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CoC 25–An early maturing high-yielding and red rot-resistant sugarcane variety suitable for the East Coast Zone of India

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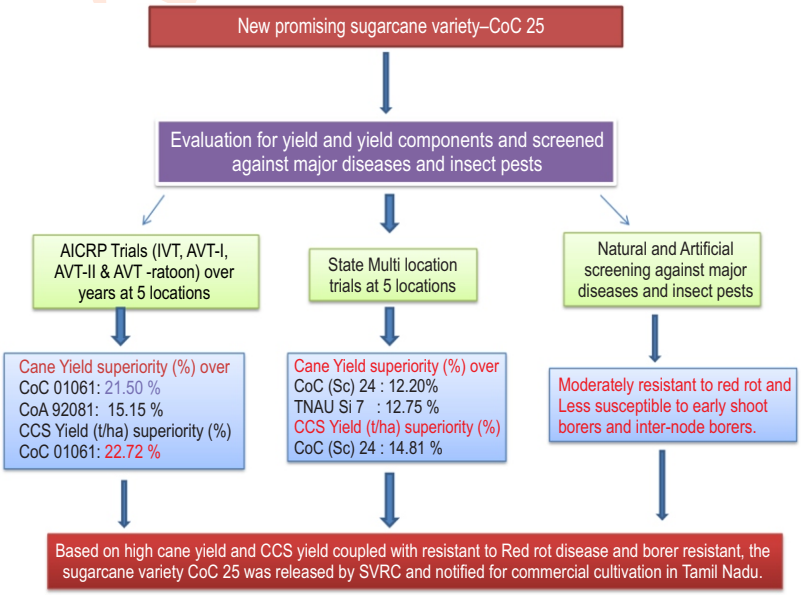
Abstract

Aim: To develop early duration high-yielding sugarcane variety coupled with resistance or tolerant to major disease (red rot) and insect pests (borer complex).

Methodology: CoC 25 was developed from two parents (Co 85002 and HR 83-144) and evaluated in station trials, state multi-location trials (five locations) and zonal varietal trials of AICRP (S) trials (IVT, AVT-I, AVT-II and AVT ratoon in five locations). Simultaneously, this clone was screened for major pest and diseases.

Results: Based on the superiority performance of CoC 25 in cane yield (21.50% higher) and sugar yield (22.72% higher), it was observed in AICRP trials over the national check variety CoC 01061. Cane yield superiority was 12.75% compared to check variety observed in state multi-location trials. The CoC 25 was found moderately resistant (3.6%) to red rot disease and less susceptible to early shoot borer (9.42%) and inter-node borers.

Interpretation: The results of this study revealed that CoC 25 is superior in terms of cane yield, CCS yield and resistance to red rot disease and it is less susceptible to borers. It was released by SVRC and notified for commercial cultivation in Tamil Nadu and Puducherry.



Key words: Cane yield, CCS yield, Red rot resistance, Sugarcane

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Introduction

Sugarcane (*Saccharum* sp. hybrids) is one of the major commercial crops in the world and a major producer of sugar and ethanol (Silva *et al.,* 2016). India is the second largest sugar producer after Brazil in terms of area (48.67 lakh ha) and production (376.91 million tonnes). In India, Tamil Nadu state ranks fourth in area and production next to Uttar Pradesh, Maharashtra and Bihar, and it ranks first in productivity. In Tamil Nadu, sugarcane is cultivation occupies 1.31 lakh ha area, producing 14.12 million tonnes of sugarcane with a productivity of 105.62 t ha^{-1}. (Ganapathy *et al.,* 2024). Besides sugar production, sugarcane produces numerous valuable byproducts like alcohol used by the pharmaceutical industry, ethanol used as a fuel, baggage used for paper industry, chip board manufacturing and also burning sugar mills furnaces and press mud used as a rich source of organic matter and nutrients for crop production (Soomro *et al.,* 2006). Sugarcane is grown in different agro-climatic conditions in the world. However, sugarcane crop is facing significant challenges, mainly low productivity, low sugar recovery, and higher cost of cultivation (Ganapathy *et al.,* 2024).

While the cultivation of low yielding sugarcane varieties, directly affects sugarcane production, and plays a significant role in decreasing sugarcane productivity (Mian, 2006). There are many reasons (season, choice of variety, proper agronomic practices and nutrients) for low productivity in sugarcane; however, selection of low-yielding variety for cultivation is one of them. Subsequently, there is a need to develop and introduce better high yielding varieties (Chattha and Ehsanullah, 2003). Varieties play an important part in deciding the yield, while, agronomical practices and climatic component help to investigate their intrinsic potential. Cultivating improved high-yielding sugarcane varieties is the only solution to the problem of low yield and low sugar recovery (Nirmoth and Sharma, 2022). In order to get better sugar recoveries, early mature sugarcane types are selected at the beginning of crushing season. Additionally, early maturing cultivars are less affected by the season, and when planted late, the growth of early maturing clones aids in the recovery of a larger sugar output. Production and productivity of sugarcane mainly dependes on the varieties, season and agronomic package of practices besides balanced nutrition.

Among the components, varieties play an important role in sugar mills and farming communities. Hence, it is imperative to identify new sugarcane varieties to replace the deteriorating commercial varieties so that overall productivity can be stabilized. Therefore, to meet the immediate demands of sugarcane farming community and sugar factory, there is a need to release and popularize early maturing, high sugar varieties having high tonnage with good ratooning ability to meet the challenges for improving sugar recovery, especially during the beginning of crushing season (Ganapathy and Jayakumar, 2023). Tamil Nadu, an important sugarcane growing state in the country, faces several abiotic and biotic stresses and this necessitate improved location specific sugarcane varieties for the zone. The sugar industry in Tamil Nadu and other states of this zone is looking towards ways to revive itself, through application of innovative and improved production technologies, the most important among them being the use of high yielding and high sugar varieties. Keeping in view, to accomplish the need of sugarcane farmers, the long-term programme of varietal development in sugarcane was initiated at Sugarcane Research Station, Tamil Nadu Agricultural University (TNAU), Cuddalore, Tamil Nadu, India, under All India Co-ordinated Research Project pertaining to East Coast Zone of India.

Materials and Methods

Breeding materials and Hybridization: High-yielding sugarcane variety CoC 25 was selected as an experimental plant for the present study. CoC 25 was developed through hybridization followed by selection that involved two high-yielding and high-quality parents (Co 85002 x HR 83-144) at Sugarcane Research Station, Cuddalore. Tamil Nadu, India. The study area is located at 11°46'N latitude and 79°46'E longitude, 4.60 m above mean sea level. The study was carried out during 2009–2018 and was funded by AICRP on Sugarcane. The female parent is a high yield and high sugar variety, developed from high sugar variety CoC 671 (Wonder cane) and Co 62198. Another parent, HR 83-144, is a red rot-resistant type. The hybridization work was carried out at the National Hybridization Garden (NHG), Sugarcane Breeding Institute (SBI), Coimbatore, India. The fluff materials were collected from NHG, SBI, Coimbatore and the fluff nursery was raised at Sugarcane Research Station, TNAU, Cuddalore, India.

Evaluation of trials: Based on the superior performance of the clone in fluff nursery, ground nursery and first clonal evaluation trials, the clone was promoted to station yield evaluation trials (Pre Zonal Trials) *viz.,* Initial yield trial (IYT), Advanced Yield Trial-I (AYT-I), Advanced Yield Trial II (AYT-II) and Advanced Yield Trial – ratoon (AYT-R). Based on superiority performance, this hybrid was promoted to Multi-location Trials (MLT) in different districts (Cuddalore, Coimbatore, Erode, Trichy, Vellore and Dharmapuri) sugar mills along with CoC(Sc) 24 and TNAU Sugarcane Si 7 as checks. Simultaneously, this clone was nominated to Zonal Varietal Trials under All India Co-ordinated Research Projects (AICRP) on sugarcane for the East Coast Zone of India. Under AICRP(S) trials, the clone was evaluated at five locations including Tamil Nadu, Andhra Pradesh and Orissa.

After an initial varietal trial (IVT), the clone was promoted for Advanced Varietal Trial (AVT), which consisted of two plant crops and a ratoon crop involving four entries *viz.,* CoC 11336, CoC 10336, CoA 11321 and CoA 11323 and two standards CoA 92081 and CoC 01061. All the experiments were laid out in a Randomized Block Design with three replications. The plot size was 8 rows of 6 m length, each with an inter-row spacing of 90 cm. The recommended agronomic practices were followed as per technical programme of All India Co-ordinated Research Project (S). Simultaneously, this variety was tested for red rot resistance

by plug method of inoculation against prevalent races of red rot pathogens, Cf 04 and Cf 06 (Mohanraj *et al.,* 2012). After two months of incubation, the inoculated canes were split open longitudinally along the point of inoculation and graded on a 0-9 scale. The disease reaction was classified using an average score and classification suggested by Srinivasan and Bhat. (1961). Test for resistance towards major insect pests (mainly borers) was carried out and grouped by using the classification described by Rao and Rao (1973). Agronomic trials were evaluated for the overall performance under the recommended growing conditions.

Data collection and Statistical analyses: The observations were recorded on cane yield and other yield attributes *viz.,* number of millable canes (NMC), single cane weight (kg), stalk length, stalk diameter and quality traits like Brix%, Sucrose percent in juice, Purity percent, Commercial Cane Sugar (CCS) percent, CCS yield (t ha^{-1}) as per the technical programme and statistically analyzed (Panse and Sukhatme, 1978). The disease reaction of red rot was classified as per average score. The clones were classified as Resistant (0 to 2.0), Moderately Resistant (2.1 to 4.0), Moderately Susceptible (4.1 to 6.0), Susceptible (6.1 to 8.0) and Highly Susceptible (above 8.0) as per Srinivasan and Bhat (1961). CoC 25 was screened for borer complex along with check varieties. The percentage of borer incidence was recorded and grouped following classification of Rao and Rao (1973). For early shoot borer, 0-15 % incidence was Less Susceptible (LS); 15.1-30% incidence was considered Moderately Susceptible (MS) and >30% as Highly Susceptible (HS). The agronomic evaluation was carried out for yield and important yield contributing traits. Based on the yield and quality traits along with pest and disease resistance, the best clone was selected and promoted for State Variety Release Committee (SVRC). The proposal was accepted, and released as a new sugarcane variety during 2018 in the name of "Sugarcane CoC 25" for Tamil Nadu State and Puducherry (UT). CoC 25 was notified by the Government of India (S.O.399 (E)/ 2018) and more than 500 tonnes of breeder seeds of CoC 25 was produced and distributed every year to sugar mills and farmers of Tamil Nadu.

Results and Discussion

The performance of CoC 25 in different trials for yield and quality traits were recorded and presented in Tables 1-7. This variety was evaluated in station trials, Multi-location trials in sugar mills located in different districts of Tamil Nadu and tested at All India Co-ordinated Research Project Trials along withNational standards (checks). It is a high yielding, early maturing and quick growing thick cane. It is moderately resistant to red rot disease and less susceptible to borers. Evaluation of pre-release clones along with checks (popular ruling varieties) are an important step in any variety developmental programme. Hence, the proposed clone (CoC 25) was also evaluated for yield and quality characters in station trials (Pre-zonal evaluation trials). The

Table 1: Average performance of CoC 25 in different Station trials (3)(2009-2012)

Entry/ Characters	CoC25 (Proposed clone)	CoC(Sc) 24 (Check)	CD (0.05%)	CV (%)	Per cent increase over check CoC(Sc) 24
Cane Yield (t ha^{-1})	147.48	130.27	10.57	5.32	13.21
Commercial Cane Sugar (%)	12.75	12.65	0.12	0.43	0.79
Sugar Yield (t ha^{-1})	18.81	16.48	1.31	4.15	14.14
Sucrose (%)	17.65	17.42	0.11	0.25	1.32
NMC ('000ha^{-1})	121.50	112.65	12.76	6.18	7.86
Cane length (cm)	295.45	272.14	14.42	4.85	8.57
Cane girth (cm)	2.95	2.53	0.13	2.41	16.60
Single cane weight (kg)	1.32	1.12	0.12	3.58	17.86

Table 2: Mean performance of CoC 25 in Station Ratoon trials (AVT-R)

Entry/ Characters	CoC25 (Proposed clone)	CoC(Sc) 24 (Check)	CD (0.05%)	CV (%)	Per cent increase over check CoC(Sc) 24
Cane Yield (t ha^{-1})	142.20	120.32	10.27	4.94	18.19
CCS (%)	12.85	12.70	0.14	0.52	1.18
Sugar yield (t ha^{-1})	18.27	15.28	1.12	4.29	19.57
Sucrose %	17.82	17.46	0.16	0.53	2.06
NMC ('000ha^{-1})	118.43	110.81	11.25	5.87	6.88
Cane length (cm)	290.33	260.05	15.43	3.67	11.64
Cane girth (cm)	2.92	2.54	0.13	2.15	14.97
Single cane weight (kg)	1.31	1.08	0.15	4.67	21.30

Table 3: Overall performance of CoC 25 in Multi-location trials in Tamil Nadu – 2011-13

Location and Characters	Proposing clone	Check 1	Check 2	Per cent increase of CoC 25 over Checks	
	CoC 25	CoC (Sc) 24	TNAU Si 7	CoC (Sc) 24	TNAU Si 7
I.Cuddalore District Region					
Cane yield (t ha^{-1})	155.17	141.12	140.80	09.96	10.21
CCS (%)	12.66	12.28	12.54	3.09	0.96
Sugar yield (t ha^{-1})	19.64	17.33	17.66	13.33	11.23
II. Coimbatore District Region					
Cane yield (t ha^{-1})	158.56	142.59	141.35	11.20	12.18
CCS (%)	12.71	12.40	12.62	2.50	0.71
Sugar yield (t ha^{-1})	20.15	17.68	17.84	13.98	12.98
III. Trichy District Region					
Cane yield (t ha^{-1})	160.14	143.81	142.67	11.36	12.25
CCS (%)	12.63	12.45	12.56	1.45	0.56
Sugar yield (t ha^{-1})	20.23	17.90	17.92	12.97	12.87
IV. Vellore District Region					
Cane yield (t ha^{-1})	148.91	134.52	133.84	10.70	11.26
CCS (%)	12.74	12.47	12.63	2.17	0.87
Sugar yield t ha^{-1})	18.97	16.77	16.90	13.09	12.23
V. Paiyur Region					
Cane yield (t ha^{-1})	152.76	136.79	135.64	11.67	12.62
CCS (%)	12.72	12.43	12.63	2.31	0.71
Sugar yield (t ha^{-1})	19.44	17.01	17.13	14.26	13.42
Over all mean performance (2011-2013)					
Cane yield (t ha^{-1})	153.65	136.94	136.28	12.20	12.75
CCS (%)	12.72	12.43	12.63	2.33	0.71
Sugar yield (t ha^{-1})	19.54	17.02	17.21	14.81	13.53

performance of sugarcane clones for yield, quality and its contributing characters has already been reported by Ganapathy *et al.* (2024); Farrag Ellail *et al.* (2018). In station trials, variety CoC 25 recorded an average cane yield of 147.48 t ha^{-1} with 13.21% increase over check variety CoC(Sc) 24, which recorded 130.37 t ha^{-1}. Similar results on cane yield in sugarcane has been reported by Sadras *et al.* (2022). Cane yield is a major charater used to assess the potential of a sugarcane clone. Ganapathy and Jayakumar (2023) reported that it is mainly due to the combination of environmental responses and genetic potential of a genotype.

The results on cane yield in the present study are in accordance with the work of Arain *et al.* (2018). Ganapathy and Ravichandran (2022) reported higher variability among sugarcane genotypes for cane yield and yield contributing traits, when tested in clonal evaluation trials. For sugar yield, it was recorded 18.81 t ha^{-1} with an increase of 14.14 % over standard variety CoC(Sc) 24, which was 16.48 t ha^{-1}. Singh *et al.* (2015) reported for various levels of sugar yield and sucrose per cent in sugarcane clones. CoC 25 exhibited higher number of millable cane (1,21,500 ha^{-1}) and sucrose content (17.65 %), when compared to the check variety CoC (Sc) 24. The proposed variety CoC 25 recorded high cane length (295.45 cm) and cane girth (2.95 cm), and these 8.57% and 16.60 % higher, over the check variety CoC(Sc) 24. This finding is analogous with Pooja *et al.* (2022) who reported variable cane thickness among the sugarcane genotypes in their study. With regard to single cane weight, the proposed variety (CoC 25) recorded 1.32 kg in station trials (Table 1), which was 17.86 % higher than check variety. This is in accordance with the findings of Ganapathy and Purushothaman (2022). Cane thickness and single cane weight are an important yield contributing character and greater cane thickness would enhance the acceptability of varieties from farmer's point of view. This finding is analogous with Singh *et al.* (2015) who reported variable cane thickness among the sugarcane genotypes in their study.

The assessment of ratoon performance of test clones is an important part of varietal development programme. This type of evaluation caters to the preference of sugarcane farmers for varieties with good ratoonability and good performance in ratoon crop (Swapna *et al.,* 2020). The variety was evaluated for yield and quality traits in ratoon crop also. The mean performance of CoC 25 in ratoon crops are presented in Table 2. Variety CoC 25 exhibited better yield (mean value of 142.20 t ha^{-1}) over standard variety CoC(Sc) 24 (120.32 t ha^{-1}), which was 18.19 % increase over the check variety. For sugar yield, the mean value of CoC 25 was 18.27 t ha^{-1}, which was 19.57 % increase over check variety. The sucrose content was 17.82 % and the number of millable canes per hectare was 118.43 (x1000 ha^{-1}). The cane length of

Table 4: Mean performance of CoC 25 in AICRP Zonal trials during 2013-2016

Trials / Characters	Proposing clone	National Standard	Per cent increase over standard
	CoC 25 **(CoC 11336)**	CoC (Sc) 23 **(CoC 01061)**	% increase over best check CoC 01061
IVT (Early) - (2013-14)			
Cane yield (tha^{-1})	125.60	106.23	18.23
CCS (%)	12.48	12.32	01.30
Sucrose (%)	17.35	17.20	0.87
CCS yield (tha^{-1})	15.68	13.08	19.88
AVT (Early) I Plant (PI) – (2014-2015)			
Cane yield (tha^{-1})	131.56	113.83	15.58
CCS (%)	12.64	12.44	1.61
Sucrose (%)	17.36	17.32	0.23
CCS yield (t ha^{-1})	16.62	14.15	17.54
AVT (Early) II Plant (PII) – (2015-2016)			
Cane yield (t ha^{-1})	139.25	111.91	24.43
CCS (%)	12.81	12.77	0.31
Sucrose (%)	17.62	17.48	0.80
CCS yield (t ha^{-1})	17.83	14.29	24.77
AVT (Early) - Ratoon (R) – (215-2016)			
Cane yield (t ha^{-1})	134.43	104.94	28.10
CCS (%)	12.84	12.75	0.71
Sucrose (%)	17.70	17.50	1.14
CCS yield (t ha^{-1})	17.27	13.38	29.07
Overall mean performance			
Cane yield (t ha^{-1})	132.71	109.23	21.50
CCS (%)	12.69	12.57	0.95
Sucrose (%)	17.61	17.38	1.32
CCS yield (t ha^{-1})	16.85	13.73	22.72

CoC 25 in rotoon crop was 190.33 cm, the cane girth was 2.92 cm and single cane weight of the variety was 1.31 kg, it was 21.30 % increase over check variety CoC(Sc) 24 (Table 2). Thus, the results indicated that the variety CoC 25 showed excellent performance in ratoon crop. Elayaraja and Shanthi (2021) also reported the ratoon performance of sugarcane clones in their study. In sugarcane cultivation, farmers select good ratoon performing varieties since, they are maintaining second and third ratoon crops to reduce the cost of cultivation (re-planting cost was saved in ratoon crops). The proposed variety CoC 25 recorded higher yield (142.20 t ha^{-1}) and higher number of millable canes (1,18,430 ha^{-1}) in ratoon crops, clearly indicated that, it was a good ratoon performing variety. Sugarcane farmers cultivating good ratoon performing variety, have not only found reduction in the cost of cultivation, but have received higher net income.

Similar results on sugarcane crop has been reported by Arati Yadawad *et al.* (2022). Study on developed promising hybrids or varieties in multi-locations over the years, are one of the most difficult tasks for plant breeders. Testing genotypes or hybrids in multi-environment trials is essential for variety release in any crop (Meena *et al.,* 2023). In this context, the CoC 25 was evaluated in multi-location trials along with check varieties CoC(Sc) 24 and TNAU Sugarcane Si 7. The trials were conducted at five different district sugar mills in Tamil Nadu, India. The pooled mean data of CoC 25 and checks are presented in Table 3. CoC 25 recorded the mean cane yield of 153.65 t ha^{-1}, which was 12.20 % and 12.75 % higher than the standards CoC(Sc) 24 and TNAU Si 7, varieties. The sugar yield, was 19.54 t ha^{-1}, which is 14.81 and 13.53 % higher over the standards CoC(Sc) 24 and TNAU Si 7, varieties, CoC 25 produced higher sugar yield (19.54 t ha^{-1}) over check variety, clearly indicated stable performance in different environments / locations. CoC 25 easily adapted to new environments and showed high stability at all locations. Varieties that showed stable performance at all locations is a positive indication for sugarcane farming. These outcomes are in line with the findings of Abu Ellail *et al.* (2021). Bakshi Ram *et al.* (2013) and Guddadamath *et al.* (2014) who reported yield and quality characters of sugarcane genotypes under varied environments. The AICRP(S) trials of pooled mean data of CoC 25 in different traits are presented in Table 4. In zonal evaluation trials, CoC 25 was evaluated as CoC 11336 in early maturity group along with National standards (CoA 92081 and CoC 01061) during 2013 to 2016. The clone CoC 11336 produced cane yield of 132.71 t ha^{-1}, which was 21.50 % higher than the best standard CoC 01061. Similar results on newly released early maturing sugarcane variety

Table 5: Overall performance of CoC 25 in different yield evaluation trials

Name of trials	Number of trials/ Locations	Cane yield (t ha^{-1})	CCS (%)	Sugar yield (t ha^{-1})
Station trials	5	147.49	12.75	18.81
Ratoon trials	2	142.20	12.85	18.27
Multi-location trials	51	153.65	12.72	19.54
AICRP (S) trials	20	132.71	12.81	17.00
On Farm trials	15	151.54	12.75	19.32
Total / Average	93	145.55	12.76	18.57

Table 6: Reaction of CoC 25 to Red rot disease during 2015-2017

Clone	Plug method				Total	Reaction
	CT	LW	WS	NT		
CoC 25	0.0	1.2	0.0	2.4	3.6	MR
Check						
Co C 671	1.0	3.0	2.0	3.0	9.0	HS
Co 86249	0.0	1.0	0.0	1.0	2.0	R

CT - Condition of Top, LW- Lesion Width; WS- White Spot, &CT - Nodal Transgression.
Scale: 0 – 2.0 - Resistant (R); 2.1 – 4.0 - Moderately Resistant (MR); 4.1 – 6.0 - Moderately Susceptible (MS); 6.1 - 8.0 - Susceptible (S); > 8.0 - Highly Susceptible (HS)

Table 7: Reaction of CoC 25 to Early shoot borer and Inter-node borer damage

Proposed variety and Checks	Mean per cent damage level of early shoot borer		Rating	Mean per cent damage level of inter-node borer	Rating
2015-16					
CoC 25	9.42		Less Susceptible	15.38	Less Susceptible
Co C (Sc) 24 ©	11.44		Less Susceptible	19.23	Less Susceptible
2016-17					
CoC 25	10.65		Less Susceptible	11.53	Less Susceptible
Co C (Sc) 24 ©	14.62		Less Susceptible	12.00	Less Susceptible
Early shoot borer Damage level (%)	Rating (ESB)		Inter node borer Damage level (%)	Rating (INB)	
0 – 15.0	Less Susceptible	:	0 - 30.0	Less Susceptible	
15.1 – 50.0	Moderately Susceptible	:	30.1 - 50.00	Moderately Susceptible	
Above 50	Highly Susceptible	:	Above 50	Highly Susceptible	

(CoLk 07201) exhibited more than 20 per cent higher cane yield over check variety has been reported by Pathak *et al.* (2016) and is line with the results of Pooja *et al.* (2022) sucrose per cent was also high in the variety CoC 25 (17.61%). Sucrose content in cane juice is an important quality trait for determining the quality of sugarcane genotypes as it influences the sugar recovery and sugar production in factory. Nawaz *et al.* (2017) has earlier reported sucrose content in sugarcane in his study. The CCS yield of CoC 25 was 16.85 t ha^{-1}, which was 22.72 % higher than the best check variety CoC 01061, which was 13.73 t ha^{-1}. Ganapathy and Ravichandran (2022) reported CCS yield and quality traits in AICRP trials on sugarcane. This clone exhibited higher cane yield and its contributing traits in plant-I, Plant- II and ratoon crops over check variety in AICRP (S) trials. Similar findings in AICRP on sugarcane have been previously reported by Elayaraja and Shanthi (2021). Devi *et al.* (2018) and Sadras *et al.* (2022) reported higher variability among sugarcane genotypes for cane yield and quality traits, when tested in clonal evaluation trials. Large-scale demonstrations were conducted at farmer's field as On Farm Trials, and the results are depicted in Table 5. Fifteen large scale demonstrations were conducted at farmer's field on CoC 25 variety, which recorded an average cane yield of 151.54 t ha^{-1}, *i.e.,*

Table 8: Description of the sugarcane variety (Morphological characters) -CoC 25

Descriptor	Descriptor State
Parentage	Co 85002 x HR 83-144
Stem Colour (Unexposed	Greenish yellow
Stem Colour (Exposed)	Pinkish green
Ivory marks	Absent
Corky patches	Absent
Inter-node shape	Cylindrical
Inter-node alignment	Zig-zag
Pithiness	Slightly pithy
Inter-node thickness	Thick cane
Inter-node splits	Absent
Node swelling	Present
Root zone colour	Unexposed : Yellow
No. of root eye rows	Two
Root eye arrangement	Zig zag
Bud size	Medium
Bud shape	Round and compact
Bud cushion	Absent
Germpore position	Apical
Bud groove	Deep &extend all over the length of the inter node
Growth ring colour	Yellowish
Leaf width	Medium
Lamina colour	Green
Leaf carriage	Open tip drooping
Leaf sheath colour	Green with pink tinge with scarious border.
Leaf sheath waxiness	Present
Leaf sheath spines	Absent
Leaf sheath clasping	Loose
Dewlap colour	Green
Ligular process	Slightly indicated, asymmetrical
Shape of the ligule	Deltoid
Flowering	Shy flowering
Salient features	• Erect, tall thick pinkish green cane • Cylindrical internodes with prominent bud groove • Leaf sheath - Semi clasping • Leaves are open with tips trooping

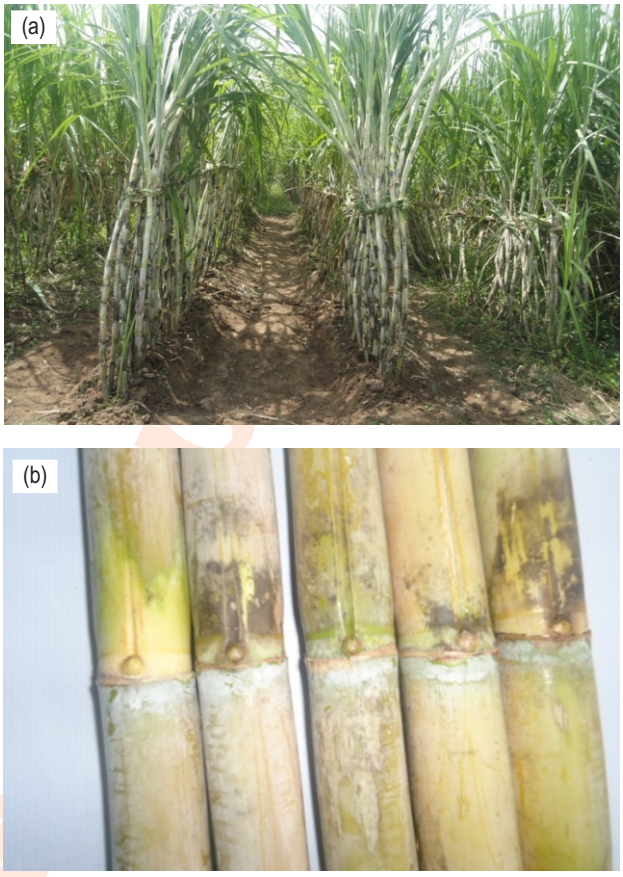

Fig. 1: Salient features of sugarcane variety CoC 25: (a) Field stand of CoC 25 (b) Cane Nodal region of CoC 25.

11.84 % increase over check variety CoC 24 (135.50 t ha^{-1}). Commercial cane sugar percent of CoC 25 was 12.75 and sugar yield was 19.32 t ha^{-1}, this was 12.98 % higher than check variety CoC(Sc) 24 (17.10 t ha^{-1}). The overall mean performance of variety CoC 25 is shown in Table 5. The proposing variety CoC 25 recorded 145.55 t ha^{-1} cane yield, 12.76 % CCS and 18.57 t ha^{-1} sugar yield. Similar results on sugarcane has been reported by Appunu *et al.* (2014) and Pooja *et al.* (2022). Similarly, many mid-late sugarcane clones have been identified and released after on-farm testing at state level (Bora *et al.,* 2011; Charumathi *et al.,* 2010). Even though variety Co 86032 is cultivated over a larger area in Tamil Nadu, its poor ratoobility and susceptibility yellow leaf disease are reportedly reducing the production potential every year. This is responsible for varietal degeneration in sugarcane (Appunu *et al.,* 2014). The overall performance of CoC 25 in two plant and one ratoon crops across Tamil Nadu is shown in Table 3, that highlights the superiority of CoC 25 over check variety (CoC 24). The potential variety CoC 25 could be best alternate in early season variety for Co 86032 in Tamil Nadu. The chief morphological characters of CoC 25 is presented in Table 8. This variety is characterized by thickness, tall, and it is a good ratooner. It is a fast-growing cane with cylindrical internodes and round-shaped medium sized buds. Stem clour of the variety was pinkish green (exposed condition) (Fig. 1).

In sugarcane, red rot disease, caused by *Collectotrichum falcatum* Went, is prevalent in all sugarcane growing areas. Red rot, an important disease in sugarcane crop, can lead to substantial economic losses, in the absence of an efficient management strategy (Viswanathan, 2018). Most high-yielding and high sugar varieties, such as CoC 671, CoC 8001, CoC 85061, CoC 90063 and CoC 92061 are susceptible to red rot disease (Viswanathan, 2021). Red rot disease was assessed by the plug method in variety CoC 25 along with susceptible (CoC 671) and resistant (Co 86249) check varieties. The results revealed that CoC 25 recorded moderately resistant (MR)

reaction to red rot disease (Table 6). Red rot disease reaction of different sugarcane clones has been reported by Ravichandran *et al.* (2023). Screening of red rot disease for sugarcane clones (Pre-release) is an imperative step in sugarcane variety developmental programme. Red rot resistant clones approved by State Variety Release Committee (SVRC) have been released for commercial cultivation in Tamil Nadu.

Screening pre-release cultures for major pests are important step in varietal development programme in any crop. In this regard, early shoot borer Incidence of CoC 25 was recorded for two consecutive years. The mean cumulative percent incidence of borers was worked out and is presented in Table 7. For early shoot borer, the cumulative mean per cent damage level was 9.42% in the first year and 10.65% in the second year; the overall rating was less susceptible. The mean per cent damage level of inter-node borer was 15.38 % in the first year and 11.53 % in the second year and the over all rating was less susceptible (Table 7). Similar results on borer incidence in sugarcane clones has been earlier reported by Rajinder *et al.,* (2017) and Jayakumar (2018).

In conclusion, the released and notified (S.O. 399(E)/ 2018) new sugarcane hybrid, CoC 25, is promising for cane yield and juice quality and resistant to red rot disease. At the same time, it is less susceptible to the borer complex. CoC 25 is a fast growing pinkish green, thick cane with good ratooning ability and an excellent field stand. Farmers highly preferred this variety and it produced higher yield in plant and ratoon crops. The cultivation of improved high sugar varieties like CoC 25, along with suitable innovative technological interventions can be an important step in this direction. This high yielding early maturing variety CoC 25 with its excellent performance in the plant and ratoon crops, will play a significant role in improving the productivity, profitability and sustainability of sugarcane cultivation in Tamil Nadu. At the outset, It is suggested that new sugarcane variety will not only increase the area, production and productivity of sugarcane crop in the east coast zone of India, but will also help to improve the livelihood of farmers.

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