

Electronic Journal of Plant Breeding



Research Article

CO18: A high yielding with extra long staple *Gossypium barbadense* cotton variety suitable for Central zone

P. Vindhivarman, M. Gunasekaran, N. Premalatha, M. Kumar, L. Mahalingam, N. Meenakhshiganesan, S. Rajeswari, K.Ganesamurthy and S.Geetha

Department of Cotton, Centre for Plant Breeding and Genetics, TNAU, Coimbatore – 641 003, Tamil Nadu, India.

*E-Mail: cotton@tnau.ac.in

Abstract

The cotton variety CO 18 (culture TCB 37) is a *Gossypium barbadense* variety identified for release by Tamil Nadu Agricultural University, Coimbatore during 2020. This variety was developed at the Department of Cotton, through selection from EC 101786. This variety recorded a mean seed cotton yield of 872 kg/ha as against 621 kg/ha of the Zonal check variety Suvin under irrigated condition. The percentage increase in seed cotton yield was 40.4 per cent. The variety has a yield potential of 1720 kg/ha as has been recorded in Rahuri centre during 2017-18. The variety has recorded an Upper Half Mean Length (UHML) of 35.1 mm, micronaire of 3.5 µg/inch and bundle strength of 36.2 g/tex in HVI mode. The variety recorded a mean boll weight of 3.1 g/boll, is superior to check Suvin and qualifying varieties (GSB 41 and ARBB 1302). CO18 combines high yield potential, big boll size and basic tolerance to pests and diseases. The culture TCB 37 was identified for release as CO 18 by Central Variety Identification Committee during 2020 and the farmers will be highly benefitted by cultivating this variety.

Key words: Cotton, *Gossypium barbadense*, fibre quality, boll size

INTRODUCTION

Cotton (*Gossypium* spp.) is designated as “white gold” and “king of fibres” among all the fibre crops. Four species in *Gossypium*, viz., *Gossypium herbaceum*, *Gossypium arboreum*, *Gossypium hirsutum* and *Gossypium barbadense* are cultivated ones. Among the four species, *G. barbadense* is meant for the highest quality of fibre with extra-long staple cotton. Popularly this species is known as Sea island cotton, Egyptian cotton, Pima cotton and extra-long staple cotton. *Gossypium barbadense* is the species grown for extra-long staple fibres and represents just a tiny proportion of the world’s total cotton production. *Gossypium barbadense* is the second most cultivated species, known for the best fiber quality (Liu *et al.*, 2015). *Gossypium barbadense* has been domesticated in Peru and distributed in Brazil in the pre-Columbian era. This species is known for excellent fiber quality with long,

strong and fine fibers. In India, research on *G. barbadense* has been neglected as compared to other cultivated species. Genetic improvement of *barbadense* varieties for both productivity and fiber quality has been very limited. *Gossypium barbadense* variety Suvin is still regarded as a unique fiber class in the international market, but the productivity has been reduced. The available interspecific hybrids, viz., DCH 32 and TCHB 213, though high yielding often suffers from low micronaire. The fibre strength does not meet the ICAR-Central Institute for Research on Cotton Technology norms for 80’s count. Hence, more efforts are necessary to increase micronaire and strength. (Khadi and Gopalakrishnan, 2007). There is an urgent need to develop strong base material to serve the cause of developing a new variety of *barbadense* and this improved *barbadense* varietal base, is essential for improving

the performance of interspecific hybrids. Therefore it is necessary to give much attention to improve the yielding ability of the highly priced *G. barbadense* cotton looking to its superior fiber quality.

MATERIALS AND METHODS

The variety CO 18 (TCB 37) is the selection from EC 101786 during 2007-08. The single plant selection and selfing programme was initiated during 2008-09 at the Department of Cotton, Tamil Nadu Agricultural University,

Coimbatore. This culture TCB 37 was proposed for evaluation under ICAR-All India Coordinated Research Project on Cotton and Multilocation Trial during 2014-15 and 2016-17, respectively. The culture TCB 37 was evaluated in ICAR-All India Coordinated Research Project on Cotton trials during 2014-15 and 2017-18 across nine locations. Based on the superiority in nine locations in the Central zone, the culture TCB 37 was proposed for release as CO 18 variety.

Table 1. Mean seed cotton yield (kg/ha) in coordinated varietal trials

Particulars	Year of testing	Number of Locations	Culture (TCB 37)	Check (Common check/Zonal check) Suvin	Qualifying Variety 1 GSB 41	Qualifying Variety 2 ARBB 1302
Central Zone	2014-15	3	647	466	639	-
Central Zone	2015-16	2	696	573	-	566
Central Zone	2016-17	2	1028	637	-	818
Central Zone	2017-18	2	1229	885	-	-
	Weighted mean	9	872	621	639	692

Table 2. Adaptability to agronomic variables - Seed cotton yield (kg/ha) of TCB 37 at Main Cotton Research Station, Surat

Spacing	75% RDF	100% RDF	125% RDF	Mean	CD @ 5%
120 x 45 cm	481	573	576	543	NS
120 x 30 cm	686	832	829	783	NS
Mean	583	702	702		NS
CD @ 5%	NS	NS	NS		

Table 3. Fibre quality traits of the culture TCB 37

Year of Testing	Number of locations	Culture (TCB 37)	Check (Common check/Zonal check) Suvin	Qualifying Variety 1 GSB 41	Qualifying Variety 2 ARBB 1302
Upper Half Mean Length (mm)					
2014-15	3	34.0	34.2	32.6	-
2015-16	2	34.4	35.1	-	34.9
2016-17	2	34.7	34.5	-	32.4
2017-18	1	37.2	32.2	-	-
Mean		35.1	34.0	32.6	33.7
Micronaire ($\mu\text{g}/\text{inch}$)					
2014-15	3	3.4	3.1	3.2	-
2015-16	2	3.5	2.9	-	3.3
2016-17	2	3.6	3.4	-	3.6
2017-18	1	3.7	3.8	-	-
Mean		3.5	3.3	3.2	3.5
Bundle Strength (g/tex)					
2014-15	3	32.1	30.7	30.5	-
2015-16	2	37.6	36.1	-	38.5
2016-17	2	37.6	37.1	-	36.2
2017-18	1	37.4	41.4	-	-
Mean		36.2	36.3	30.9	37.4

RESULTS AND DISCUSSION

The overall performance of *Gossypium barbadense* L. CO 18 (culture TCB 37) was summarized in **Table 1**. This culture has registered a mean seed cotton yield of 872 kg/ha with a 40.4 per cent increase over the check Suvin (621 kg/ha) in nine locations under winter irrigated conditions between 2014-15 and 2017-18. The variety has a yield potential of 1720 kg/ha as has been recorded in Rahuri centre during 2017-18. Spacing experiment viz., 120 x 45 cm and 120 x 30 cm and different doses of fertilizers viz., 75% RDF, 100% RDF and 125% RDF were conducted during 2018-19. There is no significant difference between fertilizer doses, spacing and their interaction. Numerically, a higher seed cotton yield of 832 kg/ha was recorded at 120 x 30 cm spacing with 100% of RDF (**Table 2**). The culture TCB 37 recorded Upper Half Mean Length (UHML) of 35.1 mm with bundle strength of 36.2 g/tex and micronaire value of 3.5 μ g/inch (**Table 3**). It registered mean lint of 291 kg/ha with ginning outturn

of 35.2 %. It recorded a mean number of bolls per plant of 27 and a boll weight of 3.1 g (**Table 4**). The culture was found to be moderately resistant to *Alternaria leaf blight*, root rot (**Table 5**) and moderately resistant to leaf hoppers (**Table 6**). The performance of culture TCB 37 was also evaluated under Multilocation Trial conducted in three locations viz., Coimbatore, Srivilliputhur and Veppanthattai during 2016-2019. This culture recorded a mean seed cotton yield of 957 kg/ha as against 750 kg/ha of the Zonal check variety Suvin under irrigated conditions. The percentage increase in seed cotton yield was 27.6 per cent (**Table 7**). The complete description of TCB 37 as per the DUS characters is presented in **Table 8 & Fig.1**. Based on the superiority over check Suvin evaluated in nine locations of Central Zone, the culture TCB 37 was identified for release as CO 18 by Central Variety Identification Committee during 2020.

Table 4. Performance of TCB 37 for other important traits

Year of Testing	Number of locations	Culture (TCB 37)	Check (Common check/Zonal check) Suvin	Qualifying Variety 1 GSB 41	Qualifying Variety 2 ARBB 1302
Mean Lint yield (kg/ha)					
2014-15	3	206	141	204	-
2015-16	2	217	176	-	179
2016-17	2	330	187	-	251
2017-18	2	409	276	-	-
Mean	9	291	195	204	215
Mean GOT %					
2014-15	3	31.9	30.8	32.3	-
2015-16	2	30.7	30.5	-	31.7
2016-17	2	32.1	29.0	-	29.9
2017-18	2	31.7	29.8	-	-
Mean	9	31.6	30.0	32.3	30.8
Mean number of bolls per plant					
2014-15	3	15	13	16	-
2015-16	2	35	20	-	15
2016-17	2	25	21	-	24
2017-18	2	31	28	-	-
Mean	9	27.0	21.0	16	20
Mean boll weight (g)					
2014-15	3	3.0	3.1	2.8	-
2015-16	2	3.0	3.1	-	3.3
2016-17	2	3.5	2.4	-	2.5
2017-18	2	3.0	3.1	-	-
Mean	9	3.1	2.9	2.8	2.9

Table 5. Reaction to major diseases

Year of Testing	Trial locations	Culture (TCB 37)	Check (Common check) Suvin	Qualifying Variety 1 GSB 41	Qualifying Variety 2 ARBB 1302
Bacterial Leaf Blight					
2014-15	SRT	2	3	2	-
Alternaria Leaf Blight/spot					
2014-15	Rahuri	1	2	2	-
2015-16	Rahuri	1	1	-	2
2016-17	Rahuri	3	1	-	1
2017-18	Rahuri	3	1	-	-

Table 6. Reaction to major insect pests

Year of Testing	Trial locations	Culture (TCB 37)	Check (Common check) Suvin	Qualifying Variety 1 GSB 41	Qualifying Variety 2 ARBB 1302
A. Jassids / 3 leaves *					
2014-15	Rahuri	8.06 (2.83)	10.47 (3.31)	7.53 (2.83)	-
2015-16	Rahuri	17.17 (4.20) (IV)	17.56 (4.25) (IV)	-	21.61 (4.70) (IV)
2016-17	Rahuri	11.17 (3.42) (II)	11.94 (3.53) (II)	-	11.61 (3.48) (I)
B. Whiteflies / 3 leaves **					
2014-15	Rahuri	5.17 (2.38)	5.17 (2.38)	5.06 (2.36)	-
2015-16	Rahuri	1.11 (1.27)	1.06 (1.25)	-	1.00 (1.22)
2016-17	Rahuri	4.61 (2.26)	5.06 (2.36)	-	4.72 (2.29)
C. Open boll damage (%)**					
2014-15	Rahuri	14.99 (22.78)	12.64 (20.83)	15.42 (23.12)	-
2015-16	Rahuri	47.35 (43.48)	39.86 (39.15)	-	15.77 (23.52)
2016-17	Rahuri	17.82 (24.97)	29.47 (32.88)	-	24.35 (29.57)
2017-18	Rahuri	36.09 (36.92)	39.77 (39.10)	-	-
D. Locule damage (%)**					
2014-15	Rahuri	10.41 (18.82)	8.26 (16.70)	10.18 (18.61)	-
2015-16	Rahuri	23.01 (28.67)	20.18 (26.69)	-	15.92 (23.52)
2016-17	Rahuri	8.87 (17.33)	11.82 (20.11)	-	10.37 (18.79)
2017-18	Rahuri	19.75 (26.38)	25.48 (30.32)	-	-

*Figures in Parenthesis are Grades (Jassids)

** Values in the parenthesis are transformed values (white fly, Open boll damage (%) & Locule damage (%))

Table 7. Performance of TCB 37 in MLT during 2016 to 2019

Year of testing	Centres	Seed cotton yield (kg/ha)		CD @ 5 %	CV %
		TCB 37	Suvin		
2016-17	Coimbatore	743	420	97.9	14.7
	Srivilliputtur	1130	774	307.0	16.5
	Veppanthattai	654	667	44.9	6.2
2017-18	Coimbatore	813	694	180.7	11.5
	Srivilliputtur	1270	890	141.4	10.6
	Veppanthattai	642	497	46.8	7.3
2018-19	Coimbatore	817	698	31.5	7.4
	Srivilliputtur	1737	1427	128.4	6.7
	Veppanthattai	804	682	71.7	8.4
	Mean	957	750		

Table 8. Detailed description of TCB 37 as CO 18

Characteristics	CO 18 (TCB 37)	Characteristics	CO 18 (TCB 37)
Hypocotyl: Pigmentation	Absent	Flower : Male sterility (Only for A and B lines)	Absent
Leaf :Colour	Dark green	Boll : Bearing habit	Solitary
Leaf : Hairiness	Sparse	Boll :Colour	Green
Leaf : Appearance	Cup	Boll : Shape (Longitudinal section)	Elliptic
Leaf : Gossypol glands	Present	Boll : Surface	Pitted
Leaf :Nectaries	Present	Boll : Prominence of tip	Pointed
Leaf : Petiole pigmentation	Present	Boll : Opening	Open
Leaf : Shape	Semi – digitate	Boll : Weight of seed cotton / boll	Medium (3.0 g)
Plant : Stem hairiness	Smooth	Seed : Fuzz	Low
Plant : Stem pigmentation	Present	Seed : Fuzz colour	White
Plant : Height (cm)	Medium Tall (100-105 cm)	Seed : Index (100 seed weight)	Medium (9.3 g)
Plant : Growth habit	Semi- spreading (>42 cm)	Ginning (%)	High (36.1%)
Bract : Type	Normal	Fibre :Colour	White
Flower : Time of flowering (50% of plants with at least one open flower)	Late	Fibre : Length (UHML)	Extra long staple (34.7 mm)
Flower : Petal colour	Deep yellow	Fibre : Strength	Very good (35.5 g/tex)
Flower : Petal spot	Present	Fibre : Fineness (Micronaire value)	Fine (3.5)
Flower : Stigma	Exerted	Fibre Uniformity	Good (86-87 %)
Flower : Anther filament colouration	Absent	Fibre: Maturity	Good (0.75 %)
Flower : Pollen colour	Deep yellow		



Seed



Lint



Flower colour



Single plant



Field view

Fig.1. Morphological characteristics of TCB 37**REFERENCES**

Liu, Xia, Zhao, Bo and Xiao-Ya Chen. 2015. *Gossypium barbadense* genome sequence provides insight into the evolution of extra-long staple fiber and specialized metabolites. *Sci. Rep.* **5**, 14139. [\[Cross Ref\]](#)

Khadi, B.M. and Gopalakrishnan, N. 2007. Extra long staple cotton scenario in India and World. Model training course on ELS. Organized at CICR, Regional Station, pp.5-10.