

DEVELOPMENT, CHARACTERIZATION, EVALUATION AND RELEASE OF SUGARCANE VARIETY 2013 R 81 (CO R 19141) AS RUDRUR CHERUKU-81 FOR TELANGANA

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Date of Receipt: 24-01-2025

Date of Acceptance: 22-03-2025

ABSTRACT

Sugarcane is one of the most important commercial crops in India, contributing significantly to sugar, jaggery, ethanol and several produces for agro based industries. The present study provides an insight into the development, evaluation and release of 2013R81 (CoR19141) variety which is a mid-late maturing variety released as Rudrur Cheruku-81. The clone originated from the progeny, 81V48 Poly Cross (PC) and developed through the clonal selection at the Regional Sugarcane and Rice Research Station (RS&RRS), Rudrur. The variety was selected and evaluated through sequential stages. Evaluation under station yield trials, the variety recorded a mean cane yield of 131.91 t ha⁻¹ with anyield advantages of 22.19% and 25.62% over the standard check varieties, Co86032 and CoC671 respectively. The clone exhibited desirable juice quality, with a mean sucrose content of 19.43% and commercial cane sugar (CCS) of 13.45% at 12 months. Initial Varietal Trials conducted under AICRP system of Peninsular Zone, the variety produced a mean cane yield of 127.27 t ha⁻¹, confirming its wider adaptability and stable performance. Minikittesting proved its superiority under farmers' field conditions with an average yield advantage of 10.4% over the commercial checks. The variety exhibited tolerance to biotic stresses and superior jaggery quality with higher recovery (11.46%) with satisfactory juice quality during post-harvest storage. The comprehensive evaluation revealed that 2013R81 (Rudrur Cheruku-81) combines high cane yield, desirable juice quality, broad adaptation and tolerance to major biotic stresses, making it a promising varietal replacement for enhancing sugarcane productivity and profitability in Telangana.

Keywords: *Saccharum* spp.; sugarcane breeding; varietal development; cane yield; juice quality; commercial cane sugar; jaggery quality; AICRP; Telangana; Rudrur Cheruku-81

Sugarcane (*Saccharum* spp.) is majorly cultivated in the tropical and subtropical regions of the world. Owing to its high biomass production and efficient conversion of solar energy into sucrose, sugarcane plays a vital role in ensuring food, energy and livelihood security (Moore *et al.*, 2014; Jackson, 2005). Globally, sugarcane is cultivated at nearly 26 million hectares with an annual production exceeding 1.9 billion tons, accounting for approximately 80% of the world's sugar production, while the remaining sugar is obtained from sugar beet (FAOSTAT, 2023). India is the second-largest producer of sugarcane after Brazil and occupies a prominent position in the global sugar market. The crop is cultivated over approximately 5.8 million hectares with an annual production of more than 490 million tons, supporting over 50 million farmers and agricultural workers directly or indirectly in India. (Department of Agriculture & Farmers Welfare, 2023).

Telangana is in the Peninsular Sugarcane Zone of India, where tropical climatic conditions favor sugarcane cultivation under predominantly irrigated production systems. Commercial cultivation is concentrated in districts such as Kamareddy,

Nizamabad, Sangareddy, Medak, Khammam, Mahabubnagar and Wanaparthy. Sugarcane is an economically important crop that supports farm livelihoods and supplies raw materials to the sugar and jaggery industries. However, crop productivity is increasingly constrained by declining groundwater resources, increasing cost of cultivation, climatic variability and the continued cultivation of older commercial varieties with reduced yield potential. These production constraints highlight the importance of developing and promoting improved sugarcane varieties with high cane yield, superior juice quality, broad adaptation and improved tolerance to major biotic and abiotic stresses (Yadav and Solomon, 2006; Nair, 2011; Singh *et al.*, 2021).

Genetic improvement through systematic breeding has been the primary strategy for enhancing sugarcane productivity worldwide. An ideal commercial variety should combine high cane yield, superior sucrose accumulation, desirable commercial cane sugar (CCS), good ratooning ability, resistance to major diseases and insect pests and adaptability across diverse agro climatic conditions (Jackson, 2005;

Berding *et al.*, 2004; Nair, 2011). Sugarcane improvement programmes generally involve hybridization, clonal selection and sequential evaluation through station and multilocation trials before varietal release (Cox *et al.*, 2000).

The sugarcane breeding programme at the Regional Sugarcane and Rice Research Station (RS&RRS), Rudrur, PJTAU is being involved in development of improved varieties through systematic hybridization, clonal selection and multilocation evaluation. Candidate clones are assessed in station trials, AICRP coordinated trials and minikit demonstrations in farmers' field before release. Among the advanced breeding lines, 2013 R 81 (Co R 19141) consistently recorded superior cane yield with stable performance and desirable quality traits across diverse test environments (AICRP on Sugarcane, 2023; SVRC, 2024).

The clone recorded a higher cane yield over the existing commercial checks while maintaining desirable sucrose content, commercial cane sugar (CCS). In addition, it recorded tolerance to major diseases and insect pests, stable performance across diverse environments and good jaggery-making quality. The present investigation was carried out with an objective to assess the breeding history, yield performance, juice quality, resistance to major diseases and insect pests, post-harvest quality attributes, jaggery quality and DUS characteristics of the sugarcane clone 2013 R 81 (Co R 19141) and to establish its suitability as a mid-late maturing commercial variety for Telangana.

MATERIAL AND METHODS

The present investigation was conducted at the Regional Sugarcane and Rice Research Station (RS&RRS), Rudrur, Professor Jayashankar Telangana Agricultural University (PJTAU), Telangana, India. The research station was situated in the Northern Telangana Agro-Climatic Zone at an altitude of approximately 404 m above sea level. The experimental fields were characterized by black soils with good drainage and moderate fertility, which are representative of the major sugarcane-growing regions of Telangana. The sugarcane clone 2013 R 81 (Co R 19141) was derived from the progeny 81 V 48 PC wherecrossing programme was carried out in 2012 at Sugarcane Breeding Institute, Coimbatore and developed at RS&RRS, Rudrur (Fig.1). This clone

progressed through various stages of clonal selection, starting with the seedling nursery in 2012–13, then advancing to the settling nursery in 2013–14 and the selection nursery in 2014–15. Due to its outstanding agronomic performance, it advanced to the Preliminary Yield Trial in 2015–16, followed by Main Yield Trial-I in 2016–17, Main Yield Trial-II and Main Yield Trial-Ratoon in 2017–18. The clone was later assessed through coordinated testing during the Initial Varietal Trial (IVT) of the All India Coordinated Research Project (AICRP) on Sugarcane in Peninsular Zone. Due to its stable performance in station and coordinated multilocation trials, 2013 R 81 was later evaluated under farmers' field conditions through minikits testing conducted by the Telangana RythuVignanaKendras (TRVKs) and Krishi Vigyan Kendras (KVKs) across Telangana from 2021 to 2024. The variety was tested in 26 locations during the Eksali planting season to assess its adaptability and yield performance under diverse production environments.

RESULTS AND DISCUSSION

Cane Yield Performance in Main Yield Trials

Clone 2013 R 81 consistently showed superior performance compared to the standard check varieties, Co 86032 and CoC 671 in the Main Yield Trials conducted at RS&RRS, Rudrur (Table 1). In the MYT-I, MYT-II and ratoon trials, this clone recorded a pooled mean cane yield of 131.91 t ha⁻¹, indicating yield advantages of 22.19% over Co 86032 and 25.62% over, CoC 671. The observed superior performance in both plant and ratoon crops highlights the clone's high yield potential and stability in Telangana. Cane yield coupled with juice quality traits determine a variety's commercial value and its sugar-producing potential.

Juice Quality Characteristics

The high cane yield observed in 2013 R 81 was accompanied by favourable juice quality parameters, as shown in Table 2. The clone exhibited a mean sucrose content of 19.43% and a Commercial Cane Sugar (CCS) of 13.45% after a year which were comparable to the standard check, Co 86032 and superior to 83 R 23 varieties. At 10 months after sowing, the clone registered a sucrose content of 16.60% and CCS of 12.16%, indicating satisfactory sugar accumulation prior to full maturity. Although, CoC 671 showed a slightly higher CCS at 10 months since it is an early variety, however 2013 R 81 maintained an

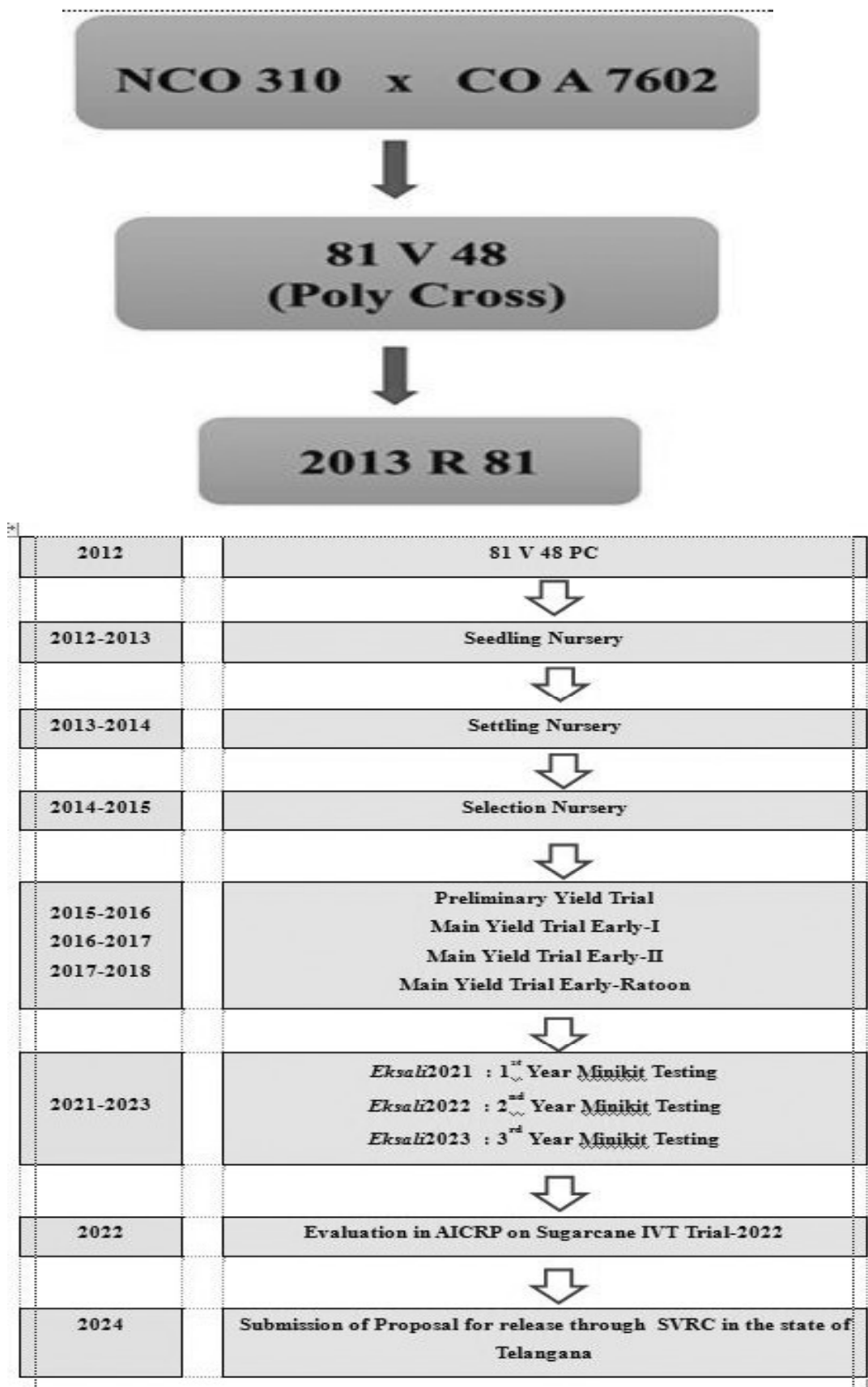


Figure1. Pedigree flow chart of 2013 R 81 (Co R 19141) development

Table 1. Performance 2013 R 81 clone in different trials at Regional Sugarcane and Rice Research Station, Rudrur

S. No.	Year	Name of the trial	Cane yield (t/ha)			% Increase over check, Co C 671	% Increase over check, Co C 671	CD (5%)	CV (%)
			2013 R 81	Check variety, Co 86032	Check variety, Co C 671				
1.	2016-17	MYT-I	103.74	94.43	79.56	9.70	30.39	17.50	8.90
2.	2017-18	MYT-II	155.57	124.02	121.34	25.43	28.20	15.00	6.68
3.	2017-18	MYT-R	136.43	105.4	114.09	29.44	19.58	22.69	10.60
		Mean	131.91	107.95	105.00	22.19	25.62		

Note: MYT-Main Yield Trial, MYTR-Main Yield Trial Ratoon**Source:**SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)**Table 2a. Performance of 2013 R 81 clone in Main Yield Trials conducted from 2016-2017 to 2017-2018 at RS&RRS, Rudrur**

S.No	Clone number	Parentage	Cane yield (t/ha)				CCS yield (t/ha)				SCW (Kg)				NMC ('000/ha)			
			IP	IIP	R	Mean	IP	IIP	R	Mean	IP	IIP	R	Mean	IP	IIP	R	Mean
1	2013 R 81	81 V 48 PC	103.74	155.57	136.43	131.91	13.21	21.83	18.54	17.86	1.14	1.55	1.5	1.4	91.65	100.68	91.05	94.46
2	83 R 23	-	85.86	112.09	105.38	101.11	9.49	13.59	13.02	12.03	1.06	1.09	1.09	1.08	81.45	102.07	96.48	93.33
3	Co C 671	-	79.56	121.34	114.09	105	10.54	15.74	14.99	13.76	1.02	1.51	1.53	1.35	78.35	80.37	74.81	77.84
4	Co 86032	-	94.43	124.02	105.4	107.95	12.46	16.87	13.81	14.38	0.93	1.18	1.13	1.08	91.2	86.14	84.54	87.29
	CD (0.05)		17.15	15	22.69		1.8	2.08	2.44		NS	0.06	0.18		24	10.25	11.3	
	CV (%)		8.9	6.68	10.65		4.9	7.95	11.19		8.12	2.15	6.58		10.5	6.77	8	

Note: IP: Main Yield trial Plant I, IIP: Main Yield trial Plant II, R: Main Yield trial Ratoon**Source:**SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

excellent balance between cane yield and juice quality. These results suggest that the clone possesses desirable processing quality in addition to its superior productivity. To confirm the consistency of its performance across diverse agro-climatic conditions, the clone was subsequently assessed in multi-location trials.

Performance of 2013 R 81 in Initial Varietal Trial (AICRP on Sugarcane)

The performance of 2013 R 81 (Co R 19141) was further validated under the Initial Varietal Trial (IVT) of the All India Coordinated Research Project (AICRP) on Sugarcane during Eksali 2022–23 across seven test locations representing the Peninsular Zone (Tables 3a–3c). The clone exhibited stable performance across diverse agro-climatic conditions, confirming its wider adaptability and stable yield. The clone recorded a mean cane yield of 127.27 t ha⁻¹, which was higher than the standard varieties Co 86032 (118.10 t ha⁻¹), Co 09004 (112.55 t ha⁻¹) and CoC 671 (99.20 t ha⁻¹) (Table 3a). The highest cane yield of 143.51 t ha⁻¹ was recorded at Coimbatore, followed by 136.97 t ha⁻¹ at Navsari and 135.67 t ha⁻¹ at Belagavi, demonstrating the clone's consistent performance across all locations.

In terms of juice quality, 2013 R 81 registered a mean CCS of 13.68% across all locations (Table 3b). Although the commercial checks recorded comparatively higher average CCS values, the clone maintained satisfactory recoverable sugar in combination with superior cane productivity. Likewise, the mean sucrose content at 12 months was 19.37% (Table 3c), with values exceeding 20% at Mandya and Padegaon, indicating good sugar accumulation under favorable growing conditions. The combined performance of cane yield, CCS and sucrose clearly demonstrated that 2013 R 81 registered an excellent balance between productivity and juice quality. The superior yield advantage observed under coordinated multilocation evaluation confirms its adaptability across the Peninsular Zone and supports its suitability for commercial cultivation in Telangana and similar sugarcane-growing environments.

Performance of 2013 R 81 in Minikit Testing

The clone consistently outyielded the respective check varieties (Co 86032, 2003 V 46 and 93 V 297) across all the locations. The cane yield of 2013 R 81 ranged from 114.90 to 128.60 t ha⁻¹, while the

corresponding check varieties recorded yields between 103.90 and 121.80 t ha⁻¹. The yield advantage varied from 5.4 to 17.5% over the checks, indicating stable superiority across locations and seasons. On a pooled basis, the clone recorded an average cane yield of 121.70 t ha⁻¹, compared with 110.80 t ha⁻¹ for the check varieties, resulting in an overall yield advantage of 10.4% (Table 4). The superior performance of 2013 R 81 under farmers' field conditions confirmed the results obtained in station and AICRP evaluations and demonstrated its wider adaptability, yield stability and suitability for commercial cultivation in the sugarcane-growing regions of Telangana.

Reaction of 2013 R 81 to Major Diseases

The disease reaction of 2013 R 81 was evaluated under both station conditions at RS&RRS, Rudrur and coordinated trials under the AICRP on Sugarcane to assess its resistance against major sugarcane diseases (Tables 5a and 5b). Under station evaluation, the clone exhibited moderate resistance to Yellow Leaf Disease (YLD) and red rot by the plug method, while it showed resistance to red rot by the nodal method. Compared with other test clones, 2013 R 81 exhibited a more favorable disease response, indicating its potential for stable field performance.

The coordinated AICRP evaluation further confirmed the disease tolerance of the clones across different testing locations. 2013 R 81 exhibited moderately resistant reactions to red rot against both CF 06 and CF 12 pathotypes under the plug method and showed resistance under the cotton swab method. The clone also exhibited moderately resistant reactions to Yellow Leaf Disease and resistant reactions to smut and wilt. The favorable response to these economically important diseases indicates that 2013 R 81 possesses a broad spectrum of disease tolerance, contributing to its yield stability and suitability for commercial cultivation in the state of Telangana.

Reaction of 2013 R 81 to Major Insect Pests

The reaction of 2013 R 81 to major insect pests was assessed during 2019–20 and 2021–22 under field conditions at RS&RRS, Rudrur (Tables 6a and 6b). The clone consistently exhibited low susceptibility (LS) to early shoot borer, internode borer and scale insects during both years of evaluation. The cumulative incidence of early shoot borer remained considerably

Table 2b. Performance of 2013 R 81 for quality traits in Main Yield Trial conducted from 2016-2017 to 2017-2018 at RS&RRS, Rudrur

S.No	Clone number	Parentage	Sucrose % 12 th month				CCS% 12 th month				Sucrose % 10 th month				CCS% 10 th month			
			IP	IIP	R	Mean	IP	IIP	R	Mean	IP	IIP	R	Mean	IP	IIP	R	Mean
1	2013 R81	81 V 48 PC	19.1	19.81	19.39	19.43	12.73	14.03	13.59	13.45	18.74	15.32	15.73	16.6	12.53	12.81	11.13	12.16
2	83 R 23	-	16.53	17.3	17.47	17.1	11.05	12.12	12.36	11.84	16.48	16.56	17.01	16.68	10.97	12.03	9.79	10.93
3	Co C 671	-	19.13	18.45	18.6	18.73	13.25	12.97	13.14	13.12	18.01	18.98	18.95	18.65	13.31	13.11	9.05	11.82
4	Co 86032	-	19.2	19.1	19.3	19.2	13.2	13.6	13.1	13.3	16.29	16.82	16.43	16.51	10.82	11.52	12.44	11.59
	CD (0.05)		1.38	0.64	0.5		1.2	0.51	0.4		0.8	1.05	1.33		1.2	0.91	1.25	
	CV (%)		4.63	2.03	1.59		5.95	2.26	1.83		1.1	3.47	7.36		5.8	4.42	10.62	

Note: IP: Main Yield trial Plant I, IIP: Main Yield trial Plant II, R: Main Yield trial Ratoon

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 3a. Performance of 2013 R 81 for cane yield (t/ha) in Initial Varietal Trial (AICRP on Sugarcane) during Eksali, 2022-23

S.No	Entry	Coimbatore	Belgavi	Kolhapur	Mandya	Navasari	Padegon	Rudrur	Mean
1	Co R 19141	143.51	135.67	135.1	106.39	136.97	122.02	111.2	127.27
Standards									
1	Co 86032	109.11	121.47	152.4	130.19	96.57	124.05	92.94	118.10
2	CoC 671	122.31	119.73	88.9	82.22	108.35	85.23	87.65	99.20
3	Co 09004	119.5	140.31	103.5	107.22	102.61	127.95	86.73	112.55
	SEm±	7.43	7.88	6.16	5.69	5.04	7.82	6.3	
	CD (0.05)	21.17	22.39	17.08	16.17	14.33	22.22	17.89	
	CV (%)	10.42	11.14	10.12	9.58	8.07	12.24	11.86	

Source: PI (AICRP on Sugarcane) report 2022-23, Pg No 99-133

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 3b. Performance of 2013 R 81 for commercial cane sugarcane (CCS%) in Initial Varietal Trial (AICRP on Sugarcane) during Eksali, 2022-23

S.No	Entry	Coimbatore	Belgavi	Kolhapur	Mandya	Navasari	Padegon	Rudrur	Mean
1	Co R 19141	11.56	13.73	13.9	14.87	13.57	14.86	13.3	13.68
	Standards								
1	Co 86032	15.65	15.06	13.8	14.03	15.08	14.47	13.71	14.54
2	CoC 671	13.45	14.47	14.1	14.64	15.72	15.65	13.76	14.54
3	Co 09004	15.04	14.34	14	14.95	15.55	15.46	14.06	14.77
	SEm±	0.74	0.46	0.6	0.28	0.46	0.37	0.23	
	CD (0.05)	2.12	1.31	1.65	0.8	1.29	1.05	0.66	
	CV (%)	1.41	5.58	7.52	3.39	5.51	4.34	3.1	

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 3c. Performance of 2013 R 81 for sucrose% at 12th month in initial varietal trial (AICRP on Sugarcane) during Eksali, 2022-23

S.No	Entry	Coimbatore	Belgavi	Kolhapur	Mandya	Navasari	Padegon	Rudrur	Mean
1	Co R 19141	16.61	19.53	19.4	20.8	19.16	21.1	19.01	19.37
	Standards								
1	Co 86032	21.94	21.44	20.4	19.62	20.82	20.66	19.43	20.62
2	CoC 671	19.39	20.77	19.9	20.5	21.73	22.23	19.62	20.59
3	Co 09004	21.26	20.49	19.8	20.94	21.65	22.02	19.99	20.88
	SEm±	0.34	0.54	0.54	0.39	0.53	0.46	0.31	
	CD (0.05)	0.95	1.53	1.51	1.11	1.51	1.31	0.89	
	CV (%)	2.93	4.58	4.81	3.39	4.59	3.83	2.91	

Table 4. Performance of 2013 R 81 in minikit trials conducted by DAATT centers and KVK of Telangana from 2021 to 2023

Season	Station / TRVK KVK	No. of Locations	Minikit yield (t/ha) (2013 R 81)	Check yield (t/ha) (Co 86032, 2003 V 46 and 93 V 297)	Percent increase/decrease over check
Eksali 2021-22	Rudrur, KVK	2	119.07	110	8.2
	Maitummeda, TRVK	1	116.8	109.3	6.8
	Sangupet, TRVK	1	128.4	121.8	5.4
	Mahabubnagar, TRVK	1	124.8	112.4	11.0
Eksali 2022-23	Rudrur, KVK	3	128.6	109.4	17.5
	Maitummeda, TRVK	3	120.11	112.2	7.0
Eksali 2023-24	Rudrur, KVK	10	114.9	103.9	10.5
	Maitummeda, TRVK	5	121.1	108.1	12.0
		26	121.7	110.8	10.4

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 5a. Reaction of 2013 R 81 to major diseases at RS&RRS, Rudrur, during 2021-22

Clones	YLD	Red rot	
		Plug method	Nodal method
2013 R 81	MR	MR	R
2013 R 76	MR	MS	S
2014 R 50	MR	MS	S
2010 R 854	MS	S	S
93V297 (C)	S	-	-
2016 R 97	MR	HS	S

Note: **R** – Resistant, **S** – Susceptible, **MR** – Moderately Resistant,**MS** – Moderately Susceptible, **HS** – Highly Susceptible, **YLD**- Yellow Leaf Disease

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 5b. Reaction of 2013 R 81 to major diseases in IVT trials of AICRP on Sugarcane during 2022-23

Clones	Redrot (Plug Method)		Redrot (Cotton Swab Method)		Smut	Wilt	YLD natural conditions
	cf 06	cf 12	cf 06	cf 12			
2013 R 81	MR	MR	R	R	MR	R	R
Co 09004 (C)	MR	MR	R	R	HS	MS	S
Co 86032 (C)	MR	MR	R	R	S	R	HS
CoC (C)	HS	HS	S	S	HS	S	-

Note: **R** – Resistant, **S** – Susceptible, **MR** – Moderately Resistant,

MS – Moderately Susceptible, **HS** – Highly Susceptible, **YLD**- Yellow Leaf Disease

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 6a. Reaction of 2013 R 81 (Co R 19141) to early shoot borer, inter node borer and scale insect at RS&RRS, Rudrur, during the year, 2019-20

S.No	Clone	Cumulative Incidence of ESB (% DH)	Reaction	% Intensity of Internode borer	% Incidence of Internode borer	Reaction	% Infection of Scale insect	Reaction
1	2013 R 81	4.28	LS	5.15	12.50	LS	1.67	LS
2	2013 R 76	22.85	MS	6.96	8.87	LS	8.33	LS
3	2014 R 50	15.71	MS	6.46	5.82	LS	16.66	MS
4	Co 8014	31.42	HS	8.07	16.57	LS	45.00	HS
5	97 R 129	5.7	LS	6.30	4.69	LS	70.00	HS

Note: **R** – Resistant, **S** – Susceptible, **MR** – Moderately Resistant,

MS – Moderately Susceptible, **HS** – Highly Susceptible

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 6b. Reaction of 2013 R 81 (Co R 19141) to early shoot borer, inter node borer and scale insect at RS&RRS, Rudrur, during 2021-22

S.No	Clone	Cumulative Incidence of ESB (% DH)	Reaction	% Intensity of Internode borer	% Incidence of Internode borer	Reaction	% Infection of Scale insect	Reaction
1	2013 R 81	8.9	LS	10.6	10.7	LS	4	LS
2	2013 R 76	23.8	MS	19.5	17.3	LS	16.00	MS
3	2014 R 50	14.9	LS	9.9	21.3	MS	8	LS
4.	Co 8014	35.7	HS	22.4	30.7	MS	32	MS
5.	2015 R 21	26.9	MS	4.5	1.3	LS	4	LS

Note: **R** – Resistant, **S** – Susceptible, **MR** – Moderately Resistant,

MS – Moderately Susceptible, **HS** – Highly Susceptible

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table7. Agronomic evaluation of 2013 R 81 during Eksali 2021-22 and 2022-23

Treatments	Tiller count DAS 90	Tiller count DAS 120	No. of internodes	Cane length	Cane girth	Gross Returns	COC	Net Returns	BC Ratio	NMC (000/ha)	SCW (kg/cane)	Cane Yield (t/ha)
2013R81	96.4	117.8	22.7	264.6	3.0	377592	187073	190519	2.03	92.7	1.47	114.4
2013R76	86.8	103.0	21.3	213.4	2.9	338740	175876	162864	1.96	88.3	1.43	102.6
2014R11	87.6	97.4	25.0	269.4	2.8	375282	169548	205734	2.29	85.8	1.52	113.7
2011R305	76.3	90.4	21.1	247.5	2.8	355361	180688	174673	2.00	81.2	1.4	107.7
97R129	70.0	82.6	22.0	251.2	2.8	360707	181755	178952	2.00	77.3	1.44	109.2
2011R1	89.8	107.6	23.0	245.5	3.1	318500	186599	131901	1.74	78.2	1.57	96.5
Co 86032©	92.2	105.2	21.6	208.9	2.3	215971	186711	42761	1.21	76.7	0.93	69.5
SEm±	4.02	3.94	0.68	10.18	0.12					3.4	0.09	6
CD (0.05)	12.40	12.13	2.09	31.36	0.35					10.4	0.27	18.3
CV (%)	8.15	6.78	5.25	7.26	7.11					7.1		10.1

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81).

lower than that observed in the susceptible checks, whereas damage due to the internode borer and scale insect also remained within the low-susceptibility category.

The stable expression of low susceptibility over two consecutive years demonstrates the ability of 2013 R 81 to withstand major insect pests prevalent in Telangana. The combined tolerance to important diseases and insect pests, together with its superior cane yield and desirable juice quality, enhances the adaptability and commercial value of the variety and supports its recommendation for large-scale cultivation under the agro-climatic conditions of Telangana.

Post-Harvest Deterioration Studies

The post-harvest quality of 2013 R 81 was evaluated under Eksali 2023–24 by monitoring changes in sucrose, commercial cane sugar (CCS), purity and juice extraction up to 96 hours after harvest (Table 8). Similar to other sugarcane entries, gradual reductions in juice quality parameters were observed with an increasing storage duration. The sucrose content of 2013 R 81 declined from 20.0% at harvest to 18.7% after 96 hours, whereas CCS decreased from 14.4% to 12.5% during the same period. Purity also decreased from 99.2% to 80.0%, and juice extraction reduced from 51% to 45% after 96 hours. Despite the expected post-harvest deterioration, the clone retained satisfactory juice quality for up to 48 hours, indicating its suitability for harvesting, transportation and crushing under commercial conditions. The gradual decline in quality traits observed after harvest emphasizes the importance of timely processing to maximize sugar recovery.

Jaggery Quality Evaluation

Jaggery prepared from 2013 R 81 exhibited desirable quality characteristics, confirming its suitability for jaggery production (Table 9). The variety recorded 90.65°Brix, 84.15% sucrose, 11.46% recovery and the highest jaggery yield of 16.48 t ha⁻¹ among the evaluated entries. It also maintained high purity (93.84%) with a comparatively low moisture content (9.59%), desirable hardness and acceptable color intensity, indicating the production of high-quality jaggery. The favorable physico-chemical properties, including pH (5.43) and electrical conductivity (4.12 dS m⁻¹), further support its suitability for processing. The

superior jaggery yield coupled with high cane productivity and satisfactory juice quality, demonstrates that 2013 R 81 is well suitable for both the sugar industry and the traditional jaggery sector in Telangana, thereby providing greater market opportunities and enhanced profitability for farmers.

Distinct Morphological Characteristics (DUS)

The distinctness, uniformity and stability (DUS) characteristics of 2013 R 81 (Co R 19141) were recorded using standard sugarcane descriptors (Table 10 & Fig. 2). The clone is characterized by a semi-erect stool habit, greenish-yellow exposed stalks, yellow-green unexposed stalks, straight cylindrical internodes with medium waxiness and large ovate buds with an apical germ pore. The foliage consists of medium-width leaves with a curved leaf tip, green-purple leaf sheath, green dewlap and deltoid ligule. The variety also exhibited non-flowering behavior under the evaluation conditions. These stable morphological characteristics provide reliable diagnostic features for varietal identification and distinguish 2013 R 81 from the existing commercial sugarcane varieties cultivated in the state (Fig. 3).

CONCLUSION

The sugarcane clone 2013 R 81 (Co R 19141) recorded higher cane yields over the standard check varieties under different stages of evaluation, demonstrating its yield superiority and stable performance across environments. This variety also possessed desirable juice quality, as evidenced by its satisfactory sucrose and commercial cane sugar (CCS) content, together with good jaggery-making characteristics.

The clone exhibited moderate resistance to red rot and yellow leaf disease, resistance to smut and wilt, and low susceptibility to major insect pests, indicating its suitability for sustainable cultivation. Furthermore, acceptable post-harvest juice quality retention and distinct DUS characteristics strengthen its commercial value and varietal identity. The combined evaluation of agronomic performance, juice quality, disease and insect pest reaction, post-harvest behavior, and processing quality established the superiority of 2013 R 81 over the existing commercial checks evaluated in this study. Based on its consistent

Table 8. Post harvest deterioration studies in 2013 R 81 during Eksali 2023-24

Entries	Sucrose percent					CCS percent					Purity percent					Juice extraction percentage				
	0 hrs	24 hr	48 hr	72 hr	96 hr	0 hr	24 hr	48 hr	72 hrs	96 hr	0 hr	24 hr	48 hr	72 hr	96 hr	0 hr	24 hr	48 hr	72 hr	96 hr
Time																				
2018R235	20.2	19.9	19.2	18.8	18.2	14.1	13.7	13.7	12.5	11.7	89.8	86.8	86.7	81.6	77.5	55	53	52	51	50
2016 R 1	20.0	19.6	18.9	18.7	17.8	14.0	14.3	13.3	12.9	12.2	90.7	99.4	85.5	87.2	86.9	53	52	51	50	49
2016 R 74	19.1	18.7	18.3	17.2	16.9	13.9	13.5	12.9	11.3	11.5	97.4	91.1	89.0	82.2	81.8	55	54	53	52	51
2018R200	19.6	19.6	19.2	18.1	17.8	14.3	13.7	14.0	11.9	12.0	99.3	91.1	95.5	80.3	84.6	53	52	50	49	48
2013 R 81	20.0	19.6	19.4	19.1	18.7	14.4	13.7	13.6	12.8	12.5	99.2	96.1	87.2	84.6	80.0	51	50	48	46	45
2018 R 31	19.6	19.1	18.8	18.2	17.5	14.2	13.6	13.5	12.6	11.3	97.8	94.9	93.0	88.8	81.3	53	52	51	50	48

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

Table 9. Quality parameters of jaggery prepared from 2013 R 81 in 2018-19 at RS&RRS, Rudrur

Variety	Brix (%)	Sucrose (%)	Recovery (%)	Jaggery yield (t ha ⁻¹)	Purity (%)	Moisture (%)	Hardness (cm)	Color intensity (%)	pH	EC (d Sm ⁻¹)
2013R81	90.65	84.15	11.46	16.475	93.84	9.59	36.62	38.58	5.4345	4.117
2014R11	90.42	81.75	10.67	14.85	92.41	9.8	30.305	34.455	4.8685	5.585
2013R76	85.915	78.65	9.365	12.975	89.96	11.13	29.11	36.235	5.101	5.145
97R129 (Check)	92.11	86.15	11.085	13.88	93.54	9.67	35.88	37.03	5.257	2.112
Co 8014 (Check)	91.69	85.55	10.94	14.465	93.315	10.035	37.195	39.16	4.787	2.445
Mean	89.5	82.695	10.53	14.24	92.125	10.2	33.455	35.695	5.205	4.15

Source: SVRC Release Proposal of Rudrur cheruku-81 (2013 R 81)

2a.2013 R 81 Leaf sheath



2b.Cane internode view



Figure 2. Images of Rudrur cheruku-81 (2013R81)



Figure 3. Cane view of Rudrur cheruku- 81 (2013 R 81) variety

Table 10. DUS characters of 2013 R 81 (Co R 19141)

S. No.	Name of the descriptor		Descriptor Status
1	Stool habit	:	Semi-erect
2	Stem colour exposed	:	Greenish yellow
3	Stem colour unexposed	:	Yellow Green
4	Ivory marks	:	Absent
5	Weather marks	:	Absent
6	Internode shape	:	Cylindrical
7	Internode alignment	:	Straight
8	Wax on internode	:	Medium
9	Pithiness	:	Absent
10	Root zone colour exposed	:	Green
11	Root zone colour unexposed	:	Light green
12	Number of root eye rows	:	Three
13	Arrangement of root eye	:	Irregular
14	Bud size	:	Large
15	Bud shape	:	Ovate
16	Growth ring colour	:	Yellow green
17	Leaf width	:	Medium
18	Leaf sheath spines	:	Absent
19	Dewlap colour	:	Green
20	Ligule shape	:	Deltoid
21	Inner auricle shape	:	Incipient
22	Flowering	:	Absent

performance under research station, coordinated multilocation and farmers' minikit field evaluations, 2013 R 81 (Rudrur Cheruku-81) was identified as a promising mid-late maturing sugarcane variety for commercial cultivation in Telangana. This variety has the potential to contribute to varietal diversification, enhance sugarcane productivity, and support the raw material requirements of both the sugar and jaggery industries in the state.

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