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Characterization of Sugarcane Accessions for DUS Descriptors

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ABSTRACT

Germplasm is the basic material for selection and improvement through breeding to ensure food security needs of the worlds rapidly rising population. Constant evaluation and characterization of the existent, yet uncharacterized germplasm is useful and it is many times the cornerstone for the development of new and better varieties. A systematic study was conducted to characterize the one hundred and thirty one germplasm accessions using 27 DUS descriptors given by PPV&FRA at Agricultural Research Station, Perumallapalle, Tirupati during 2012-13. The data were collected on parameters pertaining to stem, leaf, leaf sheath, bud and internode. All the varieties varied greatly for different characters. These germplasm accessions are reservoirs for different parameters and they can be exploited in any breeding programmes for production of promising sugarcane varieties.

Key words : Characterization, Germplasm, Sugarcane, DUS descriptors, PPV&FRA.

Germplasm collection, conservation, characterization, maintenance and utilization of plant genetic resources are essential components of crop improvement programmes. Characterization is one of the prerequisite for identification of genotypes in a large germplasm. Mislabeling the clones in germplasm collection naturally misleads the breeding programme apart from misuse of resources. Hence breeder wishes to periodically verify the trueness to label of clones in a germplasm collection. Keeping this in view a systematic study was made to characterize the sugarcane germplasm by using 27 DUS descriptors given by the Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA), Government of India to document the data for easy identification and also to avoid the duplication and unnecessary evaluations of repetitive accessions in the collection and for locating useful genes from the germplasm accessions. This ultimately aims at production of promising varieties of sugarcane for commercial cultivation.

MATERIAL AND METHODS

The one hundred and thirty one germplasm accessions having different places of origin were evaluated during 2012-13 at Agricultural Research Station, Perumallapalle, with plot size of 6m× 2R × 0.9m = 10.8m^2 in augmented design. Recommended package of practices were adopted to raise a healthy crop. Necessary prophylactic measures were taken to safeguard the crop from pests and diseases.

The data were collected by random selection of canes and were used for the characterisation of the germplasm lines based on DUS descriptors. The descriptors utilized for present investigation were: plant growth habit, leaf sheath spines, shape of ligule, shape of inner auricle, colour of dewlap, leaf blade curvature, leaf blade width which were recorded at 240 DAP (End of grand growth stage); adherence of leaf sheath, internode colour (Unexposed), internode colour (Exposed), internode diameter, internode shape, internode alignment, internode growth cracks (splits), internode rind surface appearance, internode waxiness, shape of bud, size of bud, bud groove, bud cushion, bud tip in relation to growth ring, prominence of growth ring which were recorded at 300DAP (Maturity stage); width of root band, internode cross-section, internode pithiness, number of millable canes per stool and cane length which were recorded at 360 DAP (Harvest stage) (PPV&FRA,2005).

RESULTS AND DISCUSSION

All the germplasm accessions showed significant variation for the descriptors related to leaf, internode and node. The characterization and grouping of genotypes was furnished in the Table

1. Elahi and Ashraf (2001) also characterized sugarcane lines using the description of Artschwager (1930, 1940, 1948), Barber (1919) and Dillewijin (1952). Akhtar *et al*. (2001) also characterized sugarcane genotypes using morphological descriptors related to stalk, leaf and node.

Among 131 germplasm accessions 40 genotypes were erect and 91genotypes were semi-erect in growth habit. Based on visual observation leaf sheath spines were found to be absent in 58 genotypes, sparse in 46 genotypes and dense in 27 genotypes. The absence of leaf sheath spines is a preferred character to the farmers as manual harvesting charges of canes with spiny leaf sheath is higher and absence of leaf sheath spines is considered for developing varieties having low cost of production. As far as ligule shape is considered, three genotypes had strap shape, 94 had deltoid shape and 34 had crescent shape of ligule. Incipient auricle was found in 18 genotypes, deltoid in 71, dentoid in six, unciform in one, lanceolate in 33 and falcate in two.

Out of 131 genotypes, 10 with green, 27 with greenish yellow, 42 with yellow, 23 with yellowish green, 15 with brown and 14 with purple dewlap were observed. Leaf blade curvature was erect in 22, curved tip in 74 and arched form in 35 genotypes. Leaf width was observed to be narrow in four, medium in 64 and broad in 63. The range of the leaf width was 2.5 – 7.2cm. The highest leaf width was observed in 92A326 (7.2cm) genotype and the lowest width was observed in the genotype SES594 (2.5cm). Adherence of leaf sheath to cane is an important character and weak adherence is desirable as it reduces cost of stripping of leaves during harvesting. 44 genotypes had weak, 73 had medium and 14 had strong adherence of leaf sheath. Unexposed stem colour was green in three, greenish yellow in 10, yellow in 97, yellow green in 20 and greyed yellow colour in one accession. Incase of internode colour when exposed to sun, 61 with green yellow, 25 with yellow green, one with yellow, three with grey and 41 with purple colour were recorded.

Internode diameter ranged from 0.9 cm to 3.3 cm. The highest internode diameter was observed in the genotype, 97A85 (3.3cm) and the least diameter was observed in the genotype, SES594 (0.9cm). Among 131 genotypes, 43 with thin, 85 with medium and 3 with thick internode diameter were observed. A total of 109 genotypes showed cylindrical shape of internode, nine with tumescent, two with bobbin and 11 with conoidal shape. The alignment of internode was zig zag in 78 genotypes.

Growth cracks were present in 36 and absent in 95 genotypes. The genotypes were grouped for internode rind surface and it was found to be smooth on 75, surface with corky patches on 18, surface with ivory marks on four and surface with both corky patches and ivory marks on 34. In six genotypes wax on internode was absent and it was light in 51, medium in 52 and heavy in 22. Absence of growth cracks, splits, ivory marks, corky patches and presence of wax have significance in drought tolerance of the varieties. Among the accessions, 49 with ovate, 12 with obovate, 46 with oval, 18 with round, three with pentagonal, two with rhomboid and one with pentagonal shape of bud were observed. For bud size, 36 with small, 83 with medium and 12 with large size of bud were recorded. The range of the size of bud was 3.5 mm to 1.1 cm. With regards to bud groove, 68 with absence, 45 with shallow and 18 with deep bud groove were observed. Bud cushion was present in 15 and absent in 116 accessions.

When bud tip in relation to growth ring was observed, 39 genotypes had bud tip below the growth ring, bud tip touching the growth ring in 78 and in 14 bud tip was above the growth ring. Among the genotypes, 102 possessed weak and 29 had strong prominent growth ring. Ten genotypes with narrow, 109 with medium and 12 with broad root band were recorded. Similarly 109 genotypes showed round and 22 showed oval internode cross section. 40 genotypes were grouped under presence and 91 under absence of internode pithiness. One genotype with low, 81 with medium, 36 with high and 13 with very high number of millable canes per stool were recorded. The highest number of millable canes per stool were observed in SES594 (10), followed by CoS767 and 95V74 with 9; 99V30, Co85004, 2002V48, 92A38, 2003V46, 97V72, 94V108, 97R424, 92A10, 2005T50 with 8 number of millable canes per stool.25 with short, 75 with medium, 30 with tall and one with very tall cane height were recorded. Tall cane lengths, high

Table 1. Characterization and Grouping of Genotypes for 27 DUS descriptors.

S.No	Character	Genotypes
1	**Growth habit**	
	a)Erect	Co7508,2000V59,Co2001-15,Co99004,2002A192,CoS8346, Bo91,BARAGUA,81V99,97A85,Co7717,Co1148,Co62399,Co364, Co38436, CoS767, 2004A75, 2004A55, 2004A82, 2006T10, 2006T13, 2006T18, 2006T8, 2006T3,89V74,97V178, 97V163, 97R199, 97R7, 97R183, 97R15, 97R424, 93R217, 2000A213, 2004T67, 93A145, 97R129, 97V118, 87A298.
	b)Semi erect	90A272,99V30,83R23,93R44,Co85004, Co94008,Co2001-13, Co7219, CoT8201, 83V15,2002V48,85R186, 97R401, 97R272, 97R383, Co86032, 2003T129, 81V48,97A44,92A355,92A38, 90A278, 92A54, KHAKAI,SES594, Co6907, 84A125, CoA7602, CoC671, Co975, Co997, Co419, 2003V46, 2004A63, 2004A107, 2004A103, 2006T34, 2006T33,2006T35,2006T36,2006T23,2006T19, 95V221, 92V225, 95V48,94V101,93V297, 92V104, 94V104, 95V423, 95V74, 95V428, 92V206, 95V72, 94V108, 97R267,93R276,93R113, 85A146, 82V12, 86V96, 92R62, 93R129,97R134, 97R123,97R163,97R395, 97R217, 97R6, 97R174 ,93R167 ,92A326, 2000A225, 2005T16, 95V348, 94V103, 2002V2, 95V303, 92A10, 88A189, 94A73, 92A374, 93A53, 92A126,92A130,2005T89, 2005T52, 2003T123, 2005T50, 2004T68, 2003T121, 83V288.
2	**Leaf sheath hairiness**	
	a)Absent	93A145, 99V30, 83R23, 85R186, 97R401, 97R272, 97R383, Co99004, 2003T129, 2002A192, 97A44,92A355,92A38,90A278,92A54,CoS8346, B091, BARAGUA, KHAKAI, 81V99, SES594, Co6907, Co975, Co1148, Co62399, Co38436, 2004A63, 2006T34, 2006T33, 2006T36, 2006T19, 95V221, 94V101, 94V104, 95V423, 95V74, 92V206 97R267, 97R183, 97R15, 82V12, 92R62, 92R123, 97R163, 97R424, 97R395, 97R217, 93R217, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 90A272, 83V15.
	b)Sparse	Co7508, Co-2001-13, CoT8207,2002V48, 97R129, Co86032, 81V48, 97A85, CoA7602, CoC671, Co364, CoS767, 2004A55, 2004A82, 2006T35, 2006T13, 2006T23,2006T8,2006T3, 97V178,92V225,95V48, 97V163, 95V72, 97R276, 97R7, 85A146, 86V96, 97R134, 97R6, 97R167, 2000A213, 2000A225, 95V348, 94V103,2002V2, 95V303, 92A10, 92A374, 93A53, 87A298, 92A130, 2004T68,Co94008 Co7219, 93V297.
	c)Dense	2000V59, 93R44, Co2001-15,84A125, Co7717, Co997, Co419, 2003V46, 2004A75, 2004A107, 2004A103, 2006T10, 2006T18, 97V118, 92V104, 95V428, 94V108,97R199, 93R113,93R129,97R174, 92A326, 94A73, 2003T121, Co5004, 89V74, 83V288.
3	**Shape of ligule**	
	a)Strap shape	Co99004,B091, CoA76032
	b)Deltoid	93A145, 99V30, 93R44, Co2001-13, Co2001-15,2002V48, 85R186, 97R272, 97R129, 97R383, 2003T129, 81V48, 2002A192, 97A44, 92A355, 92A38, 90A278, CoS8346, BARAGUA, KHAKAI, Co6907, CoC671, Co1148, Co997, Co62399, Co364, Co38436, 2003V46, 2004A75, 2004A55, 2004A107, 2004A103, 2004A82, 2 006T34, 2006T33,2006T10,\2006T35,2 006T13, 2006T18, 2006T36, 2006T23, 2006T19, 2006T8, 2006T3, 95V221, 95V48, 94V101, 93V297, 92V104, 94V104, 95V423, 97V163, 95V428, 92V206, 95V72, 94V108, 97R199, 97R267, 93R113, 97R7, 97R183,97R15,85A146, 92R62, 93R129,97R134,97R123,97R103, 97R424, 97R395, 97R217, 97R6, 93R217, 97R174, 497R167, 200A213, 2000A225, 2005T16, 95V348, 94V103, 2002V2, 95V303, 92A10, 94A73 ,92A374, 92A126, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 2004T68, 2003T121.

S.No	Character	Genotypes
	c)crescent	200V59, Co94008, Co7219, CoT8201, 83V15, 97R401, Co86032, 92A54, 81V99, 97A8, SES594, 84A125, Co7717, Co975, Co419, CoS767, 2004A63, 89V74, 97V178, 92V225, 95V74, 97R276, 82V12, 86V96, 92A326, 93A53, Co7508, 90A272, 83R23, Co85004, 87A298, 83V288, 97V118, 88A189.
	d)arc shape	NIL
4	**Shape of inner auricle**	
	a)Incipient	Co94008, CoT8201,83V15,97R129,81V48,90A278,SES594, Co62399, CoS767,95V221,95V48,95V72,82V12,93R129,97R217,90A272, Co85004,83V288.
	b)Deltoid	Co7508,93A145,2000V59, Co2001-13, Co2001-15, Co86032, Co99004, 2003T129,92A355,92A54,BO91,BARAGUA,KHAKAI,81V99,Co6907, CoC671,Co975,Co364, Co3843, 2003V46, 2004A75, 2004A55, 2004A107, 2004A103, 2006T33, 2006T13, 2006T18, 2006T36, 2006T23, 2006T19, 2006T8,2006T3, 97V178, 94V101, 92V104, 94V104, 95V423, 95V74, 97V163, 95V428, 92V206, 94V108, 97R199, 97R267, 97R276, 93R113, 97R183, 97R15, 92R62, 97R134, 97R123, 97R163, 97R424, 97R6, 97R174, 97R167, 2005T16, 95V348, 2002V2, 95V303, 92A10, 88A189, 92A374, 92A126, 92A130, 2005T89, 2005T52,2004T67, 2003T123,2004T6, 97V118.
	c)Dentoid	85R186, 97A85, CoA7602, 200A213, 94V103, 94A73.
	d)Unciform	84A125
	e)Calciform	NIL
	f)Lanceolate	99V30,93R44,2002V48,97R401,97R272,97R383,2002A192,97A44,92A38, CoS8346, Co7717, Co1148, Co997, Co419, 2004A63, 200A82, 2006T34, 2006T10,2006T35,89V74,92V225,97R7,85A146,86V96,97R395, 93R217, 92A326, 2000A225, 87A298, 2005T50, 83R23, Co7219, 93V297.
	g)Falcate	93A53, 2003T121.
5	**Colour of dewlap**	
	a)Green	Co86323, Co99440, 81V48, 2006T23, 86V96, 95V348, 2005T89, 2004T67, Co7219, 87A298.
	b)Greenish yellow	Co2001-13, 97A44, 92A355,92A38,92A54, CoS8346,KHAKAI,81V99, Co38436, 2004A107, 2006T34, 2006T18, 2006T36,95V221,92V104,95V423, 85A14, 97R123, 97R6, 97R167, 2000A213, 2000A225, 2005T16, 95V303, 94A73, 93A53, 92A130.
	c)Yellow	2000V59, 93R44, Co2001-15, 2002V48, 97R272, 2003T129, 2002A182, SES594, Co364, 2003V46, 2004A82, 2006T33, 2006T10, 2006T13, 2006T8, 2006T3, 97V178, 92V225, 95V48, 94V101, 95V74, 97V163, 95V428, 92V206, 95V72, 94V108, 97R199, 97R276, 93R113, 97R183, 97R15, 83R288, 92R62, 93R129, 97R134, 97R163, 97R395, 97R217, 92A374, 92A126, 2003T123, 2003T121.
	d)Yellowish green	90A278, BARAGUA, Co62399, 2004A75, 2004A63, 2004A55, 2004A1032006T35, 2006T19, 94V104, 97R267, 97R7, 97R424, 93R217, 97R174, 92A326, 94V103,2002V2,92A10, 2005T52, 2005T50, 2004T68.
	e)Brown	97R401, 97R383, 97A85, Co6907, 84A125, CoA7602, Co7717, Co975, Co997, CoS767, 90A272, 93A145, Co85004, 89V74, 97V118.
	f)Purple	CoT8201, 83V15, 85R186, 97R129, CoC671, Co1148, Co419, 82V12, Co7508, 83R23, Co94008, BO91, 93V297, 88A189.
6	**Leaf blade curvature**	
	a)Erect	85R186, Co86032,81V48,97A44,92A355,KHAKAI, Co997, Co364, 2004A63, 92V225, 95V423,97V163,97R15,85A146,82V12,2005T16,95V348, 92A126, 83R23, Co85004, 83V15, 93V297.

S.No	Character	Genotypes
	b)Curved tip	Co7508, 90A272, 99V30,2000V59,93R44, Co2001-13, Co2001-15, Co7219, CoT8201, 2002V48,97R401,97R272,97R129, Co99004, 2003T129, 92A38,90A278,92A54,CoS8346,BO91,BARAGUA, Co6907, 84A125, Co7717, Co419, Co62399, Co38436, 2003V46, 2004A75, 2004A107, 2006T34, 2006T33, 2006T10, 2006T36, 2006T3, 95V112, 89V74, 97V178, 95V48,94V101, 95V74, 95V428, 95V72, 97R199, 97R267, 97R278, 93R113, 97R7, 97R183,83V288, 92R62, 93R129, 97R123, 97R424, 97R395, 97R217, 97R6, 97R167, 92A326,2000A225, 2002V2, 95V303, 92A10, 94A73, 92A374, 93A53, 87A298, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 2003T121.
	c)Arched	97R383, 2002A192, 81V99, 97A85,SES594 CoA7602, CoC671, Co975, Co1148, CoS767, 2004A55, 2004103, 2004A82, 2006T35, 2006T13, 2006T18, 2006T23, 2006T19, 2006T8, 92V104, 94V104, 92V206, 94V108, 86V96, 97R134, 97R163,93R217,97R174,2000A213,94V103,2004T68,93A145, Co94008, 97V118, 88A189.
7	**Leaf blade width**	
	a)Narrow (<3.0cm)	92A355,SES594,92R62,97R424
	b)Medium (3-5cm)	93A145,2000V59,Co2001-13, Co2001-15, Co7219, 83V15, 2002V48, 97R272, 97R383, 2003T129, 2002A192, 92A38, 90A278, CoS8346, BO91, BARAGUA, KHAKAI, 81V99, Co6907, Co7717, Co975, Co419, Co62399, Co364, Co38436, CoS767, 2004A75, 2004A63, 2004A55, 2004A103, 2006T34, 2006T33, 2006T10, 2006T13, 2006T36, 2006T23, 2006T19, 2006T3, 95V221, 92V225, 95V48, 92V104, 95V428, 95V72, 97R199, 97R267, 97R7, 97R15, 85A146, 82V12, 93R129, 97R134, 97R163, 97R395, 93R217, 92A10, 94A73, 92A374, 92A126, 92A130, 2003T123, 2005T50, 87A298, 97V118.
	c)Broad (>5cm)	90A272, 99V30, 93R44, Co94008, CoT8201,85R186,97R401,97R129, Co86032, Co99004, 97A44, 92A54, 97A85, 84A125, CoA7602, CoC671, Co1148, Co997,2003V46,2004A1072004A82,2006T35, 2006T18,2006T8, 97V178, 94V101, 94V104, 95V423, 95V74, 97V163, 92V206, 94V108, 97R276, 93R113, 97R183, 86V96, 97R123,97R217,97R6, 97R174, 97R167, 92A326, 2000A213, 2000A225, 2005T16, 95V348, 94V103, 2002V2, 95V303, 93A53, 2005T89,2005T52, 2004T67, 2004T68, 2003T121, Co7508, 83R23, Co85004, 81V48, 89V74,93V297, 83V288, 88A189.
8	**Adherence of leaf sheath**	
	a)Weak	Co7219,83V15,2002V48,97R272,97R383, Co86032, Co99004,2002A192,97A44, 92A355,81V99, Co6907, Co419, Co62399, Co364,2003V46,2004A55, 2006T34, 2006T36,95V221, 95V48,94V101,94V104, 92V206, 94V108, 97R276, 97R7, 82V12, 86V96,92R62, 93R129, 97R134, 97R217, 2005T16, 95V348, 95V303, 2005T50, 2003T121, 90A272, Co94008, 97R129, 93V297, 83V288, 88A189.
	b)Medium	93A145,99V30,2000V59,83R23,93R44, Co2001-15, CoT8201,85R186,97R401, 2003T129,81V48,92A38,90A278,92A54,BARAGUA,KHAKAI,97A85,84A125, CoA7602, CoC671, Co7717, Co975, Co1148, CoS767,2004A75,2004A63, 2004A107,2004A103,2004A82, 2006T33,2006T10,2006T23, 2006T19, 2006T8, 2006T3, 89V74, 97V178, 92V104, 95V423, 95V74, 97V163, 95V428, 95V72,97R267,97R113,97R183,97R15,85A146,97R123,97R163, 97R424, 97R395, 97R6, 93R217, 97R167, 92A326, 2000A213, 2000A225, 94V103, 2002V2, 92A10,94A73,92A374, 93A53, 92A126, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2004T68, Co7508, Co85004.

S.No	Character	Genotypes
	c)Strong	Co2001-13, CoS8346,BO91,SES594, Co997, Co38436, 2006T35,2006T13, 2006T18, 92V225, 97R199, 97R174, 97V118, 87A298.
9	**Internode colour (Un exposed**	
	a)Green	BO91, Co1148, 2004T67.
	b)Greenish yellow	97R401, 97R383, 2004A107, 2004A103, 88A189, 2005T50, 83R23, Co6907, 93V297, 87A298.
	c)Yellow	93A145, 99V30, 2000V59, 93R44, Co2001-13, Co2001-15, CoT8201, 2002V48, 97R272, 97R129, Co99004, 2003T129, 2002A192, 97A44, 92A355, 92A38, 90A278, 92A54, CoS8346, BARAGUA, KHAKAI, 81V99, 97A85, SES594, 84A125, CoC671, Co975, Co62399, Co364, Co38436, 2003V46, 2004A75, 2004A63,2004A55,2004A82,20 06T34, 2006T33, 2006T35, 2006T13, 2006T18, 2006T36, 2006T23, 2006T19, 2006T8, 2006T3, 95V221, 89V74, 97V178,92V225, 97V118, 94V101, 92V104, 94V104, 95V423, 95V74, 97V163, 95V428, 92V206, 94V108, 97R199, 97R267, 93R113, 97R7, 97R183, 97R15, 85A146, 86V96, 92R62, 93R129, 97R134, 97R123, 97R163, 97R424, 97R395, 97R217, 97R6, 93R217, 97R174, 97R167, 92A326, 2000A213, 2000A225, 2005T16, 95V348, 94V103, 2002V2, 95V303, 92A10, 92A374, 93A53, 92A126, 92A130, 2005T89, 2005T52, 2003T123, 2004T68, 2003T121.
	d)Yellow green	83V15,85R186,Co86032,81V48, Co7717, Co997,Co419,2006T10,95V48, 95V72, 97R276, 82V12, 94A73, 90A272, Co85004, Co94008, Co7219, CoA7602, CoS767, 83V288.
	e)yellow white	NIL
	f)greyedgreen	NIL
	g)orange white	NIL
	h)greyed yellow	Co7508
10	**Internode colour (exposed)**	
	a)Green yellow	99V30,2000V59, Co2001-13, 2002V48, 97R272, 2002A192, 97A44, 92A355, 92A38, 90A278, 92A54,KHAKAI,81V99,SES594, Co975, Co997, Co62399, Co364, Co38436, 2004A75, 2004A55, 2004A82, 2006T33, 2006T35, 2006T13,2006T36, 2006T23, 2006T3, 95V221, 97V178, 92V225, 97V118, 94V101, 94V104,95V428,92V206,97R199,97R267,93R113,97R7, 97R183, 97R15, 85A146, 92R62,97R134,97R123,97R163,97R424,97R395,97R6,93R217, 97R167, 92A326,2000A213,2000A225,92A10,94A73,92A374,92A126,92A130
	b)Yellow green	CoT8201, 2003T129, 84A125,CoA7602,2006T34,95V423,95V74,94V108, 97R174, 94V103, 2002V2, 95V303, 2005T52, Co7508, 90A272, 93A145, 83R23, Co85004, Co7219,97R401, Co99004, 97A85, CoS767, 86V96, 87A298. Co6907.
	c)Yellow	Co7717, 2005T50, 93V297.
	d)Grey	93R44, Co94008, Co2001-15,83V15,85R186,97R129,97R383, Co86032,81V48,
	e)Purple	CoS8346,BO91,BARAGUA, CoC671, Co1148, Co419, 2003V46, 2004A63,2004A107, 2004A103, 2006T10, 2006T18, 2006T19, 2006T8, 95V48, 92V104, 97V163, 95V72, 97R276, 83V288, 82V12, 93R129, 2005T16, 95V348, 88A189, 93A53, 2005T89, 2004T67, 2003T123, 2004T68, 2003T121, 99V74.
	f)Brown	NIL
11	**Internode diameter**	
	a)Thin(<2.2cm)	Co2001-13,92A54,Bo91,SES594, CoS767,97R167, 2002V2,92A10.

S.No	Character	Genotypes
	b)Medium(2.2-3.0cm)	Co7508, 90A272, 99V30, 83R23, 93R44, Co85004, Co2001-15, Co7219, 83V15, 2002V48, 97R272, 97R129, Co99004, 2003T129, 2002A192, 97A44, 92A38, CoS8346, BARAGUA, KHAKAI, 81V99, Co6907,84A125, CoC671, Co7717,Co975, Co1148, Co997, Co62399, Co364, Co38436, 2003V46, 2004A75, 2004A63, 2004A55, 2004A82, 2006T34, 2006T10, 2006T35, 2006T13, 2006T36, 2006T23, 2006T19, 2006T8, 2006T3, 95V221, 89V74, 97V178, 92V225, 95V48, 97V118, 93V297, 92V104, 94V104, 95V423, 95V74, 97V163, 95V428, 95V72, 94V108, 97R199, 97R267, 97R276, 93R113, 97R7, 97R183, 97R15, 85A146, 82V12, 92R62, 93R129, 97R134, 97R123, 97R163, 97R424, 97R395,97R217, 97R6, 93R217, 97R174, 2000A213, 2000A225, 2005T16, 95V348, 95V303, 94A73,92A374,93A53,92A126,2004T67, 2003T123, 2004T68, 2000V59, 86V96.
	C)Thick(>3.0cm)	Co94008,CoT8201,85R186,97R401, 97R383, Co86032, 81V48, 92A355, 90A278, 97A85, CoA7602, Co419,2004A107, 2004A103,2006T33, 2006T18, 94V101, 92V206, 92A326, 94V103, 2005T50, 2003T121, 93A145, 83V288, 88A189, 87A298.
12	**Internode shape**	
	a)cylindrical	93A145 99V30 2000V59 83R23 93R44 Co2001-13 Co2001-15 83V15 2002V48 85R186 97R401 97R272 Co99004 2003T129 81V48 2002A192 97A44 92A355 92A38 90A278 92A54 CoS8346 BO91 BARAGUA KHAKAI 81V99 97A85 SES594 Co6907 CoA7602 CoC671 Co7717 Co975 Co997 Co364 Co38436 CoS767 2003V46 2004A75 2004A63 2004A55 2004A107 2004A103 2004A82 2006T34 2006T33 2006T10 2006T35 2006T13 2006T18 2006T36 2006T23 2006T19 2006T8 95V221 92V225 95V48 97V118 94V101 93V297 92V104 94V104 95V423 95V74 97V163 95V428 92V206 95V72 94V108 97R199 97R276 93R113 97R7 97R183 97R15 85A146 83V288 86V96 92R62 97R134 97R123 97R163 97R395 97R217 97R6 93R217 97R174 97R167 2000A213 2000A225 2005T16 95V348 94V103 2002V2 95V303 92A10 88A189 94A73 92A374 93A53 92A126 92A130 2005T89 2005T52 2004T67 2003T123 2005T50 2004T68 2003T121
	b)conoidal	Co7508 Co85004 Co94008 Co7219 CoT8201 97R129 97R383 84A125 89V74 82V12
	c)tumescent	Co419 Co62399 2006T3 97V178 97R267 93R129 97R424 92A326 87A298
	d)bobbin	90A272 Co1148
13	**Internode alignment**	
	a)straight	Co7508,93A145,83R23,93R44, Co2001-15, CoT8201, 83V15, 85R186, 97R272, 97R129,97R383,Co86032,2003T129, 81V48, 2002A192, 92A355, CoS8346, BARAGUA, SES594,84A125, CoA7602, CoC671, Co1148, Co997, Co364, Co38436, 2003V46, 2004A55, 2004A82, 2006T35, 2006T18, 89V74, 97V178, 95V48, 94V101, 93V297, 95V423, 95V72, 97R199, 93R113, 97R7, 82V12, 86V96, 97R174, 97R167, 2005T16, 95V348, 94V103, 92A10, 87A298, 2005T52, 2004T67, 2004T68
	b)slightly zig zag	90A272, 99V30, 2000V59, Co85004, Co94008, Co2001-13, Co7219, 2002V48, 97R401, Co99004, 97A44, 92A38, 90A278, 92A54,BO91, KHAKAI, 81V99, 97A85, Co6907, Co7717, Co975, Co419, Co62399, CoS767, 2004A75, 2004A63, 2004A107, 2004A103, 2006T34, 2006T33, 2006T10, 2006T13, 2006T36, 2006T23, 2006T19, 2006T8, 2006T3, 95V221, 92V225, 97V118, 92V104, 94V104, 95V74, 97V163, 95V428, 92V206, 94V108, 97R267, 97R276, 97R183, 97R15, 85A146, 83V288, 92R62, 93R129, 97R134, 97R123, 97R163, 97R424, 97R395,

S.No	Character	Genotypes
		97R217, 97R6, 93R217, 92A326, 2000A213, 2000A225, 2002V2, 95V303, 88A189, 94A73, 92A374, 93A53, 92A126, 92A130, 2005T89, 2003T123, 2005T15, 2003T121.
14	**Internode growth crack**	
	a) Present	93A145, 2000V59, Co2001-15, 83V15, 97R272, 97R129, Co86032,81V48,92A355,97A85, Co7717, Co975, Co1148, Co364, Co5767, 89V72, 94V101, 92V104, 94V104, 94V108, 97R264,97R183,82V12,92R62, 97R424, 97R395, 93R217, 97R174, 95V348,95V303, 94A73,92A374, 93A53, 92A126, 87A290, 2004T68.
	b) Absent	Co7508, 90A272,99V30,83R23,93R44, Co85004, Co94008, Co2001-13, Co7219, CoT8201, 2002V48, 8R186, 97R401, 97R383,Co99004,2003T129, 2002A192, 97A44, 92A38, 90A278, 92A54, CoS8346, BO91, BARAGUA, KHAKAI, 81V99, SES594, Co6907,84A125, Co7602, CoC671, Co997, Co419, Co62399, Co38436, 2003V46, 2004A75, 2004A63, 2004A55, 2004A107, 2004A103, 2004A82, 2006T34, 2006T33, 2006T10, 2006T35, 2006T13, 2006T18,2006T36, 2006T23, 2006T19,2006T8,2006T3,95V221, 97V178, 92V225, 95V40, 97V118, 93V297, 95V423, 95V74, 97V163, 95V428, 92V206, 95V72, 97R199, 97R276, 93R113, 97R7, 97R15,85A146, 83V288, 86V96, 93R129, 97R134, 97R123, 97R163, 97R217, 97R6,97R167, 92A326, 2000A213, 2000A225, 2005T16, 94V103, 2002V2, 92A10, 88A189, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 2003T121.
15	**Internode :rind surface**	
	a)Smooth	Co7508,90A272,99V30,93R44, Co2001-13, Co2001-15, CoT8201, 97R401, 97R383, Co99004, 2003T129, 2002A192, CoS8346, BO91, BARAGUA, KHAKAI, 81V99, 97A85, SES594, Co975, Co997, Co62399, Co364, Co38436, CoS767, 2003V46, 2004A75, 2004A55, 2004A107, 2004A82, 2006T34, 2006T33, 2006T10, 2006T35, 2006T13, 2006T36, 2006T23, 2006T8, 2006T3, 95V221, 95V48, 95V423, 97V163, 92V206, 97R199, 93R113, 97R7, 97R15, 86V96, 97R134, 97R6, 93R217, 97R174, 92A326, 2000A213, 2000A225, 2005T16, 95V348, 94V103, 2002V2, 95V303, 92A10, 94A73, 92A374, 93A53, 92A126, 87A298, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 2004T68, 2003T121.
	b)Corky patches only	93A145, 2000V59, 83R23, Co85004, Co7219,83V15,85R186, Co6907, 84A125, CoA7602, CoC671,Co7717, 2004A63, 97V118, 82V12, 97R123, 97R163, 88A189.
	c)Ivory marks only	81V48, Co1148, 2006T18, 95V128.
	d) Both Corky patches and Ivory marks	Co94008, 2002V48, 97R272, 97R129, Co86032, 97A44, 92A355, 92A38, 90A278, 92A54, Co419,2004A103,2006T19,89V74,97V178,92V225,94V101, 93V297, 92V104, 94V104, 95V74, 95V72, 94V108, 97R267, 97R276, 97R183, 85A146,83V288,92R62, 93R129, 97R424, 97R395,97R217, 97R167.
16	**Wax on internode**	
	a)absent	CoS8346 81V99 Co62399 2004A63 2004A55 2005T52
	b)light	99V30 2000V59 93R44 Co85004 Co2001-13 Co2001-15 2002V48 Co86032 2002A192 BO91 Co6907 84A125 CoC671 Co364 Co38436 CoS767 2004A75 2004A82 2006T33 2006T10 2006T13 2006T36 2006T19 2006T8 2006T3 92V225 97V163 95V428 92V206 95V72 94V108 97R199 97R183 83V288 93R129 97R134 97R123 97R163 97R395 97R217 93R217 97R174 2000A213 2000A225 2005T16 2002V2 92A374 93A53 92A130 2005T89 2003T121

S.No	Character	Genotypes
	c)medium	Co7508 90A272 93A145 83R23 Co7219 CoT8201 83V15 97R272 97R129 2003T129 81V48 97A44 92A355 92A38 90A278 92A54 BARAGUA KHAKAI Co7717 Co975 Co1148 2003V46 2006T34 2006T35 2006T23 95V221 89V74 97V178 95V48 97V118 94V101 93V297 95V423 97R267 97R276 93R113 97R7 97R15 85A146 82V12 92R62 97R424 97R6 97R167 95V348 94V103 95V303 92A10 88A189 94A73 92A126 2003T123
	d)heavy	Co94008 85R186 97R401 97R383 Co99004 97A85 SES594 CoA7602 Co997 Co419 2004A107 2004A103 2006T18 92V104 94V104 95V74 86V96 92A326 87A298 2004T67 2005T50 2004T68
17	**Bud shape**	
	a)oval	99V30 Co2001-13 97R272 2003T129 97A44 92A355 92A38 92A54 BO91 KHAKAI Co6907 Co62399 Co364 Co38436 2003V46 2004A63 2004A55 2004A107 2004A103 2004A82 2006T33 2006T35 2006T13 2006T18 2006T36 2006T23 2006T8 97V178 95V48 94V104 95V74 97V163 95V428 94V108 97R267 97R276 97R183 92R62 93R129 97R424 97R6 92A326 2002V2 95V303 93A53 2004T68
	b)ovate	2000V59 83R23 93R44 Co85004 Co94008 Co2001-15 Co7219 CoT8201 85R186 Co86032 Co99004 81V48 CoS8346 BARAGUA 81V99 84A125 CoA7602 Co7717 Co419 CoS767 2004A75 2006T34 2006T10 2006T19 2006T3 89V74 92V225 97V118 94V101 92V104 95V423 97R199 93R113 97R15 86V96 97R134 97R123 97R395 93R217 97R174 2005T16 95V348 88A189 94A73 92A374 92A126 2005T89 2003T123
	c)round	83V15 2002V48 97R401 2002A192 90A278 Co975 Co1148 95V221 93V297 92V206 97R7 85A146 82V12 97R217 97R167 2000A213 2000A225 2005T50
	d)obovate	93A145 97R129 97R383 97A85 CoC671 95V72 83V288 97R163 94V103 92A10 87A298 2005T52
	e)rhomboidal	SES594 2004T67
	f)pentagonal	Co7508 90A272 2003T121
18	**Bud Size**	
	a)Small (6mm or Less)	93A145,99V30,2000V59, Co2001-13, Co2001-15,2002V48, 2003T129, 81V48, 2002A192, 92A355,92A38,90A278,92A54, Co62399, Co364, 2006T34, 2006T13, 2006T8, 95V221, 97V178, 92V225, 92V104, 95V74, 95V428, 97R276, 97R183, 85A146, 93R129, 97R134, 97R216, 92A326, 88A189,2000A213, 2005T16, 95V303, 92A130, 2005T50.
	b)Medium (6-9mm)	Co7508, 90A272, 83R23, 93R44, Co94008, Co7219, CoT8201, 83V15, 85R186, 97R129, 97R383, Co86032, Co99004, 97A44, CoS8346, BO91, BARAGUA, KHAKAI, 81V99, 97A85,Co6907,84A125,CoA7602CoC671, Co7717, Co975, Co1148, Co997, Co419,Co38436,CoS767,2003V46, 2004A75, 2004A63, 2004A55, 2004A107, 2004A103, 2004A82, 2006T33, 2006T10, 2006T35, 2006T18, 2006T36, 2006T23,2006T3,89V74,95V48,97V118,94V101,93V297,94V104, 95V423, 97V163, 92V206, 95V72, 94V108, 97R199, 93R113, 97R7, 97R15, 82V12, 92R62, 97R123, 97R163, 97R424, 97R6, 97R174, 97R167, 2000A225, 95V348, 2002V2, 92A10.94A73,92A374, 93A53, 92A126, 87A298, 2005T89, 2005T52, 2003T123, 2004T68, 2003T121.
	c)Large (9mm or more)	Co85004, 97R401,97R272,SES594,2006T19,97R267,83V288,86V96,97R395, 93R217, 94V103, 2004T67.
19	**Bud groove**	
	a)absent	Co7508 90A272 99V30 Co2001-13 Co2001-15 83V15 2002V48 97R401 97R272 97R383 Co86032 Co99004 2002A192 97A44 92A355 90A278 92A54 KHAKAI 97A85 Co7717 Co975 Co1148 Co997 Co62399 Co364 Co38436

S.No	Character	Genotypes
		CoS767 2003V46 2004A75 2004A63 2004A55 2004A107 2004A103 2006T34 2006T33 2006T10 2006T35 2006T13 2006T23 2006T8 2006T3 95V221 97V178 94V101 93V297 92V104 95V428 92V206 95V72 94V108 97R267 97R7 97R183 97R15 92R62 97R217 97R6 93R217 97R167 92A326 2000A213 2000A225 94V103 2002V2 92A126 2005T89 2005T52 2003T121
	b)shallow	93A145 2000V59 83R23 93R44 Co85004 Co94008 CoT8201 85R186 97R129 2003T129 81V48 92A38 CoS8346 BO91 Co6907 84A125 CoA7602 CoC671 Co419 2004A82 2006T18 2006T36 89V74 92V225 95V48 94V104 95V423 95V74 97V163 97R276 85A146 83V288 82V12 93R129 97R134 97R163 97R424 2005T16 95V348 95V303 88A189 93A53 87A298 2004T67 2004T68
	c)deep	Co7219 BARAGUA 81V99 SES594 2006T19 97V118 97R199 93R113 86V96 97R123 97R395 97R174 92A10 94A73 92A374 92A130 2003T123 2005T50
20	**Bud cushion**	
	a)absent	Co7508 90A272 93A145 99V30 2000V59 83R23 93R44 Co94008 Co2001-13 Co7219 CoT8201 83V15 85R186 97R401 97R272 97R129 97R383 2003T129 81V48 2002A192 97A44 92A355 92A38 90A278 92A54 CoS8346 BO91 BARAGUA 81V99 SES594 Co6907 84A125 CoA7602 CoC671 Co975 Co997 Co62399 Co364 Co38436 CoS767 2003V46 2004A63 2004A55 2004A107 2004A103 2004A82 2006T34 2006T33 2006T10 2006T35 2006T13 2006T18 2006T36 2006T23 2006T19 2006T8 2006T3 95V221 97V178 92V225 95V48 97V118 94V101 93V297 92V104 94V104 95V423 95V74 97V163 95V428 92V206 95V72 94V108 97R199 97R267 97R276 93R113 97R7 97R183 97R15 85A146 83V288 82V12 92R62 93R129 97R134 97R123 97R163 97R424 97R395 97R217 97R6 93R217 97R174 97R167 92A326 2000A213 2000A225 2005T16 95V348 94V103 2002V2 92A10 88A189 94A73 92A374 93A53 92A126 87A298 92A130 2005T89 2005T52 2004T67 2003T123 2004T68 2003T121
	b)present	Co85004 Co2001-15 2002V48 Co86032 Co99004 KHAKAI 97A85 Co7717 Co1148 Co419 2004A75 89V74 86V96 95V303 2005T50
21	**Bud tip in relation to growth ring**	
	a)below	Co7508 93A145 99V30 2000V59 Co94008 2002V48 97R383 2002A192 90A278 CoS8346 97A85 CoA7602 Co1148 Co997 Co62399 CoS767 2004A107 2004A103 2006T35 2006T18 2006T36 2006T23 95V221 93V297 92V206 95V72 97R276 97R7 85A146 97R163 97R217 97R6 97R167 92A326 2000A213 2000A225 95V303 93A53 2003T121
	b)touching	90A272 83R23 Co85004 Co2001-13 Co2001-15 CoT8201 83V15 85R186 97R401 97R129 Co86032 Co99004 2003T129 81V48 97A44 92A355 92A38 92A54 BO91 KHAKAI 81V99 Co6907 84A125 CoC671 Co7717 Co975 Co419 Co364 Co38436 2003V46 2004A63 2004A55 2004A82 2006T34 2006T33 2006T10 2006T13 2006T19 2006T8 2006T3 89V74 97V178 92V225 97V118 94V101 92V104 94V104 95V74 97V163 95V428 94V108 97R199 97R267 93R113 97R183 97R15 83V288 82V12 92R62 93R129 97R134 97R123 97R424 2005T16 95V348 94V103 2002V2 92A10 88A189 94A73 92A374 92A126 87A298 92A130 2005T89 2005T52 2005T50 2004T68
	c) above	93R44 Co7219 97R272 BARAGUA SES594 2004A75 95V48 95V423 86V96 97R395 93R217 97R174 2004T67 2003T123
22	**Prominence of growth ring (node swelling)**	
	a)weak	90A272 99V30 2000V59 83R23 93R44 Co85004 Co2001-13 Co2001-15 2002V48 97R272 Co86032 2003T129 81V48 2002A192 97A44 92A355 92A38

S.No	Character	Genotypes
		90A278 92A54 CoS8346 BO91 BARAGUA KHAKAI 81V99 97A85 SES594
	b)strong	Co6907 CoA7602 Co1148 Co419 Co364 Co38436 CoS767 2003V46 2004A75 2004A63 2004A55 2004A107 2004A103 2004A82 2006T34 2006T33 2006T10 2006T35 2006T13 2006T18 2006T36 2006T23 2006T19 2006T8 2006T3 95V221 92V225 95V48 94V101 92V104 94V104 95V423 95V74 97V163 92V206 95V72 94V108 97R199 97R276 93R113 97R7 97R183 97R15 85A146 92R62 93R129 97R134 97R123 97R163 97R395 97R217 97R6 93R217 97R174 97R167 92A326 2000A213 2000A225 2005T16 95V348 94V103 2002V2 95V303 92A10 94A73 92A374 93A53 92A126 92A130 2005T89 2005T52 2004T67 2003T123 2005T50 2004T68 2003T121
		Co7508 93A145 Co94008 Co7219 CoT8201 83V15 85R186 97R401 97R129 97R383 Co99004 84A125 CoC671 Co7717 Co975 Co997 Co62399 89V74 97V178 97V118 93V297 95V428 97R267 83V288 82V12 86V96 97R424 88A189 87A298
23	**Width of root band**	
	a)narrow	97A44 90A278 Co364 2006T13 92V225 97R199 93R113 97R134 2000A213 88A189
	b)medium	Co7508 90A272 93A145 99V30 2000V59 83R23 93R44 Co85004 Co94008 Co2001-13 Co2001-15 Co7219 CoT8201 83V15 2002V48 85R186 97R401 97R272 97R129 97R383 Co86032 Co99004 2003T129 81V48 2002A192 92A355 92A38 92A54 CoS8346 BO91 BARAGUA KHAKAI 81V99 97A85 Co6907 84A125 CoA7602 CoC671 Co7717 Co975 Co1148 Co997 Co419 Co62399 Co38436 2003V46 2004A75 2004A63 2004A55 2004A103 2004A82 2006T34 2006T33 2006T10 2006T35 2006T36 2006T23 2006T19 2006T8 2006T3 95V221 89V74 97V118 94V101 93V297 92V104 94V104 95V423 95V74 97V163 95V72 94V108 97R267 97R276 97R183 97R15 85A146 83V288 82V12 86V96 92R62 93R129 97R123 97R163 97R395 97R217 97R6 97R174 97R167 92A326 2000A225 2005T16 95V348 94V103 2002V2 95V303 92A10 94A73 92A374 93A53 92A126 87A298 92A130 2005T52 2004T67 2003T123 2005T50 2004T68 2003T121
	c)broad	SES594 CoS767 2004A107 2006T18 97V178 95V48 95V428 92V206 97R7 97R424 93R217 2005T89
24	**Internode cross section**	
	a)round	93A145 99V30 2000V59 93R44 Co85004 Co94008 Co2001-13 Co2001-15 2002V48 97R272 Co99004 2003T129 81V48 2002A192 97A44 92A355 92A38 90A278 92A54 CoS8346 BO91 BARAGUA KHAKAI 81V99 97A85 SES594 Co6907 CoC671 Co975 Co1148 Co997 Co62399 Co364 Co38436 2003V46 2004A75 2004A63 2004A55 2004A107 2004A103 2004A82 2006T34 2006T33 2006T10 2006T35 2006T13 2006T18 2006T36 2006T23 2006T19 2006T8 95V221 97V178 92V225 95V48 94V101 93V297 92V104 94V104 95V423 95V74 97V163 95V428 92V206 95V72 94V108 97R199 97R267 97R276 93R113 97R7 97R183 97R15 85A146 83V288 92R62 97R134 97R123 97R163 97R424 97R395 97R217 97R6 93R217 97R174 97R167 92A326 2000A213 2000A225 2005T16 95V348 94V103 2002V2 95V303 92A10 88A189 94A73 92A374 93A53 92A126 87A298 92A130 2005T89 2005T52 2004T67 2003T123 2005T50 2004T68 2003T121
	b)oval	Co7508 90A272 83R23 Co7219 CoT8201 83V15 85R186 97R401 97R129 97R383 Co86032 84A125 CoA7602 Co7717 Co419 CoS767 2006T3 89V74 97V118 82V12 86V96 93R129

S.No	Character	Genotypes
25	**Internode Pithiness**	
	a)Present	90A272, Co85004, Co94008,CoT8201,83V15,97R401,97R129,97R383, Co990042002A192,97A44,92A38,90A278,BO91,97A85, Co6907,84A125, CoA7602, CoC671, Co7717, Co975, Co997, Co419, 2006T1895V221, 89V74,97V118, 92V104, 94V104, 97R267, 83V288, 82V12, 94V103, 2002V2, 95V303, 92A10, 88A189, 92A130, 2005T89, 2003T121.
	b)Absent	Co7508, 93A1499V30,2000V59,83R23,93R44, Co2001-13, Co2001-15, Co7219, 2002V48, 85R186, 97R272, Co86032, 2003T129, 81V48, 92A355, 92A54, CoS8346, BARAGUA, KHAKA,81V99, SES594, Co1146, Co62399, Co364, Co38436, CoS767, 2003V46, 2004A75, 2004A63, 2004A55, 2004A107, 2004A103, 2004A82, 2006T34, 2006T33, 2006T10, 2006T35, 2006T13, 2006T36, 2006T23, 2006T19, 2006T8, 2006T3, 97V178, 92V225, 95V48, 94V101, 93V297, 95V423, 95V74, 97V163, 95V428, 92V206, 95V72, 94V108, 97R199, 97R276, 93R113, 97R7, 97R183, 97R15, 85A146, 86V96, 92R62, 93R129, 97R134, 97R123, 97R163, 97R424, 97R395, 97R217, 97R6, 93R217, 97R174, 97R167, 92A326, 2000A213, 2000A223, 2005T16, 95V348, 94A73, 92A374, 93A53, 92A126, 87A298, 2005T52, 2004T67, 2003T123, 2005T50, 2004T68.
26	**No. of millable canes/ stool**	
	a)Low(<3)	Co7508.
	b)Medium(3-5)	90A272,93A145,83R23,93R44, Co94008, Co2001-13, Co2001-15, Co7219, CoT8201, 83 V15,85R186,97R401,97R129,97R383, Co99004, 2003T129, 81V48, 2002A192, 97A44, 92A355, KHAKAI, 81V99, 97A85, Co6907, 84A125, CoA7602, CoC671,Co7717, Co975, Co419, Co62399, Co364, 2004A75, 2004A63, 2004A55, 2004A107, 2006T10, 2006T13, 2006T18, 2006T36, 2006T19, 2006T8, 2006T3, 89V74, 97V178, 95V48, 97V118, 94V101, 93V297, 95V423, 97V163, 97R199, 97R276, 97R7, 97R15, 83V288, 82V12, 86V96, 92R62, 93R129, 97R134, 97R163, 97R217, 97R174, 92A326, 2000A213,
	C).High (5.1-7)	2000A225, 95V348, 2002V2, 95V303, 88A189, 94A73, 92A374, 93A53, 92A126, 87A298,92A130,2005T89, 2004T67, 2003T123. 2000V59, 97R272, Co86032,90A278,92A54, CoS8346,BO91, BARAGUA, Co1148, Co997, Co38436, 2004A103, 2004A82, 2006T34, 2006T33, 2006T35, 2006T23, 95V221, 92V225, 92V104, 95V428, 92V206, 97R267, 93R113, 97R183, 85A146, 97R123, 97R395, 97R6, 93R217, 97R167, 2005T16, 94V103, 2005T52, 2004T68, 2003T121.
	D) Very High(>7)	99V30, Co85004, 2002V48, 92A38, SES594, CoS767, 2003V46, 94V104, 95V74, 95V72, 97R424, 92A10, 2005T50.
27	**Cane length**	
	a)Short (<1.75 m)	93A145,93R44, Co85004,2003T129,92A355,90A278,92A54, SES594Co364, Co38436,2004A63, 97R7, 82V12, 97R134, 97R6, 2005T16, 92A374, 93A53, 92A130, 2005T89, 2005T52, 2004T67, 2003T123, 2005T50, 2003T121
	b)Medium (1.75-2.5 m)	Co7508, 90A272, 99V30, 2000V59, 83R23, Co94008, Co2001-13, Co7219, 2002V48, 97R401, 97R272, 97R129, 97R383, 81V48, 2002A192, 97A44, 92A38, CoS8346, BO91, BARAGUA, KHAKAI, 97A85, 84A125, CoA7602, Co7717, Co1148, Co997, Co419, Co62399, CoS767, 2004A75, 2004A55, 2004A107, 2004A103, 2004A82, 2006T34, 2006T33, 2006T10, 2006T35, 2006T18, 2006T36, 2006T23, 2006T19, 2006T3, 95V221, 92V225, 97V118,

S.No	Character	Genotypes
		92V104, 94V104, 95V423, 95V74, 97V163, 92V206, 95V72, 94V108, 97R276, 97R183, 97R15, 85A146, 93R129, 97R123, 97R424, 97R395, 97R217, 97R167, 92A326, 2000A213, 2000A225, 2002V2, 95V303, 92A10, 88A189, 94A73, 92A126, 87A298, 2004T68.
	c)Tall (2.6 – 3.25 m)	Co2001-15, CoT8201,83V15,85R186, Co86032, Co99004,81V99, Co6907, CoC671, Co975, 2003V46, 2006T13, 2006T8, 89V7, 97V178, 95V48, 94V101, 93V297, 95V428, 97R199, 97R267, 93R113, 83V288, 92R62, 97R163, 93R217, 97R174, 95V348, 94V103
	d)Very Tall (>3.25 m)	86V96

number of millable canes and single cane weight have strong positive correlation to cane yield (Rahman *et al.,* 2008).

Mislabeling the clones in germplasm collection naturally misleads the breeding programme apart from misuse of resources. Hence breeder wishes to periodically verify the trueness to label of clones in a germplasm collection. Appropriate morphological and molecular markers would be helpful to verify that the clones are true to label. The characterization of the germplasm lines using DUS descriptors is helpful for varietal identification and protection. The one hundred and thirty one germplasm accessions are reservoirs for different parameters and they can be exploited in any breeding programmes for production of promising sugarcane varieties.

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