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Short Communication

Selection for juice quality and red rot disease index in sugarcane (*Saccharum officinarum* L.)

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Red rot, caused by *Colletotrichum falcatum* Went, is the most important disease of sugarcane (*Saccharum officinarum* L.) in India, which had caused the complete failure of many commercial varieties. In general, it is believed that red rot susceptibility is correlated with high juice quality [1]. However, Ram *et al.*, [2] found no correlation between HR Brix and disease index in seedlings of seven crosses. Considering these contradictory reports 230 progenies of 40 crosses, 7 general crosses and 7 poly crosses were evaluated in an RBD with 2 replications. The plot size was a 6m row spaced at 90 cm. Five canes/plot were inoculated by the most virulent race (Cf08) of red rot pathogen during August 2004. The reaction of each clone was recorded during October 2004 by following the internationally accepted 0-9 scale. Observations were recorded on hand refractmeter Brix (HR Brix) at the time of inoculation (August 2004) and evaluation (October 2004) and pol % in juice during January 2005 and red rot disease index to study the relationship among these traits. Clones were grouped as low $\langle(+x-\sigma)$, medium $(+x-\sigma)\rangle$ $\langle(+x-\sigma)$ and high$\rangle$ $(+x+\sigma)$ on the basis of juice quality at the three growth stages. Mean and genotypic coefficients of variation (GCV) and genotypic correlations were computed amongst the four traits studied in the population as well as in low, medium and high juice quality groups.

Mean disease index of all progenies was 6.65, which indicated the predominance of susceptible and highly susceptible progenies in the population (Table 1). Of the 230 clones tested 63 (27.4%) clones were R and MR, 21 (9.1%) were MS and 146 (63.5%) clones were S and HS. The GCV for disease index was 39.1 % indicating enough variability for the trait. The mean HR Brix during August was 8.59, which increased to 16.38 during October. However, the coefficient of variation for HR Brix was 22.47 % in August, which was reduced to 17.03 % in October. This indicated better chances of effective selection for this trait during early in the season (i.e., in August). The mean pol % in juice was 14.62 % during January. The coefficient of variation for pol % was 17.03 %. It revealed that selection would be more effective on the basis of pol % at later stages (January-March), when differences among clones narrowed down for HR Brix.

Table 1. Mean and genotypic coefficient of variation (GCV) for red rot disease index and HR Brix of 230 sugarcane progenies

Parameters	HR Brix (August)	HR Brix (October)	Pol % (January)	Disease index
Mean	8.59	16.38	14.62	6.65
GCV	22.47	17.03	17.03	39.10
Range	4.1-13.4	8.0-22.5	7.48-20.5	2-9

HR Brix during August and October was correlated significantly (Table 2). However, pol % in juice during January was not correlated with HR Brix during August but it was associated with HR Brix during October. Clones with low HR Brix during August have shown low, medium and high juice quality during October and January. Of the 41 clones with low HR Brix during August 10, 30 and 1 clones showed low, medium and high (respectively) HR Brix during October. Whereas 5, 30 and 6 clones showed low, medium and high pol %, respectively, during January. Similar was the case with medium and high HR Brix clones during August. Of the 39 high HR Brix clones during August only 13 and 8 clones showed high juice quality during October and January, respectively. The disease index was not correlated with any of the juice quality traits recorded during August, October and January (Table 2). This clearly contradicted the general conviction [1] that high juice quality is related to susceptibility to red rot disease.

When clones were classified on the basis of HR Brix during August, HR Brix during August and October

Table 2. Correlation between HR Brix and disease index for red rot in sugarcane

Characters	HR Brix (October)	Pol % (January)	Disease index
HR Brix (August)	0.306**	0.061	−0.090
HR Brix (October)		0.314**	0.025
Pol % (January)			0.057

Table 3. Correlation between HR Brix and disease index for red rot and means of 3 groups on the basis of juice quality in sugarcane

HR Brix Group	No. of clones	Mean	Characters	HR Brix (October)	Pol % (January)	Disease index
At the time of inoculation (August 2004)						
Low <(+x –σ)	41	5.83	HR Brix (August)	–0.166	0.072	0.059
			HR Brix (October)		0.057	0.259
			Pol % (January)			–0.146
Medium (+x –σ)> <(+x +σ)	150	8.59	HR Brix (August)	0.229**	0.057	–0.089
			HR Brix (October)		0.322**	–0.102
			Pol % (January)		0.049	
High >(+x +σ)	39	11.48	HR Brix (August)	–0.144	–0.294	–0.212
			HR Brix (October)		0.476**	0.417**
			Pol % (January)			0.352*
At the time of evaluation (October 2004)						
Low <(+x –σ)	36	11.71	HR Brix (August)	0.302	–0.171	0.040
			HR Brix (October)		–0.010	0.098
			Pol % (January)			–0.304
Medium (+x –σ)> <(+x +σ)	159	16.56	HR Brix (August)	0.131	–0.03	0.147
			HR Brix (October)		0.159*	0.072
			Pol % (January)			0.116
High > (+x +σ)	35	20.35	HR Brix (August)	0.280	0.172	0.072
			HR Brix (October)		0.110	–0.070
			Pol % (January)			0.113
Pol % (January 2005)						
Low <(+x –σ)	34	10.51	HR Brix (August)	0.302	–0.064	0.040
			HR Brix (October)		0.157	0.098
			Pol % (January)			–0.058
Medium (+x –σ) > <(+x +σ)	153	14.59	HR Brix (August)	0.131	0.120	–0.147
			HR Brix (October)		0.232**	0.072
			Pol % (January)			–0.074
High >(+x +σ)	43	18.00	HR Brix (August)	0.280	0.380*	0.072
			HR Brix (October)		0.498**	–0.070
			Pol % (January)			0.063

were correlated in medium group alone (Table 3). HR Brix during October and pol % during January were correlated in medium and high groups. When clones were classified on the basis of HR Brix during October, juice quality during October and January was correlated in medium group only. Classification of clones on the basis of juice quality during January also showed association between juice quality during October and January in medium and high groups. Clones with high pol % during January also showed higher HR Brix during August in high group alone. This indicated that clones with higher pol % during January tended to have higher HR Brix during August. However, proportion of such clones was low (24.8%).

These results thus indicated that sugarcane clones showed differential sugar accumulation during August to January. At the earliest, sugarcane clones could be classified as low, medium and high quality clones on the basis of HR Brix during October. However, if selection is delayed to February-March it would be better to select on the basis of pol % as differences amongst clones for HR Brix narrowed down.

Clones with higher HR Brix during August, disease index had showed significant positive correlation with juice quality during October and January (Table 3). This indicated that clones with high HR Brix during August (>10.6) tended to be more susceptible to red rot disease. These results questioned the validity of the general statement that juice quality is positively correlated with susceptibility to red rot as the association between low, medium and high juice quality types with red rot resistance was lacking. However, it may be kept in mind that the disease rating of the parental clones is having an overwhelming influence on the proportion of resistant clones in progenies [1] as indicated by high heritabilty values for red rot disease index [3]. The parental clones also influence the juice quality of progenies. However, the conclusions drawn from the present study based on 230 clones derived from 54 families are expected to have wider applicability in sugarcane breeding.

References

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