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POTENTIAL INTER-VARIETAL CROSS COMBINATIONS FOR SUGARCANE YIELD AND OTHER ATTRIBUTES DURING SELECTION IN INDO-GANGETIC PLAINS OF UTTARAKHAND

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) grown under Indo-Gangetic plain of Uttarakhand is subject to drought, heat, cold, salinity, water logging, pest & disease. To overcome this vulnerable situation, plant breeders are constantly in search of genotypes. Evolving sugarcane varieties involves 12-14 years. The first six to seven years include selection of promising families with the maximum potential for producing economically viable genotypes would be of great interest and usefulness to the sugarcane breeders. During family selection, whole family of seedlings is selected. In view to assess the overall performance of Inter varietal cross combinations during different stages of selection. Sixteen bi parental crosses were made at national hybridization garden, Sugarcane breeding institute, Coimbatore in the year 2015-16 to create genetic variability. Seedlings were raised at Sugarcane Research Station, Kashipur and Pantnagar. In present investigation, 1055 seedling from 16 different cross combination were studied and three cross combination viz Co S 8436 x Co Pant 97222, Co 0238 x Co 1148 and Co 0238 x Co Pant 97222 were found superior.

Key words : *Sugarcane, inter-varietal, cross combinations, Uttarakhand, selection and clone*

The thrust area in sugarcane is cane yield and sugar yield so far breeding is concern, however sugar yield has been the prime traits for mills and yield and diseases to the farmers. In breeding programme, breeders are producing thousand of seedlings which consist of hybrid families. In seedling stage they have employed intensive selection of individual seedling for first clonal generation from the whole population or first select the most promising families based on H.R. Brix (%) and visual selection for stalk with large volumes and low pith (1). Hence crosses are attempted between superior parents with at least one of the parents involved in cross should be well adopted and proven variety in the area or contrast parents, followed by selection of superior clones. (2, 3) suggested that estimates of heritability for sucrose content were high as compared to cane yield and it could be taken as selection criterion for improving sugar yield by making crossing with high sugared with adopted genotypes and selection could be made for sucrose per se. However, sucrose yield cane be increased by improving cane yield also, as this trait has higher genetic variability than sucrose (4). Progenies are screened based on number of millable canes (NMC) with solidness and thickness of canes. Hence, identification of promising families with the maximum potential for producing economically viable genotypes would be of great interest and use fulness to the sugarcane breeders. During family selection, whole family of seedlings is selected or rejected based on the family means value, in individual seedling selection is restricted to selected families. The present study was undertaken in view to assess the overall performance of inter-varietal cross combinations during different stages of selection under varietal evolution programme.

MATERIALS AND METHODS

Sixteen bi-parental crosses were made at National Hybridization Garden, Sugarcane Breeding Institute. Coimbatore in the year 2015-16 to create genetic variability. Fluffs of these crosses were sown in 2016-17 at Sugarcane Research Centre, Kashipur and Pantnagar. The experiment was conducted for evaluation of different stages during the year 2016-19. Total 1055 seedling were raised from fluff in poly house condition. Each seedling was spaced at 90 cm with row to row and 45 cm plant to plant distance was maintained and single bud set of standard variety.

It was planted on the basis of HR Brix (%), cane diameter, number of millable cane per clump and visual selection, 1055 seedlings were promoted for first clonal (C_1) generation. Observations were taken in C_1 stage and finally 1040 clones selected for C_2 stage from sixteen cross combinations for Advance stage finally. Twenty Nine clones were selected from sixteen cross combinations and evaluated in randomized block design with two replication and recommended agronomical practices were applied as per recommendations.

RESULTS AND DISCUSSION

Maximum seedlings/gm fluff was recorded in Co 0238 x Co 1148, Co S 8436 x Co Pant 97222 followed by Co 98010 x Co 1148 and Bo 91 x Bo 128 On the basis of H.R. Brix %, cane diameter, number of millable canes/clump and visual selection, 1055 were promoted from first

Table-1 : Screening of clones at sugarcane research centre, Kashipur in selection process.

Crosses	No. of Clones (good)	Total	H.R. Brix (> 20)
Co Bln 04174 x Co Pant 97222	16	19	10
Co S 8436 P.C.	108	126	61
81V 48 (Co V 89101) P.C	90	95	52
Co 86002 x Co S 510	13	15	09
Co S 95422 P.C	48	57	27
Co S 8436 x Co Pant 97222	22	25	17
Co 98008 x Co 775	37	51	19
Co LK 94184 x Co Pant 97222	54	59	28
ISH 100 x Co 775	62	65	21
Co 98010 x Co 1148	119	122	42
Co 0238 x Co 1148	178	218	124
Bo 91 x Bo 128	149	166	72
Co Pant 90223 x Co 1148	03	03	01
Co 0238 x Co Pant 97222	05	05	05
Co 0238 x Co 775	05	08	08
Co S 8436 x Co Pant 97222	06	06	05

Table-2 : Evaluation of clone for number of millable canes per clumps at sugarcane research centre, Kashipur.

Crosses	No. of millable canes per clumps at 12th Month
Co Bln 04174 x Co Pant 97222	16
Co S 8436 P.C	09
81V 48 (Co V 89101) P.C	18
Co 86002 x Co S 510	14
Co S 95422 P.C	20
Co S 8436 x Co Pant 97222	22
Co 98008 x Co 775	16
Co LK 94184 x Co Pant 97222	19
ISH 100 x Co 775	07
Co 98010 x Co 1148	13
Co 0238 x Co 1148	12
Bo 91 x Bo 128	26
Co Pant 90223 x Co 1148	09
Co 0238 x Co Pant 97222	10
Co 0238 x Co 775	15
Co S 8436 x Co Pant 97222	17

Mean H.R. Brix of Standard

Standard	Mean H.R. Brix in January
Co 0238	22.20
Co J 64	22.40
Co S 767	21.60
Co Pant 97222	21.20

Table-3 : Clones selected from promising cross combination.

Selection No.	Crosses
S-999	Co S 8436 x Co Pant 97222
S-1350	Co 0238 x Co 1148
S-1424	Co 0238 x Co 1148
S-1810	Co 0238 x Co Pant 97222
S-983	Co S 8436 x Co Pant 97222
S-1413	Co 0238 x Co 1148

generation and finally 1040 clones. Selected for C2 stage from Sixteen cross combination viz, Co Bln 04174 x Co Pant 97222, Co S 8436 P.C, 81V 48 (Co V 89101) P.C, Co 86002 x Co S 510, Co S 95422 P.C, Co S 8436 x Co Pant 97222, Co 98008 x Co 775, Co LK 94184 x Co Pant 97222, ISH 100 x Co 775, Co 98010 x Co 1148, Co 0238 x Co 1148, Bo 91 x Bo 128, Co Pant 90223 x Co 1148, Co 0238 x Co Pant 97222, Co 0238 x Co 775 & Co S 8436 x Co Pant 97222 based on different attributes. Twenty nine clones selected from C_2 generation and promoted in advance stage. These twenty nine clones were evaluated with standards Co J 64, Co 0238, Co S 767, Co Pant 97222 in R.B.D. with two replications. Finally on the basis of trait observations and disease resistance with overall good performance. Six clones were selected from three different cross combinations viz Co S 8436 x Co Pant 97222, Co 0238 x Co 1148 and Co 0238 x Co Pant 97222 for further studies.

The cane yield depends on the number of millable canes/ha stalk heights, stalk diameter and single cane weights etc. (5). Number of millable canes is the primary raw material produced by the farmers and processed by the sugar mills to produce sugarcane yield is the primary measure of productivity and a key selection criterion in sugarcane breeding. Individual selection for the most important characters (tonnes cane, Brix %) is expected to be inefficient, about 80 % of the variation being due to environmental effects with only 16 to 20 % due to genotype (6). Breeding and Selection method improve cane yield would therefore also focus on these components.

Six clones from different cross combination viz Co S 8436 x Co Pant 97222, Co 0238 x Co 1148 and Co 0238 x Co Pant 97222 were found superior based on quantitative traits as well as different attributes. Most of the parents in cross combinations belong to early group. Emphasis should be given on these combinations in future breeding programme to get the desirable clones for future breeding programme to get the desirable clone for future breeding needs in Indo genetic plains of Uttarakhand.

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