 to 2012-13	50	1.011	0.844	19.8
Over all mean		0.991	0.832	19.1

Table 3. Quality characters of Multicut fodder sorghum TNFS 0952

Characters	TNFS 0952	CO (FS) 29
Dry matter (%)	25.9	23.6
Dry matter yield (t/ha/yr)	49.73	39.41
Crude protein (%)	9.86	8.64
Crude protein yield (t/ha/yr)	4.90	3.41
Crude fibre (%)*	19.80	21.00
Crude fat (%)*	2.5	2.25
HCN (ppm)	172	185
Nitrogen (%)	2.01	1.52
Phosphorus (%)	0.144	0.151
Potassium (%)	1.45	1.22

* Reduced fibre content improves the digestibility

Table 4. Morphological characters of Multicut fodder sorghum TNFS 0952

Characters	TNFS 0952	CO (FS) 29
Leaf colour	Green	Green
4 th leaf length (cm)	85 - 95	80 - 90
4 th leaf width (cm)	4.5 - 5.0	3.5 - 4.2
No. of leaves/stem	9-11	8-10
Leaf stem ratio	0.26	0.24
Ligule	Membranous	Hairy
Leaf midrib colour	White	White
Waxy bloom	Present	Slightly present
Plant height (cm)	270 - 290	260 - 280
No. of tillers /plant	12-17	10-15
Stem girth (cm)	3.5 - 4.0	2.5 - 3.0
Days to 50% flowering	65 - 70 days	65 - 70 days
Length of panicle (cm)	45 - 55	40 - 50
No. of spikelet's per panicle	50 - 55	45-50
Inflorescence compactness	Loose erect	Loose semi erect
Seed colour	Dark purple	Black
Seed size	Medium bold	Medium slender
Shattering	Very low	Very high
Endosperm colour	Light brown	Light brown
Awns	Present	Present
1000 seed weight (g)	5.2	5



Luxurious growth of TNFS 0952



Profuse tillering with broader and longer leaves

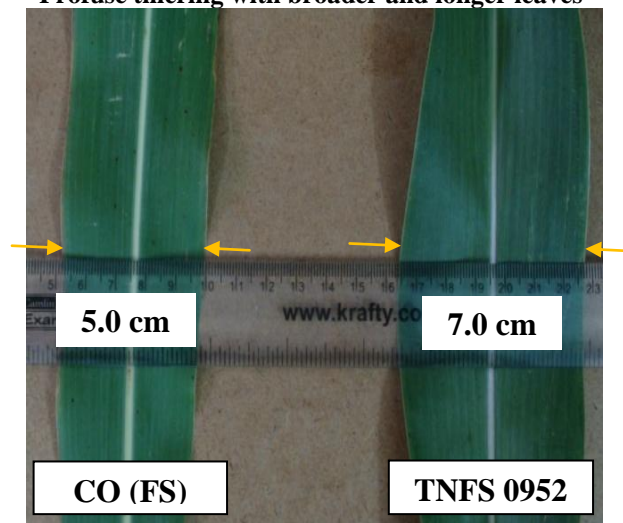
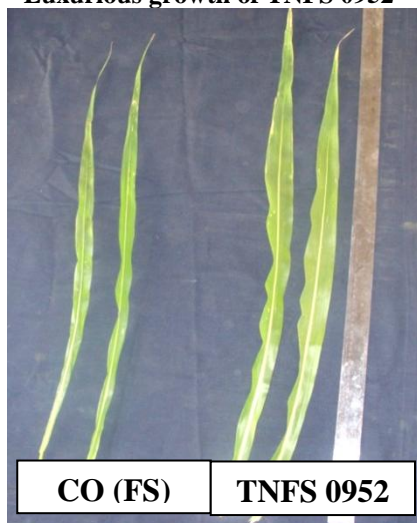


Fig 1.. Morphological features of Multicut fodder sorghum TNFS 0952