Indian J. Genet., **54** (3): 317–320 (1994)

VARIATION FOR MORPHOLOGICAL AND QUALITY ATTRIBUTES IN CLONES OF CALLUS REGENERANTS IN SUGARCANE CV. COC-671

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(Received: August 6, 1994; accepted: October 15, 1994)

ABSTRACT

Fifteen clones obtained from callus derived plants in sugarcane cv. COC-671 were assessed in the field for morphological and quality aspects including cane yield. Five of the clones exhibited significantly higher cane yield (82.2 kg/row) than control (51 kg/row). The observed superiority of these clones for cane yield over control was related either to higher number of internodes per plant or more number of shoots per meter length. Regarding quality of cane juice, only two clones had sucrose content above 20% and commercial sugar cane higher than 14% as compared to 19.46 and 13.89% respectively, in the plants developed from sets. The reducing sugar lower than recorded in control was found in 10 clones, the lowest value being 0.102%.

Key words: Somaclones, sugarcane, tissue culture, callus regeneration.

The expression 'somaclonal variation' was first used by Larkin and Scowcroft [1] to identify the genetic variation found in somaclones, i.e. plants regenerated from any type of in vitro tissue culture. Such variation plays an important role, especially in vegetatively propagated species. Somaclonal variation can be due to pre-existing genetic variation that is expressed in regenerated plants, or induced by the tissue culture process itself [2]. Among the plant tissue culture methods, plants regenerated from disorganized calli are reported to have relatively higher variation level. The present paper deals with assessment of variation for morphological and quality aspects amongst the clones developed from callus regenerants of sugarcane var. COC 671.

MATERIALS AND METHODS

Sugarcane sets obtained from each of the 15 callus-derived plants of variety CoC-671 were grown in plant-to-row method along with check at the Sugarcane Research Centre,

Punjabrao Krishi Vidyapeeth, Akola during October, 1989. Each row of 6 m length was spaced at 90 cm. All the cultivation practices recommended for sugarcane crop were followed. At the harvest, five random plants from each row were used for recording observations on plant height, millable height, No. of internodes, stem girth, and cane yield. These five plants were crushed together and the cane juice obtained was used to record quality parameters, namely, corrected Brix, sucrose, commercial cane sugar (CCS) percentage, and reducing sugars following the standard analytical methods.

RESULTS AND DISCUSSION

The results (Table 1) revealed cane yield of five somaclones to be significantly more than control. Clone-9 exhibited highest cane yield (82.2 kg/row). A significant increase in cane yield over control was also shown by Clones No. 3, 7, 13 and 14. The data indicate that the average number of internodes in Clones No. 3 and 13 was the main component reflecting superiority of these clones for cane yield. However, in Clones No. 7 and 14, the major factor responsible for higher cane yield, was average number of shoots per meter row length. In the remaining clones, cane yield was either nonsignificant or lower than the plants developed by sets. The study identified only one clone (No. 13) having significantly higher girth over control.

As regards quality aspects of cane juice, it was found that only two clones, viz. Clones 1 and 15 had sucrose content greater than 20.00 and commercial cane sugar (CCS) higher than 14.00 as against 19.46 and 13.89%, respectively, in control (Table 1). Clone 1 exhibited the lowest level of reducing sugar (0.102%), followed by Clones 8 and 11.

The range of variation in the clones of callus-derived plants observed in the present study shows in vitro culture via callus to be a potential mechanism for producing genetic variability in sugarcane. According to some authors [3–5] somaclonal variation has its origin as a natural process in the survival strategy to plants. However, in the in vitro cultures, especially callus, cell suspension and protoplast cultures, such variations may be accentuated. In asexually propagated crops like sugarcane, regeneration after callusing creates variation that could be tapped for cane yield and quality improvement in sugarcane.

Table 1. Observations on yield and other parameters of sugarcane somaclones

Clone No.	No. of shoots per meter length	Height at harvest (cm)	Millable height at harvest (cm)	No. of inter-nodes	Girth (cm)	Yield per line (kg)	Corr-ected Brix	Suc-rose (%)	C.C.S. (%)	Reduc-ing sugar (%)
1	17.66	257.47** (3.484)	252.47** (3.484)	31.92 (0.748)	11.04 (0.479)	52.33 (1.616)	22.18	20.30	14.27	0.102
2	15.66	289.00 (11.421)	284.00 (15.54)	36.06 (1.603)	11.70 (0.424)	52.33 (2.338)	20.18	16.61	11.08	0.324
3	16.66	237.00** (9.695)	232.00** (9.695)	34.4 (1.503)	12.3 (0.374)	69.00** (1.516)	22.88	19.54	13.43	0.273
4	13.50	250.00* (10.00)	245.00* (10.00)	35.2* (1.319)	11.2 (0.561)	47.00 (0.765)	19.68	17.10	11.72	0.344
5	15.50	244.00** (7.810)	239.00** (7.810)	30.9 (1.827)	12.1 (0.367)	47.00 (0.732)	18.88	17.16	12.02	0.450
6	15.83	277.00 (8.60)	272.00 (8.60)	36.2* (1.356)	11.7 (1.239)	37.00 (1.970)	19.18	16.44	11.34	0.526
7	20.50	282.00 (17.86)	277.00 (17.86)	36.2 (2.939)	11.3 (0.435)	59.00 (0.851)	19.18	16.19	10.94	0.458
8	18	261.00** (3.122)	256.00** (3.122)	35.3* (1.442)	10.25 (1.118)	54.00 (0.656)	20.54	18.50	12.90	0.171
9	20.66	244.00* (8.86)	239.00* (8.86)	31.8 (2.939)	11.0 (0.741)	82.20** (2.129)	19.08	16.92	11.72	0.909
10	11.85	206.00** (15.763)	201.00** (15.763)	27.8 (1.462)	10.2 (0.624)	63.00 (0.948)	21.68	18.91	13.00	0.247
11	19.50	296.00 (7.314)	291.00 (7.314)	34.4 (1.653)	11.95 (0.544)	50.00 (1.303)	21.60	18.67	12.77	0.201
12	15.50	270.00 (27.064)	265.00 (27.064)	33.6 (2.135)	11.70 (0.463)	54.0 (0.452)	21.68	19.62	13.72	0.270
13	18	288.50 (7.271)	283.50 (7.271)	33.8 (1.435)	11.5** (0.188)	56.000** (0.851)	22.41	19.78	13.67	0.381
14	18.33	258.00 (10.380)	250.80 (11.386)	32.1 (1.638)	11.00 (0.374)	58.00** (0.439)	21.51	19.38	13.52	0.304
15	17.66	270.5 (20.967)	265.5 (20.967)	30.3 (2.537)	11.45 (0.266)	46.5 (0.777)	21.81	20.06	14.13	0.324
Control	16.50	285.00	280.00	30.00	11.15	51.0	20.54	19.46	13.89	0.409

Note. The figures in parentheses indicate SE.

*,**Significant at 5% and 1% levels, respectively.

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