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Research Article

Co 12009: Midlate sugarcane variety for tropical India

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Abstract
Co 12009 was identified by ICAR-Sugarcane Breeding Institute, Coimbatore as a high yielding and midlate maturing variety which was selected from the cross of [{(Co 7201 x (Co 62174 x SES 91)} x Co 88037)}] x Co 62198. The variety was approved in the 83rd meeting of the Central Sub Committee on Crop standards, Notification and released for cultivation as a midlate variety in the States of Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Tamil Nadu and Telangana of Peninsular Zone. It has SES 91 (*S. spontaneum)* as a genetic base and is a product of three nobilized generations. It performed well in All India Coordinated Research Project AICRP(S) trials conducted across the centres of Peninsular zone for cane yield, sugar yield and sucrose % with an overall mean of 119.65 t/ha of cane yield, 17.31 t/ha of commercial cane sugar, 19.91 per cent of juice sucrose at 360 days of harvest in comparison with midlate standard Co 86032. It is an excellent ratooner with an improvement of 13.70 and 10.43 per cent for sugar and cane yield, respectively over Co 86032 and also performed well under 125 % RDF (recommended dose of fertilizer) condition and wide row spacing for cane yield and it was superior to all the three standards *viz*., CoC 671, Co 86032 and CoSnk 05103. It is resistant to red rot and proved its wide adaptability in varied environments and also a promising donor for drought. Co 12009 is viewed as a potential midlate variety and is expected to produce higher cane and sugar yield in the states of Peninsular zone.

Keywords: Co 12009, Midlate variety, Cane yield, sugar yield, Sugar cane

INTRODUCTION

In sugarcane cane, yield is an important character and varieties play an important role in sugarcane production and its sustainability. New varieties with high yield coupled with good quality and well suited for varied environments and different maturity phases are identified and are a continuous process. Intermittent and prolonged drought is observed in farmer's fields due to irregular rainfall patterns and hence clones that exhibit tolerance to low moisture levels are more desirable. Varietal development based on the evaluation of different genotypes under varying environmental conditions is essential to select high-yielding and stable varieties. There is a need to identify high –yielding new crop varieties adapted to the varying ecological and climatic conditions. The varietal improvement programme at the ICAR -Sugarcane Breeding Institute, Coimbatore, is focused in developing superior varieties with the potential to increase sugar yield and combining high cane yield, sucrose content and resistance to pests and diseases. Efforts are continuously being made to identify alternate sugarcane varieties that combine diverse background, high yield and varied adaptability with wide performance to the changing climatic/ecological conditions through multilocation testing to improve the productivity in tropical India. The midlate maturing sugarcane variety Co 12009, is a variety with a new genetic base of SES 91 (*S.spontaneum*) identified through multilocation testing in the tropical zone of India that combines high yield and quality in comparison with Co 86032 at twelve months of age indicating its potential as a high yielding variety with wide adaptability under varied environments and red rot resistance.

MATERIALS AND METHODS

Co 12009 was identified through hybridization and

selection of the cross [{(Co 7201 x (Co 62174 x SES 91)} x Co 88037)}] x Co 62198 of which SES 91 clone is a new genetic base involving *S. spontaneum.* It is the nobilized third back cross product of F_1 hybrid involving Co 62174 and SES 91 and crossed with *viz.*, BGC 25021, Co 7201, Co 88037 and Co 62198 at three stages of nobilisation. The clone was evaluated in the ground nursery at ICAR-Sugarcane Breeding Institute, Research Centre, Agali and in subsequent clonal stages at ICAR- SBI, Coimbatore for yield and quality parameters during the period of 2006-2012. The clone was tested in Initial Varietal Trial (IVT) (2015-16) under the All India Coordinated Research Project on Sugarcane [AICRP(S)] in 14 centres of Peninsular India and promoted to advanced Varietal Trial (AVT) testing (2017-2019) in major tropical regions of sugarcane (Coimbatore, Akola, Basmathnagar, Kolhapur, Mandya, Navsari, Padegaon, Perumalapalle, Powerkheda, Pravaranagar, Pugalur, Pune, Sameerwadi, Sankeshwar and Thiruvalla centres). The trials were laid out in randomized block design (RBD) replicated thrice with a plot size of eight rows of 6 m length spaced 90 cm apart. Normal cultural practices were followed and plant protection measures were carried out to raise a healthy crop (Sundara, 1998). Observations were recorded at 300 and 360 days on the number of millable canes ('000/ ha), cane thickness (cm), cane height (cm), single cane weight (kg), CCS (t/ha) and cane yield (t/ha) at 360 days. Quality parameters (Brix %, Sucrose% and CCS %) were recorded at 300 and 360 days. The red rot reaction of this clone was evaluated under natural and artificial conditions with predominant red rot causing pathotype in the Peninsular region. Statistical analysis was carried out using a standard procedure (Singh and Chaudhary,1985). The genealogy of Co12009 is given below.

RESULTS AND DISCUSSION

AVT (Two plant and one ratoon crops) were conducted in 14 centres of the Peninsular zone during 2017-2019. Co 12009 recorded 119.65 t/ha of cane yield, 17.31 t/ha of commercial cane sugar, 19.91 per cent of juice sucrose and 15.47 per cent of pol in the cane at 360 days of harvest (**Table 1**) and topped in 18 and 21 trials compared to all the standards for cane yield (t/ha) and sugar yield (t/ha), respectively. Co 12009 recorded an average CCS yield of 17.31 t/ha from three crops (2P+1R) with an overall improvement of 10.40 , 18.08 and 15.32 per cent for sugar yield over the best midlate standard Co 86032 (15.68 t/ha) and early standard varieties *viz.,* CoC 671 (14.66 t/ha) and CoSnk 05103 (15.04 t/ha) from 21 trials. Co 12009 with an overall mean cane yield of 119.65 t/ha showed an improvement of 9.03, 23.42 and 7.92 per cent in comparison with the standards Co 86032 (109.73 t/ha), CoC 671 (96.93 t/ha) and CoSnk 05103 (110.85 t/ ha), respectively (**Table 2 and Table 3**).

Co 12009 was the best entry in the ratoon trials with an improvement of 13.70 and 10.43 per cent for sugar and cane yield, respectively over Co 86032. It recorded 30.11 and 34.19 per cent improvement for sugar and cane yield, respectively over the early standard CoC 671.

Out of 33 locations tested, Co 12009 topped in 10 centres for juice sucrose % and 15 locations for Pol % cane. Co 12009 recorded 19.91 sucrose per cent with an improvement of 1.80 and 6.99 per cent over the midlate standard Co 86032 and early standard CoSnk 05103, respectively (**Table 1**). In ratoon crop, the entry showed an improvement of 2.52 and 8.07 per cent over the standards checks Co 86032 and CoSnk 05103, respectively. This entry performed well across the zone for cane and sugar yield, sucrose % and pol % cane. Among the 14 locations tested, Co 12009 topped in Padegaon, Basmathnagar and Perumallapalle for juice sucrose % and CCS %. Co 12009 ranked first in five locations for Pol % cane. It recorded juice sucrose of 17.46 per cent at 300 days in comparison with Co 86032 (17.35 %) and CoSnk 05103 (16.34 %) with an improvement of 0.61 and 6.86 per cent over the checks, respectively.

The mean Pol% in cane in Co 12009 was 15.47 per cent which was 2.25 and 6.84 per cent improvement over the zonal standards Co 86032 and CoSnk 05103, respectively. It showed a 1.97 per cent improvement in Pol % in cane over the qualifying variety CoM 12085 (15.17 %). The entry recorded a mean CCS of 14.10 per cent across the zone with an overall improvement of 2.28 and 7.35 per cent over Co 86032 and CoSnk 05103, respectively.

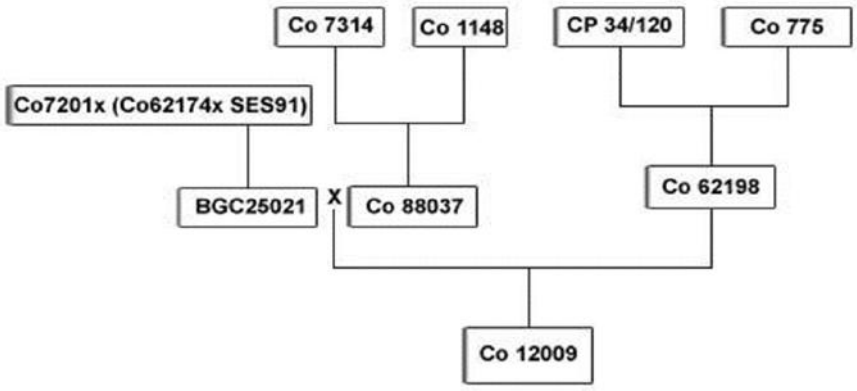

Table 1. Performance of Co 12009 (2P+1R) across 14 centres in Peninsular zone in advanced varietal trials (2017-2019) at 360 days

Entries/ Standards	CCS (t/ha)	Cane yield (t/ha)	Sucrose %	CCS %	Purity %	Pol % in cane	Cane diameter (cm)	Cane length (cm)	Single cane weight (kg)	NMC ooo/ha
Co 12009	17.31	119.65	19.91	14.10	92.50	15.47	2.81	294.36	1.17	93.02
Co 86032	15.68	109.73	19.55	13.79	91.87	15.13	2.81	252.66	0.98	97.70
CoC 671	14.66	96.93	20.81	14.78	93.22	16.20	2.81	251.83	1.01	84.30
CoSnk 05103	15.04	110.85	18.61	13.14	91.11	14.48	2.48	282.65	0.80	115.43
% improvement over Co 86032	10.40	9.03	1.80	2.28	0.68	2.25	-0.02	16.50	19.19	-4.79
% improvement over CoC 671	18.08	23.42	-4.30	-4.57	-0.77	-4.51	-0.18	16.89	15.58	10.34
% improvement over CoSnk 05103	15.32	7.92	6.99	7.35	1.52	6.84	13.13	4.14	46.78	-19.41

In Coimbatore, Co 12009 recorded a cane yield of 119.60 t/ha with an improvement of 21.60 per cent against Co 86032 (98.36 t/ha). It recorded a sugar yield of 17.05 t/ha in comparison with standard checks Co 86032 (13.78 t/ha), CoC 671 (13.80 t/ha) and CoSnk 05103 (14.74 t/ha) and showed an increase of 23.68, 23.56 and 15.65 per cent for sugar yield, respectively. In Padegaon, it recorded a sugar yield of 20.21 t/ha with an improvement of 11.64 and 9.62 per cent over CoC 671 and CoSnk 05103, respectively (**Table 2 and Table 3**).

Co 12009 performed well in Navsari, Padegaon, Pravaranagar, Perumallapalle, Kolhapur and Sankeshwar centres for cane and sugar yield. It performed well for juice sucrose % in Coimbatore, Padegaon, Kolhapur, Pune, Rudrur, Sankeshwar and Thiruvalla.

It recorded an overall improvement (2P+1R) of 9.48, 27.14, 28.47 and 19.16 per cent for cane yield over popular variety Co 86032 in Kolhapur, Navsari, Perumallapalle and Sankeshwar centres, respectively.

Co 12009 has the ideal plant characters of very tall, erect, thick canes and early fast growth with high tillering ability. The clone possesses tall canes of 294.36 cm in length. It recorded 16.50 per cent improvement for cane height over Co 86032 and 16.89 per cent over CoC 671. Single cane weight, the major component of yield trait was high which ranged from 1.21 kg (Rudrur) to 2.06 kg (Pravaranagar) and recorded an improvement of 19.19 per cent over Co 86032 (**Table 1**). Under wide row spacing of 120 cm between rows, Co 12009 recorded a cane yield of 158.83 t/ha with an improvement of 16.24, 11.61 and 10.41 per cent over CoC 671, Co 86032 and CoSnk 05103, respectively. The clone performed well under 125 % RDF (recommended dose of fertilizer) condition for cane yield and it was superior to standards *viz.*, CoC 671, Co 86032 and CoSnk 05103 with an improvement of 11.50, 4.50 and 5.76 per cent, respectively (**Table 4**).

Identification and release of variety with resistance to new pathological or entomological stresses and improved adaptation to abiotic stresses like drought will have a great impact on sugarcane productivity. This variety with resistance to red rot and adaptation to varied environments is a boon for the Peninsular zone. Co 12009 was MS-MR (Plug) at Coimbatore, Navsari and Thiruvalla centres and resistant (Nodal) to red rot in all centres and smut in all centres except Pune (**Table 5**). However, no natural incidence of smut was observed during the evaluation period. Co 12009 is less susceptible to top borer in Mandya. It was less susceptible to moderately susceptible for early shoot borer, internode borer, mealy bug (except in Padegaon) and scale insect (**Table 6**).

The variety has distinct morphological characters (**Table 7**). It has very tall, erect, thick, greenish wax coated canes with smooth, zigzag, cylindrical to bobbin shaped long internodes, yellow orange growth ring and light yellow dewlap. It is characterized by prominent deep bud grooves, small ovate buds, open tip droopy leaves and a green sheath with very light spines.

The identified midlate variety was compared with Co 86032 for its juice sucrose % and cane yield at 360 days. It combines high yield and quality in comparison with Co 86032 at ten and 12 months of age indicating its potential as a high yielding clone for the tropical zone. Co 12009 possess high and stable yield and better quality characteristics in plant and ratoon crops across the 14 centres of the Peninsular zone in c omparison with the popular variety Co 86032. It combines red rot resistance and would certainly suit cultivation in the Peninsular zone. Co 12009 (THE GAZETTE OF INDIA :3099 4773/G/2020) is viewed as a potential midlate variety and is expected to produce higher cane and sugar yield in the states of the Peninsular Zone.

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Table 2. Performance of Co 12009 in Peninsular zone for CCS (t/ha)

Crop	Entry	Coimbatore	Akola	Basmathnagar	Kolhapur	Mandya	Navsari	Padegaon	Perumalapalle	Pravaranagar	Pune	Rud rur	Sameerwadi	Sankeshwar	Thiruvalla	Mean
I Plant	Co 12009	15.34	14.33		22.57	16.03	17.30	22.71	13.47	20.51	21.12	8.67	6.44	18.15	8.95	18.15
	Co 86032	14.43	8.88		17.31	12.32	12.99	20.58	14.69	22.10	19.68	13.08	8.43	12.72	10.72	15.57
	CoC 671	15.28	10.86		17.05	11.50	15.14	20.04	17.41	20.24	19.12	16.43	4.72	13.80	8.73	16.04
	CoSnk 05103	14.29	12.27		17.15	9.32	11.84	18.55	15.03	16.37	18.94	9.75	6.33	12.44	6.76	14.62
	% over Co 86032	6.31	61.37		30.39	30.11	33.18	10.35	-8.30	-7.19	7.32	-33.72	-23.61	42.69	-16.51	16.57
	% over CoC 671	0.39	31.95		32.38	39.39	14.27	13.32	-22.63	1.33	10.46	-47.23	36.44	31.52	2.52	13.13
	% over CoSnk 05103	7.35	16.79		31.60	72.00	46.11	22.43	-10.38	25.29	11.51	-11.08	1.74	45.90	32.40	24.15
II Plant	Co 12009	17.31	2.08	14.88	18.53	12.12	17.74	20.66	18.16	19.55	16.54	21.31	25.91	17.18	11.97	17.84
	Co 86032	14.12	3.00	15.20	16.72	14.76	14.69	21.95	12.91	19.37	17.55	16.62	29.45	17.01	12.53	17.15
	CoC 671	13.36	1.84	13.87	15.90	14.73	13.79	21.31	10.65	17.17	16.77	13.61	21.61	16.73	12.54	15.54
	CoSnk 05103	14.64	5.80	15.86	14.83	15.85	13.68	20.26	11.25	17.77	16.50	11.07	26.93	15.88	12.41	15.92
	%. over Co86032	22.59	-30.67	-2.11	10.83	-17.89	20.76	-5.88	40.67	0.93	-5.75	28.22	-12.02	1.00	-4.47	4.02
	% over CoC 671	29.57	13.04	7.28	16.54	-17.72	28.64	-3.05	70.52	13.86	-1.37	56.58	19.90	2.69	-4.55	14.80
	% . over CoSnk 05103	18.24	-64.14	-6.18	24.95	-23.53	29.68	1.97	61.42	10.02	0.24	92.50	-3.79	8.19	-3.55	12.06
Ratoon	Co 12009	18.49			14.40	11.39	14.22	17.25	15.25	20.54	19.54	12.50	7.60	14.11	8.96	15.77
	Co 86032	12.80			12.82	13.32	11.49	16.47	9.13	21.57	17.34	15.06	10.43	8.73	9.97	13.87
	CoC 671	12.75			10.48	7.54	11.06	12.95	11.64	18.34	12.63	17.13	2.57	6.68	8.41	12.12
	CoSnk 05103	15.29			13.38	16.02	11.54	16.49	9.93	17.28	16.47	15.38	13.27	11.32	9.12	14.31
	% over Co 86032	44.45			12.32	-14.49	23.76	4.74	67.03	-4.78	12.69	-17.00	-27.13	61.63	-10.13	13.67
	% over CoC 671	45.02			37.40	51.06	28.57	33.20	31.01	12.00	54.71	-27.03	195.72	111.23	6.54	30.11
	% over CoSnk 05103	20.93			7.62	-28.90	23.22	4.61	53.58	18.87	18.64	-18.73	-42.73	24.65	-1.12	10.20
Mean 2P+1R	Co 12009 *Weighted mean	17.05	14.33	14.88	18.50	13.18	16.42	20.21	15.63	20.20	19.07	16.91	25.91	16.48	11.97	17.31*
	Co 86032	13.78	8.88	15.20	15.62	13.47	13.06	19.67	12.24	21.01	18.19	15.84	29.45	12.82	12.53	15.68*
	CoC 671	13.80	10.86	13.87	14.48	11.26	13.33	18.10	13.23	18.58	16.17	15.37	21.61	12.40	12.54	14.66*
	CoSnk 05103	14.74	12.27	15.86	15.12	13.73	12.35	18.43	12.07	17.14	17.30	13.23	26.93	13.21	12.41	15.04*
	% over Co86032	23.68	61.37	-2.11	18.46	-2.13	25.76	2.75	27.63	-3.87	4.82	6.72	-12.02	28.55	-4.47	10.40
	% over CoC 671	23.56	31.95	7.28	27.79	17.09	23.18	11.64	18.09	8.70	17.89	9.99	19.90	32.87	-4.55	18.08
	% over CoSnk 05103	15.65	16.79	-6.18	22.35	-4.01	32.92	9.62	29.47	17.85	10.19	27.83	-3.79	24.72	-3.55	15.32

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Table 3. Performance of Co 12009 in Peninsular zone for Cane yield (t/ha)

Crop	Entry	Coim batore	Akola	Basmat hnagar	Kolha pur	Mand ya	Nav sari	Pade gaon	Perumal apalle	Pravar anagar	Pune	Rud rur	Sameer wadi	Sankesh war	Thiru valla	Mean
I Plant	Co 12009	112.91	112.95		141.56	119.55	128.70	149.85	106.84	137.31	144.32	66.58	54.63	122.78	68.54	127.68
	Co 86032	108.00	79.57		122.14	94.37	106.20	139.57	109.44	138.42	139.02	99.03	71.14	100.07	87.29	113.68
	CoC 671	102.61	84.22		104.89	81.93	108.15	123.55	122.55	131.30	124.18	128.52	34.18	89.45	65.00	107.28
	CoSnk 05103	114.68	90.10		124.38	69.71	109.26	129.73	131.48	115.10	134.61	78.37	56.02	87.29	57.41	110.63
	% over Co 86032	4.55	41.95		15.90	26.68	21.19	7.37	-2.38	-0.80	3.81	-32.77	-23.21	22.69	-21.48	12.32
	% over CoC 671	10.04	34.11		34.96	45.92	19.00	21.29	-12.82	4.58	16.22	-48.19	59.83	37.26	5.45	19.02
	% over CoSnk 05103	-1.54	25.36		13.81	71.50	17.79	15.51	-18.74	19.30	7.21	-15.04	-2.48	40.66	19.39	15.41
II Plant	Co 12009	121.47	16.71	111.65	120.67	90.41	127.47	135.11	132.63	134.19	112.37	153.93	93.87	128.49	96.94	119.94
	Co 86032	98.84	23.11	93.38	115.09	103.90	96.44	146.98	98.14	135.23	123.22	145.47	102.35	125.46	92.50	113.62
	CoC 671	84.83	14.39	94.37	103.80	96.63	92.02	135.95	73.47	116.71	110.79	100.58	81.94	113.85	92.22	99.78
	CoSnk 05103	106.43	46.60	110.47	107.15	116.67	103.74	140.97	95.58	124.48	120.35	112.78	89.50	122.26	96.81	111.32
	% over Co86032	22.90	-27.69	19.57	4.85	-12.98	32.18	-8.08	35.14	-0.77	-8.81	5.82	-8.29	2.42	4.80	5.56
	% over CoC 671	43.19	16.12	18.31	16.25	-6.44	38.52	-0.62	80.52	14.98	1.43	53.04	14.56	12.86	5.12	20.20
	% over CoSnk 05103	14.13	-64.14	1.07	12.62	-22.51	22.87	-4.16	38.76	7.80	-6.63	36.49	4.88	5.10	0.13	7.74
Ratoon	Co 12009	124.42			91.63	79.03	105.65	113.62	113.99	146.49	131.46	104.70	64.14	101.32	74.57	111.23
	Co 86032	88.23			86.00	96.89	81.95	115.89	67.55	154.19	122.68	123.50	79.20	70.36	76.80	100.72
	CoC 671	78.03			67.91	50.26	79.33	91.03	80.85	123.18	84.09	127.42	21.67	46.82	66.57	82.89
	CoSnk 05103	119.76			92.36	116.60	91.94	120.85	92.49	133.11	119.41	129.32	107.84	88.90	70.55	110.47
	% over Co 86032	41.02			6.55	-18.43	28.92	-1.96	68.75	-4.99	7.16	-15.22	-19.02	44.00	-2.90	10.43
	% over CoC 671	59.45			34.93	57.24	33.18	24.82	40.99	18.92	56.33	-17.83	195.99	116.40	12.02	34.19
	% over CoSnk 05103	3.89			-0.79	-32.22	14.91	-5.98	23.25	10.05	10.09	-19.04	-40.52	13.97	5.70	0.69
Mean 2P+1R	Co 12009 *Weighted mean	119.60	112.95	111.65	117.95	96.33	120.61	132.86	117.82	139.33	129.38	109.04	93.87	117.53	96.94	119.65*
	Co 86032	98.36	79.57	93.38	107.74	98.39	94.86	134.15	91.71	142.61	128.31	112.34	102.35	98.63	92.50	109.73*
	CoC 671	88.49	84.22	94.37	92.20	76.27	93.17	116.84	92.29	123.73	106.35	61.13	81.94	83.37	92.22	96.93*
	CoSnk 05103	113.62	90.10	110.47	107.96	100.99	101.65	130.52	106.52	124.23	124.79	110.31	89.50	99.48	96.81	110.85*
	% over Co86032	21.60	41.95	19.57	9.48	-2.09	27.14	-0.96	28.47	-2.30	0.84	-2.94	-8.29	19.16	4.80	9.09
	% . over CoC 671	35.16	34.11	18.31	27.93	26.30	29.45	13.71	27.66	12.61	21.65	78.38	14.56	40.97	5.12	24.08
	% over CoSnk 05103	5.26	25.36	1.07	9.25	-4.62	18.65	1.80	10.61	12.15	3.68	-1.16	4.88	18.14	0.13	7.93

Table 4. Adaptability to Agronomic Variables

Trait	Row Spacing	Co 12009	CoC 671	Co 86032	CoSnk 05103
Cane yield (t/ha)	Normal	158.83	136.63	140.38	142.30
	Wide row	126.31	119.07	132.03	127.30
	Percentage gain or loss when sown	i) Normal : 16.24, 11.61 and 10.41 % higher cane yield over CoC 671 , Co 86032 and CoSnk 05103 ii)Wide row : 6.08 % higher than CoC 671			
	Fertilizer				
	The response of new promising elite genotype Co 12009 to higher level of fertilizer i.e. 125 % RDF (350:78.13:150 kg NPK/ha) was studied and it gave 11.50 %, 4.50 and 5.76 % higher cane yield over CoC 671, Co 86032 and CoSnk 05103 respectively.				

Table 5. Reaction of Co 12009 to major diseases

Disease	Method of evaluation	Trial	Test Centers						
			Plug			Nodal			
			CBE	NAV	TVA	CBE	NAV	TVA	CoC 671
Red rot	Artificial	IVT (2015-16)	MS	MR	MR	R	R	R	HS
		AVT-I (2017-18)	-	MR	MS		R	S	HS
		AVT- II (2018-19)	-	MR	MS		R	S	HS
				KLP	PDN	SKW	NAV	PNE	Co 740
Smut	Artificial	IVT (2015-16)		MS	MS	R	MS	HS	HS
		AVT-I (2017-18)		MS	MR	MS	HS		HS
		AVT- II (18-19)		MS			MS	HS	HS

Testing centers: CBE- Coimbatore, NAV- Navsari; TVA- Thiruvalla; KLP- Kohlapur; PDN- Padegaon; SKW- Sankeshwar; PNE- Pune; AKL- Akola

Reaction : R- Resistant, MR-Moderately resistant, MS-Moderately susceptible , HS –Highly Susceptible

Table 6. Reaction of Co 12009 to insect pests

		Name of variety: Co 12009							
Pest		Trial	Co 12009						
			PDN	CBE	NAV	MDY	PUN	AKL	PWD
Early shoot borer	Natural	IVT Midlate (2015-16)	MS	LS	LS	LS	LS	LS	MS
		AVT-I (2017-18)	MS				MS	-	MS
		AVT II (2018-19)		MS					
Internode Borer	Natural	IVT Midlate (2015-16)	MS	HS	LS	MS	LS		
		AVT-I (2017-18)	LS	HS		LS	MS	-	-
		AVT II (2018-19)		LS					
Top Borer	Natural	IVT Midlate (2015-16)		LS	LS	LS			
		AVT-I (2017-18)	-		-	LS			
Mealy bug	Natural	IVT Midlate (2015-16)	MS		LS		LS		
		AVT-I (2017-18)	HS		-	-	LS	-	-
Scale insect	Natural	IVT Midlate (2015-16)	MS		LS				
		AVT I (2017-18)	MS			-	-	LS	

Testing centres:NAV –Navasari, PDN – Padegaon, MDY-Mandya, PUN – Pune, AKL – Akola

Reaction : MS-Moderately susceptible : LS –Less susceptible ; HS –Highly Susceptible

Adaptability to Agronomic Variables

Table 7. Distinguishing morphological characters

S. No.	Traits	Description
1.	Parentage	[{(Co7201x(Co62174xSES91)}*Co 88037)}] x Co 62198
2.	Stool habit	Erect
3.	Stem colour (E)	Light green (Yellow green)
4.	Stem colour (UE)	Light green (Yellow green)
5.	Ivory marks	Absent
6.	Corky patches	Absent
7.	Internode shape	Cylindrical – Bobbin
8.	Internode alignment	Straight - slightly zigzag
9.	Internode diameter	2.9 cm
10.	Splits	Absent
11.	Wax	Heavy
12.	Node swelling	Absent
13.	Root zone colour (E)	Green
14.	Root zone colour (UE)	Yellow green
15.	Number of root eye rows	Three
16.	Arrangement	Irregular
17.	Bud size	Small
18.	Bud shape	Oval, pointed
19.	Bud cushion	Absent
20.	Germpore position	Apical
21.	Bud groove	Deep, near bud prominent
22.	Growth ring colour	Yellow orange
23.	Leaf length	1.4 m
24.	Leaf width	6.0 cm
25.	Lamina colour	Green
26.	Leaf carriage	Open, tip droopy
27.	Leaf sheath colour	Green
28.	Leaf sheath waxiness	Medium
29.	Leaf sheath spines	Very light
30.	Leaf sheath clasping	Tight
31.	Dewlap colour	Light yellow
32.	Ligular process	Transitional on one side and short lanceolate on other side
33.	Shape of ligule	Straight with lozenge
34.	Flowering	30%
35.	Salient characteristics	Greenish, wax coated, long internodes, prominent bud groove, tall canes, closed droopy canopy and slightly bobbin shaped canes.

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