Table S1 The pedigree of 92 sugarcane varieties that were used in present study

Sl. No.	Variety	Pedigree	Sl. No.	Variety	Pedigree
1	BO109	Co 1193 × BO 32	47	CoS02258	Co 1158 GC
2	BO110	Co 1193 × BO 50	48	CoS02264	Co 1148 PC
3	BO120	BO 91 × BO 43	49	CoS03279	CoH 76 PC
4	BO128	BO 85 × BO 43	50	CoS109	Co 290 × Co 281
5	BO129	B0 85 × BO 43	51	CoS245	Co 421 × Co 313
6	BO130	BO 91 × BO 43	52	CoS443	Co 527 × Co 453
7	BO136	BO 89PC	53	CoS510	
8	BO137	BO 106 FC	54	CoS514	Co 419 × Co 285
9	BO138	Co 9701 × Co 1148	55	CoS541	Co 419 × Co 285
10	BO91	BO 55 x BO 43	56	CoS687	
11	BO99	Co 1207 × BO 43	57	CoS767	Co 419 × Co 313
12	Co1148	P 4383 × Co 301	58	CoS770	Co 1158 × CoS 510
13	Co1158	Co 421 GC	59	CoS797	Co 1148 × Co 775
14	Co1336	Co 1139 × G 2866	60	CoS8207	Co 617 × BO 47
15	Co419	PoJ 2728 × Co 290	61	CoS8315	Co 1148 GC
16	Co453	Zwart Cheribon × Co 285	62	CoS8432	MS 68/47 × Co 1148
17	Co6425	Co 312 × BO 10	63	CoS8436	MS 68/47 × Co 1148
18	Co6811	Co 726 × Co 721	64	CoS88230	Co 1148 × Co 775
19	Co87263	Co 312 × Co 6806	65	CoS90265	Co 775 × Co 1148
20	CoB94164	BO 91 × Co 775	66	CoS90269	Co 7717 × Co 1148
21	CoH06265	CP 61-23 × Co 1148	67	CoS91230	CoS 775 × Co 1148
22	CoH06266	CoS 95255 GC	68	CoS91269	BO 91 × Co 1158
23	CoH110	Co 1148 GC	69	CoS94257	BO 91 × Co 62198
24	CoH119	Co 7704 GC	70	CoS94270	Co 7704 × MS 68/47
25	CoH35	Co 1148 Self	71	CoS95222	BO 91 × BO 17
26	CoH56	Co 62174 × Co 7717	72	CoS95255	Co 1158 × Co 62198
27	CoH92	Co 7704 GC	73	CoS95270	Co 1158 × CoS 510
28	CoH99	CoH 7803 × CoS 510	74	CoS96258	CoS 510 Self

29	CoJ64	Co 976 × Co 617	75	CoS96268	Co 1158 × Co 62198
30	CoJ83	CoJ 64 x Co 1148	76	CoS96269	
31	CoJ85	Q 63 × CoJ 70	77	CoS96275	CoS 8119 × Co 62198
32	CoJ88	CoJ 82315 × Co 1148	78	CoS97258	70A2 GC
33	CoJ89	LG 72115 × CoJ 82315	79	CoS97261	70A2 GC
34	CoLk8001	Co 62174 × Co 1148	80	CoS97264	Co 1158 × CoS 510
35	CoLk8102	Co 1158 GC	81	CoS99259	Co 767 GC
36	CoLk94184	CoLk 8001 (self)	82	CoSe00235	CoJ 46 × Co 87268
37	CoP9206	CoC 671 × Co 1148	83	CoSe01235	CoS 8119 × Co 62198
38	CoP9301	CoC 671 × BO 99	84	CoSe01424	
39	CoP9302	BO 91 × Co 62174	85	CoSe92423	BO 91 × Co 453
40	CoP9702	BO 99 × NCo 310	86	CoSe95422	BO 91 × Co 453
41	CoPant06224	CoH 7808 PC	87	CoSe95436	BO 91 × Co 62198
42	CoPant84211	Co 6806 × Co 6912	88	CoSe96436	BO 91 × Co 62198
43	CoPant90223	CoS 91269 GC	89	CoSe98231	CoS 7927 × Co 775
44	CoPant96219	CoS 767 × CoPant 84212	90	UP0097	Seo 1444/91 × Seo 1854/91
45	CoPant97222	CoPant 84212 GC	91	UP05	CoS 7903 × Co 718
46	CoS01256	Co 86011 × CoS 510	92	UP9530	

Table S2. List of 32 phenotypic descriptors and yield traits that were recorded in 92 sugarcane varieties

Sl. No	Trait	Expression type
Qualitative characteristics (23)		
1	Growth habit	Erect, Semi erect
2	Leaf sheath hairs	Absent, Sparse, Dense
3	Ligule shape	Strap, Deltoid, Crescent, Arched
4	Inner auricle	Incipient, Deltoid, Dentoid, Unciform, Calcariform, Lanceolate, Falcate
5	Dewlap colour	G, G-Y, Y, Y-G, B, P
6	Curvature	Erect, Curved tip, Arched
7	Adherence	Weak, Medium, Strong
8	Internode colour (NE)	G, G-Y, G-W, Y, Y-G, Y-W, O-W, G-G, G-Y
9	Internode colour (E)	G-Y, Y-G, Y group, Greyed group, B group, P group
10	Internode shape	Cylindrical, Bobbin, Tumescent, Conoidal, Obconoidal, Curved
11	Zig-zag alignment	Absent, Present
12	Rind surface	Smooth, Corky, Ivory marks, Corky + Ivory.
13	Waxiness	Light, Medium, Heavy
14	Bud shape	Ovate, Obovate, Oval, Round, PentaG, Rhom, Rectangular, TP, Beaked
15	Bud groove	Absent, Shallow, Deep
16	Bud cushion	Absent, Present
17	Bud tip in respect to growth ring	Below growth ring, Touching, Above growth ring
18	Prominence of Grt. Ring	Weak, Strong
19	Internode Cross sect.	Round, Oval
20	Pithiness	Absent, Present
21	Growth crack	Absent, Present

22	Root band width	Narrow, medium, broad
23	Bud size	Small, Medium, Large
Quantitative characteristics (9)		
24	Leaf blade width (cm)	
25	Internode diameter (cm)	
26	Number of millable canes per stool	
27	Plant height (meter)	
28	Sucrose content (%)	
29	Fibre per cent	
30	Commercial cane sugar	
31	Brix per cent	
32	Purity per cent	

Table S3. Amplicon data and polymorphic information content (PIC) values of 174 SSR primers over the 92 sugarcane varieties

Sl. No.	Primer*	Size range of product (bp)	Number of loci amplified	PIC value
1	IISR_104	90-400	8	0.302
2	IISR_111	110-380	13	0.553
3	IISR_114	140-580	12	0.580
4	IISR_115	140-500	10	0.648
5	IISR_116	250-380	7	0.493
6	IISR_117	60-170	4	0.680
7	IISR_121	20-700	18	0.980
8	IISR_123	30-1000	15	0.890
9	IISR_127	145-170	3	0.821
10	IISR_131	200-800	11	0.980
11	IISR_132	270-900	5	0.639
12	IISR_134a	500-800	4	0.756
13	IISR_134b	220-300	5	0.343
14	IISR_137	160-800	12	0.748
15	IISR_139	120-240	6	0.552
16	IISR_140	150-400	13	0.419
17	IISR_141	170-500	5	0.852
18	IISR_142	120-350	4	0.917
19	IISR_144	140-300	8	0.493
20	IISR_145	140-1000	19	0.619
21	IISR_146	120-350	8	0.468
22	IISR_148	160-210	3	0.980
23	IISR_14a	220-800	7	0.448
24	IISR_14b	250-500	6	0.561
25	IISR_156	160-260	5	0.826
26	IISR_159	100-270	6	0.519
27	IISR_176a	150-320	10	0.566

28	IISR_176b	160-800	13	0.561
29	IISR_176c	90-400	13	0.538
30	IISR_179	40-1000	27	0.860
31	IISR_17a	150-250	7	0.525
32	IISR_17b	140-250	5	0.517
33	IISR_17b	160-600	8	0.930
34	IISR_17c	160-600	9	0.582
35	IISR_183	50-1100	17	0.980
36	IISR_184	40-700	14	0.840
37	IISR_199a	200-500	7	0.665
38	IISR_209	140-400	6	0.568
39	IISR_210	150-420	7	0.730
40	IISR_213	900-1200	3	0.764
41	IISR_227	90-170	8	0.321
42	IISR_236	160-1040	13	0.960
43	IISR_255	40-590	12	0.860
44	IISR_256	150-270	7	0.565
45	IISR_259	300-350	2	0.778
46	IISR_261	140-300	5	0.341
47	IISR_267	150-370	5	0.567
48	IISR_269	150-900	11	0.560
49	IISR_270	335-1000	17	0.990
50	IISR_275	350-1000	4	0.847
51	IISR_276	100-700	11	0.661
52	IISR_279	800-1350	6	0.990
53	IISR_281	30-700	16	0.780
54	IISR_288	140-260	7	0.480
55	IISR_298a	140-400	7	0.612
56	IISR_298b	130-350	8	0.670
57	IISR_299	150-340	5	0.509

58	IISR_306	130-650	14	0.521
59	IISR_308a	100-400	9	0.630
60	IISR_308b	180-500	8	0.681
61	IISR_310	110-300	9	0.381
62	IISR_313	130-340	9	0.386
63	IISR_317	90-400	9	0.441
64	IISR_319	100-140	4	0.498
65	IISR_322	70-600	16	0.920
66	IISR_333	130-150	3	0.586
67	IISR_335a	150-500	9	0.373
68	IISR_335b	210-700	7	0.446
69	IISR_336	120-370	8	0.464
70	IISR_337	450-1000	6	0.296
71	IISR_338	30-800	11	0.970
72	IISR_34	140-400	7	0.651
73	IISR_4	140-500	9	0.329
74	IISR_42	160-310	7	0.542
75	IISR_46b	160-280	5	0.475
76	IISR_48	30-1000	17	0.860
77	IISR_7	30-600	6	0.693
78	IISR_74	250-1000	4	0.644
79	IISR_75	150-350	2	0.532
80	IISR_76	150-420	6	0.511
81	IISR_77	160-600	9	0.435
82	IISR_78	70-700	10	0.655
83	IISR_80	120-300	8	0.748
84	IISR_81a	130-500	14	0.400
85	IISR_81b	130-590	14	0.422
86	IISR_82a	200-580	7	0.755
87	IISR_82b	140-550	10	0.706

88	IISR_88a	140-450	13	0.533
89	IISR_89	150-500	7	0.368
90	IISR_9	150-170	3	0.537
91	IISR_90	360-400	3	0.262
92	IISR_91	110-500	8	0.655
93	IISR_94a	150-300	7	0.702
94	IISR_98	35-70	3	0.968
95	EST A15	30-800	14	0.633
96	EST A19	90-900	9	0.586
97	EST A26	160-600	8	0.544
98	EST A48	150-800	12	0.294
99	EST A51	200-700	9	0.500
100	EST A63	200-1000	16	0.491
101	EST A64	40-1000	20	0.663
102	EST A66	80-1000	11	0.319
103	EST A68	120-200	5	0.483
104	EST A70	30-1000	20	0.650
105	EST A71	60-750	14	0.847
106	EST B13	50-1100	12	0.639
107	EST B133	30-1020	23	0.435
108	EST B134	80-1300	15	0.520
109	EST B135	100-1200	8	0.591
110	EST B14	280-1200	9	0.721
111	EST B145	30-1200	22	0.616
112	EST B157	40-1100	19	0.722
113	EST B37	150-1200	12	0.444
114	EST B39	40-1300	24	0.517
115	EST B40	140-1300	16	0.552
116	ESTA61	250-750	7	0.610
117	ESTA69	190-800	12	0.649

118	ESTB136	130-750	9	0.590
119	ESTB145	150-700	9	0.733
120	ESTB146	75-750	11	0.665
121	ESTB147	40-450	13	0.595
122	ESTB149	120-750	10	0.409
123	SCA01	370-1000	6	0.738
124	SCA08	150-500	9	0.714
125	SCB01	110-1000	14	0.784
126	SCB02	50-750	11	0.775
127	SCB08	330-1000	6	0.485
128	SCB10	100-600	8	0.446
129	SCC01	250-800	7	0.640
130	SCC02	180-600	9	0.422
131	SCC04	180-700	7	0.570
132	NKS05	160-500	7	0.627
133	NKS06	150-450	9	0.716
134	NKS11	150-1000	18	0.670
135	NKS28	80-1000	16	0.970
136	NKS29	140-900	17	0.760
137	NKS32	40-900	18	0.660
138	NKS40	120-210	7	0.767
139	NKS43	160-1200	18	0.930
140	NKS49	140-1000	17	0.960
141	NKS50	100-900	18	0.990
142	NKS51	140-500	12	0.750
143	NKS52	120-400	13	0.720
144	NKS53	70-1000	12	0.980
145	NKS56	200-1100	19	0.950
146	SEGMS113a	50-550	11	0.390
147	SEGMS121	50-200	5	0.120

148	SEGMS14	310-1000	10	0.288
149	SEGMS16a	240-400	3	0.150
150	SEGMS17	130-500	8	0.537
151	SEGMS20	40-700	17	0.445
152	SEGMS215	180-1200	11	0.410
153	SEGMS23	370-1000	8	0.600
154	SEGMS23	250-1100	9	0.531
155	SEGMS235	60-1000	4	0.180
156	SEGMS249a	290-1000	7	0.580
157	SEGMS249a	275-1200	9	0.377
158	SEGMS25b	50-800	9	0.431
159	SEGMS32	70-1300	18	0.445
160	SEGMS35	40-120	5	0.488
161	SEGMS38	185-1000	14	0.430
162	SEGMS40	50-1000	7	0.520
163	SEGMS44	40-800	15	0.340
164	SEGMS63	150-1100	14	0.680
165	SEGMS65	40-1200	13	0.330
166	SEGMS70	40-1100	17	0.468
167	SEGMS73	50-800	14	0.585
168	SEGMS770	160-1000	9	0.320
169	SEGMS780	125-500	7	0.108
170	SEGMS1016	50-700	16	0.656
171	SEGMS1020	50-700	12	0.803
172	SEGMS11	180-800	9	0.723
173	SEGMS114	50-500	6	0.651
174	SEGMS118a	30-550	14	0.529

*Primers with prefix IISR have been adopted from Singh et al. (2013), EST- from Oliveira et al. (2009), SC- from Pinto et al. (2004), NKS- from Govindaraj et al. (2005), and SEGMS- from Parida et al. (2009)

Table S5 Mean data for the nine quantitative traits recorded in 92 sugarcane varieties over the three years (2011-12, 2012-13 and 2013-14)

Variety	Trait								
	NMC	**LBW**	**ID**	**PH**	**FP**	**SP**	**CB**	**PP**	**CCS**
BO 109	6.67	4.19	2.32	2.37	13.45	12.81	14.42	88.96	8.88
BO 110	6.33	4.09	2.60	2.26	13.87	14.88	17.89	83.22	9.98
BO 120	6.17	4.00	2.35	2.23	18.00	16.36	19.29	84.83	11.09
BO 128	6.67	4.30	2.56	2.32	15.15	15.66	18.04	86.88	10.74
BO 129	5.67	3.93	2.51	2.28	14.58	14.52	17.26	84.08	9.80
BO 130	5.33	4.49	2.36	2.13	16.82	17.03	20.05	84.93	11.55
BO 136	6.83	3.71	2.37	2.09	15.65	14.57	17.52	83.16	9.77
BO 137	7.83	4.30	2.28	2.07	17.06	15.62	18.38	84.96	10.59
BO 138	5.50	4.30	2.33	2.20	17.46	14.59	17.52	83.38	9.79
BO 91	8.33	3.97	2.31	2.28	14.28	14.96	18.04	82.97	10.02
BO 99	8.50	3.58	2.68	2.21	13.26	14.05	17.01	82.77	9.39
Co 1148	5.67	4.33	2.44	2.34	13.78	12.60	14.94	84.41	8.52
Co 1158	5.50	3.32	2.40	2.26	16.93	14.86	17.19	86.44	10.17
Co 1336	9.33	3.08	2.24	2.22	16.65	12.40	15.14	81.95	8.25
Co 419	6.00	2.67	2.50	2.15	14.20	12.72	15.72	80.95	8.42
Co 453	4.17	3.27	2.37	2.21	15.36	15.25	17.58	86.76	10.45
Co 6425	5.83	4.48	2.47	2.13	13.98	13.55	15.97	84.82	9.18
Co 6811	6.83	4.12	2.54	2.03	17.51	15.77	17.66	89.27	10.96
Co 87263	4.83	4.87	2.81	2.48	13.91	16.73	19.72	84.84	11.34
Co 89003	4.33	3.27	2.26	2.19	13.37	16.18	18.44	87.72	11.15
Co 89029	5.00	4.14	2.30	2.33	17.04	14.79	17.72	83.50	9.95
CoB 94164	8.17	3.74	2.38	2.43	14.22	14.09	16.47	85.51	9.59
CoH 110	6.17	4.75	3.36	2.45	14.45	13.97	16.84	82.95	9.36
CoH 119	4.83	4.56	2.86	2.18	13.87	12.40	14.92	83.23	8.32
CoH 35	4.33	4.22	3.05	2.40	16.60	12.75	15.50	82.27	8.50
CoH 56	6.17	4.60	2.64	2.20	14.85	14.95	17.83	83.82	10.07

CoH 92	5.33	4.21	3.07	2.04	11.48	16.25	18.57	87.65	11.19
CoH 99	3.67	3.62	2.85	2.15	15.10	13.94	16.80	82.85	9.34
CoJ 64	5.00	4.40	2.50	2.39	15.25	17.40	20.24	85.99	11.87
CoJ 83	5.33	4.42	2.98	2.32	14.64	16.09	18.71	86.00	10.98
CoJ 85	4.17	5.13	3.41	2.17	11.18	16.34	19.43	84.16	11.02
CoJ 88	7.67	5.02	2.59	2.36	15.79	16.15	19.19	84.26	10.90
CoJ 89	6.67	4.22	2.70	2.33	14.54	12.95	16.16	80.30	8.52
CoLk 8001	5.17	4.54	2.68	2.47	17.68	14.40	16.75	85.94	9.82
CoLk 8102	5.67	3.95	2.48	2.36	14.68	14.00	16.61	84.30	9.46
CoLk 94184	4.83	4.12	2.24	2.47	15.48	16.81	19.78	84.98	11.40
CoP 9206	5.17	4.31	2.44	2.25	17.88	12.98	15.80	82.24	8.66
CoP 9301	5.17	3.42	2.25	2.17	13.71	16.31	18.37	88.80	11.31
CoP 9302	7.50	5.13	2.32	2.29	20.18	12.44	15.39	80.89	8.23
CoP 9702	7.17	3.68	2.44	2.29	14.89	11.70	14.24	82.19	7.80
CoPant 84211	4.17	4.67	2.42	2.30	14.22	16.35	19.28	84.83	11.08
CoPant 84212	7.17	4.30	2.53	2.35	12.24	14.53	17.37	83.63	9.78
CoPant 90223	7.33	4.92	2.53	2.18	12.36	15.83	18.49	85.61	10.78
CoPant 96219	6.50	5.83	2.85	2.31	11.69	15.88	18.99	83.61	10.68
CoPant 97222	5.83	4.62	2.84	2.15	14.01	14.73	17.59	83.75	9.91
CoS 01256	5.67	4.16	2.60	2.20	14.03	13.23	15.94	83.06	8.86
CoS 02258	4.83	3.97	2.40	2.14	13.67	14.58	17.54	83.24	9.78
CoS 02264	4.33	3.64	2.35	1.87	13.96	15.52	18.47	84.07	10.47
CoS 03279	4.83	3.09	2.42	2.26	13.41	16.92	19.63	86.16	11.56
CoS 109	6.83	3.58	2.41	2.20	17.14	15.01	18.20	82.46	10.03
CoS 245	4.33	3.53	2.26	2.13	15.20	14.90	17.83	83.49	10.02
CoS 443	7.33	3.57	2.18	1.45	14.08	14.76	17.47	84.47	9.98
CoS 510	5.33	3.45	2.13	1.43	14.80	15.97	18.41	86.72	10.94
CoS 514	3.83	2.33	2.37	1.67	16.00	15.10	17.62	85.65	10.29
CoS 541	5.00	4.15	2.28	1.51	14.44	13.18	16.09	81.96	8.77
CoS 687	6.33	4.29	2.41	1.72	11.52	14.64	17.11	85.57	9.96

CoS 767	5.33	4.09	2.53	2.35	15.45	14.11	16.34	86.37	9.64
CoS 770	5.50	4.57	2.64	2.31	12.27	11.15	13.43	83.33	7.47
CoS 797	6.67	2.41	2.28	1.33	16.58	11.70	13.64	85.97	7.97
CoS 8207	6.00	4.13	2.73	2.15	13.98	14.08	16.71	84.31	9.51
CoS 8315	5.33	3.98	2.39	2.23	14.08	13.60	16.82	80.84	8.99
CoS 8432	5.00	5.19	2.77	2.00	12.09	15.07	17.88	84.28	10.18
CoS 8436	4.83	4.44	3.06	1.96	13.61	16.14	18.23	88.60	11.17
CoS 88230	4.83	5.23	2.93	2.18	10.30	15.77	18.26	86.35	10.78
CoS 90265	3.50	2.06	2.31	1.95	12.44	13.94	16.69	83.51	9.37
CoS 90269	6.50	3.72	2.35	1.87	13.21	14.66	17.59	83.29	9.84
CoS 91230	3.83	3.84	2.45	2.02	11.16	15.46	17.91	86.26	10.57
CoS 91269	5.00	4.42	2.36	2.28	15.89	12.80	15.44	82.89	8.57
CoS 94257	7.00	4.21	2.46	2.23	13.60	13.78	16.50	83.51	9.26
CoS 94270	7.17	4.31	2.77	2.23	12.15	13.23	16.42	80.56	8.73
CoS 95222	7.17	3.22	2.48	2.27	13.54	15.10	17.74	85.14	10.25
CoS 95255	5.67	4.10	2.48	2.26	12.63	18.06	20.19	89.46	12.56
CoS 95270	8.33	4.11	2.43	2.32	12.47	14.47	16.94	85.41	9.84
CoS 96258	6.00	5.20	2.98	1.94	10.38	15.81	18.41	85.87	10.78
CoS 96268	4.67	3.53	2.31	2.19	11.90	17.18	19.74	87.05	11.79
CoS 96269	6.83	3.66	2.38	2.47	12.98	14.42	16.91	85.28	9.80
CoS 96275	6.67	4.54	2.48	2.35	12.85	15.63	18.60	84.05	10.55
CoS 97258	5.33	3.68	2.45	2.20	14.16	13.40	16.52	81.15	8.87
CoS 97261	7.00	4.65	2.48	2.14	16.54	15.55	18.59	83.66	10.47
CoS 97264	7.17	3.75	2.63	2.15	12.82	14.88	17.73	83.88	10.03
CoS 99259	6.83	4.73	2.70	1.84	8.97	14.85	17.70	83.90	10.01
CoSe 00235	7.17	3.98	2.58	2.34	14.80	15.12	17.66	85.60	10.29
CoSe 01235	6.17	3.97	2.30	2.17	15.59	17.55	20.56	85.35	11.93
CoSe 01424	7.00	3.78	2.48	2.21	13.03	14.89	17.60	84.62	10.08
CoSe 92423	6.50	4.76	2.85	2.48	14.89	13.56	16.75	81.02	8.97
CoSe 95422	6.67	4.24	2.29	2.15	12.39	14.08	16.54	85.14	9.56

CoSe 95436	4.67	3.54	2.42	2.09	13.72	14.77	16.93	87.15	10.15
CoSe 96436	7.50	4.25	2.26	2.27	17.95	14.98	17.99	83.32	10.06
CoSe 98231	6.50	4.55	2.58	1.73	13.78	14.19	17.13	82.83	9.50
UP 0097	6.50	4.44	2.62	2.37	12.87	13.39	15.61	85.77	9.13
UP 05	5.67	3.64	2.08	2.22	14.09	13.95	17.32	80.55	9.20
UP 9530	7.17	4.37	2.43	2.24	17.62	15.13	17.31	87.41	10.41

NMC: number of millable canes, LBW: leaf blade width, ID: internode diameter, PH: plant height, FP: fibre per cent, SP: sucrose per cent, CB: corrected Brix, PP: purity per cent, CCS: commercial cane sugar.