SHORT COMMUNICATION

VARIABILITY STUDIES IN THE INTERSPECIFIC HYBRIDS OF SUGARCANE DERIVED WITH DIFFERENT CYTOTYPES OF *SACCHARUM SPONTANEUM* L.

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Abstract

In sugarcane breeding, inter-varietal hybridization over several decades has led to narrow genetic base in the present day cultivars. New genetic stocks have to be developed to meet the diverse demand. The progenies of commercial cultivars x *S. spontaneum* provides greater genetic diversity as *Saccharum spontaneum* is the most cytologically diversed wild species in *Saccharum* complex. Hence some progenies derived from the crosses involving the commercial cultivars (Co 8371 and Co 86249) and different cytotypes of *S. spontaneum* (2n = 64, 72 and 80) were assessed for their variability. In the hybrid group involving Co 8371 with 3 cytotypes (2n=64, 72 and 80), the extent of variability was high with 2n=64 for NMC (34.5%), internode number (16.7%) and internode length (21.2%). The clones of Co 8371 x *S. spontaneum* (2n=72) exhibited higher CV% for cane height (17.0%). The cytotype 2n=80 incorporated higher variability for sucrose content in juice (24.9%). In the crosses involving Co 86249 with the cytotypes 64 and 80, variability was high for NMC (34.3%), and internode length (17.9%) with 2n=80. However, the progeny mean for NMC was higher in the cytotype 64 derived crosses. The hybrid 04 - 924 (derivative of the cytotype 80) was found to be highly vigorous with 30 - 45 internodes and cane weight of 1.1- 1.65 kg. It reiterates separate selection criteria for sugarcane x *S. spontaneum* F1 and BC1. Two hybrids with higher biomass and moderate brix have been identified as dual purpose energy canes which are under location trial.

Key words: *Saccharum spontaneum*, cytotypes, variability, hybrids, progeny mean

In sugarcane breeding, the interspecific hybrid derivatives developed by utilizing *S. spontaneum* during the early nobilization in Indonesia (POJ 2725 and POJ 2878) and India (Co 205 and Co 213) formed the basis for all the varietal improvement programmes in the world. Subsequent intervarietal hybridization over several decades has led to narrow genetic base in the present day cultivars. New genetic stocks have to be developed to utilize them in breeding of sugarcane to meet the diverse demand of sugar industry. The progenies of commercial cultivars x *S. spontaneum* provide greater genetic diversity which may form an ideal stage for the incorporation of new variation into the commercial background in addition to the reduction of breeding cycle in the selection programme (Shang *et al*., 1968). *Saccharum spontaneum* is cytologically the most diverse wild species in *Saccharum* complex with various cytotypes (2n = 40 - 128) and wider distribution (Panje, 1964). This species exists with about 41 cytotypes,the foremost being 2n=40, 48, 56, 60, 64, 72, 80, 88, 96, 112 and 120. The cytotype 64 is predominant in distribution and utilization and its' dominance over other cytotypes is an interesting area for analysis. Hence, some progenies derived from the crosses involving commercial cultivars and different cytotypes of *S. spontaneum* (2n = 64, 72 and 80) were assessed for their variability and further exploitation.

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A total of 77 hybrids derived from six crosses involving commercial cultivars (Co 8371 and Co 86249) and four clones of *S. spontaneum* with different chromosome number (SES 410, 2n=64; SES 590, 2n=64; SH 216, 2n=72: IND 84-415, 2n=80) were clonally evaluated along with the parents. The clones were accommodated in randomized block design with two replications in a plot size of 10 feet length spaced at 90 cm. Observations were recorded on number of millable canes (NMC), cane height, thickness, number of internodes, internode length and sucrose % at 12th month. Data were subjected to statistical analysis (Panse and Sukhatme, 1961).

Increasing the efficiency of interspecific hybridization in sugarcane is a long-cherished goal in nobilization. But lack of information on the relative merits of individual characters in the various hybrid groups involving various mating groups of interspecific hybrids remains a lacuna in increasing their production efficiency (Bakshi Ram and Hemaprabha, 1990) and is pertained to the progenies derived with the different cytotypes of same species also. The morphological observations on the hybrids indicated intermediate appearance between the parents (Table 1). Analysis of variance for various parameters indicated that all the characters exhibited significant differences and it implies more diversification in the hybrids. Similar significant difference for NMC, cane height and thickness of hybrids involving different variants of *S. spontaneum* from Andhra Pradesh and Arunachal Pradesh was reported earlier (Anonymous 1991).

In the hybrid group involving Co 8371 with three cytotypes (2n= 64, 72, 80), the extent of variability was high in the cross of Co 8371 x *S. spontaneum* (2n=64) for NMC (34.5%), internode number

Table 1. Variability in the hybrids derived with different cytotypes of *Saccharum spontaneum*

Mean/ parent	NMC	Height (cm)	Thickness (cm)	No. of internodes	Internode length (cm)	Sucrose (%)
Co 8371 (2n=108) x *S. spontaneum* (SES 410, 2n=64)						
Progeny mean	38.5**	189.8**	1.7**	11.7**	16.1**	7.1**
Range	22.5 - 62.0	161.4 - 232.1	1.6 -1.8	8.3 - 14.9	12.6 - 20.0	6.0 - 9.0
CV %	34.5	10.6	3.9	16.7	21.2	17.0
Co 8371	26.5	181.3	3.0	19.9	9.2	16.9
SES 410	68.0	144.5	0.5	16.0	9.2	3.0
Co 8371 (2n=108) x *S. spontaneum* (SH 216, 2n=72)						
Progeny mean	34.4**	206.0**	1.7**	15.4**	13.0**	6.3**
Range	25.5- 49.5	128.3 - 260.1	1.6 - 2.1	12.8 -19.6	9.1- 16.8	5.5 - 8.0
CV %	33.5	17.0	7.0	13.2	18.5	18.1
Co 8371	26.5	181.3	3.0	19.9	9.2	16.9
SH 216	86.0	151.3	0.8	10.8	13.2	5.9

Table 1 Continued

Mean/ parent	NMC	Height (cm)	Thickness (cm)	No. of internodes	Internode length (cm)	Sucrose (%)
Co 8371 x *S. spontaneum* (IND 84 - 415, 2n = 80)						
Progeny mean	32.3**	190.5**	1.7**	15.1**	13.9**	6.8**
CV%	24.8	10.1	4.4	13.2	17.6	24.9
Range	13.5 - 47.0	151.5 -220.8	1.5 - 1.8	12.0 -18.0	10.2 -18.5	4.9 - 9.0
Co 8371	26.5	181.3	3.0	19.9	9.2	16.9
IND 84 - 415	100.5	175.6	0.5	13.8	15.0	3.8
Co 86249 (2n=106) x *S. spontaneum* (SES 410, 2n=64)						
Progeny mean	36.6**	185.1**	1.6**	14.1**	12.6*	4.3**
Range	24.2 - 64.5	174.0 - 213.1	1.4 - 1.8	11.1-17.8	10.1-16.1	4.0- 8.9
CV	28.6	7.6	7.3	15.7	16.4	23.1
Co 86249	31.0	190.0	2.7	19.8	11.2	18.4
SES 410	68.0	144.5	0.5	16.0	9.2	3.0
Co 86249 (2n=106) x *S. spontaneum* (SES 590, 2n = 64)						
Progeny mean	54.0**	178.7**	1.7**	15.4**	12.2**	8.2**
Range	22.5 - 69.5	160.6 - 220.0	1.7 -1.8	8.3 - 18.5	9.7 - 15.4	6.8 - 10.5
CV%	30.4	23.9	4.0	10.9	16.0	19.3
Co 86249	37.0	190.6	2.6	19.8	11.2	18.4
SES 590	64.0	188.5	1.1	16.0	9.1	3.0
Co 86249 (2n=106) x *S. spontaneum* (IND 84 - 415, 2n = 80)						
Progeny mean	34.9**	161.5**	1.6**	16.7**	11.1**	8.3**
Range	20.8 - 62.5	105.3 - 214.0	1.4 - 1.8	13.3 -19.6	8.3 - 13.8	5.5 - 11.3
CV%	34.3	7.01	8.6	13.3	17.9	20.1
Co 86249	37.0	190.6	2.6	19.8	11.2	18.4
IND 84 - 415	100.5	175.6	0.5	13.8	15.0	3.8

*significant at 0.05 probability: ** significant at 0.01 probability

(16.7%) and internode length (21.2%). The clones of Co 8371 x *S. spontaneum* (2n=72) exhibited higher coefficient of variation (CV) for cane height (17.0%). The cytotype 2n=80 involved progenies (Co 8371x *S. spontaneum*, 2n = 80) incorporated higher variability for sucrose per cent (24.9%).

In the crosses involving Co 86249 with the cytotypes 2n= 64 and 80, the extent of variability was high in the hybrid group of Co 86249 x *S. spontaneum* (2n=80) for NMC (34.3%) and internode length (17.9%). However, the progeny mean for NMC was higher in the cytotype 64 derived crosses. Between the two clones utilized, SES 590 (2n=64) imparted maximum NMC with progeny mean of 54.0. The hybrid 04 - 1766 possessed maximum of 69.5 canes/ 10 m row. Suganya *et al*. (2012) reported that cytotype 64 derived hybrids were stable with n+n transmission and higher cytotypes resulted in elimination of chromosomes.

The hybrid 04 - 924 (derivative of the cytotype 80) which is separately maintained in the crossing plot was found to be highly vigorous with 30 - 45 internodes and cane weight of 1.1- 1.65 Kg (Fig. 1). It reiterates separate selection criteria for sugarcane x *S. spontaneum* F1 and BC1 as emphasized by Alexander (1985). It will be advantageous to select suitable hybrids for specific purposes for further utilization for quicker gains in breeding cycle. Two hybrids with higher biomass and moderate Brix have been identified as dual purpose energy canes which are under location specific trials.

Fig.1. The hybrid 04 – 924 (Co 8371x *Saccharum spontaneum*, 2n=80)

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