

**Research Article****A high yielding fodder cowpea CO 9****C. Babu, K. Iyanar, G. Vijayakumar, A. Kalamani, K. Velayudham, A. Velayutham, C.R. Anandakumar and K. Ganesamurthy**Department of Forage Crops, Centre for Plant Breeding and Genetics  
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**Abstract**

A high green fodder yielding fodder cowpea culture TNFC 0924 bred and developed in the Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore was released as Fodder cowpea CO 9 during 2016. It is a cross derivative of CO 5 and Bundel Lobia 2. This culture was identified owing to its superior performance in the Station trials conducted from 2010 to 2012. It was evaluated in OFT and MLT. Simultaneously it was tested in AICRP trials during 2012 and 2013. TNFC 0924 had performed better for green fodder and dry matter yield besides higher protein content than the check. Reduced fibre portions like crude fibre (19.9 %), Acid Detergent Fibre (28.0) and Neutral Detergent Fibre (34.0) confers increased palatability, digestibility and intake rate. It is moderately resistant to Yellow Mosaic Virus and resistant to major pests. TNFC 0924 is obsessed with higher green fodder, dry matter and crude protein yield. The palatability, digestibility and intake rate is higher as compared to the check CO (FC) 8.

**Key words**

Fodder cowpea, Crude Protein, Crude fibre, Acid Detergent Fibre, Neutral Detergent Fibre, 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, 2012-13) 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 (132.4 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.

Leguminous fodders are regarded as 'Natural Protein Banks' to livestock as they produce and supply the major portion of the world's plant protein. Legume forages are equal to concentrates and are likely to be substitutes for the later.

Cowpea is considered as an important annual herbaceous and leafy leguminous fodder crop owing to its high nutritional value and short duration. It is grown over two-thirds of the developing world usually as a companion or relay crop with major cereals. Development of new varieties that are resistant to insects and pests or shorter life cycles have contributed to increase cultivation of the crop (Rachie, 1985). Cowpea can make a valuable contribution towards livestock fodder and supply nitrogen to the soil (Lal *et al.*,

1978). The feeding value of fodder cowpea is high and quite comparable with Lucerne.

In India, it is grown in some parts of Rajasthan, Gujarat, Maharashtra, Karnataka and Tamil Nadu. It has a great potential for sustainable agriculture in marginal lands and semi-arid regions of the country. It is estimated that about 6.5 lakh hectare is under different forms of cowpea and the share of fodder cowpea is 3 lakh ha (IGFRI, 2013). It is grown alone or as a mixture for fodder purposes usually with sorghum (*Sorghum bicolor*), bajra (*Pennisetum americanum*), maize (*Zea mays*) and sugarcane (*Saccharum officinarum*).

### Materials and methods

The earlier variety CO (FC) 8 was released during 2004. In order to improve its green fodder yield potential, hybridization programme was initiated during 2008 involving elite fodder cowpea parents. A promising entry TNFC 0924 was identified from the cross combination of CO 5 x Bundel Lobia 2. The detailed breeding programme and method of evaluation of TNFC 0924 are shown in the fig.1.

After stabilization TNFC 0924 was subjected to evaluation against CO (FC) 8 from 2010 to 2012 at Forage Research Farm, Coimbatore. It was nominated for inclusion in AICRP trials and evaluated during 2012 and 2013 in 21 locations of 11 states comprising of all the five zones across India. It was also evaluated in Multi Location Trial during 2014 in 14 research stations of TNAU covering 13 districts of Tamil Nadu. It was proposed for conducting OFTs during 2013 and 2014. A total of 87 OFTs was conducted across Tamil Nadu.

### Results and discussion

In the station trials, TNFC 0924 had accomplished a green fodder yield of 20.16 t/ha as compared to check CO (FC) 8 (17.43 t/ha). The per cent increase in green fodder yield (GFY) over CO (FC) 8 was 15.66. TNFC 0924 ranked first at National level during *kharif* 2012 and 2013 consecutively for green fodder yield, dry matter yield and crude protein yield in the AICRP trials. During *kharif* 2012, it was tested in 21 locations comprising of all the five zones across India and recorded a mean GFY of 28.59 t/ha over the National check Bundel Lobia 1 with a superiority level of 19.22 %. The results of MLT conducted at 14 centres revealed that, TNFC 0924 had recorded a green fodder yield of 23.55 t/ha as against the check (19.65 t/ha). The per cent increase in GFY over CO (FC) 8 was 19.85. The results obtained from On Farm Trials revealed that TNFC 0924 had registered a mean GFY of 24.76 t/ha as against 20.74 t/ha in CO (FC) 8. The per cent increase in GFY over CO (FC) 8 was 19.38 respectively (Table 1).

The overall results revealed that the culture TNFC 0924 had registered remarkably higher mean green fodder yield of 22.82 t/ha against the check CO (FC) 8 (19.27 t/ha). The per cent increase in green fodder yield over the check was 18.42. The seed yield potential of TNFC 0924 was higher (745 kg/ha) as compared to CO (FC) 8 (610 kg/ha) being bold size of seeds (plate 1).

TNFC 0924 had exhibited superior performance in almost all the locations against the corresponding checks with respect to yield and quality thus proving its wider adoptability.

With regard to quality aspects, TNFC 0924 recorded higher crude protein percentage of 21.56 which resulted in higher crude protein yield (0.83 t/ha) as compared to CO (FC) 8 (19.54% and 0.59 t/ha) (Table 2). Similarly, higher dry matter content in TNFC 0924 (16.86%) contributed to higher dry matter yield (3.85 t/ha). Reduced fibre portions like crude fibre (19.9 %), ADF (28.0) and NDF (34.0) confers increased palatability, digestibility and intake rate. Relatively higher level of Nitrogen, Potassium and Magnesium in TNFC 0924 signifies the nutritive value of the fodder as compared to CO (FC) 8. Based on South eastern categorization system (Dennis, 2011), the grading on the quality of TNFC 0924 was adjudged as premium quality fodder. The colour of the seeds of TNFC 0924 is light brown (uniform) as against buff to gray buff in CO (FC) 8 (Table 3).

TNFC 0924 is moderately resistant to YMV and resistant to major pests. Considering the supremacy of the fodder cowpea culture TNFC 0924 in Research Station trials (2010-2012), AICRP trials (*kharif* 2012 & 2013), MLT (*kharif* 2014) and OFT (*kharif* 2013 & 2014), it was proposed and released during 2016 as Fodder cowpea CO 9. The package of practices for the new variety fodder cowpea CO 9 is furnished in table 4.

### Special features

- Higher green fodder and dry matter yield (22.82 and 3.85 t/ha)
- More number of branches with broader leaves
- Higher protein content (21.56 %)
- Reduced fibre portions confer increased digestibility, palatability and intake rate
- Moderately resistant to yellow mosaic virus and resistant to major pests
- Shorter in duration (50-55 days); Suited for intercropping with sorghum and maize

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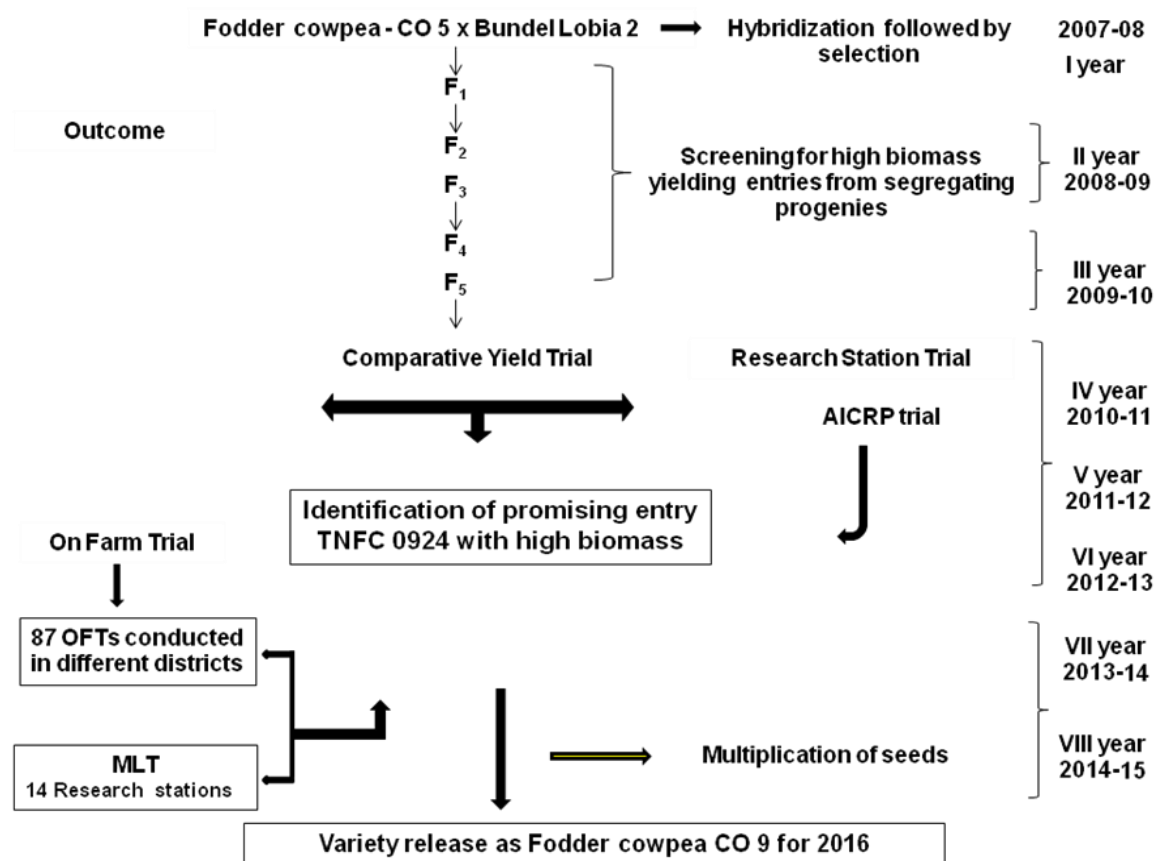


Fig. 1. Pedigree details of fodder cowpea culture TNFC 0924

**Table 1. Mean green fodder yield of fodder cowpea culture TNFC 0924**

S. No.	Trials	No. of trials	Green fodder yield (t/ha)			% increase over CO (FC) 8	% increase over Bundhel Lobia 1*
			TNFC 0924	CO (FC) 8	Bundhel Lobia 1*		
1.	Research Station Trial (2010 -2012)	3	20.16	17.43	-	15.66	
2.	AICRP Trials (2012 and 2013)	33	28.59	-	23.98	-	19.22
3.	MLT (2014)	14	23.55	19.65	-	19.85	
4.	OFT (2013 and 2014)	87	24.76	20.74	-	19.38	
<b>Over all mean</b>			<b>22.82</b>	<b>19.27</b>	<b>-</b>	<b>18.42</b>	

\* National check

**Table 2. Quality parameters of fodder cowpea culture TNFC 0924**

S. No.	Characters	TNFC 0924	CO (FC) 8
1.	Dry matter (%)	16.86	15.60
2.	Dry matter yield (t/ha)	3.85	3.01
3.	Crude protein (%)	21.56	19.54
4.	Crude protein yield (t/ha)	0.83	0.59
5.	Crude fat (%) #	1.40	1.57
6.	Ash (%)	11.0	11.0
7.	Crude fibre (%)	19.9	21.0
8.	Acid Detergent Fibre (%)*	28.0	29.0
9.	Neutral Detergent Fibre (%) +	34.0	38.0
10.	Non Fibre Carbohydrates (%) ^	32.04	29.89
11.	Digestible Dry Matter (%)	67.09	66.31
12.	Dry Matter Intake (%)	3.53	3.16
13.	Relative Forage Quality --	174.72	158.17
14.	Metabolizable Energy (MJ/kgDM)	9.37	9.51
15.	Nitrogen (%)	3.03	2.93
16.	Phosphorus (%)	0.35	0.35
17.	Potassium (%)	2.29	2.18
18.	Calcium (%)	2.78	2.80
19.	Magnesium (%)	2.01	1.98

(Estimated at Department of Forage Crops, TNAU, Coimbatore-3)

# Lesser fat content increases the palatability

\* Reduced ADF content increases the digestibility

+ Reduced NDF improves intake rate

^ Higher Non Fibre Carbohydrates implies higher digestible carbohydrates

-- Fodder with RFQ value above 140 will be considered as premium quality fodder

**Table 3. Morphological characters of fodder cowpea culture TNFC 0924**

S. No.	Characters	TNFC 0924	CO (FC) 8
1.	Habit	Semi spreading, erect in early stages of growth, later on trailing/ creeping, indeterminate type with luxurious growth.	Semi spreading, erect in early stages of growth, later on trailing/ creeping, indeterminate type with luxurious growth.
2.	Branching	4 - 5	3- 4
3.	Leaves	Dark green; Trifoliolate, entire, lush green foliage	Medium green; Trifoliolate, entire, lush green foliage
4.	Terminal leaflet length/breadth	12/10 cm	10/8 cm
5.	Total leaf area	5517 cm <sup>2</sup>	2296 cm <sup>2</sup>
6.	LAI	6.13	5.10
7.	Plant height at maturity	130 – 140 cm	100-120 cm
8.	Twining tendency	Pronounced	Pronounced
9.	Plant hairiness	Glabrescent	Glabrescent
10.	Inflorescence	Axillary raceme	Axillary raceme
11.	Flower colour	Violet	Violet
12.	Calyx	Green	Green
13.	Pod attachment to peduncle	Erect	Erect
14.	Pod curvature	Slightly curved	Slightly curved
15.	Pod colour	Green	Green
16.	Mature pod	Straw colour	Straw colour
17.	Pod length	14 – 16 cm	12 - 14 cm
18.	Number of locules/pod	14 – 16 seeds	12 – 14 seeds
19.	Seeds shape	Rhomboid	Rhomboid
20.	Seed colour	Light brown (uniform)	Buff to Gray buff
21.	Testa texture	Smooth	Smooth
22.	1000 seed weight	170 g	120 g
23.	Days to 50% flowering	50 – 55 days	55 – 60 days
24.	Days to maturity	90 – 95 days	95 - 100 days



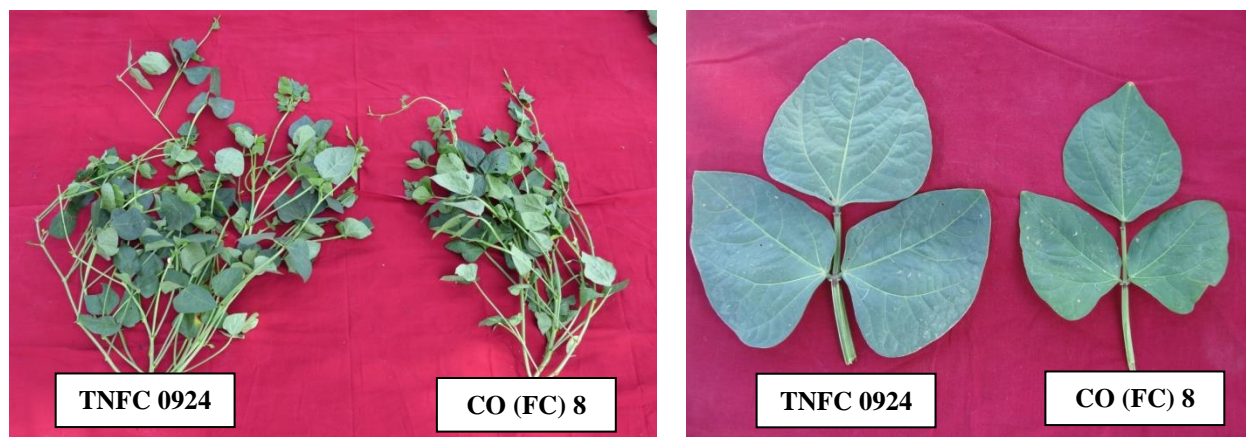
**Table 4. Package of practices - fodder cowpea culture TNFC 0924**

Season	: <i>Kharif, rabi</i> and summer
Duration	: For fodder purpose: 50 - 55 days For seed purpose: 90 - 95 days
Preparatory cultivation	: Plough 2 to 3 times to obtain a good tilth and form ridges and furrows of 6 m length and 60 cm apart.
Seed rate	: 25 kg/ha <i>Rhizobium</i> treatment with 600g/ha is beneficial
Spacing	: For fodder purpose: Sow the seeds at 30 x 15 cm interval on both sides of the ridges For seed purpose: 60 x 15 cm
Manuring	: <u>Basal: For irrigated crop only</u> NPK: 25 : 40 : 20 kg/ha
Inter cultivation	: Hand weeding may be done at 15-20 DAS
Irrigation	: Once in 10 days or need based
Plant protection	: Generally not required for fodder purpose.
Harvest	: For fodder: At 50% flowering stage (50 - 55 days) For seed: 90 - 95 days
Yield	: Green fodder yield: 22.82 t/ha Seed yield: 745 kg/ha

**Plate 1. Morphological features of fodder cowpea TNFC 0924**



**Luxurious growth of TNFC 0924**



**Individual plants and leaves in comparison with check**