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CLONAL SELECTION OF SUGAR CANE FOR TEXAS AND LOUISIANA
FROM A COMMON GERMPLASM POOL

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ABSTRACT

The sugar cane (a complex hybrid of *Saccharum* spp.) cultivar improvement program for the irrigated Lower Rio Grande Valley of Texas, initiated in 1961, has expanded greatly over the past 20 years. Initially, only 8 to 12 cultivars, selected from those previously released from commercial production in Louisiana or Florida, were screened annually for their production potential in the Lower Rio Grande Valley. The current introduction and screening program is more comprehensive utilizing 1) all clones advanced from the first to the second line trials at the U. S. Sugarcane Laboratory at Houma, Louisiana; 2) the advanced "CP" assignments from the U. S. Sugarcane Field Station, Canal Point, Florida; and 3) the "L" assignments from the Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana. During the period 1981-83, 191 clones were assigned Texas ("TCP") selection numbers. These clones were derived from crosses made at Canal Point but were selected in Texas from the early line trials. Only 10% of the lines selected in Texas were advanced to "CP" assignment status in Louisiana, the other 90% having been discarded. The difference in selections from a common germplasm pool was influenced by the response of clones to two contrasting environments and by the difference in selection criteria of the two programs.

INTRODUCTION

Sugar has been a major commodity of the Lower Rio Grande Valley for well over 150 years. From the establishment of the first mill in 1858 (Cowley and Smith, 1969), the early industry, although successful, was plagued with logistical problems, i.e. lack of transportation and distance to markets, as well as chronic crop production problems with insects, diseases, and salinity. By 1922, the sugar industry of the Lower Rio Grande Valley ceased to function.

During the 1960's, a need arose for new crop enterprises to bolster farm incomes and to provide employment. The Texas Agricultural Experiment Station at Weslaco and the Crops Research Branch of the U. S. Department of Agriculture (USDA) initiated studies to reassess the potential for sugar cane production in this irrigated region. During the first decade of sugar cane cultivar evaluation, approximately 8-12 cultivars were introduced annually to Texas from the U. S. Sugarcane Field Station at Canal Point, Florida, the U. S. Sugarcane Field Laboratory at Houma, Louisiana, and the Louisiana Agricultural Experiment Station at Baton Rouge, Louisiana. When the W. R. Cowley Sugar House began milling operations in late 1973, seven cultivars recommended for commercial production in the Lower Rio Grande Valley were CP 44-101, CP 52-68, CP 55-30, CP 61-37, L 60-25, L 62-96, and NCo 310. All cultivars were or had been grown commercially in Louisiana.

During the mid 1970's, the number of introductions was increased to approximately 30 annually to more rapidly identify promising candidates for commercial production. A review of the selection program in 1979 noted that 16 cultivars had been released for commercial production in Texas; but that, only two cultivars, CP 66-315 and CP 68-350, had been released independently from Florida and Louisiana (Table 1). These results suggested that the diversity of the germplasm introduced to Texas was limited due to previous selection of the material for environments somewhat dissimilar from that of the Rio Grande Valley of Texas. A second disadvantage cited was that only early-maturing cultivars were being tested and that potentially a late-maturing cultivar might be needed to replace NCo 310 if sugar cane smut (caused by *Ustilago scitaminea* Syd.) became a major problem.

Based on these concerns, research was initiated to evaluate germplasm for Texas from all the selections from the first clonal trials at the U. S. Sugarcane Laboratory at Houma. By obtaining clones at this stage in the breeding program late-maturity germplasm could likely be selected. The objective of this research was to compare simultaneous selections in both Texas and Louisiana of a common pool of sugar cane germplasm to identify promising parental breeding lines for Texas.

Table 1. Sugar cane cultivars grown in Texas 1973-1984.

CP 44-101- ¹	CP 63-588 [^]	L 60-25 [^]
CP 50- 28 [^]	CP 65-357- ¹	L 62-96 [^]
CP 52- 68 [^]	CP 66-315 [^]	
CP 55- 30 [^]	CP 67-412 [^]	NCo 310 [^]
CP 56- 59 [^]	CP 58-350 [^]	
CP 57-614- ¹	CP 70-321- ¹	
CP 61- 37- ¹		

- Released in Texas only.

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- Released in Texas and Louisiana.

- Released in Texas and Florida.

MATERIALS and METHODS

Selections at Houma from the first line trials of the Houma 1976-1978 breeding series were introduced from 1979-1981 and planted at the Texas Agricultural Experiment Station quarantine farm at Rio Grande City, Texas. The clones were grown under production practices common to Texas and selections were made based on Brix, number of stalks, and vigor. These same lines were evaluated simultaneously in second line trials in Louisiana following traditional selection criteria, i.e. Brix, erectness, number of stalks, vigor, stalk density, and stalk diameter. Following selection and evaluation during a three-year period, cultivar assignments from Texas and Louisiana were compared. In addition, promising parental breeding lines were identified by reviewing the crossing combinations of the Texas assignments.

RESULTS and DISCUSSION

From the 1976-1978 Houma breeding series, 2188 clones of sugar cane were evaluated in Texas and Louisiana. The total of "CP" assignments from the USDA program at Houma and "TCP" assignments from the Texas Agricultural Experiment Station at Weslaco are presented in Table 2. More assignments were made in Texas than in Louisiana, possibly because of the less rigorous selection criteria and because with the use of combine harvesters fewer clones were eliminated from the program due to their tendency to lodge. About 10% of the lines received a "TCP" assignment which interestingly agrees with the selection rate established in 1957 (Breaux et al., 1963) when the U. S. Sugarcane Field Laboratory revised its selection program. The number of common assignments between Texas and Louisiana during the three years of the study totals 21 or approximately 10% of the "TCP" assignments, but from 1976 to 1978 the number of common assignments decreased between the two programs (Table 2). The cause of this trend and the potential for its continuation cannot be assessed at this time. However, the critical issue of the study is that because of differences in criteria and environment, germplasm for Texas needs to be introduced from the earlier stages of the Louisiana selection program.

Table 2. Number of "CP" or "TCP" assignments made from clones in the 1976-1978 Houma breeding series by the Texas and Louisiana selection programs.

Houma breeding series	Total clones	Total assignments		Common assignments	
		Texas	Louisiana	(Number)	(% of Texas Total)
	(Number)	(TCP)	(CP)		
1976	757	77	43	11	14
1977	656	99	60	8	8
1978	775	36	71	2	6
Total	2188	212	174	21	10

Common assignments of the 1976-1978 Houma breeding series between Texas and Louisiana are presented in Table 3. In these cases, the "CP" designation received priority over the "TCP" designation. A review of the parentage of the common assignments between Texas and Louisiana shows that lines CP 66-346, CP 72-355, CP 73-343, and L 65-69 are useful parents in both programs.

Table 3. Common "CP" assignments in Louisiana and Texas.

Line	Parentage
<u>1976 series</u>	
CP 81-302	CP 52-68 x CP 70-300
CP 81-309	CP 65-357 x CP 67-411
CP 81-310	CP 70-321 x L 62-96
CP 81-320	CP 65-357 x CP 66-346
CP 81-324	CP 70-300 x CP 66-346
CP 81-326	CP 71-334 x L 65-69
CP 81-331	CP 65-357 x CP 66-346
CP 81-334	CP 73-345 x CP 66-346
CP 81-336	CP 72-355 x L 65-69
CP 81-338	CP 66-346 x L 65-69
CP 81-340	CP 71-318 x CP 66-346
<u>1977 series</u>	
CP 82-513	CP 74-383 x CP 72-355
CP 82-517	CP 74-383 x CP 72-355
CP 82-522	CP 72-555 x CP 73-343
CP 82-523	CP 72-355 x CP 73-343
CP 82-529	CP 77-403 x CP 66-346
CP 82-531	CP 72-356 x CP 73-343
CP 82-538	CP 70-330 x CP 73-343
CP 82-539	CP 70-330 x CP 73-351
<u>1978 series</u>	
CP 83-631	CP 65-357 x CP 77-413
CP 83-640	CP 76-330 x CP 77-413

From a review of the parentage of all "TCP" assignments made on the 1976-1978 Houma breeding series, the most popular lines for utilization as parents in a Texas breeding program are given in Table 4.

Table 4. Most frequently observed parents of the Texas "TCP" assignments.

Parent	Total crosses (Number)	Texas assignments (%)
CP 66-346	59	28
L 65-69	37	17
CP 72-355	26	12
CP 65-357	25	12

CP 66-346 was by far the most common parent, being represented in 28% of the progeny that received a "TCP" assignment. CP 66-346 is known as a good male parent that tends to confer a large, attractive barrel in its progeny. Larger barrel size is preferred in the Texas program than in the Louisiana program and the clones which received "TCP" assignments tended to be of slightly larger barrel size than most Louisiana "CP" selections. L 65-69, CP 72-355, and CP 65-357 are excellent parents for early maturity and good juice quality. L 65-69 confers good resistance to sugar cane mosaic virus, CP 72-355 confers good stalk population, and CP 65-357 is a good general combining line with good erectness and population. Because L 65-69 and CP 65-357 are susceptible to sugar cane smut (caused by *Ustilago scitaminea* Syd.), progeny should be screened for susceptibility to the disease in later stages of the program.

The results of the study suggest that, as long as numbers are manageable, the Texas selection program has been improved by introducing germplasm from the earlier stages of the Louisiana selection program. More time will be needed to assess the ultimate success, i.e. the release of commercial cultivars, of this increased effort.

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