AN OVERVIEW OF 2005 ACTIVITIES IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

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The primary objective of the LSU AgCenter Sugarcane Variety Development Program is to contribute to the profitability of the Louisiana sugarcane industry by developing improved sugarcane varieties.

Sugarcane variety development in the LSU AgCenter is carried out by a team of scientists (Table 1). The LSU AgCenter sugarcane breeding team and the United States Department of Agriculture (USDA) sugarcane breeding team work independently yet cooperatively to produce "L" and "HoCP or Ho" varieties, respectively. The best varieties from the two programs are brought together for evaluation at the nursery, infield, and outfield test locations. Outfield testing is conducted by personnel of the LSU AgCenter, the USDA, and the American Sugar Cane League. Seed increase is carried out by the American Sugar Cane League and begins when varieties are introduced to the outfield testing stage. The cooperative efforts of sugarcane breeding are done in accordance with the provisions of the "Three-Way Agreement of 1978." After yield data for one crop cycle (plantcane, first stubble, and second stubble) are collected in the outfield testing stage, those varieties that show promise are released for commercial production.

Table 1. Members of the LSU AgCenter Sugarcane Variety Development Team in 2005.

Team Member	**Unit**	**Responsibility**
Kenneth Gravois	St. Gabriel Research Station	Program Leader
Keith Bischoff	St. Gabriel Research Station	Selection
Collins Kimbeng	Agronomy	Molecular Breeding
Gene Reagan	Entomology	Insect Resistance
Jeff Hoy	Plant Pathology & Crop Physiology	Disease Resistance
Jim Griffin	Agronomy	Herbicide Tolerance
Sonny Viator	Iberia Research Station	Variety Testing
Terry Bacon	St. Gabriel Research Station	Variety Testing
Gert Hawkins	St. Gabriel Research Station	Sucrose Laboratory
Chris LaBorde	St. Gabriel Research Station	Photoperiod and Crossing
Mike Duet	St. Gabriel Research Station	Outfield Testing
Todd Robert	St. Gabriel Research Station	Variety Testing
Joel Hebert	St. Gabriel Research Station	Farm Manager

A total of 96,787 seedlings from 194 crosses from the 2004 crossing series were planted in the field in the spring of 2005. A total of 93,490 seedlings survived transplanting. In addition, 4,215 seedlings were planted in a cross appraisal trial. The majority of the seedlings were from crosses of commercial varieties and elite experimental varieties. Selection will be carried out in 2006 when the seedlings are in the first stubble crop.

Photoperiod treatments to induce flowering began on May 31 and continued until September 10. Flowering in 2005 was below average, with 240 crosses being made. The below average performance was likely due to Hurricanes Katrina and Rita and above average August temperatures. Germination tests were conducted in December and January. Seed production for 2005 was more than adequate based on germination test results, with 173,763 true seed produced during 2005.

In the fall of 2005, individual selection was practiced on first stubble seedlings that represented the 2003 crossing series. The cross appraisal was combine harvested prior to selection. Family selection (top 60% in 2005) was utilized based on information from the cross appraisal results. Due to Hurricanes Katrina and Rita, the seedlings were severely lodged and tangled. Selection was done during the third week of September as the combine harvester peeled away each row. From this initial population, 1,548 clones were selected and planted to establish the first-line trials.

Established procedures were used to advance superior clones of the 2002 crossing series from first-line trials to second-line trials (601 clones) and of the 2001 crossing series from second-line trials to increase trials (287 clones). Preliminary ratings for cane yield and plant type in August were done prior to the Hurricanes. Clones with acceptable ratings were further evaluated for lodging, broken tops, borer damage, diseases, pith/tube, and Brix/sugar per ton.

The best 35 experimental varieties from the 2000 crossing series were assigned permanent variety designations in the fall of 2005. Newly assigned varieties were entered in replicated nursery trials at three locations (St. Gabriel Research Station, USDA-ARS Ardoyne Farm, and Iberia Research Station). "L", "HoCP, or Ho" varieties of the 2005 assignment series were exchanged in the fall of 2005 to plant cooperative infield and off-station nursery tests the following year.

Experimental varieties were replanted in infield and off-station nursery tests (14 varieties of the 2004 series), introduced to the outfield tests (three varieties of the 2003 series), and planted in outfield tests (two experimental varieties of the 1999 assignment series; two experimental varieties of the 2001 assignment series). Breeding personnel assisted Dr. Jeff Hoy and Dr. Gene Reagan in entering experimental varieties in the sugarcane smut and sugarcane borer resistance trials, respectively.

The decision regarding the further testing and seed increase of candidate varieties was determined at the Variety Advancement Committee meeting. The 2005 meeting was held on August 10, 2005, at the American Sugar Cane League office in Thibodaux, Louisiana.

The distribution of "L" and "LCP" experimental clones through stages of testing in 2005 is presented in Table 2. The practice of planting nursery and infield trials at multiple locations allows efficient identification of superior varieties in each assignment series.

Progress in the LSU AgCenter Sugarcane Variety Development Program would not be possible without the financial support of state funds from the LSU AgCenter and the Louisiana sugar industry through the American Sugar Cane League.

Table 2. Number of "L" varieties by assignment series at the most advanced stage of testing in 2005.

Series	**Stage of Testing**	**Number of experimental varieties**
L 1999	Outfield – Replanted and harvested as plantcane, first stubble, and second stubble Off-station nurseries – harvested as fourth stubble	2
L 2000	Outfield – Replanted and harvested as plantcane and first stubble Off-station nurseries – harvested as third stubble	0
L 2001	Outfield – Replanted and harvested as plantcane On-station nurseries – harvested as third stubble Off-station nurseries – harvested as second stubble	2
L 2002	Outfield – Planted On-station nurseries – first stubble harvested Off-station nurseries plantcane harvested	0
L 2003	Outfield - Introduced On-station nurseries – harvested as first stubble Off-station nurseries – harvested as plantcane	3
L 2004	On-station nurseries – harvested as plantcane Off-station nurseries - planted	14
L 2005	Assignment – On-station nurseries planted	35

2005 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

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The LSU AgCenter's Sugarcane Variety Development Program encompasses many stages to develop new commercial sugarcane varieties for the Louisiana sugarcane industry. The duration of the program spans a thirteen year period from crossing to variety release. The first stage of the program is the photoperiod induction and crossing stage. For subsequent stages to be successful, success must first be achieved at both photoperiod induction and crossing. Photoperiod induction is essential for the transition or phase change from the vegetative to the reproductive stage of the sugarcane life cycle. In addition to photoperiod induction, proper hybridization techniques are the other key for the production of viable seed. Viable "true" seed is seed that has a sufficient germination count. The objective of crossing is to produce viable "true" seed from the most desirable crosses. This seed will then be advanced to the seedling stage of the Sugarcane Variety Development Program.

Cuttings of potential parent varieties used for the 2005 crossing season were planted in the fall of 2004. After establishing the plants from the cuttings, the plants were fertilized biweekly with a 200 ppm solution of Peter's 20-20-20. In late January 2005, the cuttings were then transferred to can culture. In early April, the cans were moved from the greenhouse to the photoperiod rail carts. Soluble fertilizer applications were continued on a biweekly basis. Fertilization was discontinued in early- to mid-May to condition the plants for floral induction. Three additional applications of dry granular fertilizer (8-24-24, one Tbs/can) were applied to the cans during July, August, and September. A reduced nitrogen ratio makes a higher C:N ratio, which is more desirable for the ease of flowering.

Natural lighting and six light-tight chambers were used for photoperiod treatments. To prevent overwhelming the crossing facilities, two flowering peaks were planned for September 23 and October 8 although these two flowering peaks can be advanced or delayed because of certain climatic factors. Records of varietal flowering, past photoperiod response, and pollen production were used to determine the most appropriate photoperiod treatment for each variety. The first photoperiod treatments began on May 30. All photoperiod treatments (time from artificial sunrise to natural sunset) were initiated with a minimum of 34 consecutive days of 12½ hours of constant day length. After the initial constant photoperiod days, day length was shortened by one minute per day. Treatments differed by the number of days with constant day length and the date on which the decline of photoperiod was initiated. All photoperiod treatments were discontinued on September 10, 2005, when natural day length was 12½ hours and decreasing.

Photoperiod treatments require pulling the carts out of the photoperiod bays at their appropriate time each morning to receive full sunlight. On certain days when the weather was severe, the carts were pushed back into the photoperiod chambers to protect the parental varieties from wind damage. While in the photoperiod chambers, artificial lighting was used. In addition to artificial lighting, the doors were partially opened to allow natural light to enter the chambers.

Flowering percentage of total stalks was very poor on the photoperiod carts in 2005 (Tables 1-2). Total flowering percentage for the six bays was 24%, which was comprised from 1,602 stalks. To make matters worse, mechanical failure to Bay 4 of the photoperiod chambers resulted in a lack of darkness required to transition the sugarcane plants into the reproductive stage as can be seen in Table 1. Although the flowering percentage was low in 2005, successful seed production is comprised of a multitude of factors. An adequate germination rate provided the Variety Development Program with sufficient seed production. In 2005 as in previous years, seedlings were produced from hybridization techniques that used sugarcane yield components, borer resistance, and disease resistance as some of the criteria to determine which breeding stocks were most compatible.

The flowering season in 2005 began during the third week of September. The normal time frame for first flowering can be as early as the last week of August or as late as the second week of September. There can be a slight deviation on when the first flower appears due to temperature during the photoperiod induction phase, varietal characteristics, and the photoperiod treatments. Crossing began on September 13 and ended on November 16, 2005. The end date was a true end date; there were no more flowers to be used for hybridization. This was an unusual year because of the low number of flowers that were produced. A total of 380 tassels of 111 varieties were used to produce 241 crosses producing 174,070 viable seed with 140,545 seed produced from biparental crosses (Table 3). The germination rate is one of two components that measure the success of this stage in the crossing program. The other component is photoperiod induction. Close attention was made once again in maintaining high relative humidity within the crossing greenhouse; high relative humidity has been proven in past studies to increase seed set. High relative humidity is maintained with the use of a misting system that has been installed inside of the crossing greenhouse. The majority of crosses made were done with the best possible combinations available due to the lack of flowering. High temperatures throughout the summer months can result in poor production of sugarcane flowering as is being speculated in 2005. Along with the hot summer months, high temperatures in September can also result in poor seed set. To manage high temperatures, the crossing greenhouse is white-washed at the beginning of the crossing season (late August). Along with the shading effect of the white-washed greenhouse, the misting system also has a cooling effect on the greenhouse environment.

Table 1. Summary of the 2005 photoperiod treatments for the LSU AgCenter's sugarcane variety development program.

Bay	Cart	Treatment Start Date	Days of Constant Photoperiod	Date Photoperiod Decline Started	Days of Declining Photoperiod		Mean Flowering Date	Total Stalks	Percent Flowered
					Peak 1	Peak 2			
1	A	16-Jun	44	30-Jul	72	87	288±15	100	39
1	B	16-Jun	44	30-Jul	72	87	289±14	90	43
1	C	16-Jun	44	30-Jul	72	87	285±15	85	24
2	A	16-Jun	34	20-Jul	72	87	291±14	101	27
2	B	16-Jun	34	20-Jul	72	87	294±15	94	13
2	C	16-Jun	34	20-Jul	72	87	293±19	85	19
3	A	30-May	37	6-Jul	87	102	275±21	77	29
3	B	30-May	37	6-Jul	87	102	267±10	85	28
3	C	30-May	37	6-Jul	87	102	284±21	76	18
4	A	30-May	37	6-Jul	87	102	281±22	90	18
4	B	30-May	37	6-Jul	87	102	290±12	89	9
4	C	30-May	37	6-Jul	87	102	304	86	1
5	A	4-Jun	36	10-Jul	82	97	274±15	98	38
5	B	4-Jun	36	10-Jul	82	97	284±17	97	13
5	C	4-Jun	36	10-Jul	82	97	275±9	88	15
6	A	30-May	41	10-Jul	82	97	281±18	84	35
6	B	30-May	41	10-Jul	82	97	277±14	95	24
6	C	30-May	41	10-Jul	82	97	285±18	82	33

Table 2. Summary of can, variety, and flower information on bays 1-6 subjected to photoperiod treatments.

Varieties used in crossing	Cans with stalks	Cans with tassels	Total stalks	Total tassels	Mean stalks per can	Mean tassels per can†	Mean pollen rating‡	Mean days to flower§
---Number---								
111	324	127	1602	380	4.95±1.12	3.02±1.55	4.71±1.72	85.94±17.28

† Based upon cans with tassels.
‡ Rating of 1 to 4 being male and 5 to 9 being female.
§ Days from decline date to flowering.

Table 3. Summary of 2005 crossing and seed production.

Type of Cross	Crosses	Sum of Seed Production	Mean Seed Production Per Cross	Mean Seed Production Per Female Tassel	Mean Germination Per Gram Seed
---Number---					
Biparental	196	140,545	721±1001	680±942	104±118
Polycross	16	12,419	828±962	808±971	144±164
Self	29	21,106	728±1294	728±1293	99±140
Total	241	174,070	728±1034	694±988	106±124

Table 4. Summary of can, variety, and flowering information on bays 7 and 8 under natural photoperiod.

Total Cans	Total Varieties		Variety Flowering Stage		Mean stalks per can	Mean stalks in a reproductive phase per can
	Known flowering response	Unknown flowering response	Number in Reproductive Phase†	Number in Nonreproductive Phase‡		
---Number---						
108	5	88	67	38	5.34±1.0	4.73±1.1

† Based upon cans that have been rated as either initiated or in boot stage.
‡ Denotes the number of varieties that had some stalks that did not flower; varieties will overlap in some cases.

Table 5. Varietal flowering summary in 2005 in the photoperiod bays.

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
CP65-357	39±1	.	.	.	13	.	.
CP73-351	39±1	.	.	.	10	.	.
CP79-348	37	.	.	.	11	.	.
CP83-644	41	287	112±16	6±2	28	2	7
CP89-2143	36±1	.	.	.	8	.	.
HO01-564	41	292	107±6	5	12	2	17
HO02-653	44	307	96	3	12	1	8
HO89-889	39±1	.	.	.	8	.	.
HO91-572	41±4	273	90±4	3	10	2	20
HO95-988	39±1	273	97±4	7	74	7	9
HOCP00-927	36	.	.	.	11	.	.
HOCP00-930	41±2	294	97±6	6±1	10	6	60
HOCP00-950	37	269	82	7	19	1	5
HOCP01-517	37±1	.	.	.	16	.	.
HOCP01-523	36	.	.	.	15	.	.
HOCP01-551	41	290	99	3	9	1	11
HOCP01-561	37	301	114	5	15	1	7
HOCP02-610	38±2	262	93±10	2±1	10	5	50
HOCP02-618	40±2	283	86±4	4±1	13	7	54
HOCP02-620	44±0	280	74±5	6±1	5	2	40
HOCP02-623	36±0	264	82±4	4±1	9	4	44
HOCP02-625	34	320	119	4	11	1	9
HOCP02-632	40±1	.	.	.	11	.	.
HOCP02-640	35	.	.	.	11	.	.
HOCP02-652	43±1	259	71±3	5±1	10	8	80
HOCP03-703	34	.	.	.	5	.	.
HOCP03-708	34	.	.	.	5	.	.
HOCP03-718	34	.	.	.	6	.	.
HOCP03-757	41	276	89±3	3	6	3	50
HOCP85-845	39±1	.	.	.	44	.	.
HOCP88-739	38±1	.	.	.	12	.	.
HOCP89-831	37	.	.	.	3	.	.
HOCP89-846	38±1	256	83±5	5	23	12	52
HOCP91-552	42±1	256	64±2	3	17	14	82
HOCP91-555	39±1	.	.	.	15	.	.
HOCP92-618	37	320	133	3	21	1	5
HOCP92-624	39±1	256	76±2	7	26	20	77
HOCP92-648	44	283	88±8	7	22	3	14
HOCP93-746	43±1	.	.	.	7	.	.
HOCP95-951	37	262	83±8	6±1	6	2	33
HOCP96-509	36	.	.	.	17	.	.
HOCP96-540	37±1	264	90±3	4	65	34	52
HOCP96-561	36	266	97±7	4	10	8	80
HOCP97-606	36	.	.	.	16	.	.
HOCP97-609	34	307	106	3	12	1	8
HOCP98-741	40±1	256	70±4	4	7	.	.
HOCP98-781	39±1	.	.	.	6	4	67

Table 5. Continued.

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
HOCP99-815	41	312	121	7	6	1	17
HOCP99-825	36	.	.	.	4	.	.
HOCP99-866	44	.	.	.	5	.	.
L00-266	41	.	.	.	12	.	.
L01-281	35	.	.	.	11	.	.
L01-283	38	.	.	.	21	.	.
L01-299	41	264	91±5	4	34	10	29
L02-316	39±1	271	92±4	5	10	6	60
L02-324	39±1	.	.	.	8	.	.
L02-325	38±1	.	.	.	11	.	.
L02-342	39±1	.	.	.	12	.	.
L03-364	41	294	103	4	4	1	25
L03-365	34	.	.	.	5	.	.
L03-371	34	.	.	.	6	.	.
L03-374	44	312	103±2	4±1	10	3	30
L03-378	39±1	.	.	.	14	.	.
L03-387	41	278	92±3	4±1	9	3	33
L03-392	35	269	83±7	7	12	5	42
L03-396	44	276	73±6	6	6	6	100
L04-405	34	.	.	.	4	.	.
L04-407	37	.	.	.	5	.	.
L04-408	36	.	.	.	5	.	.
L04-410	41	271	86±3	3	6	4	67
L04-418	36	.	.	.	6	.	.
L04-420	44	.	.	.	6	.	.
L04-423	44	.	.	.	3	.	.
L04-425	34	283	94±6	3±1	6	5	83
L04-430	36	.	.	.	6	.	.
L04-434	44	313	102	7	2	1	50
L04-437	34	.	.	.	4	.	.
L89-113	36	.	.	.	11	.	.
L91-255	39	.	.	.	17	.	.
L91-281	44	283	87±7	6	10	5	50
L92-312	41	287	96	6	7	1	14
L92-321	36	.	.	.	5	.	.
L94-424	39	.	.	.	9	.	.
L94-426	35±1	280	97±9	4±1	22	5	23
L94-428	37	.	.	.	17	.	.
L94-432	39	.	.	.	10	.	.
L94-433	41	271	97±7	4±1	13	8	62
L97-128	39±1	256	79±2	7	77	52	68
L97-137	40±1	.	.	.	17	.	.
L98-197	40±2	.	.	.	9	.	.
L98-207	38±1	.	.	.	34	.	.
L98-209	36±1	273	96±9	7	28	3	11
L99-226	39±1	264	85±3	3	67	32	48
L99-233	38±1	256	70±1	3	32	28	88

Table 5. Continued.

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
LCP81-010	38±1	262	93±6	5	26	15	58
LCP82-089	41	304	119±6	4±1	16	2	13
LCP85-384	36±1	280	111±5	4	89	7	8
LCP86-454	38	.	.	.	22	.	.
N27	37	.	.	.	7	.	.
TUCCP77-042	36±1	287	104±3	6±1	16	7	44
US01-039	37	.	.	.	6	.	.
US01-040	37	287	102±2	3	5	2	40
US02-095	44	.	.	.	6	.	.
US02-099	41	315	124	7	3	1	33
US79-010	39±2	262	88±6	6±1	12	7	58
US80-004	36	.	.	.	9	.	.
US90-018	36	.	.	.	6	.	.
US93-015	35	.	.	.	11	.	.
US96-002	34	.	.	.	6	.	.
US99-002	44	307	99±2	7	7	4	57
US99-004	44	278	77±4	4±1	5	4	80

Table 6. Crosses and seed made in 2005 sorted by cross number.

Cross	Female	Male	Seed
XL05-001	HOCP89-846	L99-233	99
XL05-002	HOCP92-624	L99-233	830
XL05-003	L97-128	L99-233	912
XL05-004	HOCP91-552	L99-233	1486
XL05-005	L99-233	L99-233	613
XL05-006	HOCP92-624	HOCP98-781	121
XL05-007	HOCP92-624	HOCP91-552	2521
XL05-008	L97-128	HOCP91-552	452
XL05-009	HOCP91-552	HOCP91-552	3783
XL05-010	HOCP92-624	L99-233	2873
XL05-011	L97-128	L99-233	1306
XL05-012	HOCP02-652	L99-233	79
XL05-013	HOCP92-624	HOCP02-610	949
XL05-014	L97-128	HOCP02-610	106
XL05-015	HOCP02-610	HOCP02-610	1856
XL05-016	HOCP92-624	HOCP91-552	998
XL05-017	L97-128	HOCP91-552	88
XL05-018	HOCP89-846	HOCP91-552	394
XL05-019	HOCP95-951	L99-233	817
XL05-020	L97-128	L99-233	115
XL05-021	LCP81-010	L99-233	2035
XL05-022	L97-128	US79-010	20
XL05-023	US79-010	US79-010	18
XL05-024	HOCP92-624	HOCP02-623	226
XL05-025	L97-128	HOCP02-623	122
XL05-026	HOCP02-623	HOCP02-623	35
XL05-027	L01-299	HOCP89-846	56
XL05-028	LCP81-010	HOCP89-846	379
XL05-029	HOCP89-846	HOCP89-846	0
XL05-030	L97-128	HOCP96-540	232
XL05-031	HOCP96-540	HOCP96-540	5607
XL05-032	L97-128	L99-226	382
XL05-033	L99-226	L99-226	197
XL05-034	L97-128	L99-233	677
XL05-035	L97-128	HOCP02-652	46
XL05-036	HOCP96-561	HOCP02-652	479
XL05-037	HOCP02-652	HOCP02-652	0
XL05-038	L97-128	L99-226	550
XL05-039	HOCP91-552	05P1	1318
XL05-040	L99-226	05P1	412
XL05-041	L99-233	05P1	867
XL05-042	HOCP00-950	L99-233	185
XL05-043	HOCP92-624	L99-233	4993
XL05-044	L01-299	L99-233	219
XL05-045	LCP81-010	L99-233	2979
XL05-046	HOCP92-624	HOCP91-552	767
XL05-047	L97-128	HOCP91-552	540
XL05-048	HOCP92-624	HOCP96-540	3411
XL05-049	L03-392	HOCP96-540	0
XL05-050	HOCP91-552	05P2	3756
XL05-052	L99-226	05P2	582
XL05-053	LCP81-010	L04-410	2600
XL05-054	L97-128	L04-410	145
XL05-055	L01-299	L04-410	225
XL05-056	L04-410	L04-410	497
XL05-057	L02-316	HOCP96-540	1059
XL05-058	L94-433	L99-233	446
XL05-059	L97-128	HOCP02-652	75
XL05-060	HOCP91-552	05P3	1718
XL05-061	L01-299	05P3	236
XL05-062	L94-433	05P3	1396
XL05-063	L99-226	05P3	39
XL05-064	L99-233	05P3	857
XL05-065	LCP81-010	HOCP91-552	2554
XL05-066	HO95-988	L94-433	12
XL05-067	L97-128	L94-433	20
XL05-068	L94-433	L94-433	44
XL05-069	HO95-988	L04-410	79
XL05-070	LCP81-010	L04-410	17
XL05-071	US79-010	L04-410	195
XL05-072	HOCP02-623	HOCP91-552	182
XL05-073	L01-299	HOCP91-552	284
XL05-074	L98-209	HOCP91-552	984
XL05-075	HOCP02-623	HOCP98-781	545
XL05-076	HOCP96-561	HOCP98-781	589
XL05-077	L02-316	HOCP98-781	448
XL05-078	HOCP98-781	HOCP98-781	19
XL05-079	HOCP02-652	L99-226	0
XL05-080	HOCP96-561	L99-226	321
XL05-081	L97-128	L99-226	1527
XL05-082	L03-392	HOCP96-540	0
XL05-083	L97-128	HOCP96-540	821
XL05-084	HO91-572	HOCP96-540	1260
XL05-085	HOCP89-846	HOCP03-757	334
XL05-086	HOCP92-624	HOCP03-757	269
XL05-087	LCP81-010	HOCP03-757	1043
XL05-088	HOCP03-757	HOCP03-757	1248
XL05-089	HOCP92-624	L99-226	529
XL05-090	HOCP02-652	L99-226	157
XL05-091	HOCP96-540	L99-226	4686
XL05-092	L97-128	L99-226	818
XL05-093	HOCP92-624	HOCP91-552	494
XL05-094	L03-396	HOCP91-552	49
XL05-095	L98-209	HOCP91-552	247
XL05-096	HOCP92-624	L99-233	2818
XL05-097	HOCP02-652	L99-233	198
XL05-098	HOCP96-540	L99-233	5412
XL05-099	L03-396	L99-233	420
XL05-100	L97-128	L99-233	1286
XL05-101	HOCP92-624	HOCP89-846	1603
XL05-102	HOCP96-540	HOCP89-846	2229
XL05-103	L97-128	HOCP89-846	367

Table 6. Continued

Cross	Female	Male	Seed	Cross	Female	Male	Seed
XL05-104	HOCP95-951	L99-233	978	XL05-154	L97-128	US01-040	687
XL05-105	L97-128	L99-233	1880	XL05-155	L03-387	US01-040	313
XL05-106	HOCP96-561	L99-233	965	XL05-156	US01-040	US01-040	381
XL05-107	L02-316	L04-410	736	XL05-157	HOCP02-620	L94-426	310
XL05-108	L97-128	L04-410	1159	XL05-158	L97-128	L94-426	37
XL05-109	L03-392	L99-226	0	XL05-159	L97-128	L99-233	26
XL05-110	US79-010	L99-226	1254	XL05-160	HOCP02-618	L99-233	697
XL05-111	US99-004	L99-226	6055	XL05-161	L02-316	L99-226	264
XL05-112	L03-387	L99-226	1352	XL05-162	US01-040	L99-226	1156
XL05-113	L03-396	HOCP02-652	24	XL05-163	L97-128	HOCP02-618	348
XL05-114	L97-128	HOCP02-652	377	XL05-164	US79-010	HOCP02-618	32
XL05-115	L97-128	HOCP96-540	2751	XL05-165	HOCP02-618	HOCP02-618	39
XL05-116	HO95-988	HOCP89-846	0	XL05-166	L97-128	LCP81-010	27
XL05-117	L01-299	HOCP89-846	366	XL05-167	HO01-564	LCP81-010	38
XL05-118	LCP81-010	HOCP89-846	2341	XL05-168	LCP81-010	LCP81-010	0
XL05-119	L99-226	HOCP89-846	90	XL05-169	HO95-988	L01-299	24
XL05-120	HO95-988	HOCP03-757	0	XL05-170	HOCP00-930	L01-299	31
XL05-121	HOCP96-561	HOCP03-757	438	XL05-171	TUCCP77-042	L01-299	51
XL05-122	LCP85-384	HOCP03-757	380	XL05-172	L01-299	L01-299	0
XL05-123	HO95-988	HOCP96-540	1385	XL05-173	HOCP00-930	L03-364	21
XL05-124	L99-226	HOCP96-540	1011	XL05-174	L97-128	L03-364	0
XL05-125	HOCP02-620	L94-426	303	XL05-175	L03-364	L03-364	10
XL05-126	HOCP89-846	L94-426	511	XL05-176	HOCP02-652	HOCP02-610	681
XL05-127	L99-226	L94-426	1104	XL05-177	US99-004	HOCP02-610	600
XL05-128	L94-426	L94-426	22	XL05-178	HOCP92-624	L02-316	405
XL05-129	HO95-988	HOCP02-623	390	XL05-179	L97-128	L02-316	302
XL05-130	HOCP92-624	HOCP02-623	1405	XL05-180	HOCP92-648	HOCP89-846	53
XL05-131	HOCP92-648	HOCP02-623	385	XL05-181	LCP81-010	HOCP89-846	33
XL05-132	L91-281	L04-425	60	XL05-182	L91-281	HOCP89-846	0
XL05-133	L94-426	L04-425	382	XL05-183	L03-392	L01-299	39
XL05-134	HOCP02-618	L04-425	655	XL05-184	TUCCP77-042	L01-299	86
XL05-135	L04-425	L04-425	652	XL05-185	TUCCP77-042	L99-226	58
XL05-136	L91-281	HOCP96-540	1019	XL05-186	LCP81-010	HOCP96-561	65
XL05-137	L01-299	HOCP96-540	492	XL05-187	HO01-564	HOCP96-561	28
XL05-138	L03-396	HOCP96-540	379	XL05-188	L94-433	HOCP96-561	18
XL05-139	L94-433	HOCP96-540	693	XL05-189	L97-128	HOCP96-561	9
XL05-140	L97-128	HOCP96-540	519	XL05-190	HOCP96-561	HOCP96-561	5
XL05-141	HOCP03-757	L04-425	1618	XL05-191	LCP85-384	LCP82-089	1811
XL05-142	US99-004	L04-425	4662	XL05-192	L97-128	LCP82-089	293
XL05-143	HOCP02-618	L99-226	1352	XL05-193	LCP82-089	LCP82-089	1508
XL05-144	L03-387	L99-226	1317	XL05-194	HOCP00-930	L99-226	692
XL05-145	CP83-644	L02-316	2399	XL05-195	L99-226	L99-226	263
XL05-146	HOCP89-846	L02-316	516	XL05-196	HO91-572	HOCP96-540	975
XL05-147	TUCCP77-042	L02-316	84	XL05-197	HO95-988	HOCP02-618	0
XL05-148	L02-316	L02-316	261	XL05-198	TUCCP77-042	HOCP02-618	56
XL05-149	TUCCP77-042	L99-226	129	XL05-199	US99-002	HOCP02-618	18
XL05-150	L97-128	L99-226	745	XL05-200	LCP85-384	L99-226	796
XL05-151	L92-312	L99-226	698	XL05-201	TUCCP77-042	L99-226	108
XL05-152	L97-128	HOCP96-540	173	XL05-202	L94-433	L99-226	1665
XL05-153	US79-010	HOCP96-540	774	XL05-203	L99-226	L99-226	565

Table 6. Continued

Cross	Female	Male	Seed
XL05-204	HO02-653	05P4	45
XL05-205	HOCP00-930	05P4	525
XL05-206	L04-425	05P4	275
XL05-207	US99-002	05P4	88
XL05-208	LCP85-384	HOCP02-610	909
XL05-209	HOCP92-648	LCP85-384	759
XL05-210	LCP85-384	LCP85-384	9
XL05-211	L91-281	L01-299	439
XL05-212	L03-396	L01-299	0
XL05-213	L97-128	L01-299	0
XL05-214	LCP81-010	L03-374	0
XL05-215	HOCP99-815	L03-374	3
XL05-216	L97-128	L03-374	737
XL05-217	L03-374	L03-374	0
XL05-218	US79-010	HOCP96-540	702
XL05-219	US99-002	HOCP96-540	235
XL05-220	HOCP96-540	HOCP96-540	2594
XL05-221	HO95-988	L03-374	0
XL05-222	L91-281	L03-374	226
XL05-223	LCP81-010	L03-374	498
XL05-224	L04-425	HOCP02-610	1006
XL05-225	L04-434	HOCP02-610	264
XL05-226	HOCP00-930	HOCP02-610	1475
XL05-227	HOCP02-610	HOCP02-610	880
XL05-228	HOCP00-930	LCP82-089	851
XL05-229	US99-002	LCP82-089	0
XL05-230	L98-209	LCP82-089	896
XL05-231	US02-099	HOCP96-561	207
XL05-232	HOCP89-846	L99-226	46
XL05-233	CP83-644	L99-226	30
XL05-234	HOCP92-624	LCP85-384	265
XL05-235	L03-374	LCP85-384	55
XL05-236	L94-426	LCP85-384	0
XL05-237	LCP81-010	LCP85-384	220
XL05-238	US79-010	LCP85-384	42
XL05-239	HOCP02-625	HOCP92-618	575
XL05-240	L94-433	HOCP92-618	1312
XL05-241	TUCCP77-042	05P5	305

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2005

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SUMMARY

In the selection phase of the LSU AgCenter's Sugarcane Variety Development Program, superior clones are advanced through the single-stool, first-line, second-line, and increase stages of the breeding program. In the first stubble crop of the second-line trials, those clones with acceptable breeding or commercial value are assigned a permanent variety number. A total of 96,787 seedlings from 194 crosses were planted in the field in the spring of 2005. The majority of these seedlings are progeny of crosses among commercial and elite experimental varieties. Due to Hurricanes Katrina and Rita in the fall of 2005, single stool selection was delayed until late September. Family selection was practiced on fewer stubble seedlings than in previous years because of the extremely lodged conditions and to expedite planting of first-line trials. This selection resulted in the planting of only 1,548 first-line trial plots. At the same time, superior clones were also selected and advanced through subsequent stages (601 to second-line trials, 287 to the increase stage). Assignments of permanent "L05" numbers were given to the 35 best clones of the 2000 crossing series.

PROCEDURES

In the selection stage of the LSU AgCenter's Sugarcane Variety Development Program, single stools are established from seed generated in the crossing stage. After evaluating and selecting the families for cane yield potential in the cross appraisal studies, clones with desirable phenotypes are selected and advanced through single-stool, first-line, second-line, and increase stages. In the first-stubble crop of the second-line trials, clones judged to have breeding or commercial value are assigned a permanent variety number and advanced to the nursery stage of testing.

RESULTS AND DISCUSSION

A total of 96,787 seedlings from 194 crosses of the 2004 crossing series were planted to the field in the spring of 2005 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2005, individual selection was practiced on a portion of the 70,910 stubble single-stools of the 2003 crossing series that survived the winter. The 1,548 clones selected and advanced from the single-stools were planted in 8-foot first-line trial plots. Dates of planting and harvesting of all plots in the selection phase of the program can be found in Table 2.

Nearly 2,800 first-line trial plots of the 2002 crossing series were rated for cane yield and pest resistance in August of 2005 (Table 3). Due to the hurricanes, Brix and other factors were further evaluated at planting. This second stage of advancement was concluded with the planting of 601 clones in single row 16-foot second line trials plots.

Stalk counts were made on the 773 plantcane second line trial plots of the 2001 crossing series in August 2005. Based on these counts and 2004 sucrose lab data collected, 287 clones were planted in two single row 16-foot plots representing the increase stage of the program (Table 4). One replication was planted in light soil and the other in heavy soil. These clones will be candidates for assignment in 2006. Of the 313 candidates from the first-stubble crop of the second line trial plots, the best 35 clones from the 2000 crossing series were assigned permanent "L05" numbers (Table 5). These newly assigned "L05" varieties were then planted in replicated nursery trials at three on station locations (St. Gabriel Research Station, Iberia Research Station, USDA-ARS Ardoyne Farm).

The advancement summary of clones from crosses made in 2000 through 2004 is shown in Table 6. Crosses are sorted by female parent in ascending order, with the percentile (Pcnt'l) ranking given for each cross in each stage of the program. The results of the 2003 crossing series cross appraisal in 2005 are presented in Table 7.

Table 1. Summary of selections, advancements and assignments made during 2005 by the Louisiana, "L," Sugarcane Variety Development Program's personnel.

	Crosses				Advanced to			
Crossing series	Progeny test	Selection program	Plants surviving transplanting	Over-wintered plants	1st line	2nd line	Increase	On-station Nurseries (L05 Assignments)
			------------------------------ number of clones	----------------------------				
X00	76	211	98371	75973	4158	699	313	35
X01	218	247	93019	46325	2902	773	287	
X02	200	192	72061	50951	2742	601		
X03	134	211	92598	70910	1548			
X04	67	194	93490					

Table 2. Dates of seedling and line trials planted or harvested in 2005.

Crossing Series	Test	Crop	Date Planted	Date Harvested
X2004	Seedlings	Planted	4/8 – 4/18/05	
X2004	Progeny Test	Planted	4/18/05	
X2003	Seedlings	First Stubble	4/14 -4/19/04	
X2003	Progeny Test	First Stubble	4/20/04	9/28/05
X2003	First Line Trials	Planted	9/30/05	
X2002	First Line Trials	Plantcane	9/10/04	
X2001	First Line Trials	First Stubble	9/11 - 9/17/03	11/14–11/15/05
X2002	Second Line Trials	Planted	10/10/05	
X2001	Second Line Trials	Plantcane	9/22/04	10/18/05
X2000	Second Line Trials	First Stubble	10/1/03	10/12/05
X2001	Light Soil Increase	Planted	10/19/05	
X2000	Light Soil Increase	Plantcane	9/28/04	12/5/05
X1999	Light Soil Increase	First Stubble	10/2/03	11/15/05
X1998	Light Soil Increase	Second Stubble	10/17/02	10/12/05
X2001	Heavy Soil Increase	Planted	10/19/05	
X2000	Heavy Soil Increase	Plantcane	9/28/04	11/7/05
X1999	Heavy Soil Increase	First Stubble	10/2/03	11/7/05

Table 3. Numbers of experimental clones dropped for identified faults in the 2002 crossing series first-line trials.

Trait	Fault	
	Frequency	Percent
	--------- 2742 clones enter first round of evaluation ----------	
Initial Selection (Rating)	1257	45.8
	-------- 1485 clones enter second round of evaluation --------	
Brix / All Others	884	32.2
Clones advanced to second line trial stage	601	21.9

Table 4. Number of experimental clones dropped for identified faults in the 2001 crossing series of the plantcane second line trial prior to advancement to the increase stage.

Trait	Fault	
	Frequency	Percent
	------- 773 clones enter first round of evaluation --------	
Stalk Counts / All Others	486	62.9
Clones advanced to Increase stage	287	37.1

Table 5. Mean yield data of the 2005 "L" assignments made in first-stubble second line trial plots.

Variety	Female	Male	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
			Lbs/A	Tons/A	Lbs/Ton	Lbs	Stalks/A
LCP85-384	CP77-310	CP77-407	8438	37.4	227	1.40	53089
HOCP91-555	CP83-644	LCP82-094	9256	36.4	255	1.47	49761
HOCP96-540	LCP86-454	LCP85-384	10375	44.2	235	1.87	50215
L2005-439	LCP81-010	LCP85-384	9019	38.7	233	1.41	54904
L2005-440	L97-128	L91-281	9584	38.3	250	1.42	53996
L2005-441	HOCP92-624	LCP85-384	9806	40.4	243	1.47	54904
L2005-442	LCP87-492	HOCP97-609	10716	39.1	274	1.69	46283
L2005-443	LCP87-492	L99-233	9733	38.0	256	1.47	51728
L2005-444	HOCP96-561	L99-229	10195	37.8	270	1.46	51728
L2005-445	L98-198	HOCP97-621	10310	40.0	258	1.71	46736
L2005-446	L99-229	LCP85-384	9524	39.4	242	1.77	44468
L2005-447	HOCP96-561	L99-233	14212	56.2	253	1.89	59441
L2005-448	LCP87-492	L99-233	9668	42.0	230	1.93	43560
L2005-449	LCP86-454	LCP85-384	9943	40.4	246	1.31	61710
L2005-450	US79-010	LCP85-384	11020	50.1	220	1.66	60349
L2005-451	LCP81-010	LCP85-384	10262	38.7	265	1.69	45829
L2005-452	L99-226	L99-233	8535	37.9	225	1.76	43106
L2005-453	LCP85-384	HOCP96-540	10481	46.2	227	1.59	58080
L2005-455	HOCP92-624	L98-197	8678	34.7	250	1.50	46283
L2005-456	L99-233	LCP85-384	8470	36.4	233	1.47	49459
L2005-457	L97-128	LCP87-492	10388	42.9	242	1.59	53996
L2005-458	HOCP92-624	HOCP97-609	9398	41.0	229	1.36	60349
L2005-459	L89-113	LCP85-384	9384	37.1	253	1.34	55358
L2005-460	HOCP92-624	L91-255	13660	49.3	277	1.52	64886
L2005-461	L99-233	LCP85-384	10029	43.6	230	1.55	56265
L2005-462	HOCP96-540	HOCP91-552	10595	40.0	265	1.78	44921
L2005-463	LCP81-010	L92-312	8621	31.3	275	1.47	42653
L2005-464	CP79-318	L99-233	9954	38.7	257	1.76	44014
L2005-465	HO95-988	L98-207	9813	42.5	231	1.24	68516
L2005-466	CP83-644	HOCP97-609	9372	35.9	261	1.33	53996
L2005-467	HO95-988	L94-433	8466	32.9	257	1.32	49913
L2005-468	L93-399	HOCP91-552	9112	33.6	271	1.30	51728
L2005-469	HO95-988	L98-209	10404	41.5	251	1.45	57173
L2005-470	L94-428	L91-281	10835	43.5	249	1.40	62164
L2005-471	L94-428	L91-281	9627	34.8	277	1.38	50366
L2005-472	HOCP92-624	HOCP96-522	8790	35.2	250	1.26	55811
L2005-473	HOCP95-951	LCP85-384	12711	55.3	230	2.10	52635

Table 6. Advancement summary of crosses in the 2000 through 2003 crossing series.

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
2000 Crossing Series										
CP65-357	L91-255	429	30	79	2	54	0	21	0	42
CP65-357	LCP85-384	984	40	53	6	58	4	65	0	42
CP77-405	L96-040	249	8	42	1	38	0	21	0	42
CP77-405	L98-197	242	16	77	3	79	2	87	0	42
CP77-405	L98-209	483	7	18	1	31	1	49	0	42
CP77-405	LCP85-384	940	20	29	3	35	3	60	0	42
CP78-317	L98-209	496	14	37	2	38	0	21	0	42
CP78-317	L99-229	245	22	90	3	77	1	66	0	42
CP78-317	LCP85-384	493	21	55	1	29	0	21	0	42
CP79-318	HOCP92-618	251	8	42	0	13	0	21	0	42
CP79-318	L96-040	243	16	77	0	13	0	21	0	42
CP79-318	L98-207	254	10	49	1	37	0	21	0	42
CP79-318	L98-209	249	5	27	3	75	1	63	0	42
CP79-318	L99-233	962	18	25	5	55	2	50	1	87
CP79-318	LCP85-384	727	9	17	0	13	0	21	0	42
CP83-644	HOCP97-609	251	10	51	4	88	1	61	1	94
CP89-846	LCP85-384	249	12	60	4	89	2	85	0	42
HO91-572	L94-428	250	2	16	0	13	0	21	0	42
HO91-572	LCP85-384	688	41	72	4	56	0	21	0	42
HO91-572	LCP87-492	244	0	6	0	13	0	21	0	42
HO95-988	HOCP85-845	241	11	59	1	41	0	21	0	42
HO95-988	HOCP96-561	249	5	27	0	13	0	21	0	42
HO95-988	L90-191	227	14	73	1	51	1	75	0	42
HO95-988	L94-433	426	27	75	9	93	7	97	1	93
HO95-988	L96-040	480	0	6	0	13	0	21	0	42
HO95-988	L98-207	733	31	54	4	56	4	79	1	88
HO95-988	L98-209	247	6	31	1	38	1	64	1	95
HO95-988	LCP85-384	1047	77	82	9	70	3	58	0	42
HOCP85-845	HOCP92-624	241	15	73	5	91	2	88	0	42
HOCP85-845	HOCP96-540	507	21	53	1	29	0	21	0	42
HOCP85-845	L89-113	254	1	14	0	13	0	21	0	42
HOCP85-845	L91-255	220	5	30	0	13	0	21	0	42
HOCP85-845	L98-209	470	0	6	0	13	0	21	0	42
HOCP85-845	LCP85-384	2348	129	68	11	54	5	54	0	42
HOCP91-522	US80-004	194	14	80	2	73	0	21	0	42
HOCP91-552	L90-191	182	3	21	0	13	0	21	0	42
HOCP91-552	L91-255	476	34	79	5	74	3	83	0	42
HOCP91-552	L94-432	211	9	55	1	54	1	77	0	42
HOCP91-552	L99-233	912	26	39	3	36	1	44	0	42
HOCP91-552	LCP85-384	.	0	.	6	.	1	.	0	.
HOCP92-618	HOCP96-540	697	63	90	9	82	0	21	0	42
HOCP92-618	L99-233	245	3	17	0	13	0	21	0	42
HOCP92-624	HOCP85-845	477	16	44	2	45	1	51	0	42
HOCP92-624	HOCP92-618	251	17	78	2	63	2	84	0	42
HOCP92-624	HOCP96-522	241	9	47	3	79	1	68	1	96
HOCP92-624	HOCP96-540	977	82	88	10	72	6	81	0	42

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HOCP92-624	HOCP96-561	473	2	14	0	13	0	21	0	42
HOCP92-624	HOCP97-601	249	11	56	2	63	1	63	0	42
HOCP92-624	HOCP97-609	498	46	91	16	96	6	94	1	90
HOCP92-624	HOCP97-621	486	14	39	3	58	1	48	0	42
HOCP92-624	L89-113	735	44	72	5	61	0	21	0	42
HOCP92-624	L91-255	1185	106	89	26	94	15	95	1	86
HOCP92-624	L91-281	239	29	97	2	67	1	69	0	42
HOCP92-624	L98-197	483	40	87	7	85	4	87	1	91
HOCP92-624	L98-209	236	8	44	2	69	2	90	0	42
HOCP92-624	L99-226	239	8	43	2	67	2	89	0	42
HOCP92-624	LCP85-384	2371	110	59	20	67	8	60	1	85
HOCP92-624	LCP85-384	715	32	57	3	45	1	45	0	42
HOCP92-624	LCP86-454	665	26	49	4	57	2	58	0	42
HOCP92-624	US80-004	252	7	37	1	38	1	61	0	42
HOCP92-648	HOCP85-845	243	6	33	4	90	2	86	0	42
HOCP92-648	HOCP92-624	228	8	46	3	84	3	96	0	42
HOCP92-648	L91-281	246	23	92	3	77	0	21	0	42
HOCP92-648	L93-363	238	7	39	2	67	2	89	0	42
HOCP92-648	L96-040	230	15	76	2	71	1	74	0	42
HOCP92-648	L98-209	238	2	16	0	13	0	21	0	42
HOCP92-648	LCP85-384	700	34	61	5	62	4	79	0	42
HOCP94-867	L99-226	227	36	99	3	84	1	75	0	42
HOCP95-950	LCP85-384	482	10	29	2	41	1	49	0	42
HOCP95-951	HOCP96-540	247	0	6	0	13	0	21	0	42
HOCP95-951	LCP85-384	732	24	43	5	61	3	66	1	88
HOCP96-522	CP78-317	501	20	51	1	29	0	21	0	42
HOCP96-522	HOCP96-561	453	38	88	6	84	1	55	0	42
HOCP96-522	L91-255	498	28	70	3	57	3	80	0	42
HOCP96-522	L94-432	223	9	51	2	72	2	92	0	42
HOCP96-522	LCP85-384	973	78	86	8	64	3	59	0	42
HOCP96-522	LCP85-384	615	0	6	0	13	0	21	0	42
HOCP96-540	HOCP85-845	222	10	57	0	13	0	21	0	42
HOCP96-540	HOCP91-552	232	26	95	6	94	3	96	1	98
HOCP96-540	HOCP92-624	245	0	6	0	13	0	21	0	42
HOCP96-540	L91-281	398	0	6	0	13	0	21	0	42
HOCP96-540	L92-312	248	0	6	0	13	0	21	0	42
HOCP96-540	L94-433	243	0	6	0	13	0	21	0	42
HOCP96-540	L99-229	219	0	6	0	13	0	21	0	42
HOCP96-540	US96-001	216	0	6	0	13	0	21	0	42
HOCP96-561	HOCP92-624	244	21	89	9	97	3	94	0	42
HOCP96-561	L99-229	251	19	83	4	88	2	84	1	94
HOCP96-561	L99-233	776	26	44	6	63	1	44	1	88
HOCP97-601	HOCP92-618	245	11	57	3	77	1	66	0	42
HOCP97-606	LCP85-384	486	9	25	2	41	1	48	0	42
HOCP97-609	HOCP85-845	229	6	34	3	83	2	91	0	42
HOCP97-609	HOCP92-624	469	0	6	0	13	0	21	0	42
HOCP97-609	HOCP97-621	215	13	72	1	54	1	77	0	42

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HOCP97-609	L91-255	483	19	49	4	65	3	82	0	42
HOCP97-609	LCP81-010	235	1	14	0	13	0	21	0	42
HOCP97-609	LCP85-384	227	9	51	1	51	0	21	0	42
HOCP97-621	HOCP96-540	249	0	6	0	13	0	21	0	42
HOCP97-621	LCP85-384	946	26	35	7	62	3	59	0	42
HOCP97-645	L98-197	234	12	65	5	93	2	91	0	42
HOCP97-645	L99-226	469	37	85	1	31	0	21	0	42
HOCP98-743	L98-209	675	0	6	0	13	0	21	0	42
HOCP98-743	L99-226	236	0	6	0	13	0	21	0	42
HOCP98-776	HOCP97-621	240	16	78	1	45	1	68	0	42
HOCP98-776	L91-281	250	4	21	0	13	0	21	0	42
HOCP98-776	LCP81-010	711	15	29	2	34	0	21	0	42
L89-113	L96-040	230	32	98	13	99	6	98	0	42
L89-113	LCP85-384	482	32	77	10	91	6	95	1	91
L90-191	LCP85-384	239	18	83	2	67	1	69	0	42
L90-191	US96-001	236	0	6	0	13	0	21	0	42
L91-255	HOCP85-845	481	12	33	1	31	0	21	0	42
L91-255	L96-040	447	0	6	0	13	0	21	0	42
L91-255	LCP85-384	710	36	65	2	34	2	57	0	42
L91-281	L91-255	242	18	82	1	41	0	21	0	42
L91-281	L96-040	247	4	21	0	13	0	21	0	42
L91-281	L98-197	476	17	46	3	59	1	51	0	42
L91-281	L98-209	461	35	83	5	74	3	83	0	42
L91-281	L99-237	238	23	92	5	92	0	21	0	42
L91-281	LCP85-384	1205	60	63	5	41	3	56	0	42
L93-363	HOCP92-618	239	0	6	0	13	0	21	0	42
L93-363	L96-040	477	24	63	4	67	3	82	0	42
L93-363	LCP85-384	243	7	39	3	78	1	67	0	42
L93-399	HOCP85-845	489	24	61	6	78	0	21	0	42
L93-399	HOCP91-552	237	12	65	3	81	2	90	1	97
L93-399	L99-226	233	6	34	1	49	0	21	0	42
L94-426	L96-040	248	7	37	3	76	1	64	0	42
L94-426	L98-209	249	11	56	0	13	0	21	0	42
L94-426	L99-224	234	13	70	1	49	0	21	0	42
L94-426	L99-233	234	9	48	0	13	0	21	0	42
L94-426	LCP85-384	947	25	34	3	35	1	43	0	42
L94-426	LCP86-454	237	19	86	5	93	1	71	0	42
L94-428	HOCP97-601	472	16	44	2	45	1	53	0	42
L94-428	L91-281	241	32	98	10	98	7	99	2	99
L94-428	L94-433	234	18	84	1	49	0	21	0	42
L94-428	L99-226	226	12	66	1	51	0	21	0	42
L94-428	LCP81-010	675	16	31	0	13	0	21	0	42
L94-428	LCP85-384	712	39	68	1	28	1	45	0	42
L94-432	HOCP85-845	244	5	27	1	41	0	21	0	42
L96-040	HOCP98-776	471	0	6	0	13	0	21	0	42
L96-040	LCP81-010	242	15	73	3	79	1	67	0	42
L96-040	LCP85-384	1193	36	41	4	36	2	47	0	42

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
L97-128	HOCP85-845	237	2	16	0	13	0	21	0	42
L97-128	HOCP92-618	237	15	75	0	13	0	21	0	42
L97-128	L91-281	993	119	96	13	83	6	80	1	86
L97-128	L93-363	479	52	94	18	97	4	88	0	42
L97-128	L99-229	471	53	95	6	81	2	73	0	42
L97-128	L99-233	199	22	94	3	87	2	93	0	42
L97-128	LCP81-010	699	33	60	3	49	1	47	0	42
L97-128	LCP87-492	468	40	88	4	69	1	54	1	92
L97-128	US80-004	236	12	65	0	13	0	21	0	42
L97-128	US96-001	476	32	78	3	59	1	51	0	42
L98-158	L99-233	225	11	61	1	51	0	21	0	42
L98-197	HOCP96-522	204	0	6	0	13	0	21	0	42
L98-197	US99-002	225	0	6	0	13	0	21	0	42
L98-198	HOCP97-621	445	26	71	5	75	1	55	1	93
L98-198	US79-010	474	35	82	2	45	1	53	0	42
L98-207	CP79-318	702	11	21	2	34	2	57	0	42
L98-207	L92-312	250	25	93	4	89	1	62	0	42
L98-207	POLY	1	1	99	1	99	1	99	1	99
L98-209	L94-428	238	0	6	0	13	0	21	0	42
L98-209	L99-233	476	9	25	3	59	1	51	0	42
L98-209	LCP85-384	461	0	6	0	13	0	21	0	42
L99-224	L99-226	240	14	71	2	65	0	21	0	42
L99-224	L99-233	234	8	44	2	69	1	73	0	42
L99-226	HOCP96-522	231	23	93	2	71	1	74	0	42
L99-226	L99-233	711	14	27	3	45	1	45	1	89
L99-226	LCP85-384	688	0	6	0	13	0	21	0	42
L99-229	LCP81-010	240	11	59	1	45	0	21	0	42
L99-229	LCP85-384	474	19	51	7	86	2	71	1	92
L99-233	LCP85-384	838	52	73	25	95	16	98	2	94
LCP81-010	CP78-317	458	1	13	0	13	0	21	0	42
LCP81-010	HOCP85-845	439	8	24	1	33	0	21	0	42
LCP81-010	HOCP96-561	186	7	48	0	13	0	21	0	42
LCP81-010	HOCP97-609	475	11	30	7	86	2	70	0	42
LCP81-010	HOCP97-621	229	4	23	1	51	1	75	0	42
LCP81-010	L92-312	243	13	66	3	78	2	86	1	96
LCP81-010	L94-428	239	13	67	1	45	1	69	0	42
LCP81-010	L96-040	239	6	33	0	13	0	21	0	42
LCP81-010	L98-207	705	12	23	1	28	1	46	0	42
LCP81-010	L99-233	817	13	21	1	27	0	21	0	42
LCP81-010	LCP85-384	1687	122	80	26	88	9	78	2	87
LCP81-010	US96-001	236	7	41	0	13	0	21	0	42
LCP81-010	US99-002	221	11	63	0	13	0	21	0	42
LCP81-030	HOCP85-845	249	7	37	1	38	1	63	0	42
LCP85-384	CP79-318	243	0	6	0	13	0	21	0	42
LCP85-384	HOCP92-624	236	0	6	0	13	0	21	0	42
LCP85-384	HOCP96-540	720	53	82	22	95	13	97	1	89
LCP85-384	L93-363	224	18	86	2	71	1	76	0	42

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
LCP85-384	L94-433	712	21	39	3	45	2	56	0	42
LCP85-384	L99-226	757	0	6	0	13	0	21	0	42
LCP85-384	LCP86-454	943	18	25	1	27	1	43	0	42
LCP86-454	L99-226	710	26	47	5	61	0	21	0	42
LCP86-454	L99-234	252	6	31	0	13	0	21	0	42
LCP86-454	LCP85-384	1861	157	88	27	85	14	84	1	85
LCP87-492	HOCP97-609	241	29	96	12	98	2	88	1	96
LCP87-492	L89-113	219	6	35	0	13	0	21	0	42
LCP87-492	L91-281	487	25	65	5	73	3	81	0	42
LCP87-492	L94-432	224	0	6	0	13	0	21	0	42
LCP87-492	L98-209	481	8	23	1	31	1	50	0	42
LCP87-492	L99-233	446	41	91	16	96	5	93	2	98
TUCCP77-042	LCP85-384	716	82	96	12	90	7	92	0	42
US79-010	HOCP96-540	237	13	68	3	81	1	71	0	42
US79-010	L98-209	236	13	68	1	45	1	72	0	42
US79-010	LCP85-384	700	19	35	3	49	1	47	1	90
US79-010	LCP87-492	246	4	21	1	41	1	65	0	42
US80-004	LCP85-384	664	7	17	3	53	3	77	0	42
US92-010	L91-281	201	9	57	3	87	1	78	0	42
US96-001	LCP85-384	948	15	21	2	31	0	21	0	42
US96-002	L94-432	221	3	18	1	53	0	21	0	42
US96-002	LCP85-384	468	19	53	1	31	1	54	0	42
2001 Crossing Series										
CP65-357	L92-312	240	10	61	3	72	2	84	.	.
CP77-405	L98-207	187	0	21	0	22	0	29	.	.
CP77-405	LCP85-384	394	0	21	0	22	0	29	.	.
CP78-317	HOCP91-552	191	0	21	0	22	0	29	.	.
CP79-318	L98-209	229	0	21	0	22	0	29	.	.
CP79-318	L98-209	225	0	21	0	22	0	29	.	.
CP83-644	HOCP96-540	430	15	57	9	86	3	80	.	.
CP83-644	HOCP96-561	210	7	54	1	51	0	29	.	.
CP83-644	HOCP97-621	218	0	21	0	22	0	29	.	.
CP83-644	HOCP98-778	212	0	21	0	22	0	29	.	.
CP83-644	L98-209	402	24	77	8	85	1	64	.	.
CP83-644	L99-226	398	0	21	0	22	0	29	.	.
CP83-644	L99-238	175	0	21	0	22	0	29	.	.
CP89-846	HOCP97-621	229	0	21	0	22	0	29	.	.
CP89-846	L98-209	385	0	21	0	22	0	29	.	.
HO89-889	HOCP85-845	219	11	68	1	50	0	29	.	.
HO89-889	HOCP96-561	69	0	21	0	22	0	29	.	.
HO89-889	L99-233	235	0	21	0	22	0	29	.	.
HO95-988	HOCP96-540	930	45	64	11	70	5	76	.	.
HO95-988	HOCP96-561	237	12	69	3	73	1	68	.	.
HO95-988	HOCP97-609	419	17	60	7	79	2	72	.	.
HO95-988	L89-113	452	19	61	7	77	2	69	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HO95-988	L98-207	625	65	95	28	98	10	96	.	.
HO95-988	L99-226	464	0	21	0	22	0	29	.	.
HO95-988	L99-238	197	11	74	3	76	1	74	.	.
HO95-988	LCP85-384	432	49	96	20	98	8	98	.	.
HO95-988	TUCCP77-042	424	9	47	4	64	2	71	.	.
HOCP85-845	HO95-988	197	10	69	4	85	0	29	.	.
HOCP85-845	HOCP96-540	955	31	53	6	55	1	58	.	.
HOCP85-845	HOCP97-609	228	12	71	4	81	0	29	.	.
HOCP85-845	L96-092	215	0	21	0	22	0	29	.	.
HOCP85-845	L98-207	1325	41	51	16	70	8	78	.	.
HOCP85-845	L99-233	208	11	71	2	65	2	89	.	.
HOCP85-845	LCP85-384	656	39	76	6	63	4	78	.	.
HOCP88-739	LCP85-384	208	15	85	8	95	2	89	.	.
HOCP89-846	HOCP98-741	167	17	95	1	55	1	77	.	.
HOCP89-846	LCP85-384	203	2	44	1	52	0	29	.	.
HOCP89-846	LCP85-384	178	4	48	0	22	0	29	.	.
HOCP89-846	LCP85-384	198	7	57	3	76	1	73	.	.
HOCP89-846	TUCCP77-042	201	15	86	4	85	2	91	.	.
HOCP90-941	L97-137	226	7	51	4	81	1	69	.	.
HOCP90-941	LCP85-384	223	0	21	0	22	0	29	.	.
HOCP91-552	01P1	456	15	54	1	46	0	29	.	.
HOCP91-552	HOCP96-540	543	12	48	4	58	0	29	.	.
HOCP91-552	HOCP97-609	90	0	21	0	22	0	29	.	.
HOCP91-555	HOCP00-955	200	0	21	0	22	0	29	.	.
HOCP91-555	HOCP96-509	210	10	64	0	22	0	29	.	.
HOCP91-555	HOCP96-540	198	0	21	0	22	0	29	.	.
HOCP91-555	HOCP96-540	723	22	50	4	54	2	65	.	.
HOCP91-555	HOCP98-776	149	9	77	1	56	0	29	.	.
HOCP91-555	L99-226	429	38	91	6	74	1	63	.	.
HOCP91-555	LCP85-384	203	0	21	0	22	0	29	.	.
HOCP91-555	LCP86-454	195	0	21	0	22	0	29	.	.
HOCP92-618	HOCP96-540	709	32	63	13	82	6	84	.	.
HOCP92-618	LCP85-384	429	0	21	0	22	0	29	.	.
HOCP92-618	TUCCP77-042	430	0	21	0	22	0	29	.	.
HOCP92-624	HOCP00-961	232	19	88	2	61	0	29	.	.
HOCP92-624	HOCP91-552	219	0	21	2	63	0	29	.	.
HOCP92-624	HOCP96-540	242	12	68	2	60	1	67	.	.
HOCP92-624	HOCP96-561	373	24	80	3	58	2	75	.	.
HOCP92-624	L00-257	442	21	64	7	78	4	86	.	.
HOCP92-624	L89-113	231	14	78	5	87	3	94	.	.
HOCP92-624	L94-426	181	0	21	0	22	0	29	.	.
HOCP92-624	L94-428	218	4	46	2	64	1	71	.	.
HOCP92-624	L98-207	560	18	53	9	78	3	75	.	.
HOCP92-624	L98-209	468	35	86	1	45	1	61	.	.
HOCP92-624	L99-226	232	0	21	0	22	0	29	.	.
HOCP92-624	L99-233	401	37	92	13	95	9	99	.	.
HOCP92-624	LCP85-384	144	12	88	3	86	2	94	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HOCP92-648	HOCP96-540	369	18	66	7	83	3	83	.	.
HOCP92-648	HOCP96-561	210	12	75	1	51	0	29	.	.
HOCP92-648	HOCP97-609	222	0	21	0	22	0	29	.	.
HOCP92-648	HOCP97-621	196	0	21	0	22	0	29	.	.
HOCP92-648	L99-226	345	0	21	0	22	0	29	.	.
HOCP92-648	L99-226	175	6	56	0	22	0	29	.	.
HOCP92-648	L99-234	238	0	21	0	22	0	29	.	.
HOCP92-648	LCP85-384	455	60	98	13	92	7	96	.	.
HOCP92-648	LCP85-384	198	20	94	8	97	3	95	.	.
HOCP94-806	HOCP97-621	72	0	21	0	22	0	29	.	.
HOCP94-806	L99-226	245	0	21	0	22	0	29	.	.
HOCP94-806	L99-233	236	14	76	4	80	1	68	.	.
HOCP95-951	CP79-348	420	54	98	18	97	4	87	.	.
HOCP95-951	HOCP96-540	422	22	70	10	88	3	81	.	.
HOCP95-951	HOCP96-540	232	10	62	6	91	4	97	.	.
HOCP95-951	L97-137	465	33	84	8	80	1	61	.	.
HOCP95-951	LCP82-089	450	28	79	7	77	5	92	.	.
HOCP96-509	HOCP96-561	368	25	82	3	59	0	29	.	.
HOCP96-509	L92-312	243	0	21	0	22	0	29	.	.
HOCP96-509	L99-226	226	0	21	0	22	0	29	.	.
HOCP96-509	LCP85-384	184	17	92	6	95	3	97	.	.
HOCP96-522	HOCP89-846	225	12	71	3	73	2	85	.	.
HOCP96-522	HOCP96-561	184	6	54	2	67	0	29	.	.
HOCP96-522	L91-255	207	11	71	1	51	0	29	.	.
HOCP96-522	L98-209	410	20	66	3	57	1	63	.	.
HOCP96-522	LCP85-384	203	7	56	1	52	0	29	.	.
HOCP96-540	HOCP89-846	623	0	21	0	22	0	29	.	.
HOCP96-540	HOCP96-561	237	0	21	0	22	0	29	.	.
HOCP96-540	L89-113	190	0	21	0	22	0	29	.	.
HOCP96-540	L91-255	371	0	21	0	22	0	29	.	.
HOCP96-540	L99-226	449	0	21	0	22	0	29	.	.
HOCP96-540	LCP85-384	392	0	21	0	22	0	29	.	.
HOCP96-561	HOCP85-845	452	14	51	5	68	0	29	.	.
HOCP97-606	L96-092	237	7	50	3	73	0	29	.	.
HOCP97-609	HO91-572	207	0	21	0	22	0	29	.	.
HOCP97-609	HOCP97-621	167	0	21	0	22	0	29	.	.
HOCP97-609	HOCP98-741	231	0	21	0	22	0	29	.	.
HOCP97-609	L89-113	250	0	21	0	22	0	29	.	.
HOCP97-609	L99-226	417	0	21	0	22	0	29	.	.
HOCP97-609	L99-233	142	4	49	2	75	0	29	.	.
HOCP97-609	LCP82-089	448	31	82	8	82	1	63	.	.
HOCP97-621	L98-207	452	0	21	0	22	0	29	.	.
HOCP98-741	HOCP92-618	236	0	21	0	22	0	29	.	.
HOCP98-741	L94-432	239	0	21	0	22	0	29	.	.
HOCP98-741	LCP85-384	413	43	95	8	84	3	82	.	.
HOCP98-776	CP79-348	210	2	44	0	22	0	29	.	.
HOCP98-776	HOCP96-540	177	0	21	0	22	0	29	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HOCP98-776	L91-255	203	9	62	6	93	2	90	.	.
HOCP98-776	L99-226	236	0	21	0	22	0	29	.	.
HOCP98-776	L99-233	218	6	49	1	50	0	29	.	.
HOCP98-778	CP79-318	219	0	21	0	22	0	29	.	.
HOCP98-778	HOCP97-621	93	0	21	0	22	0	29	.	.
HOCP98-781	HOCP96-540	442	38	90	5	69	0	29	.	.
HOCP99-825	L91-281	217	0	21	0	22	0	29	.	.
HOCP99-833	L98-209	180	13	85	2	68	0	29	.	.
L00-249	L94-432	236	0	21	0	22	0	29	.	.
L00-254	HOCP97-609	430	0	21	0	22	0	29	.	.
L00-254	L98-209	244	0	21	0	22	0	29	.	.
L00-254	LCP85-384	416	0	21	0	22	0	29	.	.
L00-260	HOCP97-621	232	0	21	0	22	0	29	.	.
L00-260	L99-233	400	0	21	0	22	0	29	.	.
L00-264	L94-432	145	0	21	0	22	0	29	.	.
L00-264	LCP85-384	226	7	51	2	62	0	29	.	.
L00-264	LCP85-384	202	7	57	0	22	0	29	.	.
L00-268	HOCP96-540	971	63	81	25	91	11	92	.	.
L00-271	HOCP96-540	194	11	75	1	53	1	75	.	.
L00-273	LCP82-089	198	0	21	0	22	0	29	.	.
L91-255	HOCP96-509	141	0	21	0	22	0	29	.	.
L91-255	L98-207	427	0	21	0	22	0	29	.	.
L91-255	LCP85-384	386	18	63	1	46	0	29	.	.
L91-281	HOCP96-540	240	21	90	3	72	2	84	.	.
L91-281	HOCP96-561	442	53	97	12	92	4	86	.	.
L91-281	L97-137	246	12	66	4	79	3	93	.	.
L91-281	L99-234	218	12	73	5	88	1	71	.	.
L91-281	LCP85-384	226	0	21	0	22	0	29	.	.
L93-386	HOCP96-540	363	0	21	0	22	0	29	.	.
L93-391	L98-209	215	0	21	0	22	0	29	.	.
L93-391	L99-226	206	0	21	0	22	0	29	.	.
L93-391	LCP85-384	97	0	21	0	22	0	29	.	.
L93-399	HOCP85-845	176	0	21	0	22	0	29	.	.
L93-399	HOCP85-845	326	12	58	0	22	0	29	.	.
L93-399	LCP85-384	171	0	21	0	22	0	29	.	.
L94-426	HOCP97-621	174	0	21	0	22	0	29	.	.
L94-426	L99-233	185	7	58	1	53	0	29	.	.
L94-426	LCP85-384	224	11	66	1	49	1	70	.	.
L94-426	LCP85-384	184	22	97	9	99	2	91	.	.
L94-426	LHO92-314	234	0	21	0	22	0	29	.	.
L94-428	HOCP96-540	354	32	91	11	94	6	97	.	.
L94-428	MISC	178	8	63	2	69	0	29	.	.
L94-432	HOCP96-540	209	36	99	4	83	2	88	.	.
L94-432	L89-113	208	0	21	0	22	0	29	.	.
L94-432	L91-281	195	0	21	0	22	0	29	.	.
L94-432	L98-207	337	0	21	0	22	0	29	.	.
L94-432	LCP85-384	194	0	21	0	22	0	29	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
L94-432	TUCCP77-042	383	13	56	3	58	0	29	.	.
L96-040	HOCP92-618	228	22	93	9	96	0	29	.	.
L96-040	HOCP96-540	227	13	75	1	49	0	29	.	.
L96-040	L99-233	211	0	21	0	22	0	29	.	.
L96-040	L99-233	393	26	81	6	76	1	64	.	.
L97-128	HOCP85-845	224	14	80	2	63	0	29	.	.
L97-128	L91-281	174	15	90	1	54	1	77	.	.
L97-128	L99-233	228	25	96	12	99	5	99	.	.
L97-128	LCP82-089	416	29	83	10	89	6	95	.	.
L97-128	LHO92-314	205	0	21	0	22	0	29	.	.
L97-128	TUCCP77-042	191	32	99	8	97	4	98	.	.
L97-137	HOCP94-806	219	13	76	4	82	2	87	.	.
L97-137	L94-428	406	20	66	7	80	5	93	.	.
L98-197	HOCP00-961	227	0	21	0	22	0	29	.	.
L98-207	01P5	473	2	43	0	22	0	29	.	.
L98-207	CP79-318	388	0	21	0	22	0	29	.	.
L98-207	HOCP85-845	736	45	78	18	90	5	80	.	.
L98-209	01P4	416	38	92	4	65	3	82	.	.
L98-209	HOCP97-621	474	17	58	3	55	1	60	.	.
L98-209	HOCP98-741	205	0	21	0	22	0	29	.	.
L98-209	L92-312	182	0	21	0	22	0	29	.	.
L98-209	LHO92-314	457	18	59	3	56	0	29	.	.
L98-209	TUCCP77-042	427	24	74	9	87	3	80	.	.
L99-214	HOCP97-621	235	0	21	0	22	0	29	.	.
L99-214	L99-233	207	17	88	4	84	2	89	.	.
L99-221	HOCP96-540	433	0	21	0	22	0	29	.	.
L99-226	01P4	676	12	46	2	47	1	59	.	.
L99-226	HOCP92-618	436	0	21	0	22	0	29	.	.
L99-226	HOCP96-540	757	0	21	0	22	0	29	.	.
L99-226	L89-113	204	0	21	0	22	0	29	.	.
L99-226	L99-233	754	5	43	3	48	2	65	.	.
L99-226	LCP82-089	464	19	60	4	61	1	62	.	.
L99-226	LCP85-384	843	42	68	10	70	6	81	.	.
L99-226	TUCCP77-042	621	11	46	2	47	1	60	.	.
L99-231	HOCP85-845	195	3	45	1	53	1	74	.	.
L99-231	HOCP97-621	194	0	21	0	22	0	29	.	.
L99-231	L92-312	147	0	21	0	22	0	29	.	.
L99-233	HOCP97-621	173	0	21	0	22	0	29	.	.
L99-233	L94-428	205	16	86	5	90	2	90	.	.
L99-234	HOCP96-540	216	0	21	0	22	0	29	.	.
L99-234	L98-207	365	0	21	0	22	0	29	.	.
L99-238	L94-432	220	0	21	0	22	0	29	.	.
LCP81-010	L89-113	208	0	21	0	22	0	29	.	.
LCP81-010	L91-281	209	11	71	5	89	3	95	.	.
LCP81-010	L92-312	143	0	21	0	22	0	29	.	.
LCP81-010	L92-312	124	0	21	0	22	0	29	.	.
LCP81-010	L94-428	460	6	44	2	48	1	62	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
LCP81-010	L98-207	617	39	80	15	90	5	82	.	.
LCP81-010	L98-207	1095	35	53	12	68	6	76	.	.
LCP81-010	L98-209	605	24	59	5	60	3	73	.	.
LCP81-010	L99-233	898	28	51	12	74	3	66	.	.
LCP81-010	LCP82-089	384	0	21	0	22	0	29	.	.
LCP81-010	LCP85-384	844	85	94	25	93	8	87	.	.
LCP81-010	LCP85-384	937	17	46	4	48	1	59	.	.
LCP82-089	LCP85-384	381	20	70	1	46	1	65	.	.
LCP83-137	HOCP96-561	404	34	89	9	87	4	90	.	.
LCP85-313	HOCP96-509	342	24	83	10	92	3	85	.	.
LCP85-313	HOCP97-609	415	29	83	3	57	2	72	.	.
LCP85-384	01P4	597	0	21	0	22	0	29	.	.
LCP85-384	HOCP89-846	240	19	87	3	72	1	67	.	.
LCP85-384	HOCP92-618	230	0	21	0	22	0	29	.	.
LCP85-384	HOCP97-621	471	53	96	5	67	3	79	.	.
LCP85-384	L91-281	378	0	21	0	22	0	29	.	.
LCP85-384	L99-233	609	13	47	6	66	2	66	.	.
LCP86-454	L99-233	591	32	73	6	66	3	74	.	.
LCP86-454	LCP85-384	636	45	84	10	78	4	78	.	.
LCP86-454	LCP85-384	1475	64	62	18	71	3	60	.	.
LCP86-454	TUCCP77-042	335	0	21	0	22	0	29	.	.
LHO83-153	L99-233	180	14	86	7	96	2	92	.	.
LHO83-153	LCP85-384	213	5	48	2	64	0	29	.	.
LHO92-314	L99-226	207	0	21	0	22	0	29	.	.
LHO92-314	LCP85-384	229	0	21	0	22	0	29	.	.
MISC	MISC	240	15	80	2	60	1	67	.	.
TUCCP77-042	L98-209	162	14	90	5	94	0	29	.	.
TUCCP77-042	L99-238	232	12	70	2	61	2	85	.	.
TUCCP77-042	LCP85-384	476	25	71	7	75	3	79	.	.
US96-002	LCP85-384	229	22	93	2	62	1	69	.	.
2002 Crossing Series										
CP70-321	LCP85-384	185	2	28	0	21	.	.	.	.
CP77-405	HOCP96-540	454	0	12	0	21	.	.	.	.
CP77-405	L99-233	172	3	31	0	21	.	.	.	.
CP77-405	LCP85-384	234	8	48	0	21	.	.	.	.
CP78-317	L92-312	80	9	95	2	91	.	.	.	.
CP79-318	L91-255	243	10	55	0	21	.	.	.	.
CP79-318	L92-312	222	7	45	0	21	.	.	.	.
CP79-348	HOCP92-618	239	16	77	3	74	.	.	.	.
CP79-348	L98-207	703	89	96	15	87	.	.	.	.
CP83-644	02P9	196	4	33	1	52	.	.	.	.
CP83-644	L99-233	465	19	55	6	77	.	.	.	.
CP89-831	HOCP89-846	485	22	62	3	54	.	.	.	.
HO01-566	02P9	481	17	49	3	54	.	.	.	.
HO89-889	HOCP89-846	714	18	37	2	44	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HO95-988	02P13	239	0	12	0	21	.	.	.	.
HO95-988	HOCP93-767	443	10	35	0	21	.	.	.	.
HO95-988	HOCP96-540	236	0	12	0	21	.	.	.	.
HO95-988	L00-266	249	23	88	2	60	.	.	.	.
HO95-988	L94-432	58	4	80	0	21	.	.	.	.
HO95-988	L98-207	664	41	74	10	81	.	.	.	.
HO95-988	LCP82-089	404	40	93	2	51	.	.	.	.
HO95-988	LCP85-384	464	45	90	8	83	.	.	.	.
HO95-988	LCP85-384	1203	118	91	46	97	.	.	.	.
HOCP00-905	02P3	245	26	94	13	99	.	.	.	.
HOCP00-905	02P4	477	42	87	17	97	.	.	.	.
HOCP00-920	HOCP92-618	138	3	34	0	21	.	.	.	.
HOCP00-920	L99-226	411	0	12	0	21	.	.	.	.
HOCP01-517	02P10	164	5	42	2	72	.	.	.	.
HOCP85-845	02P11	1831	6	24	1	42	.	.	.	.
HOCP85-845	02P15	226	10	61	1	48	.	.	.	.
HOCP85-845	02P3	336	14	58	0	21	.	.	.	.
HOCP85-845	HOCP89-846	234	4	31	1	47	.	.	.	.
HOCP85-845	L98-207	1343	51	52	14	70	.	.	.	.
HOCP91-552	HOCP97-609	466	0	12	0	21	.	.	.	.
HOCP91-552	L98-209	851	26	43	4	50	.	.	.	.
HOCP92-624	02P10	233	2	27	0	21	.	.	.	.
HOCP92-624	02P16	216	17	83	4	84	.	.	.	.
HOCP92-624	HOCP98-741	202	15	81	5	91	.	.	.	.
HOCP92-624	L00-259	1435	140	91	32	88	.	.	.	.
HOCP92-624	L00-266	711	35	65	9	75	.	.	.	.
HOCP92-624	L91-255	868	76	87	11	75	.	.	.	.
HOCP92-624	L98-209	1149	59	67	9	58	.	.	.	.
HOCP92-624	L99-226	1171	46	53	9	58	.	.	.	.
HOCP92-624	LCP85-384	1396	81	73	21	80	.	.	.	.
HOCP92-624	US01-040	230	41	98	9	98	.	.	.	.
HOCP93-746	L91-255	217	5	35	0	21	.	.	.	.
HOCP93-746	L99-233	463	20	59	3	55	.	.	.	.
HOCP93-749	L00-247	131	2	29	0	21	.	.	.	.
HOCP93-749	L00-266	481	0	12	0	21	.	.	.	.
HOCP93-749	LCP85-384	68	0	12	0	21	.	.	.	.
HOCP93-749	LCP85-384	239	9	52	3	74	.	.	.	.
HOCP93-767	HOCP97-609	213	0	12	0	21	.	.	.	.
HOCP93-767	L99-226	234	33	97	6	92	.	.	.	.
HOCP94-806	HOCP91-552	212	11	68	2	67	.	.	.	.
HOCP94-806	HOCP93-767	240	11	63	3	73	.	.	.	.
HOCP94-806	HOCP96-540	209	12	72	4	85	.	.	.	.
HOCP95-951	02P2	670	56	86	20	95	.	.	.	.
HOCP96-509	L98-207	1205	76	75	16	79	.	.	.	.
HOCP96-561	HOCP00-905	118	0	12	0	21	.	.	.	.
HOCP96-561	L99-226	466	16	48	6	77	.	.	.	.
HOCP98-741	HOCP85-845	249	7	40	2	60	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line		2nd Line		Increase		Assignment	
			No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l
HOCP98-741	L00-249	236	16	78	1	46	.	.	.	.
HOCP98-741	L00-268	214	22	94	2	67	.	.	.	.
HOCP98-741	L91-255	236	10	58	2	62	.	.	.	.
HOCP98-741	L94-432	225	7	43	2	65	.	.	.	.
HOCP98-741	L98-207	178	0	12	0	21	.	.	.	.
HOCP98-741	L98-209	151	0	12	0	21	.	.	.	.
HOCP98-741	L99-226	244	23	89	1	45	.	.	.	.
HOCP98-781	HOCP85-845	423	3	25	0	21	.	.	.	.
HOCP98-781	LCP85-384	684	38	70	4	52	.	.	.	.
HOCP99-866	L01-291	473	0	12	0	21	.	.	.	.
L00-247	02P4	230	13	72	3	79	.	.	.	.
L00-247	HOCP97-609	35	0	12	0	21	.	.	.	.
L00-247	L98-209	80	0	12	0	21	.	.	.	.
L00-247	L99-226	204	4	33	2	68	.	.	.	.
L00-264	L94-432	232	21	88	2	63	.	.	.	.
L00-266	LCP86-454	413	0	12	0	21	.	.	.	.
L00-268	HOCP92-618	435	21	63	3	56	.	.	.	.
L00-268	HOCP96-540	1070	0	12	0	21	.	.	.	.
L00-268	L92-321	217	0	12	0	21	.	.	.	.
L00-270	02P2	426	19	62	3	57	.	.	.	.
L00-270	HOCP96-540	521	3	25	1	43	.	.	.	.
L00-270	HOCP97-609	793	0	12	0	21	.	.	.	.
L00-270	L00-247	228	10	61	2	64	.	.	.	.
L00-270	L99-226	1089	0	12	0	21	.	.	.	.
L01-315	HOCP96-540	465	23	65	5	71	.	.	.	.
L01-315	HOCP96-561	232	4	31	0	21	.	.	.	.
L01-315	HOCP98-741	487	20	55	5	69	.	.	.	.
L01-315	HOCP99-825	78	2	38	0	21	.	.	.	.
L01-315	L94-428	188	0	12	0	21	.	.	.	.
L01-315	LCP86-454	240	8	46	1	46	.	.	.	.
L01-315	US01-040	244	0	12	0	21	.	.	.	.
L89-113	LCP85-384	250	20	84	6	89	.	.	.	.
L91-255	HOCP00-905	82	2	36	0	21	.	.	.	.
L91-281	L99-226	761	45	73	6	59	.	.	.	.
L92-312	02P2	442	0	12	0	21	.	.	.	.
L92-312	US80-004	101	0	12	0	21	.	.	.	.
L93-363	L00-259	579	15	38	4	56	.	.	.	.
L93-363	L91-255	208	31	98	4	86	.	.	.	.
L93-363	L99-226	144	12	85	3	86	.	.	.	.
L93-365	L99-233	242	7	41	0	21	.	.	.	.
L93-365	LCP85-384	236	8	48	0	21	.	.	.	.
L93-399	L98-209	229	8	49	2	63	.	.	.	.
L93-399	L98-209	394	17	59	0	21	.	.	.	.
L94-426	HOCP96-540	122	0	12	0	21	.	.	.	.
L94-426	HOCP97-609	225	15	77	1	48	.	.	.	.
L94-426	L98-207	117	2	31	1	62	.	.	.	.
L94-428	02P12	214	2	27	1	50	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line		2nd Line		Increase		Assignment	
			No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l
L94-428	HOCP96-540	482	31	76	11	88	.	.	.	.
L94-428	HOCP97-609	41	0	12	0	21	.	.	.	.
L94-428	L00-259	442	21	63	4	66	.	.	.	.
L94-428	L98-207	943	48	67	18	85	.	.	.	.
L94-433	HOCP92-618	174	11	75	0	21	.	.	.	.
L94-433	L94-428	189	0	12	0	21	.	.	.	.
L94-433	L99-226	1280	41	45	6	50	.	.	.	.
L96-040	HOCP97-609	490	0	12	0	21	.	.	.	.
L96-040	L00-268	240	8	46	0	21	.	.	.	.
L96-040	L99-226	664	0	12	0	21	.	.	.	.
L96-092	LCP85-384	463	13	40	5	71	.	.	.	.
L97-128	HOCP91-951	186	5	39	0	21	.	.	.	.
L97-128	HOCP96-540	246	18	80	8	96	.	.	.	.
L97-128	L94-428	146	6	55	0	21	.	.	.	.
L97-128	L98-207	133	7	69	0	21	.	.	.	.
L97-128	L99-233	87	6	80	1	72	.	.	.	.
L97-128	LCP85-384	69	0	12	0	21	.	.	.	.
L98-197	HOCP99-866	226	0	12	0	21	.	.	.	.
L98-207	02P10	1009	96	89	24	89	.	.	.	.
L98-207	02P7	244	0	12	0	21	.	.	.	.
L98-207	02P9	920	0	12	0	21	.	.	.	.
L98-207	L92-321	225	17	82	2	65	.	.	.	.
L98-207	L99-226	461	17	51	8	83	.	.	.	.
L98-209	HOCP97-609	213	0	12	0	21	.	.	.	.
L98-209	L01-299	326	0	12	0	21	.	.	.	.
L99-233	02P18	232	10	59	6	92	.	.	.	.
L99-233	HOCP98-741	216	0	12	0	21	.	.	.	.
L99-233	L99-226	248	9	50	2	61	.	.	.	.
LCP81-010	HOCP96-540	673	54	84	11	82	.	.	.	.
LCP81-010	L92-312	462	14	42	1	44	.	.	.	.
LCP81-010	L99-233	162	11	78	4	90	.	.	.	.
LCP81-010	LCP85-384	226	12	69	1	48	.	.	.	.
LCP81-10	02P19	223	9	54	0	21	.	.	.	.
LCP82-089	02P3	445	0	12	0	21	.	.	.	.
LCP82-089	02P4	410	0	12	0	21	.	.	.	.
LCP85-313	HOCP92-618	137	2	29	0	21	.	.	.	.
LCP85-313	HOCP97-609	159	9	72	0	21	.	.	.	.
LCP85-313	L98-209	623	31	66	8	76	.	.	.	.
LCP85-313	LCP82-089	109	4	51	1	66	.	.	.	.
LCP85-384	02P11	1105	22	33	7	55	.	.	.	.
LCP85-384	02P17	145	14	90	0	21	.	.	.	.
LCP85-384	02P3	200	0	12	0	21	.	.	.	.
LCP85-384	02P4	244	18	81	7	94	.	.	.	.
LCP85-384	HOCP01-517	444	49	95	20	98	.	.	.	.
LCP86-454	02P11	1033	0	12	0	21	.	.	.	.
LCP86-454	02P14	233	12	68	3	77	.	.	.	.
LCP86-454	L98-207	374	3	26	0	21	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
LCP86-454	LCP85-384	1366	34	37	7	52	.	.	.	.
LH083-153	HOCP92-618	92	0	12	0	21	.	.	.	.
N-27	HOCP96-540	383	38	93	11	94	.	.	.	.
N-27	L94-428	185	6	45	3	82	.	.	.	.
N-27	L98-209	657	18	39	4	53	.	.	.	.
N-27	LCP85-384	252	16	75	7	93	.	.	.	.
TUCCP77-042	LCP85-384	476	24	66	6	74	.	.	.	.
US79-010	HOCP96-540	131	17	97	4	95	.	.	.	.
US79-010	L01-299	216	17	83	3	80	.	.	.	.
US79-010	L98-207	245	10	55	0	21	.	.	.	.
US79-010	LCP85-384	102	19	99	1	68	.	.	.	.
US96-002	L01-299	185	2	28	0	21	.	.	.	.
2003 Crossing Series										
CP65-357	HO95-988	238	0	39	.	.	.	.	.	.
CP65-357	LCP85-384	1235	0	39	.	.	.	.	.	.
CP65-357	LCP85-384	964	0	39	.	.	.	.	.	.
CP73-351	HOCP96-540	457	0	39	.	.	.	.	.	.
CP77-310	HOCP91-552	231	0	39	.	.	.	.	.	.
CP83-644	HOCP97-606	244	0	39	.	.	.	.	.	.
HO01-564	L99-226	425	29	84	.	.	.	.	.	.
HO01-564	LCP85-384	238	0	39	.	.	.	.	.	.
HO89-889	L98-209	209	0	39	.	.	.	.	.	.
HO95-988	L99-226	182	0	39	.	.	.	.	.	.
HO95-988	L99-233	274	0	39	.	.	.	.	.	.
HO95-988	LCP85-384	243	27	91	.	.	.	.	.	.
HOCP00-905	HOCP00-930	154	28	99	.	.	.	.	.	.
HOCP00-905	HOCP92-618	175	0	39	.	.	.	.	.	.
HOCP00-905	HOCP96-540	222	0	39	.	.	.	.	.	.
HOCP00-905	HOCP97-609	248	0	39	.	.	.	.	.	.
HOCP00-905	L91-281	500	0	39	.	.	.	.	.	.
HOCP00-905	L94-432	377	56	97	.	.	.	.	.	.
HOCP00-905	LCP85-384	251	0	39	.	.	.	.	.	.
HOCP00-905	LCP85-384	452	0	39	.	.	.	.	.	.
HOCP00-930	HOCP91-552	478	36	86	.	.	.	.	.	.
HOCP00-930	HOCP96-540	490	0	39	.	.	.	.	.	.
HOCP00-942	L00-266	242	0	39	.	.	.	.	.	.
HOCP00-946	LCP85-384	236	0	39	.	.	.	.	.	.
HOCP00-950	HOCP01-506	212	24	92	.	.	.	.	.	.
HOCP00-950	HOCP01-506	228	0	39	.	.	.	.	.	.
HOCP00-950	HOCP91-552	668	6	79	.	.	.	.	.	.
HOCP00-950	HOCP91-552	446	0	39	.	.	.	.	.	.
HOCP00-950	HOCP96-540	934	71	87	.	.	.	.	.	.
HOCP00-950	L00-266	249	0	39	.	.	.	.	.	.
HOCP00-950	L99-226	240	23	89	.	.	.	.	.	.
HOCP01-523	HO91-572	240	0	39	.	.	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HOCP01-523	LCP85-384	234	0	39	.	.	.	.	.	.
HOCP01-523	LCP85-384	243	16	84	.	.	.	.	.	.
HOCP01-525	03P12	235	0	39	.	.	.	.	.	.
HOCP01-525	HOCP01-506	244	26	90	.	.	.	.	.	.
HOCP01-525	LCP85-384	213	31	96	.	.	.	.	.	.
HOCP01-528	03P15	175	0	39	.	.	.	.	.	.
HOCP01-541	HOCP96-540	153	0	39	.	.	.	.	.	.
HOCP01-544	L98-197	244	0	39	.	.	.	.	.	.
HOCP01-558	HOCP00-905	241	0	39	.	.	.	.	.	.
HOCP01-561	03P12	490	64	94	.	.	.	.	.	.
HOCP01-561	03P13	256	0	39	.	.	.	.	.	.
HOCP01-561	LCP85-384	172	0	39	.	.	.	.	.	.
HOCP85-845	03P22	232	32	95	.	.	.	.	.	.
HOCP85-845	HOCP01-506	483	0	39	.	.	.	.	.	.
HOCP85-845	L02-328	247	25	89	.	.	.	.	.	.
HOCP85-845	L98-207	727	68	88	.	.	.	.	.	.
HOCP85-845	L98-209	741	0	39	.	.	.	.	.	.
HOCP85-845	LCP85-384	467	0	39	.	.	.	.	.	.
HOCP88-739	LCP85-384	683	0	39	.	.	.	.	.	.
HOCP89-831	03P12	489	0	39	.	.	.	.	.	.
HOCP89-831	LCP85-384	491	0	39	.	.	.	.	.	.
HOCP89-846	HOCP96-540	796	0	39	.	.	.	.	.	.
HOCP89-846	HOCP96-540	245	0	39	.	.	.	.	.	.
HOCP89-846	L02-328	241	0	39	.	.	.	.	.	.
HOCP89-846	L98-209	442	0	39	.	.	.	.	.	.
HOCP89-846	LCP85-384	244	0	39	.	.	.	.	.	.
HOCP91-552	03P16	183	0	39	.	.	.	.	.	.
HOCP91-552	L99-226	393	44	92	.	.	.	.	.	.
HOCP92-618	L02-333	231	0	39	.	.	.	.	.	.
HOCP92-624	03P1	641	0	39	.	.	.	.	.	.
HOCP92-624	03P2	247	0	39	.	.	.	.	.	.
HOCP92-624	HOCP00-905	235	0	39	.	.	.	.	.	.
HOCP92-624	HOCP85-845	239	0	39	.	.	.	.	.	.
HOCP92-624	HOCP91-552	355	0	39	.	.	.	.	.	.
HOCP92-624	HOCP91-552	228	33	96	.	.	.	.	.	.
HOCP92-624	HOCP96-540	497	0	39	.	.	.	.	.	.
HOCP92-624	L02-320	234	0	39	.	.	.	.	.	.
HOCP92-624	L02-323	208	31	97	.	.	.	.	.	.
HOCP92-624	L91-281	502	0	39	.	.	.	.	.	.
HOCP92-624	L96-092	494	0	39	.	.	.	.	.	.
HOCP92-624	L98-209	1114	0	39	.	.	.	.	.	.
HOCP92-624	L98-209	501	0	39	.	.	.	.	.	.
HOCP92-624	L99-226	250	0	39	.	.	.	.	.	.
HOCP92-624	LCP85-384	222	0	39	.	.	.	.	.	.
HOCP92-624	LCP85-384	473	0	39	.	.	.	.	.	.
HOCP92-624	LCP85-384	498	26	82	.	.	.	.	.	.
HOCP92-624	LCP85-384	315	0	39	.	.	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increase		Assignment	
Female	Male	Survive	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l
HOCP92-648	HOCP96-540	215	0	39	.	.	.	.	.	.
HOCP92-648	L98-209	482	0	39	.	.	.	.	.	.
HOCP92-648	L98-209	487	0	39	.	.	.	.	.	.
HOCP92-648	L99-233	437	49	92	.	.	.	.	.	.
HOCP92-648	LCP85-384	1199	0	39	.	.	.	.	.	.
HOCP92-648	LCP85-384	256	0	39	.	.	.	.	.	.
HOCP92-648	LCP85-384	247	0	39	.	.	.	.	.	.
HOCP93-746	HOCP85-845	438	0	39	.	.	.	.	.	.
HOCP93-746	LCP85-384	437	0	39	.	.	.	.	.	.
HOCP93-749	L99-226	246	0	39	.	.	.	.	.	.
HOCP95-951	03P1	254	21	87	.	.	.	.	.	.
HOCP96-540	03P11	1587	0	39	.	.	.	.	.	.
HOCP96-540	03P12	474	0	39	.	.	.	.	.	.
HOCP96-540	03P18	195	0	39	.	.	.	.	.	.
HOCP96-540	03P19	200	0	39	.	.	.	.	.	.
HOCP96-540	03P6	251	0	39	.	.	.	.	.	.
HOCP96-540	03P8	249	0	39	.	.	.	.	.	.
HOCP96-540	03P9	1376	0	39	.	.	.	.	.	.
HOCP96-540	HOCP01-506	674	0	39	.	.	.	.	.	.
HOCP96-540	L02-316	1218	0	39	.	.	.	.	.	.
HOCP96-540	L98-209	435	0	39	.	.	.	.	.	.
HOCP96-540	L99-226	1435	0	39	.	.	.	.	.	.
HOCP96-561	03P19	247	43	98	.	.	.	.	.	.
HOCP96-561	L02-341	306	0	39	.	.	.	.	.	.
HOCP97-606	HOCP96-540	592	0	39	.	.	.	.	.	.
HOCP97-606	L98-209	239	0	39	.	.	.	.	.	.
HOCP97-609	03P13	365	0	39	.	.	.	.	.	.
HOCP97-609	03P15	247	0	39	.	.	.	.	.	.
HOCP97-609	HOCP96-540	805	0	39	.	.	.	.	.	.
HOCP98-741	L02-320	383	0	39	.	.	.	.	.	.
HOCP98-781	03P9	438	0	39	.	.	.	.	.	.
HOCP98-781	L98-207	481	0	39	.	.	.	.	.	.
HOCP98-781	LCP85-384	208	0	39	.	.	.	.	.	.
L01-281	03P9	428	0	39	.	.	.	.	.	.
L01-283	HOCP91-552	476	15	79	.	.	.	.	.	.
L01-283	LCP85-384	160	0	39	.	.	.	.	.	.
L01-299	LCP85-384	646	0	39	.	.	.	.	.	.
L01-299	LCP85-384	677	0	39	.	.	.	.	.	.
L02-233	L96-092	241	23	88	.	.	.	.	.	.
L02-319	HOCP96-540	407	0	39	.	.	.	.	.	.
L02-320	HOCP85-845	229	0	39	.	.	.	.	.	.
L02-320	HOCP96-540	487	0	39	.	.	.	.	.	.
L02-320	L99-226	243	12	81	.	.	.	.	.	.
L02-322	HOCP85-845	240	0	39	.	.	.	.	.	.
L02-322	HOCP96-540	132	0	39	.	.	.	.	.	.
L02-322	L99-226	211	0	39	.	.	.	.	.	.
L02-328	HO91-572	223	0	39	.	.	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increase		Assignment	
Female	Male	Survive	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l	No.	Rank Pcnt'l
L02-328	HOCP91-552	224	0	39	.	.	.	.	.	.
L02-328	HOCP91-552	204	0	39	.	.	.	.	.	.
L02-328	L99-226	896	53	83	.	.	.	.	.	.
L02-328	L99-233	711	0	39	.	.	.	.	.	.
L02-333	HOCP96-540	748	0	39	.	.	.	.	.	.
L02-336	POLY	227	0	39	.	.	.	.	.	.
L02-341	HOCP91-552	381	42	90	.	.	.	.	.	.
L02-341	HOCP91-552	208	10	80	.	.	.	.	.	.
L02-341	HOCP96-540	428	0	39	.	.	.	.	.	.
L02-351	LCP85-384	242	0	39	.	.	.	.	.	.
L91-255	HOCP96-540	471	0	39	.	.	.	.	.	.
L91-255	L00-266	437	0	39	.	.	.	.	.	.
L91-255	LCP85-384	245	0	39	.	.	.	.	.	.
L94-426	HOCP91-552	356	0	39	.	.	.	.	.	.
L94-428	HOCP96-540	246	0	39	.	.	.	.	.	.
L94-432	03P24	458	0	39	.	.	.	.	.	.
L94-432	LCP85-384	419	0	39	.	.	.	.	.	.
L94-433	HO91-572	460	0	39	.	.	.	.	.	.
L94-433	LCP85-384	1087	54	81	.	.	.	.	.	.
L96-040	HOCP00-905	241	0	39	.	.	.	.	.	.
L96-040	L94-432	477	0	39	.	.	.	.	.	.
L96-040	L99-226	1105	0	39	.	.	.	.	.	.
L96-040	LCP85-384	212	0	39	.	.	.	.	.	.
L97-128	HO91-572	186	0	39	.	.	.	.	.	.
L97-128	HOCP91-552	207	0	39	.	.	.	.	.	.
L97-128	HOCP91-552	166	0	39	.	.	.	.	.	.
L97-128	L98-197	166	0	39	.	.	.	.	.	.
L97-128	L98-207	435	31	85	.	.	.	.	.	.
L97-128	L98-209	153	23	98	.	.	.	.	.	.
L97-128	L99-226	74	0	39	.	.	.	.	.	.
L97-128	LCP85-384	188	0	39	.	.	.	.	.	.
L97-128	POLY	371	0	39	.	.	.	.	.	.
L97-137	L94-432	440	0	39	.	.	.	.	.	.
L97-137	L96-092	486	0	39	.	.	.	.	.	.
L98-207	HOCP01-553	721	0	39	.	.	.	.	.	.
L98-209	HOCP91-552	362	0	39	.	.	.	.	.	.
L98-209	HOCP96-540	229	0	39	.	.	.	.	.	.
L98-209	L98-207	1190	0	39	.	.	.	.	.	.
L99-226	03P10	233	0	39	.	.	.	.	.	.
L99-226	03P13	238	0	39	.	.	.	.	.	.
L99-226	HOCP92-618	850	44	82	.	.	.	.	.	.
L99-226	HOCP96-540	764	64	87	.	.	.	.	.	.
L99-226	L98-197	1172	0	39	.	.	.	.	.	.
L99-226	L99-233	920	0	39	.	.	.	.	.	.
L99-233	L96-092	396	0	39	.	.	.	.	.	.
LCP02-337	03P14	243	0	39	.	.	.	.	.	.
LCP02-337	03P18	342	0	39	.	.	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
LCP02-337	HOCP96-540	440	0	39	.	.	.	.	.	.
LCP02-337	L99-226	1160	0	39	.	.	.	.	.	.
LCP02-344	HOCP96-540	395	0	39	.	.	.	.	.	.
LCP02-345	HOCP96-540	450	0	39	.	.	.	.	.	.
LCP02-345	L99-226	190	0	39	.	.	.	.	.	.
LCP81-010	03P15	1323	0	39	.	.	.	.	.	.
LCP81-010	HO91-572	487	0	39	.	.	.	.	.	.
LCP81-010	HOCP91-552	242	13	83	.	.	.	.	.	.
LCP81-010	L02-320	226	0	39	.	.	.	.	.	.
LCP81-010	L98-197	786	0	39	.	.	.	.	.	.
LCP81-010	L98-207	238	0	39	.	.	.	.	.	.
LCP81-010	L98-207	694	0	39	.	.	.	.	.	.
LCP81-010	L98-207	1152	83	85	.	.	.	.	.	.
LCP81-010	LCP85-384	908	0	39	.	.	.	.	.	.
LCP81-010	LCP85-384	956	0	39	.	.	.	.	.	.
LCP82-089	LCP85-384	708	0	39	.	.	.	.	.	.
LCP85-384	03P10	866	37	80	.	.	.	.	.	.
LCP85-384	03P22	95	0	39	.	.	.	.	.	.
LCP85-384	03P24	248	0	39	.	.	.	.	.	.
LCP85-384	03P8	666	0	39	.	.	.	.	.	.
LCP86-454	03P8	246	0	39	.	.	.	.	.	.
MISC	MISC	489	0	39	.	.	.	.	.	.
N-27	HO95-988	233	30	94	.	.	.	.	.	.
N-27	03P22	466	66	95	.	.	.	.	.	.
TUCCP77-042	POLY	245	0	39	.	.	.	.	.	.
US01-039	HO91-572	481	0	39	.	.	.	.	.	.
US01-039	HOCP96-540	444	0	39	.	.	.	.	.	.
US01-039	LCP85-384	489	58	93	.	.	.	.	.	.
US01-039	LCP85-384	150	11	86	.	.	.	.	.	.
US01-040	HO91-572	172	0	39	.	.	.	.	.	.
US02-096	HOCP01-553	230	42	99	.	.	.	.	.	.
US02-096	LCP85-384	210	0	39	.	.	.	.	.	.
US99-002	LCP85-384	242	28	93	.	.	.	.	.	.
US99-004	LCP85-384	222	0	39	.	.	.	.	.	.

Table 7. Plant weight and rank summary statistics from the 2003 crossing series first stubble cross appraisal test at the St. Gabriel Research Station in 2005.

Cross	Female	Male	Plant Weight	
			Kg/Plant	Pcnt'l
XL03-250	LCP81-010	HOCP91-552	6.43	98
XL03-238	LCP81-010	L02-320	6.08	97
XL03-251	L02-341	HOCP91-552	6.02	95
XL03-278	US01-039	LCP85-384	5.99	94
XL03-361	HOCP00-950	L99-226	5.87	92
XL03-276	HOCP01-523	LCP85-384	5.81	91
LCP85-384			5.80	89
XL03-193	HOCP01-525	LCP85-384	5.76	88
XL03-246	US01-039	LCP85-384	5.71	86
XL03-369	L02-233	L96-092	5.65	85
XL03-239	HOCP98-741	L02-320	5.63	83
XL03-123	HOCP01-561	03P12	5.56	82
XL03-121	HOCP00-933	03P12	5.55	80
XL03-379	N-27	03P22	5.55	79
HOCP91-555			5.46	77
XL03-003	HOCP95-951	03P1	5.36	76
XL03-332	HOCP85-845	L02-328	5.28	75
XL03-207	HOCP00-905	L94-432	5.22	73
XL03-200	HOCP00-930	HOCP91-552	5.21	72
XL03-295	HO01-564	L99-226	5.21	70
XL03-131	HOCP92-648	L99-233	5.19	69
XL03-299	L01-283	HOCP91-552	5.18	67
XL03-203	L02-341	HOCP91-552	5.10	66
XL03-151	HOCP00-950	HOCP01-506	5.01	64
XL03-163	HOCP01-525	HOCP01-506	5.00	63
XL03-226	US01-039	HO91-572	4.94	61
L97-128			4.88	60
XL03-343	HOCP92-624	L02-323	4.87	58
XL03-383	HOCP00-905	HOCP00-930	4.86	57
XL03-218	L02-328	L99-226	4.82	55
XL03-247	US99-002	LCP85-384	4.80	54
XL03-217	L02-320	L99-226	4.79	52
XL03-305	US02-096	HOCP01-553	4.78	51
XL03-352	CP77-407	L99-226	4.74	50
XL03-231	L97-128	03P15	4.71	48
XL03-195	L02-351	LCP85-384	4.54	47
XL03-199	L94-426	HOCP91-552	4.40	45
XL03-184	HOCP85-845	L98-209	4.39	44
XL03-237	HOCP92-624	L02-320	4.36	42
XL03-109	L94-428	L98-207	4.30	41
XL03-073	L94-426	LCP85-384	4.30	39
XL03-283	HOCP00-905	L91-281	4.25	38

Table 7. Continued

Cross	Female	Male	Plant Weight	
			Kg/Plant	Pcnt'l
XL03-091	HOCP00-905	HOCP97-609	4.18	36
XL03-192	HOCP01-523	LCP85-384	4.15	35
XL03-120	HOCP96-540	L99-226	4.06	33
XL03-360	L02-322	L99-226	4.03	32
XL03-260	L01-283	LCP85-384	3.97	30
XL03-089	US01-039	HOCP96-540	3.93	29
XL03-220	LCP02-337	L99-226	3.90	27
XL03-215	LCP02-337	HOCP96-540	3.81	26
XL03-201	HOCP00-950	HOCP91-552	3.77	25
XL03-407	HOCP00-942	L00-266	3.75	23
XL03-165	HOCP85-845	HOCP01-506	3.43	22
XL03-152	HOCP96-540	HOCP01-506	3.32	20
XL03-191	HO01-564	LCP85-384	3.28	19
XL03-374	HOCP01-523	HOCP97-606	3.28	17
XL03-291	LCP02-345	HOCP96-540	3.20	16
XL03-212	L02-319	HOCP96-540	3.07	14
XL03-213	L02-320	HOCP96-540	2.96	13
XL03-304	L98-207	HOCP01-553	2.91	11
XL03-253	L97-128	HOCP91-552	2.88	10
XL03-161	LCP02-337	03P14	2.86	8
XL03-082	HOCP92-618	HOCP96-561	2.83	7
XL03-382	L02-328	HO91-572	2.79	5
XL03-388	L99-233	L96-092	2.57	4
XL03-111	HOCP01-528	L98-207	1.76	2
XL03-202	L02-328	HOCP91-552	1.60	1

2005 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS

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Five years after the initial hybridization of parents, clones that have met or exceeded criteria for desired characteristics at previous selection stages are assigned permanent numbers by each of the Louisiana Sugarcane Variety Development Programs. The LSU program assigns variety designations of "L," and the USDA program assigns variety designations of "Ho" and "HoCP." These varieties are planted in replicated nursery and infield tests at locations across the southern Louisiana sugarcane-growing areas.

One objective of the nursery and infield stages is to identify and select varieties that will perform well across the range of environments a commercial variety will encounter in Louisiana. Nursery tests are initially planted at three on-station locations (USDA-ARS - Ardoyne Farm, Iberia Research Station, and St. Gabriel Research Station) during the year of assignment, and four to five additional and different off-station locations are planted the year after assignment. There are three off-station nurseries, Newton Cane, Inc. (Bunkie), D & N Farm (Cecelia), and Landry Farms (Paincourtville), along with the two infield trial locations at Blackberry Farms (Vacherie) and Sugarland Acres, Inc. (Youngsville). Both the LSU and USDA varieties were planted at each location with the exception of D & N Farm which only contains LSU varieties. The locations, soil types, dates of planting and dates of harvest are listed in Table 1.

The on-station nursery trials were planted in single row (6-foot centers), 16-foot-long plots with 4-foot alleys. The off-station nurseries were planted in single row, 20-foot plots with 4-foot alleys. The infield tests were planted in two-row, 25-foot plots with 5-foot alleys. The experimental design for both nursery and infield tests was a randomized complete block with two replications per location. Four commercial check varieties, LCP85-384, Ho95-988, HoCP96-540, and L97-128, were planted in all nursery and infield tests for comparison.

Millable stalk counts for both nursery and infield tests were made in late July and August. A combine harvester and weigh wagon system was used to cut and weigh plots, respectively, for the infield tests. During the harvest season, 10-stalk samples were harvested by hand and stripped of leaves for the nursery tests. For the two infield tests, a 10-stalk sample was taken to the USDA Ardoyne Farm and analyzed for fiber content using the pre-breaker press method. Samples were weighed and milled at the sucrose laboratory to obtain a juice sample for analysis. Brix and pol readings were used to estimate theoretical recoverable sugar per ton as estimated by the Winter-Carp formula as reported by Gravois and Milligan (1992). Cane yield for the nursery tests was estimated as the product of stalk weight and stalk number. Cane yield for the infield tests was determined from the plot weights and reduced 14 percent to account for extraneous trash. Sugar per acre was calculated as the product of sugar per ton and cane yield.

The 2005 sugarcane crop experienced less-than-ideal growing conditions. Late winter and spring were excessively wet, making early-season cultivation and herbicide application difficult. After a wet beginning, the industry as a whole experience a dry growing season. The planting season was fairly normal until the land fall of two major hurricanes interrupted planting. After receiving the heavy rains associated with the two hurricanes, the harvest was dry which contributed to excellent maturity. The crop was lodged, and cane tonnage was lower than due to the combined effects of sugarcane rust disease and lodging. All experimental locations were harvested before any freezing temperatures occurred. Recommended cultural practices were followed at all test locations.

LCP85-384 has been the leading variety in Louisiana since 1998. Approximately 89% of Louisiana's harvested sugarcane acreage was in LCP85-384 for 2005. For comparison, LC85-384 is highlighted in the tables. To adjust for missing data, the statistical analysis calculated least square means (SAS 9 Proc Mixed). Mean separation used least square means probability differences where P=0.05. Varieties that are significantly higher or lower than LCP85-384 are denoted by a plus (+) or minus (-), respectively, next to the value for each trait.

References:

Gravois, K.A. and S.B. Milligan. 1992. Genetic relationships between fiber and sugarcane yield components. Crop Sci. 32: 62-66.

Table 1. 2005 Location, soil texture, and planting and harvest dates for the nursery and infield tests.

					Harvest Date	Varieties	
Series	Location†	Stage	Soil Texture	Planting Date	2004	No. Planted	No. Harvested
1999	Blackberry Farms	Infield	Commerce silt loam	08/17/00	10/21/05	39	2
1999	Newton Cane, Inc.	Nursery	Moreland silt loam	08/24/00	09/21/05	39	2
2000	Blackberry Farms	Infield	Commerce silt loam	08/21/01	10/21/05	48	1
2000	Newton Cane, Inc.	Nursery	Moreland silt loam	08/24/01	09/21/05	48	1
2001	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/18/01	10/13/05	37	2
2001	Iberia Research Station	Nursery	Baldwin silty clay	10/22/01	10/13/05	37	2
2001	Blackberry Farms	Infield	Commerce silt loam	08/27/02	10/21/05	38	4
2001	Newton Cane, Inc.	Nursery	Moreland silt loam	08/21/02	09/21/05	38	4
2001	D & N Farm	Nursery	Baldwin silty clay	08/22/02	10/13/05	12	2
2001	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/09/02	12/15/05	38	4
2001	Landry Farms	Nursery	Commerce silt loam	08/29/02	10/24/05	38	4
2002	Blackberry Farms	Infield	Commerce silt loam	08/20/03	12/02/05	41	4
2002	Newton Cane, Inc.	Nursery	Moreland silt loam	08/15/03	11/04/05	41	4
2002	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/19/03	12/05/05	41	4
2002	Landry Farms	Nursery	Commerce silt loam	08/21/03	10/24/05	41	4
2003	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/16/03	12/09/05	35	3
2003	Iberia Research Station	Nursery	Baldwin silty clay	10/21/03	12/01/05	35	3
2003	St. Gabriel Research Station	Nursery	Sharkey clay	10/09/03	11/08/05	35	3
2003	Blackberry Farms	Infield	Commerce silt loam	08/17/04	12/02/05	40	8
2003	Newton Cane, Inc.	Nursery	Moreland silt loam	08/31/04	11/04/05	40	8
2003	D & N Farm	Nursery	Baldwin silty clay	08/26/04	11/10/05	14	3
2003	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/19/04	12/05/05	40	8
2003	Landry Farms	Nursery	Commerce silt loam	08/18/04	12/01/05	40	8
2004	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/19/04	12/08/05	37	14
2004	Iberia Research Station	Nursery	Baldwin silty clay	10/27/04	12/01/05	37	14
2004	St. Gabriel Research Station	Nursery	Sharkey clay	10/18/04	12/08/05	37	14
2004	Blackberry Farms	Infield	Commerce silt loam	08/12/05		50	
2004	Landry Farms	Nursery	Commerce silt loam	08/18/05		50	
2004	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/19/05		50	
2004	Newton Cane, Inc.	Nursery	Moreland silt loam	08/25/05		50	
2005	St. Gabriel Research Station	Nursery	Sharkey clay	10/25/05		35	
2005	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/26/05		35	
2005	Iberia Research Station	Nursery	Baldwin silty clay	10/28/05		35	

† Ardoyne-U.S.D.A. Ardoyne Farm (Chacahoula), Blackberry Farms (Vacherie), Iberia Research Station (Jeanerette), Newton Cane, Inc. (Bunkie), St. Gabriel Research Station (St. Gabriel), D & N Farm (Cecelia), Sugarland Acres Inc. (Youngsville), Landry Farms (Paincourtville).

Table 2. Infield fourth-stubble means of the 1999 "HoCP" and "L" assignment series on a Commerce silt loam soil at Blackberry Farms in Vacherie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
CP70-321	1732 -	7.1 -	247	1.32	10708	12.4
LCP85-384	5357	20.3	264	1.23	34012	12.6
HoCP85-845	5009	19.7	254	1.32	30043	13.5
L99-226	6514	22.8	287 +	1.75	26080	12.5
L99-233	8040 +	31.8 +	253	1.21	55699	14.9 +

Table 3. Nursery fourth-stubble means of the 1999 "HoCP" and "L" assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	6320 -	36.7	171	1.48	49550 -
LCP85-384	10358	59.9	173	1.46	82038
HoCP85-845	5955 -	29.8 -	199 +	1.43	41564 -
L99-226	10700	56.4	190	2.28 +	49550 -
L99-233	9220	57.1	162	1.42	80768

Table 4. Nursery third-stubble means of the 2000 "HoCP" and "L" assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	5892	36.6	162	1.35	54269
HoCP85-845	5427	27.8 -	195	1.36	41019 -
HoCP91-555	5217	31.1	168	1.11 -	56447
HoCP00-950	7552 +	37.6	201	1.30	58080

Table 5. Infield third-stubble means of the 2000 "HoCP" and "L" assignment series on a Commerce silt loam soil at Blackberry Farms in Vacherie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	5271	19.8	264	1.22	32035	11.6
HoCP85-845	6200	24.7	250	1.52	32444	12.2
HoCP91-555	6060	23.2	261	1.40	33261	13.2
HoCP00-950	7534	27.3	275	1.48	36873	11.2

Table 6. Nursery second-stubble means of the 2001 "HoCP" and "L" assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	6393	37.0	172	1.39	53543
HoCP85-845	8019	38.8	207	1.62	48098
HoCP91-555	5779	32.1	180	1.39	46827
L01-283	10628 +	51.1 +	207	1.67	61347
L01-299	11205 +	54.3 +	207	1.62	67155 +
HoCP01-523	11115 +	51.6 +	216	1.60	64433
HoCP01-564	6891	33.8	204	1.56	43560

Table 7. Nursery second-stubble means of the 2001 "L" assignment series on a Baldwin silty clay soil at D& N Farm in Cecilia, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7334	33.3	221	1.30	51546
HoCP85-845	5519	26.6	209	1.39	38297 -
HoCP91-555	5592	27.2	205	1.27	42834 -
L01-283	9452	42.2 +	225	1.84 +	45920 -
L01-299	8412	39.5	213	1.59 +	49913

Table 8. Infield second-stubble means of the 2001 "HoCP" and "L" assignment series on a Commerce silt loam soil at Blackberry Farms in Vacherie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	5271	24.8	211	1.23	40397	12.2
HoCP85-845	7424 +	31.8 +	234	1.90 +	33571	14.3
HoCP91-555	8319 +	34.7 +	241	1.51 +	46084	11.9
L01-283	9674 +	41.6 +	233	1.79 +	46588	11.5
L01-299	9422 +	44.4 +	212	1.49 +	59831	11.8
HoCP01-523	8966 +	39.0 +	230	1.74 +	45361	12.6
HoCP01-564	8982 +	36.9 +	243	1.58 +	46913	11.9

Table 9. Nursery second-stubble means of the 2001 “HoCP” and “L” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	12092	51.1	236	1.59	64070
HoCP85-845	10287	44.8	230	2.27	39930 -
HoCP91-555	17346	63.7	273	1.99	63888
L01-283	14494	56.9	255	1.67	68244
L01-299	14747	59.5	248	1.86	64433
HoCP01-523	10955	42.5	257	1.87	47009 -
HoCP01-564	12258	43.8	280	1.64	53543

Table 10. Infield second-stubble means of the 2001 “HoCP” and “L” assignment series on a Coteau silt loam soil at Sugarland Acres, Inc. in Youngsville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	6934	25.1	277	1.31	42462	11.3
HoCP85-845	7457	29.4	254 -	1.65	35637	13.1 +
HoCP91-555	6796	25.0	273	1.43	35751	11.5
L01-283	8248	30.4	271	1.52	40452	10.9
L01-299	11050 +	41.1 +	269	1.77	47645	11.2
HoCP01-523	8801 +	33.2 +	265	1.60	42214	11.6
HoCP01-564	9138 +	31.4 +	291	1.84	35305	10.6

Table 11. Nursery third-stubble means of the 2001 “L” assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	9056	40.8	222	1.34	61256
HoCP85-845	8069	34.1	238	1.69	41518 -
HoCP91-555	10747	43.2	249	1.49	58307
L01-283	15136	61.5	246	1.71	72146
L01-299	12316	52.2	235	1.64	63979

Table 12. Nursery third-stubble means of the 2001 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	5490	26.1	210	1.18	44014
HoCP85-845	1513	8.7	191	1.19	34031
HoCP91-555	5540	26.2	211	1.10	48098
L01-283	6599	31.6	209	1.31	46056
L01-299	4216	22.5	190	1.02	49913

Table 13. Nursery first-stubble means of the 2002 "HoCP" and "L" assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7468	31.3	238	1.42	44286
HoCP91-555	10802	43.6	249	1.60	54269 +
HoCP96-540	12489 +	47.6 +	264 +	2.03 +	46646
HoCP02-610	14071 +	58.4 +	241	1.97 +	59532 +
HoCP02-618	11464 +	42.7	269 +	1.50	56991 +
HoCP02-620	9638	39.2	246	1.58	49731
HoCP02-623	8375	30.3	277 +	1.37	44468

Table 14. Infield first-stubble means of the 2002 "HoCP" and "L" assignment series on a Commerce silt loam soil at Blackberry Farms in Vacherie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	8010	29.1	276	1.47	39775	11.8
HoCP91-555	8577	31.0	278	1.64	37730	12.9
HoCP96-540	9969	36.7	272	1.90 +	38679	11.4
HoCP02-610	9141	36.6	250	2.17 +	33752	13.6
HoCP02-618	8205	31.0	265	1.38	45139	12.1
HoCP02-620	7967	31.1	257	1.36	46820	12.8
HoCP02-623	9232	36.1	256	1.47	49121	13.9

Table 15. Nursery first-stubble means of the 2002 "HoCP" and "L" assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	9008	37.2	244	1.27	59169
HoCP91-555	11800	48.8	243	1.61	60803
HoCP96-540	13023	50.0	260	1.77 +	56991
HoCP02-610	12982	55.9	233	1.89 +	58988
HoCP02-618	11565	44.1	263	1.45	60984
HoCP02-620	11402	44.3	257	1.35	65522
HoCP02-623	13601	52.4	260	1.60	65703

Table 16. Infield first-stubble means of the 2002 "HoCP" and "L" assignment series on a Coteau silt loam soil at Sugarland Acres, Inc. in Youngsville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	7078	26.0	273	1.49	36733	11.3
HoCP91-555	8574	30.1	285	1.82	34218	11.9
HoCP96-540	9002	32.8	275	2.13	30755	11.5
HoCP02-610	8811	35.2	251 -	2.07	34281	13.3
HoCP02-618	7391	27.1	273	1.47	37251	11.7
HoCP02-620	7135	27.6	259 -	1.42	39334	12.3
HoCP02-623	7020	26.6	264	1.62	33289	13.0

Table 17. Nursery plantcane means of the 2003 "HoCP" and "L" assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7411	30.8	241	1.93	32126
HoCP91-555	9981	41.5	241	1.93	43016 +
HoCP95-988	8686	34.7	251	1.77	38841
HoCP96-540	12205 +	49.2 +	248	2.28 +	43016 +
L97-128	9734	41.5	236	2.20	37389
L03-371	11197 +	43.0 +	261	2.39 +	36119
L03-378	6874	27.9	247	1.75	31944
L03-396	7658	31.2	244	1.84	33941
HoCP03-704	8285	36.3	229	1.50 -	48279 +
HoCP03-708	9490	36.4	261	1.78	41201
HoCP03-716	11443 +	49.6 +	231	2.08	47735 +
HoCP03-743	6158	23.3	266	1.77	26318
HoCP03-757	7935	31.5	252	1.82	34666

Table 18. Nursery plantcane means of the 2003 "L" assignment series on a Baldwin silty clay soil at D & N Farm in Cecilia, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	8119	31.8	256	1.46	43016
HoCP91-555	8596	29.3	294 +	1.38	42471
HoCP95-988	7768	28.0	277 +	1.46	38297
HoCP96-540	10266	35.8	287 +	1.95	37208
L97-128	9865	36.8	270	1.85	39567
L03-371	8353	29.3	289 +	1.51	38841
L03-378	7390	26.2	282 +	1.46	36119
L03-396	7778	27.0	289 +	1.59	34122

Table 19. Infield plantcane means of the 2003 "HoCP" and "L" assignment series on a Commerce silt loam soil at Blackberry Farms in Vacherie, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	6980	24.8	281	1.48	33567	12.3
HoCP91-555	9108 +	33.8 +	270	1.70	39745	13.0
HoCP95-988	9895 +	35.8 +	277	2.33	31036	12.7
HoCP96-540	10819 +	38.6 +	281	2.14	37519	12.1
L97-128	8663	32.1 +	270	2.34	28609	13.0
L03-371	9856 +	34.6 +	284	1.98	35645	10.6 -
L03-378	7528	28.4	265	1.97	29279	13.3
L03-396	6539	24.1	272	1.76	27457	13.2
HoCP03-704	7506	30.1	250 -	1.99	30301	13.6 +
HoCP03-708	9256 +	35.0 +	264	1.84	38192	14.2 +
HoCP03-716	9350 +	36.8 +	254 -	1.83	40143	12.7
HoCP03-743	7716	27.2	283	2.26	24014	11.8
HoCP03-757	7445	26.8	278	1.74	31514	11.4

Table 20. Nursery plantcane means of the 2003 "HoCP" and "L" assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	11610	43.3	268	1.64	52998
HoCP91-555	14867	53.2	279	2.04 +	51183
HoCP95-988	14756	54.7	271	1.99	54995
HoCP96-540	19399	69.1	281	2.42 +	57354
L97-128	15876	58.6	271	2.50 +	46827
L03-371	12391	44.6	280	2.17 +	40837
L03-378	14155	53.0	267	2.27 +	46645
L03-396	12876	47.8	270	1.89	50639
HoCP03-704	12191	44.3	275	1.93	46101
HoCP03-708	13786	50.5	273	1.77	56991
HoCP03-716	16430	56.5	291	2.53 +	44649
HoCP03-743	14975	53.2	282	2.17 +	49005
HoCP03-757	13188	47.4	278	1.92	49912

Table 21. Infield plantcane means of the 2003 "HoCP" and "L" assignment series on a Coteau silt loam soil at Sugarland Acres, Inc. in Youngsville, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	5733	20.4	282	1.60	25574	11.4
HoCP91-555	9409	34.1	274	1.70	40401	11.7
HoCP95-988	8852	32.4	274	1.73	37393	11.4
HoCP96-540	8407	29.4	286	2.14 +	27465	11.5
L97-128	6495	26.0	250	2.16 +	23703	13.0
L03-371	9154	31.2	292	2.20 +	28551	11.0
L03-378	5871	22.7	262	1.84	24304	11.3
L03-396	6606	23.7	280	1.91 +	25115	12.0
HoCP03-704	8484	33.9	254	2.16 +	31339	11.6
HoCP03-708	7574	28.5	267	1.80	31700	14.0 +
HoCP03-716	9665	38.9	249	2.28 +	34167	12.7
HoCP03-743	6716	24.3	277	2.01 +	24196	11.5
HoCP03-757	5565	19.8	281	2.01 +	19703	9.2 -

Table 22. Nursery first-stubble means of the 2003 "L" assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	14851	51.0	291	1.87	54677
HoCP91-555	12334	41.2	300	1.72	48324
HoCP96-540	14334	49.0	293	2.39 +	41064
L03-371	14780	51.6	286	2.38 +	43560
L03-378	15108	53.0	285	2.06	51501
L03-396	10768	38.1	284	1.75	43333

Table 23. Nursery first-stubble means of the 2003 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	14550	56.3	261	1.79	62391
HoCP91-555	10000 -	38.4 -	260	1.51	51047
HoCP96-540	17172	62.1	276	2.22 +	56265
L03-371	12562	44.6	282	1.78	50139
L03-378	12221	44.5	275	1.62	55131
L03-396	9395 -	33.0 -	284	1.50	44921

Table 24. Nursery first-stubble means of the 2003 "L" assignment series on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	11582	45.5	256	1.78	51274
HoCP91-555	13533	48.6	279	1.90	51274
HoCP96-540	11687	41.4	282	1.99	41745
L03-371	14546	51.4	283	2.09	49232
L03-378	7880	28.9	274	1.62	34712
L03-396	8741	33.5	261	1.68	39930

Table 25. Nursery plantcane means of the 2004 "L" assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	11767	38.6	305	1.50	51501	11.8
HoCP95-988	12630	41.7	305	2.11 +	39930 -	11.3
HoCP96-540	15591 +	53.5 +	293	2.69 +	39703 -	11.8
L97-128	14659	53.0 +	277 -	2.64 +	40157 -	12.9
L04-400	11718	42.6	276 -	2.25 +	37888 -	12.3
L04-403	12363	50.7	244 -	1.90	53543	11.7
L04-404	13619	49.1	278 -	2.75 +	35619 -	13.2 +
L04-407	13467	49.6	272 -	2.46 +	40384 -	13.8 +
L04-408	11085	36.6	305	1.93	37661 -	10.7
L04-409	9209	31.6	292	1.37	46056	12.9
L04-410	13636	44.1	310	2.12 +	41518 -	12.5
L04-417	9820	35.8	274 -	1.88	38115 -	17.8 +
L04-423	10462	36.5	287	1.83	39930 -	12.6
L04-425	14034	48.2	290	2.25 +	43333 -	9.6 -
L04-429	11153	40.7	275 -	1.97	41291 -	11.8
L04-430	10749	36.8	294	1.62	45375	13.0
L04-431	11571	40.6	285	2.02	40157 -	11.5
L04-434	11403	39.7	288	2.28 +	34939 -	11.2

Table 26. Nursery plantcane means of the 2004 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	10327	38.8	266	1.90	40838
HoCP95-988	10029	36.5	276	2.14	34031
HoCP96-540	11178	41.2	271	2.15	38115
L97-128	13273	55.7	240 -	2.24	49686
L04-400	7873	34.8	226 -	2.00	34712
L04-403	10564	48.0	221 -	1.98	48551
L04-404	8523	32.0	266	2.03	31763
L04-407	6665	27.3	244 -	1.62	34712
L04-408	7974	28.4	281	1.70	34031
L04-409	8041	30.0	266	1.23	48324
L04-410	12502	46.0	271	1.96	46963
L04-417	10280	38.4	268	1.97	39023
L04-423	12216	47.4	258	2.11	44468
L04-425	12693	50.6	251	2.70	38569
L04-429	9916	37.9	263	1.91	39249
L04-430	9133	34.6	263	1.62	43106
L04-431	12832	50.8	253	2.03	51047
L04-434	7937	31.7	251	2.30	27679

Table 27. Nursery plantcane means of the 2004 "L" assignment series on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, Louisiana in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	10803	36.5	294	1.70	42879	11.3
HoCP95-988	9284	33.7	275	2.14	31536	11.6
HoCP96-540	12344	42.5	291	2.39 +	35619	11.7
L97-128	11887	43.0	277	1.95	44014	12.6
L04-400	9207	35.6	264 -	1.70	40611	11.5
L04-403	14455	55.7 +	260 -	2.40 +	46509	13.5 +
L04-404	10806	37.5	288	2.00	37661	11.6
L04-407	10145	36.4	279	1.80	40838	13.2 +
L04-408	9993	32.3	310	1.55	41518	10.4
L04-409	7151	24.1	297	1.19	40611	12.4
L04-410	10665	36.2	296	1.73	41745	11.8
L04-417	8316	28.5	292	1.47	39023	14.6 +
L04-423	9544	34.0	283	2.22	30401	12.3
L04-425	13017	43.7	297	2.10	41972	10.1
L04-429	8921	29.0	310	1.79	32443	11.5
L04-430	10378	35.6	292	1.71	41518	12.8
L04-431	9430	32.3	292	1.80	36754	11.7
L04-434	10633	35.5	300	2.16	32897	10.9

Table 28. Infield and nursery fourth-stubble means of the 1999 "HoCP" and "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
CP70-321	4026	21.9	209	1.40	30129	12.4
LCP85-384	7858	40.1	218	1.35	58025	12.6
HoCP85-845	5482	24.8	226	1.37	35803	13.5
L99-226	8607	39.6	238	2.01 +	37815	12.5
L99-233	8630	44.5	207	1.31	68233	14.9

Table 29. Infield and nursery third-stubble means of the 2000 "HoCP" and "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	5581	28.2	213	1.29	43152	11.6
HoCP85-845	5813	26.3	222	1.44	36731	12.2
HoCP91-555	5639	27.2	214	1.25	44854	13.2
HoCP00-950	7543	32.4	238	1.39	47477	11.2

Table 30. Nursery third-stubble means of the 2001 "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7273	33.5	216	1.26	52635
HoCP85-845	5214	23.3	219	1.49	37775
HoCP91-555	8143	34.7	230	1.29	53202
L01-283	10964	46.9	226	1.49	59101
L01-299	8918	40.0	216	1.39	56946

Table 31. Infield and nursery second-stubble means of the 2001 "HoCP" and "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	7605	34.3	223	1.36	50403	11.7
HoCP85-845	7741	34.3	226	1.76 +	39106 -	13.7 +
HoCP91-555	8766	36.6	234	1.52	47077	11.7
L01-283	10499 +	44.5 +	238	1.70 +	52510	11.2
L01-299	10967 +	47.8 +	230	1.66 +	57795	11.5
HoCP01-523	9542	40.3	238	1.68 +	48949	12.1
HoCP01-564	8900	35.2	251	1.63 +	44025	11.3

Table 32. Infield and nursery first-stubble means of the 2002 "HoCP" and "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	7891	30.9	258	1.41	44991	11.5
HoCP91-555	9938 +	38.4 +	263	1.67 +	46755	12.4
HoCP96-540	11121 +	41.8 +	267	1.96 +	43268	11.4
HoCP02-610	11251 +	46.5 +	244	2.02 +	46638	13.4 +
HoCP02-618	9656 +	36.2	267	1.45	50091	11.9
HoCP02-620	9036	35.5	255	1.43	50352	12.5
HoCP02-623	9557 +	36.3	264	1.51	48145	13.4 +

Table 33. Nursery first-stubble means of the 2003 "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	13661	50.9	269	1.81	56114
HoCP91-555	11956	42.7	279	1.71	50215
HoCP96-540	14398	50.9	284	2.20 +	46358
L03-371	13963	49.2	284	2.08	47644
L03-378	11737	42.1	278	1.76	47114
L03-396	9635	34.9	276	1.64	42728

Table 34. Infield and nursery plantcane means of the 2003 "HoCP" and "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	7970	30.2	265	1.62	37456	11.9
HoCP91-555	10392 +	38.4 +	271	1.75	43363 +	12.3
HoCP95-988	9992 +	37.1 +	270	1.86 +	40112	12.0
HoCP96-540	12219 +	44.4 +	276	2.19 +	40512	11.8
L97-128	10127 +	39.0 +	259	2.21 +	35219	13.0
L03-371	10190 +	36.5 +	281 +	2.05 +	35999	10.8
L03-378	8363	31.6	264	1.86 +	33658	12.3
L03-396	8292	30.8	271	1.79	34255	12.6
HoCP03-704	8828	34.8	254	1.82	39278	12.6
HoCP03-708	9738 +	36.3 +	268	1.72	42294	14.1 +
HoCP03-716	11434 +	44.1 +	258	2.11 +	41947	12.7
HoCP03-743	8603	30.7	279 +	1.98 +	31156 -	11.6
HoCP03-757	8245	30.1	274	1.79	34222	10.3 -

Table 35. Nursery plantcane means of the 2004 "L" assignment series across locations in 2005.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
LCP85-384	10966	38.0	288	1.70	45073	11.5
HoCP95-988	10648	37.3	285	2.13 +	35166 -	11.5
HoCP96-540	13037	45.7	285	2.41 +	37813 -	11.8
L97-128	13273 +	50.5 +	264 -	2.28 +	44619	12.8
L04-400	9600	37.7	255 -	1.98	37737 -	11.9
L04-403	12460	51.5 +	242 -	2.09 +	49534	12.6
L04-404	10983	39.6	277	2.26 +	35014 -	12.4
L04-407	10092	37.8	265 -	1.96	38644	13.5 +
L04-408	9684	32.4	299	1.73	37737 -	10.5
L04-409	8134 -	28.6 -	285	1.26 -	44997	12.6
L04-410	12268	42.1	292	1.94	43409	12.1
L04-417	9472	34.3	278	1.77	38720	16.2 +
L04-423	10741	39.3	276	2.05	38266 -	12.5
L04-425	13248 +	47.5 +	279	2.35 +	41291	9.8 -
L04-429	9997	35.9	282	1.89	37661 -	11.7
L04-430	10087	35.7	283	1.65	43333	12.9
L04-431	11278	41.2	277	1.95	42653	11.6
L04-434	9991	35.6	279	2.25 +	31838 -	11.1

2005 LOUISIANA "HoCP" NURSERY AND INFIELD VARIETY TRIALS

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Three years after selection from single stools in the seedling stages, experimental varieties that are advanced for further testing are assigned permanent "HoCP" or "Ho" numbers. It is at this stage when these newly assigned varieties are routinely planted to replicated tests for the first time. These tests are planted at three locations (Ardoyne Farm in Chacahoula, Iberia Research Station in Jeanerette, and St. Gabriel Research Station in St. Gabriel). The year after assignment, varieties advanced for further testing are planted in two nursery trials and two infield tests. These trials are conducted on commercial farms representing various regions of the sugarcane belt. Two years after assignment, active varieties are also planted in an infield test on heavy soil at Ardoyne Farm.

USDA nursery test plots that are planted during the year of assignment consist of two replications with sixteen-foot, single row plots. There is a four-foot alleyway between plots. A minimum of three commercial varieties (LCP 85-384, HoCP 85-845, HoCP 91-555, CP 96-540, Ho 95-988, or L 97-128) are planted in each test for comparison purposes. Beginning in 2003, varieties from the USDA Recurrent Selection for Borers (RSB) program were included in nursery trials. Including RSB selections will give breeders more agronomic data on these varieties and aid in deciding what crosses should be made with these borer-resistant clones.

Nursery test plots are generally rated for agronomic traits in the spring and summer each year. Stalk counts representing mature millable stalks are made in July or August. A 10-stalk sample is hand-cut from each plot during the harvest season. Samples from USDA nurseries are taken to the Juice and Milling Quality Laboratory at Ardoyne Farm, where they are weighed and processed for sucrose analysis. Brix and pol are then used to estimate the yield of theoretical recoverable sugar (TRS) per ton of cane. Results from these analyses, combined with mature millable stalk counts and mean stalk weight, are used to calculate yield of sugar per acre, yield of cane per acre, and number of stalks per acre. Varieties with acceptable yields (both tonnage and sugar per ton) and disease and insect resistance are advanced for further testing.

An infield variety test is routinely replanted at Ardoyne Farm two years after assignment. Varieties in this test are introduced to outfield locations and primary stations in the same year. Because of weather-related circumstances out of our control, these infield tests were not planted in 2002 and 2003. Fortunately, tests were planted in 2004 (2002 HoCP & L series) and 2005 (2003 HoCP & L series). Infield tests are planted in a randomized complete block design with two replications, and include a minimum of four commercial varieties (LCP 85-384, Ho 95-988, HoCP 96-540, L 97-128, and/or HoCP 91-555) for use as checks. Plot size in infield tests are two rows wide (twelve feet) by twenty-four feet long. A 10-stalk sample is hand-cut from each plot just prior to harvesting and sent to the sucrose lab at Ardoyne Farm for processing for sucrose and fiber analysis. Plots are weighed with a tractor-pulled weigh wagon equipped with electronic load cells mounted in the axles and hitch. Plot weights and sucrose analysis are used to estimate sugar per acre, tons of cane per acre, sugar per ton of cane, mean stalk weight, and number of stalks per acre. An estimate of fiber percentage is also obtained.

Planting and harvest dates of USDA infield and nursery tests can be found in Table 1. Results from the plantcane of the 2002 HoCP series infield test can be found in Table 4. Results from individual nursery tests as well as analyses combined by series over locations can be found in Tables 2 and 3 and Tables 5 to 12. Statistical analyses were conducted for each test and for each series using PROC MIXED procedures in SAS (version 9.1). For purposes of comparison, LCP 85-384 is highlighted in each table. Yield estimates which are significantly higher or lower (P=0.05) than estimates for LCP 85-384 are noted with a "+" or "-" respectively.

Table 1. 2005 Planting and harvest dates of "HoCP" nursery & infield tests.

					Harvest Dates		
Series	Location[2/]	Soil Texture [3/]	Test type	Planting Date	2003	2004	2005
2001	IRS	Bsc	Nursery	10/23/01	11/12	10/27	10/28
2002	AFL	Csl	Nursery	11/8/02	11/24	11/05	10/17
2002	AFH	Sc	Infield	8/24/04			11/16
2003	AFL	Csl	Nursery	10/20/03		12/06	11/10
2003	IRS	Bsc	Nursery	10/21/03		11/19	11/18
2003	STG	Sc	Nursery	10/17/03		12/13	11/17
2003	AFH	Sc	Infield	9/14/05			
2004	AFL	Csl	Nursery	10/20/04			11/22
2004	IRS	Bsc	Nursery	10/27/04			11/28
2004	STG	Sc	Nursery	10/21/04			12/01
2005	AFL	Csl	Nursery	10/26/05			
2005	IRS	Bsc	Nursery	10/28/05			
2005	STG	Sc	Nursery	10/27/05			

[2/] AFH = Ardoyne Farm heavy soil, AFL = Ardoyne Farm Light soil in Chacahoula, IRS = Iberia Research Station in Jeanerette, STG = St. Gabriel Research Station in St. Gabriel.
[3/] Bsc = Baldwin silty clay, Csl = Commerce silt loam, Sc = Sharkey clay

Table 2. Nursery third-stubble means of the 2001 "HoCP" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	9707	41.1	228	1.57	51501
HoCP 85-845	4825	19.9	243	1.14	35393
HoCP 91-555	11094	42.3	263	1.29	65794
HoCP 01-523	11137	39.7	279	1.31	60349
HoCP 01-564	11057	42.2	262	1.32	64206

Table 3. Nursery second-stubble means of the 2002 "HoCP" assignment series on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	9536	37.3	256	1.28	58307
HoCP 85-845	8881	33.6	265	1.65	41745 -
HoCP 91-555	13853	50.3	276	1.60	62844
HoCP 02-610	11754	47.8	247	1.65	57626
HoCP 02-618	9989	38.3	261	1.18	64659
HoCP 02-620	12247	51.3	241	1.61	64433
HoCP 02-623	12038	43.7	274	1.45	60122

Table 4. Infield plantcane means of the 2002 "HoCP" assignment series on a Sharkey clay soil at Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
LCP 85-384	7694	28.3	271	1.67	34307	11.6
LCP 91-555	8157	28.5	287	1.78	32200	12.0
Ho 95-988	9624 +	34.4 +	280	1.98	35455	11.8
HoCP 96-540	9246	34.3 +	270	2.09	32905	11.3
L 97-128	7066	27.0	262	1.73	31382	12.1
HoCP 02-610	9608 +	36.6 +	263	2.06	35627	13.0
HoCP 02-618	6589	25.3	261	1.35	37669	12.2
HoCP 02-620	6184	24.9	248 -	1.39	35916	11.9
HoCP 02-623	8475	31.0	274	1.49	41732	13.2

Table 5. Nursery first-stubble means of the 2003 "HoCP" assignment series on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10914	39.4	277	1.57	50139
HoCP 91-555	16895 +	57.7 +	293	1.94 +	59441 +
HoCP 96-540	11449	43.9	261	2.19 +	40157 -
HoCP 03-704	11344	42.2	269	1.57	54450
HoCP 03-708	13375	46.8	287	1.66	56265
HoCP 03-716	12872	49.4 +	261	1.99 +	49686
HoCP 03-743	10217	34.5	296	1.75	39476 -
HoCP 03-757	9229	35.3	262	1.52	46509
US 90-18	7366-	26.1 -	283	1.61	32443 -
US 01-40	9302	46.1	202 -	2.20 +	41972 -
US 02-98	7292 -	31.0 -	234 -	1.73	35846 -

Table 6. Nursery first-stubble means of the 2003 "HoCP" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	13520	47.9	284	1.75	54677
HoCP 91-555	13818	49.9	277	1.58	63071
HoCP 96-540	14494	55.3	263	2.13	51954
HoCP 03-704	11851	47.0	253 -	1.66	57853
HoCP 03-708	13502	45.7	297	1.74	52408
HoCP 03-716	12366	47.1	263	1.86	51954
HoCP 03-743	13603	47.1	292	1.84	51047
HoCP 03-757	8815 -	33.6 -	263	1.25 -	54450
US 90-18	7944 -	28.6 -	279	1.44	39476
US 01-40	12285	56.1	221 -	2.09	53543
US 02-98	6714 -	26.5 -	253 -	1.49	35619

Table 7. Nursery first-stubble means of the 2003 "HoCP" assignment series on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	15568	55.3	281	1.77	63298
HoCP 91-555	14420	48.3	299	1.83	52862
HoCP 96-540	15735	56.1	282	2.27 +	49232
HoCP 03-704	15244	57.5	265	1.93	59668
HoCP 03-708	13952	46.6	300	1.72	54223
HoCP 03-716	12176	47.4	257 -	2.00	47417
HoCP 03-743	17188	56.3	306 +	2.18 +	51728
HoCP 03-757	10756 -	38.4	283	1.41 -	53316
US 90-18	11396 -	42	272	1.61	52181
US 01-40	11719	50.5	232 -	2.20 +	46056
US 02-98	9266 -	35.8	259 -	1.98	36300

Table 8. Nursery first-stubble means of the 2003 "HoCP" assignment series across locations in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	13334	47.5	281	1.70	56038
HoCP 91-555	15044	51.9	290	1.78	58458
HoCP 96-540	13893	51.8	269	2.19 +	47114 -
HoCP 03-704	12813	48.9	262 -	1.72	57324
HoCP 03-708	13610	46.4	294	1.71	54299
HoCP 03-716	12472	48.0	260 -	1.95 +	49686
HoCP 03-743	13669	46.0	298 +	1.92 +	47417 -
HoCP 03-757	9600 -	35.8 -	269	1.39 -	51425
US 90-18	8902 -	32.2 -	278	1.55	41367 -
US 01-40	11102	50.9	218 -	2.16 +	47190 -
US 02-98	7757 -	31.1 -	249 -	1.73	35922 -

Table 9. Nursery plantcane means of the 2004 "HoCP" assignment series on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10186	37.4	272	1.90	39249
HoCP 91-555	13643 +	47.9	285	2.19	43787
Ho 95-988	14770 +	54.7 +	272	2.46 +	44241
HoCP 96-540	11164	41.8	267	2.47 +	34031
L 97-128	12697	49.1 +	259	2.69 +	36527
HoCP 04-801	14954 +	60.2 +	250 -	2.68 +	45148
HoCP 04-802	13780 +	49.5 +	278	2.44 +	40838
HoCP 04-803	12310	47.4	260	2.49 +	38115
HoCP 04-805	12131	44.7	271	2.05	43560
HoCP 04-807	14631 +	56.4 +	260	2.90 +	39023
HoCP 04-809	12884	44.3	289	1.97	45148
HoCP 04-810	12274	46.3	265	2.09	44468
HoCP 04-812	12476	49.8 +	250 -	2.34 +	42653
HoCP 04-813	11430	42.9	266	1.93	44694
HoCP 04-814	17486 +	67.1 +	261	3.16 +	42653
HoCP 04-816	13314	54.5 +	243 -	2.32 +	47417 +
HoCP 04-819	13346	54.4 +	244 -	2.65 +	41064
HoCP 04-820	14996 +	58.6 +	256	2.87 +	40838
HoCP 04-821	13492 +	47.4	284	2.19	43333
HoCP 04-823	12198	45.1	270	2.29	39476
HoCP 04-824	12561	44.7	282	2.01	44241
HoCP 04-825	10924	44.4	246 -	2.00	44468
HoCP 04-827	14227 +	49.3 +	289	2.43 +	40611
HoCP 04-828	11927	51.7 +	230 -	2.25	45602
HoCP 04-829	11662	44.4	263	2.38 +	37661
HoCP 04-832	14496 +	53.7 +	270	2.19	49005 +
HoCP 04-833	11111	42.4	262	1.95	43787
HoCP 04-836	13046	48.5	269	2.10	46283
HoCP 04-837	12157	41.0	296 +	2.12	38796
HoCP 04-838	15308 +	53.2 +	287	2.23	47871 +
HoCP 04-839	11751	45.2	260	1.96	45829
HoCP 04-843	9252	36.4	255	2.06	35393
HoCP 04-844	9203	38.7	239 -	2.08	37208
HoCP 04-847	15852 +	58.0 +	273	2.86 +	40611
HoCP 04-848	13016	50.5 +	258	2.15	47871 +
HoCP 04-849	11114	39.4	282	2.01	39249
HoCP 04-852	12399	60.3 +	206 -	3.28 +	36754
HoCP 04-853	15544 +	55.9 +	278	2.11	53089 +
HoCP 04-854	15482 +	57.4 +	268	2.70 +	42426
HoCP 04-855	13671 +	51.0 +	268	2.46 +	41518
HoCP 04-856	11180	40.2	278	1.72	46736

Table 10. Nursery plantcane means of the 2004 “HoCP” assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10997	37.5	294	1.79	41972
HoCP 91-555	13230	47.4	278	1.82	52181
Ho 95-988	12902	45.3	286	2.02 +	44694
HoCP 96-540	8497	30.6	278	2.09 +	29948
L 97-128	9363	35.2	263 -	1.87 +	37661
HoCP 04-801	12544	49.1	253 -	2.38 +	40611
HoCP 04-802	9946	39.6	251 -	2.17 +	36527
HoCP 04-803	11948	44.3	270	2.29 +	38796
HoCP 04-805	13161	53.3	247 -	2.34 +	45602
HoCP 04-807	18129 +	68.2 +	266 -	3.02 +	44468
HoCP 04-809	9529	32.6	292	1.70	38342
HoCP 04-810	13677	47.7	286	2.31+	41291
HoCP 04-812	9782	39.0	249 -	1.99 +	39023
HoCP 04-813	10750	38.8	276	1.93 +	40157
HoCP 04-814	17007 +	61.6 +	276	2.89 +	42653
HoCP 04-816	10656	41.3	257 -	2.21 +	37661
HoCP 04-819	10573	40.3	263 -	2.24 +	35846
HoCP 04-820	15067	58.9 +	253 -	2.49 +	47190
HoCP 04-821	9778	33.5	293	1.93 +	34939
HoCP 04-823	14918	51.7	288	2.26 +	45829
HoCP 04-824	12942	49.0	263 -	2.17 +	44694
HoCP 04-825	8735	34.9	251 -	1.84	37888
HoCP 04-827	14691	52.0	282	2.41 +	43333
HoCP 04-828	8427	33.5	252 -	2.20 +	30401
HoCP 04-829	13856	51.5	269 -	2.34 +	44014
HoCP 04-832	11002	43.8	251 -	1.97 +	44694
HoCP 04-833	12103	45.9	264 -	1.92 +	47871
HoCP 04-836	14533	52.0	280	1.94 +	53769
HoCP 04-837	13838	49.4	281	2.22 +	44468
HoCP 04-838	11019	39.1	282	1.72	45602
HoCP 04-839	8399	33.2	253 -	1.79	37208
HoCP 04-843	16048	57.6 +	278	2.59 +	44694
HoCP 04-844	9482	38.7	248 -	1.85 +	41745
HoCP 04-847	15272	57.4 +	264 -	2.73 +	41972
HoCP 04-848	10941	47.3	229 -	2.20 +	43106
HoCP 04-849	9521	33.6	283	1.66	40611
HoCP 04-852	14151	69.2 +	204 -	3.40 +	40611
HoCP 04-853	12769	45.9	278	1.70	53996
HoCP 04-854	10828	43.7	248 -	2.02 +	43333
HoCP 04-855	12648	43.6	291	2.16 +	40384
HoCP 04-856	11245	38.9	288	1.70	45602
US 04-9601	7118	39.5	180 -	1.84	43106
US 04-9602	8872	36.2	246 -	1.79	40611
US 04-9603	10323	40.0	258 -	1.73	45829

Table 11. Nursery plantcane means of the 2004 “HoCP” assignment series on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, Louisiana in 2005.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	14233	50.8	280	2.40	42426
HoCP 91-555	14959	52.8	283	2.35	45148
Ho 95-988	13264	46.6	285	2.18	42653
HoCP 96-540	13566	51.3	265	2.90	35393
L 97-128	14352	52.7	273	2.62	40157
HoCP 04-801	13576	53.0	256	2.80	37888
HoCP 04-802	11848	42.6	280	2.21	38342
HoCP 04-803	11932	44.5	270	2.59	34258
HoCP 04-805	13994	59.3	237 -	2.84	41745
HoCP 04-807	12315	47.6	259	2.98	31989 -
HoCP 04-809	14106	49.2	287	2.20	44921
HoCP 04-810	11921	46.5	256	1.94	48098
HoCP 04-812	11552	45.5	254 -	2.48	36527
HoCP 04-813	13476	49.7	271	2.20	45148
HoCP 04-814	15650	60.2	260	3.41 +	35619
HoCP 04-816	13084	50.4	257	2.40	41972
HoCP 04-819	11001	43.6	253 -	2.73	32216 -
HoCP 04-820	14739	59.1	249 -	2.93	40384
HoCP 04-821	10090	35.7 -	285	2.25	31536 -
HoCP 04-823	11752	41.2	286	2.43	33578
HoCP 04-824	12267	47.4	259	2.29	41291
HoCP 04-825	10627	43.5	247 -	2.29	37888
HoCP 04-827	14949	51.9	287	2.29	45375
HoCP 04-828	14079	59.3	237 -	2.71	44241
HoCP 04-829	13274	51.4	258	2.47	42199
HoCP 04-832	12605	55.0	230 -	2.46	44694
HoCP 04-833	9814	40.6	242 -	2.10	38796
HoCP 04-836	13076	47.7	276	2.44	39023
HoCP 04-837	11235	37.3	301	1.97	38115
HoCP 04-838	12715	42.1	302	2.26	39023
HoCP 04-839	9432	37.3	252 -	1.85	40384
HoCP 04-843	11668	44.9	258	2.31	38342
HoCP 04-844	10003	41.1	243 -	1.92	42879
HoCP 04-847	14094	53.0	266	2.89	36754
HoCP 04-848	10593	43.4	245 -	2.16	40384
HoCP 04-849	11573	44.3	264	1.99	44468
HoCP 04-852	10272	59.3	173 -	4.15 +	28586 -
HoCP 04-853	14859	61.2	243 -	2.40	50820
HoCP 04-854	15583	57.0	274	2.88	39703
HoCP 04-855	12253	46.5	265	2.52	37208
HoCP 04-856	12111	42.5	285	1.81	46963
US 04-9601	10802	60.7	179 -	2.21	54904 +
US 04-9602	11483	46.9	245 -	2.10	44694
US 04-9603	11051	45.8	241 -	1.88	49005

Table 12. Nursery plantcane means of the 2004 "HoCP" assignment series across locations in 2005.

Variety	Sugar/ Acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ Acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	11805	41.9	282	2.03	41216
HoCP 91-555	13944	49.4	282	2.12	47039
Ho 95-988	13645	48.9	281	2.22	43863
HoCP 96-540	11076	41.2	270	2.48 +	33124 -
L 97-128	12137	45.7	265 -	2.39 +	38115
HoCP 04-801	13691	54.1 +	253 -	2.62 +	41216
HoCP 04-802	11858	43.9	270	2.27	38569
HoCP 04-803	12063	45.4	267	2.46 +	37056
HoCP 04-805	13095	52.4 +	252 -	2.41 +	43636
HoCP 04-807	15025 +	57.4 +	261 -	2.97 +	38493
HoCP 04-809	12173	42.0	290	1.95	42804
HoCP 04-810	12624	46.8	269	2.11	44619
HoCP 04-812	11270	44.7	251 -	2.27	39401
HoCP 04-813	11885	43.8	271	2.02	43333
HoCP 04-814	16714 +	63.0 +	266	3.15 +	40308
HoCP 04-816	12351	48.8	252 -	2.31	42350
HoCP 04-819	11640	46.1	253 -	2.54 +	36376
HoCP 04-820	14934 +	58.9 +	253 -	2.76 +	42804
HoCP 04-821	11120	38.9	287	2.12	36603
HoCP 04-823	12956	46.0	281	2.32	39628
HoCP 04-824	12590	47.0	268	2.15	43409
HoCP 04-825	10096	41.0	248 -	2.04	40081
HoCP 04-827	14622 +	51.1	286	2.37 +	43106
HoCP 04-828	11478	48.1	240 -	2.39 +	40081
HoCP 04-829	12931	49.1	263 -	2.39 +	41291
HoCP 04-832	12701	50.8 -	250 -	2.21	46131
HoCP 04-833	11009	43.0	256 -	1.99	43484
HoCP 04-836	13551	49.4	275	2.16	46358
HoCP 04-837	12410	42.6	293	2.10	40459
HoCP 04-838	13014	44.8	290	2.07	44165
HoCP 04-839	9861	38.6	255 -	1.87	41140
HoCP 04-843	12323	46.3	263 -	2.32	39476
HoCP 04-844	9563	39.5	243 -	1.95	40611
HoCP 04-847	15073 +	56.1 +	268	2.83 +	39779
HoCP 04-848	11517	47.1	244 -	2.17	43787
HoCP 04-849	10736	39.1	276	1.88	41443
HoCP 04-852	12274	62.9 +	194 -	3.61 +	35317
HoCP 04-853	14391	54.3 +	266	2.07	52635 +
HoCP 04-854	13964	52.7 +	263 -	2.53 +	41821
HoCP 04-855	12858	47.0	274	2.38 +	39703
HoCP 04-856	11512	40.5	284	1.74	46434

2005 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM OUTFIELD VARIETY TRIALS

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The outfield variety trials are the final stage of testing experimental varieties for their potential commercial production in Louisiana. Results from these trials are used in both variety advancement and crossing decisions. The outfield variety trials are cooperatively conducted at 10 commercial locations throughout the Louisiana Sugarcane Belt by the LSU AgCenter, the USDA-ARS, and the American Sugar Cane League.

To be considered for release, an experimental variety must equal or exceed the performance of commercial varieties with regard to yield and havestability across locations, crops, and years. Accurate varietal evaluation requires overall yield performance information in addition to performance under adverse harvest conditions. The objective of this report is to provide overall and specific location yield data by crop for the 2005 outfield tests. Included are multi-year yield analyses for appropriate test varieties (tables 3-33).

The experimental design used at each outfield location was a randomized complete block design with three replications per location. Test plots were two rows wide and 50 feet long with a 5-foot alley between plots. To reflect industry practices, all locations were harvested with a combine harvester. Each plot was weighed with a weigh wagon fitted with load cells mounted on each axle and hitch. A 15-stalk, whole-stalk sample, not stripped of leaves, was taken from each plot and sent to the USDA-ARS sucrose laboratory. Samples were hand cut for all tests. The samples were weighed, milled, and the juice analyzed for Brix and pol. Pounds of theoretical recoverable sugar per ton of cane are reported.

Cane yield for each plot was estimated by plot weight, less 14% to adjust for leaf-trash weight and 10% for harvester efficiency. Stalk number was calculated by dividing adjusted cane yield by stalk weight. Adjustments made to cane yield resulted in lower estimated stalk numbers than those achieved by growers.

Interpreting one year of yield data can be misleading because varieties may differ in relative performance from year to year. Across location means can likewise be misleading since

1Data were obtained through a cooperative effort of personnel from the LSU AgCenter, USDA-ARS, Sugarcane Research Unit, and the American Sugar Cane League in accordance to the provisions of the "Three-way Agreement of 1978." The Testing program would not be possible without the full cooperation of the growers at each outfield location.

a variety, experimental or commercial, may not perform consistently at all locations. Multi-year and multi–location testing solves these problems by averaging the inconsistent performances

LCP85-384 has been the leading variety in Louisiana since 1998 with 89% of the sugarcane acreage in 2005 grown to this variety. For comparison, LCP85-384 is highlighted in the tables. To adjust for missing data, the SAS analysis calculated least square means (v 9.0, Proc Mixed). Mean separation used least square mean probability differences (P=0.05). Varieties that are significantly higher or lower than LCP85-384 are denoted by a plus (+) or minus (-), respectively, next to the value for each trait.

Eight experimental varieties were introduced to the outfield locations for seed increase in 2005 (Table 1). Twelve experimental and five commercial varieties were planted at 10 outfield locations. Twenty-seven tests were harvested in 2005 including nine plantcane, nine first-stubble, seven second-stubble, and two third-stubble crops (Table 2).

Variety yields are reported by crop and trait with overall means and individual location data in the same table (Table 3-22) and in summary tables by crop (Tables 23-26). Tables 27-33 provide combined analysis of plantcane, first-stubble, second-stubble, and third-stubble crops averaged over several years that is used to evaluate commercial and experimental varieties.

Weather adversely affected all outfield test sites to varying degrees. Hurricanes Cindy, Katrina, and Rita produced high winds that severely lodged the varieties in each test. Useful information was noted regarding degree of lodging and broken tops. The dry weather following the hurricanes made for good field conditions at the time of harvest.

L99-226 and L99-233 continued to perform well in outfield testing in 2005 based on plantcane, first stubble, and second stubble data. L99-226 and L99-233 will be eligible for release in 2006.

HoCP00-950 was included in plantcane and first stubble tests in 2005 and produced high levels of sugar per acre in each crop. HoCP00-950 was sent from the primary seed increase stations to secondary increase stations in 2005. This variety will be eligible for release in 2007.

Four experimental varieties of the 2001 assignment series were tested in the plantcane trials: L01-283, L01-299, HoCP01-523, and Ho01-564. All of these experimental varieties produced significantly higher sugar per acre than LCP85-384. L01-283 had the highest sugar per acre of the group, where as L01-299 had the lowest sugar per acre. These varieties will be eligible for release in 2008.

Table 1. Commercial and experimental varieties planted in the outfield in 2005.

Commercial Varieties	Experimental Varieties		Experimental Varieties Introduced to the Outfield	
LCP85-384	L99-226	HO01-564	L03-371	HoCP03-708
HoCP91-555	L99-233	HOCP 02-610	L03-378	HoCP03-716
HoCP95-988	HoCP00-950	HOCP02-618	L03-396	HoCP03-743
HoCP96-540	L01-283	HOCP02-620	HoCP03-704	HoCP03-757
L97-128	L01-299	HOCP02-623		
	HOCP01-523	CP89-2143		

Table 2. Harvest and planting dates for all outfield locations harvested in 2005.

Location	Parish		Plantcane		First-stubble		Second-stubble		Third-stubble	
		2005 Planting Date	2005 Harvest Date	2004 Planting Date	2005 Harvest Date	2003 Planting Date	2005 Harvest Date	2002 Planting Date	2005 Harvest Date	2001 Planting Date
A. Landry	Iberville	09/15	12/13	09/09	10/20	09/17	**	***	**	***
Allain	St. Mary	09/21	11/22	09/01	**	09/12*	**	***	**	09/19
Alma	Pointe-Coupee	09/16	**	09/20	10/05	09/11	10/05	09/04	**	09/14
Bon Secour	St. James	09/08	12/01	09/08	10/25	09/05	10/24	09/03	10/24	09/08
Georgia	Lafourche	10/03*	12/06	09/07	12/06	09/18	12/06	09/21	**	09/15
Glenwood	Assumption	09/13	11/29	09/10	11/28	08/27	11/28	08/29	**	09/25
K. Self	Pointe-Coupee	09/15*	**	09/22*	**	***	**	***	**	***
Lanaux	St. John	09/14	12/12	08/25	12/12	09/03	11/01	09/11	11/01	09/05
Levert-St. John	St. Martin	09/09	11/03	08/26	11/03	08/26	**	09/11	**	09/19
Magnolia	Terrebonne	10/06	12/08	09/10	12/07	10/09	10/19	08/16	**	10/04
R. Hebert	Iberia	09/12	11/17	09/13	11/02	09/12	11/04	09/18	**	09/27

* Introductions only; ** No test harvested at this location; *** No test planted.

Table 3. Plantcane sugar per acre for five commercial and seven experimental varieties at nine outfield locations in 2005.

Variety	Heavy: Landry	Heavy: Magnolia	Heavy: Allains	Light: Bon Secour	Light: Georgia	Light: Glenwood	Light: Lanaux	Light: R. Hebert	Light: St. John	Mean
					(lbs/A)					
LCP85-384	7595	6268	7031	8233	6051	7286	7853	8143	4799	7029
HoCP91-555	8663	8940 +	8085	8730	6287	9167 +	9664 +	9332	5004	8208+
HoCP95-988	9414 +	7582	6916	10035+	6716	10402+	10502+	7795	6046	8379+
HoCP96-540	10827+	10241+	7500	9136	8432+	9930 +	9323	10090	6005	9054+
L97-128	8473	7361	6797	8724	5231	9371 +	8723	8101	6679	7718
L99-226	11539+	10898+	8900+	10887+	8684+	11313+	9905 +	9719	5910	9750+
L99-233	9256 +	8774 +	8344+	9213	7808+	10078+	10306+	9488	5116	8709+
HoCP00-950	9453 +	9408 +	7639	10943+	7550+	7882	10138+	9179	5756	8694+
L01-283	9344 +	9506 +	6823	10491+	8622+	11010+	10471+	9129	6351	9083+
L01-299	9481 +	6290	7289	8360	7798+	9800 +	8478	8283	5243	7891+
HoCP01-523	9850 +	9292 +	7636	9503 +	8582+	9031 +	9665 +	9585	5754	8766+
HoCP01-564	10382+	8424 +	6937	11313+	8230+	9212 +	9229	8170	5761	8629+

Table 4. Plantcane cane yield for five commercial and seven experimental varieties at nine outfield locations in 2005.

Variety	Heavy: Landry	Heavy: Magnolia	Heavy: Allains	Light: Bon Secour	Light: Georgia	Light: Glenwood	Light: Lanaux	Light: R. Hebert	Light: St. John	Mean
					(tons/A)					
LCP85-384	26.4	22.2	26.5	29.1	22.5	28.5	27.5	30.7	19.3	25.8
HoCP91-555	30.4	30.6+	27.4	33.5	23.7	35.1+	34.7+	31.5	21.4	29.8+
HoCP95-988	32.9+	28.1+	26.7	35.2+	25.3	40.9+	36.6+	28.7	24.4	31.0+
HoCP96-540	37.4+	33.8+	26.9	30.5	29.2+	35.2+	32.8+	35.0	23.9	31.6+
L97-128	30.0	28.8+	25.0	29.6	23.4	35.2+	31.6	28.1	26.4	28.7+
L99-226	37.3+	34.4+	31.6+	35.4+	28.9+	37.0+	32.3	31.0	23.8	32.4+
L99-233	33.8+	30.1+	31.0+	35.0+	28.9+	39.9+	38.4+	32.7	21.7	32.4+
HoCP00-950	31.3+	31.7+	25.2	37.0+	26.4+	28.5	32.8+	30.6	20.6	29.4+
L01-283	32.3+	32.9+	23.4	35.1+	31.0+	38.0+	36.5+	30.1	26.5	31.7+
L01-299	34.7+	25.8	26.7	30.5	30.1+	37.2+	30.4	28.3	25.2	29.9+
HoCP01-523	35.3+	30.3+	28.2	33.3	30.6+	33.6+	34.0+	32.3	22.5	31.1+
HoCP01-564	34.1+	29.5+	23.4	37.2+	28.2+	32.9+	30.7	25.6	22.1	29.3+

Table 5. Plantcane sugar per ton for five commercial and seven experimental varieties at nine outfield locations in 2005.

	Heavy			Light						
Variety	Landry	Magnolia	Allains	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/ton)					
LCP85-384	288	283	266	283	268	256	286	265	249	271
HoCP91-555	283	292	295 +	264	264	261	279	297 +	234	274
HoCP95-988	287	272	258	285	265	254	287	272	249	270
HoCP96-540	289	305	279	300	289	282	285	288 +	252	286 +
L97-128	281	257	272	295	223 -	266	276	288 +	252	268
L99-226	309 +	317	282	308 +	300 +	305 +	307 +	314 +	248	299 +
L99-233	274	291	269	264	269	253	268 -	290 +	234	268
HoCP00-950	302	297	303 +	296	286	277	310 +	300 +	278 +	295 +
L01-283	289	289	291 +	300	279	290 +	287	303 +	240	285 +
L01-299	274	244	273	273	259	263	279	293 +	209 -	263
HoCP01-523	279	307	270	286	280	269	284	297 +	256	281
HoCP01-564	305	286	296 +	304	291	279	301 +	320 +	260	294 +

Table 6. Plantcane stalk weight for five commercial and seven experimental varieties at nine outfield locations in 2005.

	Heavy			Light						
Variety	Landry	Magnolia	Allains	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs)					
LCP85-384	1.88	1.55	1.83	1.70	1.58	1.57	1.75	1.64	1.38	1.65
HoCP91-555	2.07	1.76	1.95	2.21+	1.54	1.68	1.97	1.52	1.48	1.80
HoCP95-988	2.40+	1.82+	1.94	2.59+	2.18+	2.25+	2.40+	2.15+	1.76+	2.17+
HoCP96-540	2.60+	2.09+	1.96	2.11	1.95+	1.93	2.31+	2.04+	1.75+	2.08+
L97-128	2.35+	1.78	2.26+	2.26+	2.00+	2.55+	2.60+	2.07+	2.02+	2.21+
L99-226	2.82+	2.63+	2.51+	2.83+	2.27+	2.29+	2.80+	2.42+	1.98+	2.50+
L99-233	2.20	1.81	1.59	1.84	1.88+	1.71	1.70	1.64	1.40	1.75
HoCP00-950	2.03	1.82+	1.89	2.33+	1.90+	1.76	2.06	1.82	1.58	1.91+
L01-283	2.28	1.96+	1.68	1.84	1.90+	1.98+	2.14+	1.89	1.79+	1.94+
L01-299	1.96	1.97+	1.98	2.32+	2.18+	1.89	1.78	1.70	1.65+	1.94+
HoCP01-523	2.47+	2.24+	1.99	2.33+	1.77	1.89	2.14+	1.97+	1.67+	2.05+
HoCP01-564	2.00	1.53	1.65	2.32+	1.73	1.51	1.88	1.66	1.33	1.73

Table 7. Plantcane stalk number for five commercial and seven experimental varieties at nine outfield locations in 2005.

Variety	Heavy: Landry	Heavy: Magnolia	Heavy: Allains	Light: Bon Secour	Light: Georgia	Light: Glenwood	Light: Lanaux	Light: R. Hebert	Light: St. John	Mean
					(stalks/A)					
LCP85-384	28293	28744	28984	34525	28491	36238	31700	37666	28731	31486
HoCP91-555	29593	34849	28072	31233	30775	41918	35669	41799	28880	33643
HoCP95-988	27466	30891	27662	27140	23245	36801	30832	26918-	27668	28736
HoCP96-540	28861	32301	27562	28831	29939	37578	28594	34688	27523	30653
L97-128	25518	32839	22195-	26333-	23356	27849 -	24345-	27234-	26360	26225-
L99-226	26472	26246	25255	25512-	25671	32274	23328-	25785-	24051	26066-
L99-233	30816	33526	39002+	38285	30878	47393 +	45609+	40203	31163	37431+
HoCP00-950	31016	35561	26692	31815	27847	32436	32405	33962	26010	30957
L01-283	28952	33565	28093	38329	32739	39104	34228	32332	29597	32993
L01-299	35493	26661	26961	26369-	27727	39604	34119	33518	30697	31239
HoCP01-523	29280	27101	28828	28745	34885+	35812	31716	32951	27390	30745
HoCP01-564	35002	38556 +	28381	32550	32819	43789	32920	30960	33678	34295+

Table 8. First-stubble sugar per acre for four commercial and three experimental varieties at nine outfield locations in 2005.

Variety	Heavy: Landry	Heavy: Magnolia	Light: Alma	Light: Bon Secour	Light: Georgia	Light: Glenwood	Light: Lanaux	Light: R. Hebert	Light: St. John	Mean
					(lbs/A)					
LCP85-384	7096	7665	4654	7066	6357	8261	6319	7517	6897	6874
HoCP91-555	8454	8520	5564+	8022	7625+	10832	6995	8403	7713	8018+
HoCP96-540	8013	9993	4867	8120	7483+	11820	7068	8565	8665	8292+
L97-128	7439	8880	6400+	6906	6764	9709	7499	8034	7469	7681+
L99-226	10120	8981	5991+	7871	9053+	11553	8262	9752	8743	8929+
L99-233	7197	8173	6053+	7494	7869+	10516	7816	8056	7060	7807+
HoCP00-950	8771	9108	6386+	9292+	7503+	9464	8859	8226	8735	8474+

Table 9. First-stubble cane yield for four commercial and three experimental varieties at nine outfield locations in 2005.

	Heavy		Light							
Variety	Landry	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(tons/A)					
LCP85-384	29.2	26.3	19.2	30.3	23.6	28.1	21.6	24.5	27.4	25.6
HoCP91-555	29.2	28.3	23.3+	30.5	26.0	36.0	24.7	26.2	29.9	28.2+
HoCP96-540	31.8	32.6	19.8	30.2	25.0	38.3	23.9	26.6	31.6	28.9+
L97-128	29.3	31.4	26.1+	26.6	25.1	33.7	26.6	27.2	26.1	28.0+
L99-226	38.9+	28.5	23.1+	29.3	29.6+	36.0	27.5	29.1	31.0	30.3+
L99-233	30.3	28.1	25.5+	30.3	29.2+	36.1	27.0	26.4	26.5	28.8+
HoCP00-950	31.1	30.3	23.0+	31.8	23.9	30.5	28.9	24.9	28.8	28.1+

Table 10. First-stubble sugar per ton for four commercial and three experimental varieties at nine outfield locations in 2005.

	Heavy		Light							
Variety	Landry	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/ton)					
LCP85-384	245	295	243	233	270	293	292	307	251	270
HoCP91-555	290	301	239	263	293+	300	284	321	258	283+
HoCP96-540	253	307	246	269+	300+	309	295	323	274	286+
L97-128	252	282	246	260	270	288	282	294	284+	273
L99-226	259	316	260	269+	305+	320	300	335+	281	294+
L99-233	237	291	239	247	270	290	289	306	266	271
HoCP00-950	281	301	277	292+	314+	309	306	331+	303+	301+

Table 11. First-stubble stalk weight for four commercial and three experimental varieties at nine outfield locations in 2005.

	Heavy		Light							
Variety	Landry	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs)					
LCP85-384	1.44	1.36	1.15	1.52	1.55	1.51	1.50	1.26	1.75	1.45
HoCP91-555	1.71	1.61	1.42	1.66	1.72	1.74	1.73	1.42	2.15+	1.69+
HoCP96-540	2.12+	1.73	1.65+	1.89+	1.42	1.93+	1.94	1.65+	2.55+	1.87+
L97-128	1.76+	1.84+	1.70+	2.05+	1.73	2.12+	2.15	1.81+	2.26+	1.94+
L99-226	2.32+	2.23+	1.82+	2.17+	2.31+	2.42+	2.22	1.92+	2.94+	2.26+
L99-233	1.47	1.47	1.14	1.59	1.61	1.66	1.75	1.24	2.01	1.55
HoCP00-950	1.82+	1.77	1.34	1.88+	1.54	1.67	1.87	1.42	2.09	1.71+

Table 12. First-stubble stalk number for four commercial and three experimental varieties at nine outfield locations in 2005.

	Heavy		Light							
Variety	Landry	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(stalks/A)					
LCP85-384	42327	38182	33995	39986	30769	37310	29020	39436	31797	35869
HoCP91-555	34040	35528	33096	36969	30416	41603	28322	37003	28560	33949
HoCP96-540	30176	38559	24129-	32290-	36100	40498	24964	33145	24981-	31649-
L97-128	33303	34587	30752	25924-	28779	32333	24663	30383	23121-	29316-
L99-226	33520	26134	25466-	27001-	25678	29858	26952	30461	21363-	27381-
L99-233	42389	38246	45039+	38105	36447	43650	31591	42308	26993	38308
HoCP00-950	34262	34242	35792	34197	31170	36618	30797	36322	27946	33483

Table 13. Second-stubble sugar per acre for five commercial and two experimental varieties at seven outfield locations in 2005.

	Heavy	Light						
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	Mean
				(lbs/A)				
LCP85-384	4146	3992	6280	6306	8465	6767	6515	6067
HoCP85-845	3650	2186 -	6435	6589	10057	6956	7552	6203
HoCP91-555	2476 -	3568	7874 +	7255	8529	6521	5567	5970
HoCP96-540	3781	3764	6751	7286	9391	7055	8273	6614
L97-128	5088	3829	7310	6710	11430 +	7594	6289	6893 +
L99-226	6174 +	4297	8266 +	8411 +	12319 +	8738	7628	7976 +
L99-233	4797	3229	8700 +	7533 +	11278 +	8555	7995	7441 +

Table 14. Second-stubble cane yield for five commercial and two experimental varieties at seven outfield locations in 2005.

	Heavy	Light						
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	Mean
				(tons/A)				
LCP85-384	14.3	17.3	24.5	21.3	27.9	26.8	23.8	22.3
HoCP85-845	12.2	10.2-	25.1	23.2	32.8	28.2	30.0	23.1
HoCP91-555	8.5 -	16.6	29.2+	24.9	28.7	25.3	19.4	21.8
HoCP96-540	12.3	17.0	27.5+	24.3	30.9	28.2	30.8	24.4
L97-128	17.6	15.5	27.9+	23.5	37.5+	30.1	25.0	25.3+
L99-226	18.3+	17.7	29.2+	26.6	36.1+	29.5	25.8	26.2+
L99-233	17.0	14.7	32.2+	26.9	37.9+	36.2	30.1	27.8+

Table 15. Second-stubble sugar per ton for five commercial and two experimental varieties at seven outfield locations in 2005.

Variety	Heavy	Light						
	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	Mean
				(lbs/ton)				
LCP85-384	290	230	257	295	303	252	274	272
HoCP85-845	298	212	257	284	306	249	252-	265
HoCP91-555	296	215	270	290	297	259	286	273
HoCP96-540	308	221	245	300	304	250	268	271
L97-128	291	248	261	286	306	254	253-	271
L99-226	336+	242	283	316+	341	295+	295+	301+
L99-233	283	220	270	281	297	236	266	265

Table 16. Second-stubble stalk weight for five commercial and two experimental varieties at seven outfield locations in 2005.

Variety	Heavy	Light						
	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	Mean
				(lbs)				
LCP85-384	0.98	1.20	1.45	1.47	1.53	1.58	1.45	1.38
HoCP85-845	1.15	1.05	1.90+	1.50	1.95+	1.48	1.68+	1.53
HoCP91-555	0.99	1.24	1.58	1.39	1.45	1.66	1.35	1.38
HoCP96-540	0.97	1.36	1.75+	1.74+	1.97+	2.14+	1.89+	1.69+
L97-128	1.46+	1.20	2.02+	1.64	1.83	1.89	1.74+	1.68+
L99-226	1.66+	1.54	2.14+	2.11+	2.05+	2.40+	1.93+	1.98+
L99-233	0.93	1.13	1.79+	1.48	1.61	1.48	1.28-	1.39

Table 17. Second-stubble stalk number for five commercial and two experimental varieties at seven outfield locations in 2005.

	Heavy	Light						
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	Mean
				(stalks/A)				
LCP85-384	29284	28821	33944	29665	36904	35563	33273	32493
HoCP85-845	20463 -	19214	26847 -	30883	33758	37908	36033	29301
HoCP91-555	16946 -	26752	37263	36193	39965	30580	29116	30974
HoCP96-540	25053	25474	31336	27903	31854	26456	32788	28695
L97-128	24253	26708	27645 -	28565	41079	31664	28767	29811
L99-226	22195	23883	27450 -	25391	35344	25551 -	26711	26646 -
L99-233	36460	25955	36474	36505	47102 +	48970 +	46952 +	39774 +

Table 18. Third-stubble sugar per acre for five commercial varieties at two outfield locations in 2005.

	Light		
Variety	Bon Secour	Lanaux	Mean
	(lbs/A)		
LCP85-384	5315	5414	5365
HoCP85-845	6667+	5542	6105
HoCP91-555	6383+	5778	6080
HoCP96-540	7169+	5709	6439
L97-128	6857+	5677	6267

Table 19. Third-stubble cane yield for five commercial varieties at two outfield locations in 2005.

Variety	Light: Bon Secour	Light: Lanaux	Mean
		(tons/A)	
LCP85-384	22.9	19.2	21.0
HoCP85-845	25.5	19.8	22.6
HoCP91-555	24.7	19.9	22.3
HoCP96-540	27.2	19.5	23.4
L97-128	25.9	20.3	23.1

Table 20. Third-stubble sugar per ton for five commercial varieties at two outfield locations in 2005.

Variety	Light: Bon Secour	Light: Lanaux	Mean
		(lbs/tons)	
LCP85-384	232	283	257
HoCP85-845	262+	280	271
HoCP91-555	259+	292	276
HoCP96-540	264+	292	278
L97-128	265+	281	273

Table 21. Third-stubble stalk weight for five commercial varieties at two outfield locations in 2005.

Variety	Light: Bon Secour	Light: Lanaux	Mean
		(lbs)	
LCP85-384	1.27	1.36	1.32
HoCP85-845	1.57+	1.63	1.60+
HoCP91-555	1.36	1.36	1.36
HoCP96-540	1.79+	1.90	1.84+
L97-128	1.78+	1.70	1.74+

Table 22. Third-stubble stalk number for five commercial varieties at two outfield locations in 2005.

Variety	Light: Bon Secour	Light: Lanaux	Mean
		(stalks/A)	
LCP85-384	35957	28712	32334
HoCP85-845	32342	25016	28679
HoCP91-555	36403	29122	32763
HoCP96-540	31030	21580	26305
L97-128	29132	24093	26612

Table 23. Plantcane means from nine outfield locations in 2005: Allains, BonSecour, Georgia, Glenwood, Lanaux, Landry, Magnolia, R. Hebert, and St. John farms.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7029	25.8	271	1.65	31486
HoCP91-555	8208+	29.8+	274	1.80	33643
HoCP95-988	8379+	31.0+	270	2.17+	28736
HoCP96-540	9054+	31.6+	286+	2.08+	30653
L97-128	7718	28.7+	268	2.21+	26225-
L99-226	9750+	32.4+	299+	2.50+	26066-
L99-233	8709+	32.4+	268	1.75	37431+
HoCP00-950	8694+	29.4+	295+	1.91+	30957
L01-283	9083+	31.7+	285+	1.94+	32993
L01-299	7891+	29.9+	263	1.94+	31239
HoCP01-523	8766+	31.1+	281	2.05+	30745
HoCP01-564	8629+	29.3+	294+	1.73	34295+

Table 24. First-stubble means from nine outfield locations in 2005: Alma, Bon Secour, Georgia, Glenwood, Lanaux, Landry, Magnolia, R. Hebert and St. John farms.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	6874	25.6	270	1.45	35869
HoCP91-555	8018+	28.2+	283+	1.69+	33949
HoCP96-540	8292+	28.9+	286+	1.87+	31649-
L97-128	7681+	28.0+	273	1.94+	29316-
L99-226	8929+	30.3+	294+	2.26+	27381-
L99-233	7807+	28.8+	271	1.55	38308
HoCP00-950	8474+	28.1+	301+	1.71+	33483

Table 25. Second-stubble means from seven outfield locations in 2005: Alma, Bon Secour, Georgia, Glenwood, Lanaux, Magnolia, and R. Hebert farms.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	6067	22.3	272	1.38	32493
HoCP85-845	6203	23.1	265	1.53	29301
HoCP91-555	5970	21.8	273	1.38	30974
HoCP96-540	6614	24.4	271	1.69+	28695
L97-128	6893+	25.3+	271	1.68+	29811
L99-226	7976+	26.2+	301+	1.98+	26646-
L99-233	7441+	27.8+	265	1.39	39774+

Table 26. Third-stubble means from two outfield locations in 2005: Bon Secour, and Lanaux farms.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	5365	21.0	257	1.32	32334
HoCP85-845	6105	22.6	271	1.60+	28679
HoCP91-555	6080	22.3	276	1.36	32763
HoCP96-540	6439+	23.4	278	1.84+	26305
L97-128	6267	23.1	273	1.74+	26612-

Table 27. Combined plantcane means across outfield locations from 2001 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7463	28.1	266	1.99	28825
HoCP91-555	7961+	29.3+	271	2.07	29038
HoCP96-540	8854+	32.5+	273+	2.52+	26455-
L97-128	8425+	30.8+	273+	2.52+	24681-

Table 28. Combined plantcane means across outfield locations from 2003 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7320	26.9	272	1.88	29385
HoCP91-555	8171+	29.1+	280+	1.99+	30067
HoCP96-540	8855+	31.7+	279+	2.41+	27281-
L97-128	8209+	29.4+	280+	2.35+	25138-
L99-226	9493+	32.1+	295+	2.76+	24004-
L99-233	8652+	31.7+	273	1.89	34569+

Table 29. Combined plantcane means across outfield locations from 2004 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7114	26.2	272	1.75	30328
HoCP91-555	8398+	29.8+	281+	1.94+	31433
HoCP96-540	9027+	31.8+	283+	2.27+	28546
L97-128	8123+	28.7+	283+	2.30+	25057-
L99-226	9644+	32.4+	297+	2.68+	24520-
L99-233	8762+	31.7+	276	1.83	35193+
HoCP00-950	9096+	30.2+	301+	2.03+	30045

Table 30. Combined first-stubble means across outfield locations from 2002 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7175	26.4	273	1.66	32442
HoCP91-555	7467	26.6	281+	1.78+	30422-
HoCP96-540	7853+	28.6+	275	2.07+	28158-
L97-128	7656+	27.4	281+	2.09+	26381-

Table 31. Combined first-stubble means across outfield locations from 2004 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	6736	24.8	273	1.52	33100
HoCP91-555	7823+	27.3+	285+	1.72+	32034
HoCP96-540	7951+	28.3+	281+	1.93+	29739-
L97-128	7588+	27.0+	282+	1.97+	27585-
L99-226	8676+	29.1+	299+	2.27+	25882-
L99-233	7833+	28.3+	278	1.59	36268+

Table 32. Combined second-stubble means across outfield locations from 2003 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	6197	22.7	275	1.47	31193
HoCP85-845	6109	23.5	261-	1.71+	27634
HoCP91-555	6187	22.4	278	1.53	29443
HoCP96-540	6399	23.9	270	1.78+	26979
L97-128	6920+	24.6+	283+	1.83+	27104

Table 33. Combined third-stubble means across outfield locations from 2004 to 2005.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	5212	19.3	272	1.32	29401
HoCP85-845	5655	20.8	272	1.54+	27198
HoCP91-555	5984	21.4+	284	1.43	30040
HoCP96-540	6260	22.3+	283	1.68+	27092
L97-128	6022	20.7	292+	1.63+	25646

SUCROSE LABORATORY AT ST. GABRIEL

G. L. Hawkins and K. A. Gravois
St. Gabriel Research Station

More than 2,800 samples were processed at the St. Gabriel Sucrose Laboratory during the 2005 harvest season (Table 1). Standard laboratory procedures, which include use of Octapol® clarifier, were used to measure the Brix and pol of the juice. The pol was analyzed using an autopol 880 model that could read dark samples. The juice was extracted via a three-roller mill for 2,860 samples. The computer program used for the sucrose laboratory assigns a sample identification number to each set processed; in addition, it indicated the number of samples analyzed in that set. The program was designed to automatically calculate sucrose and theoretical recoverable sugar based on the Brix and pol numbers. The laboratory numbers were recorded on the sample tags and returned to the researchers, along with the computer file that contains Brix, pol and theoretical recoverable sugar per ton of cane. The sucrose laboratory processed samples from September 2005 to December 2005.

Table 1. Number of sugarcane samples processed at the St. Gabriel Sucrose Laboratory during the 2005 harvest season.

Project Area	Leader	Number of Samples
Agronomy	James Griffin	172
	Chuck Kennedy	469
	Collins Kimbeng	354
	Magdi Selim	24
Iberia Research Station	Howard Viator	162
Plant Pathology and Crop Physiology	Jeff Hoy	289
LCES	Ben Legendre	168
USDA	Ed Richard	36
Variety Development	Line Trials	686
	Increase	133
	Nursery	241
Other		126
TOTAL		2860

THE 2005 LOUISIANA SUGARCANE VARIETY SURVEY

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INTRODUCTION

A sugarcane variety survey was conducted during the summer of 2005 by the county agents in the 24 sugarcane-growing parishes of Louisiana to determine the variety makeup and distribution across the industry in the state. The information presented in this report was summarized from those individual parish surveys.

Agents in each sugarcane-producing parish collected acreage figures by variety and crop from producers in their respective parishes. Seven varieties, CP 70-321, LCP 85-384, HoCP 85-845, HoCP 91-555, Ho 95-988, HoCP 96-540 and L 97-128, were listed along with "Others" in the survey. The category of others included, but was not limited to, small acreages of CP 65-357, CP 72-370, LCP 82-89 and LHo 83-153. The crop was divided into four categories, which included plantcane, first-stubble, second-stubble and third-stubble and older crops. Additional information regarding parish acreage was collected as needed from the local Farm Service Agency (FSA) offices.

Total State and Regional Acreage.

Actual area planted to sugarcane included in this survey for each parish, region and the statewide total are shown in Table 1. Statewide, the area planted to sugarcane in 2005 was 457,456 acres. This is approximately 99% of the total acres (462,510) as reported by the Farm Service Agency of the United States Department of Agriculture and used in "Louisiana Summary: Agriculture and Natural Resources 2005" (Anonymous 2005.) Figure 1 shows the parishes where sugarcane is grown in the state. Total area planted to sugarcane for the three regions, Bayou Teche, River-Bayou Lafourche and Northern, and parishes (counties) are also shown in Table 1. The Bayou Teche region has the largest area planted to sugarcane, with 198,862 acres reported (43.5% of the total acreage), followed by the River-Bayou Lafourche region with 161,034 acres (35.2%) and the Northern area with 97,500 acres (21.3%). The total area planted to sugarcane in the state actually increased by 772 acres or 0.2% in 2005 when compared to 2004. Acreages had declined in each of the three previous years because of the threat of acreage reductions brought about by allotments and proportionate shares as written in the current Farm Bill. However, these fears went unfounded because of lower production due to hurricanes, drought and the precipitous drop in production of the leading variety, LCP 85-384.

Sugarcane Distribution by Variety and Crop.

The estimated statewide sugarcane acreage in percent by variety and crop is shown in Table 2. The leading variety for 2005 continued to be LCP 85-384, with 89% of the total acreage followed by HoCP 91-555, HoCP 96-540 and HoCP 85-845, with 4, 3 and 2% of the total acreage, respectively. HoCP 91-555 and HoCP 85-845 are two of the older varieties still recommended for commercial planting (Legendre 2001). The new variety, HoCP 96-540, although occupying only 3% of the total acreage, was the second leading variety in the plantcane crop behind LCP 85-384 with 9% of the acreage. Producers, concerned with the decline in yield of LCP 85-384, are switching to the newer varieties, especially HoCP 96-540 until other varieties are developed and released to the industry. The two remaining new varieties, Ho 95-988 and L 97-128, occupied only limited acreage in 2005; however, it is anticipated that their acreage will increase in future years along with that of HoCP 96-540. Of the older varieties, other than LCP 85-384, only HoCP 91-555 occupied 3% or more of the acreage in plantcane through third- and older stubble crops. HoCP 85-845 continued to decline across crop years with 4% in third-and older stubble crops to only 1% in plantcane crop. CP 70-321, the leading variety prior to the release of LCP 85-384 in 1993, occupied only 1% of the total acreage and less than 1% in the plantcane crop in 2005.

The majority of the Louisiana sugarcane crop has been harvested by cane combine since 2000 when over 70% of the crop was planted to LCP 85-384 (Legendre & Gravois 2005), presumably to take advantage of the superior yield potential of the variety. However, with the lower yields experienced since 2003, especially in the older stubble crops, many producers have switched back to the whole-stalk "soldier" system for harvesting their crops because of lower costs of operating the equipment. LCP 85-384 did not perform well across the state regardless of the crop year during 2004. On the other hand, the three new varieties, Ho 95-988, HoCP 96-540 and L 97-128, along with HoCP 85-845 and HoCP 91-555, all performed well with the new varieties generally better suited to mechanical harvesting when compared to LCP 85-384.

Sugarcane Distribution by Region and Crop.

Since the prominence of LCP 85-384, there has been a trend to plant less cane each year and keep more acres in older stubble crops; however, because of the poor performance of LCP 85-384, especially in the older stubble crops, that trend changed in 2004 when more acres were replanted in all regions than had been seen in previous years (Table 3). This trend continued into 2005. In 2005, there was an increase in plantcane acreage of 10,266 acres or 2.3 percentage points when compared to 2004 while the acreage in third- and older stubble crops decreased by 12,691 acres or 2.7 percentage points during the same time frame.

For the current survey, the Northern area had only 23.0% in third and older stubble compared to 25.8% in 2004 and 34.3% in 2003 (Table 3). On the other hand, the percentage in plantcane increased from 26.0% in 2004 to 29.5% in 2005. The River-Bayou Lafourche region tends to plant more cane each year, with less of its area devoted to stubble crops. In this region, there was 20.8% of the acreage in third- and older stubble crops in 2004 and only 17.4% in 2005. However, because of the wet planting season in 2002, the River-Bayou Lafourche region had only 23.3% of its area in plantcane for the 2003 crop. This necessitated that its producers plant more cane in 2003 and subsequent years. The current survey shows that this region had 30.2% in plantcane in 2005 compared to 28.9% in 2004. The trend for less stubble and more plantcane was also evident for the Bayou Teche region. This region was also impacted by the wet planting season in 2002. With increased planting, the amount of older stubble decreased from 22.8% in 2004 to 20.6% while plantcane increased from 26.5% to 29.2%.

Sugarcane Distribution by Variety and Crop for the Three Regions.

With regards to crop from plantcane through third- and older stubble crops, LCP 85-384 was still the leading variety in all regions in 2005 (Tables 4, 5 and 6). Although still the dominant variety, its preference in plantcane diminished significantly with the new variety, HoCP 96-540, making up 11, 8 and 4% of the plantcane area in the Bayou Teche, River/Bayou Lafourche and Northern regions, respectively. However, the percentage planted to LCP 85-384 for all stubble crops remained relatively stable from preceding years. The popularity of the older varieties, CP 70-321 and HoCP 85-845, continued to lose favor by producers in all regions. CP 70-321, the predominant variety prior to LCP 85-384, comprised less than 1% of the planted area in all regions in 2005. HoCP 85-845 was grown on only 2-3% of the planted area, regardless of regions. The acreage planted to HoCP 91-555 remained virtually unchanged across crop year and regions. The area planted to the two new varieties, Ho 95-988 and L 97-128, along with HoCP 96-540, was still limited in 2005 but it is anticipated that acreage will increase significantly in ensuing years as producers look for a replacement for LCP 85-384.

Variety Trends.

For the first time since its year of commercial release in1993 has the acreage planted to LCP 85-384 decreased from the previous year, although by only two percentage points from its historical high of 91% in 2004 (Table 7). With the exception of HoCP 91-555, the acreage planted to the older varieties decreased in 2005 from the previous year. CP 70-321 which occupied 49% of the planted acreage as late as 1995 is now planted on only1% of the state's sugarcane. Only one other variety, CP 65-357, released in 1973, reached more than 70% of the total acreage in the state with a high of 71% in 1980. HoCP 96-540, released for commercial planting in 2003, and Ho 95-988 and L 97-128, released for commercial planting in 2004, are expected to gain in popularity as the area planted to LCP 85-384 is reduced. According to Waguespack et al. (2005) the three new varieties, Ho 95-988, HoCP 96-540 and L 97-128, are generally superior to LCP 85-384 in yield of sugar per acre throughout the crop cycle. Ho 95-988 has good stubbling ability; HoCP 96-540 has excellent yield of cane per acre; and, L 97-128 has early, high sucrose content to go along with its early maturity classification. Ho 95-988 is classified as resistant to mosaic and leaf scald and moderately susceptible to smut and rust and susceptible to the sugarcane borer. HoCP 96-540 is classified as resistant to smut and mosaic, moderately resistant to rust and leaf scald and moderately susceptible to the sugarcane borer. L 97-128 is classified as resistant to mosaic, moderately resistant to leaf scald and rust, moderately susceptible to smut and susceptible to the sugarcane borer. All three varieties are more erect than LCP 85-384; hence, losses associated with mechanical harvesting should be less when compared to LCP 85-384. It is anticipated that LCP 85-384 will be the predominant variety for at least the next two years; after which, it is believed that the Louisiana sugarcane industry should have a more balanced mix of varieties.

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Concern over the Dependence of a Single Variety (Monoculture).

Most sugarcane-producing areas of the world do not place a high dependence on a single variety, as is the case in Louisiana (Tew 1987). The need to avoid genetic vulnerability was seen in Cuba several years ago when its growers suffered substantial yield losses because of a rust epidemic and the heavy dependence on one variety, B 4362. As a result, guidelines were established in Cuba advising growers not to plant more than 30% of their area to B 4362, their leading commercial variety. A similar situation occurred recently in Australia with Q124 and susceptibility to orange rust. However, once a clearly superior variety is found, the inadvisability of becoming highly dependent on a single variety must be weighed against the increased profitability anticipated from the culture of only one variety.

Occasionally, expectations outweigh potential risk considerations (Tew 1987). Hoy (2005) reported that LCP 85-384 has become susceptible to brown rust, and this disease can have a significant negative impact on both cane and sugar yield in areas of severe rust infection. He reported where rust was controlled by fungicides during the entire epidemic period at one location in 2004 in the Teche region, tonnage and sugar per acre were increased 17 and 21%, respectively. However, none of the fungicides used in these studies are labeled for use. Additional studies were conducted during 2005 with similar results (Hoy, personal communication). Accordingly, the best control option at this point is to plant the new varieties which have shown a greater degree of resistance and it appears that producers are following this recommendation.

Another disease was found in LCP 85-384 in recent years, *sugarcane yellow leaf* disease (Grisham et al. 2001); it appears that the variety is tolerant to this disease at least for the moment. However, it is entirely possible that this new virus is also taking its toll on yield of this variety. In a continuing effort to lessen the dependence of the industry on one variety, the Louisiana variety development program has developed three new high yielding varieties in recent years, namely, Ho 95-988, HoCP 96-540 and L 97-128. Further, there is a good probability that one or two additional high yielding varieties could be made available to the industry during 2006, i.e. L 99-226 and L 99-233 (Kenneth Gravois, personal communication) that could further reduce the future prospect of a monoculture again.

Millhollon and Legendre (1996) found that the annual use of glyphosate as a ripener will usually increase the yield of sugar per ton of cane and per acre; however, the magnitude of the increase depended on the tolerance of the variety to the treatment. They found that LCP 85-384 is very sensitive to glyphosate, especially at rates higher than generally recommended and the treatment was shown to cause a significant reduction in cane yield in the subsequent stubble crops. Glyphosate is now used on approximately 75% of the total area planted to sugarcane for enhancing maturity of the crop and increasing yield of sugar per ton of cane and per acre. With LCP 85-384 as the major variety, there is the possibility that part of the yield decline experienced in the older stubble was caused, in part, by the sensitivity of LCP 85-384 to glyphosate. This is another reason why the industry might want to consider diversifying into other varieties. The older varieties, namely HoCP 85-845 and HoCP 91-555, are not as sensitive to annual applications of glyphosate as LCP 85-384. Research is ongoing to determine the sensitivity of the new varieties to the application of glyphosate as a chemical ripener.

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We acknowledge the assistance of the county agents for soliciting the sugarcane variety information published in this survey. We also want to thank the sugarcane producers who took the time and effort to respond to the survey from their agents. We would also like to acknowledge the assistance of the various USDA-FSA offices in the sugarcane parishes for certified acreage figures.

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Table 1. Total area planted to sugarcane in Louisiana by region and parish (county), 2005[1].

Bayou Teche region		River-Bayou Lafourche region		Northern region	
Parish	Acres	Parish	Acres	Parish	Acres
Acadia	2,026	Ascension	14,663	Avoyelles	19,226
Calcasieu	3,612	Assumption	40,063	East Baton Rouge	513
Cameron	508	Iberville	34,931	Evangeline	965
Iberia	63,506	Lafourche	30,149	Pointe Coupee	32,509
Jeff Davis	4,516	St. Charles	1,674	Rapides	12,112
Lafayette	13,715	St. James	25,850	St. Landry	16,810
St. Martin	33,172	St. John	3,950	West Baton Rouge	15,425
St. Mary	46,000	Terrebonne	9,754		
Vermilion	31,807				
Total	198,862	Total	161,034	Total	97,560
Total all regions: 457,456					

[1] Acreage based on information obtained in variety surveys from 24 parishes by the county agents in 2005.

Figure 1. Parishes (counties) in Louisiana where sugarcane is grown.

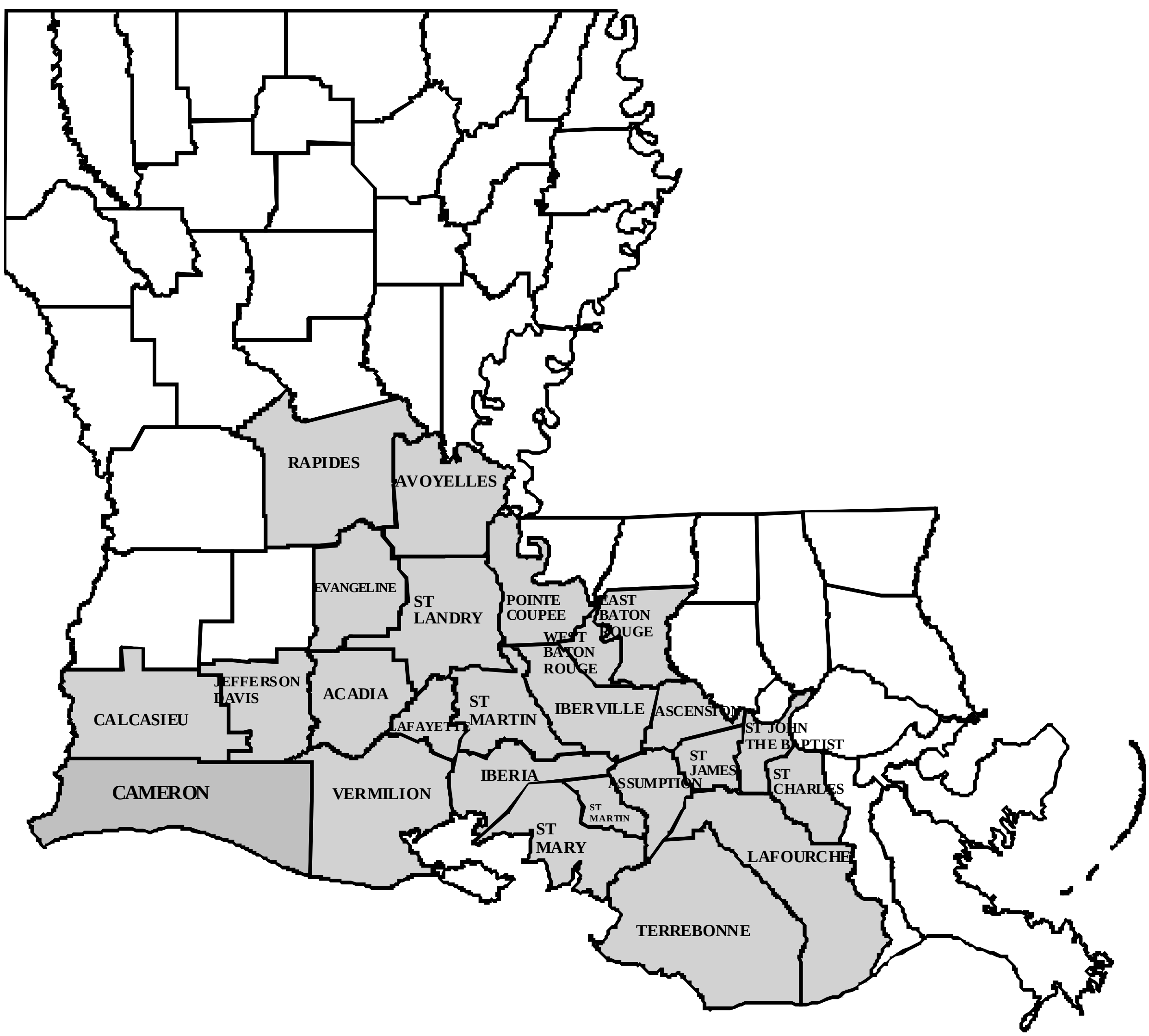

Table 2. Estimated statewide sugarcane acreage percentage by variety and crop, all regions, 2005[1].

Variety	Plant-cane	First-stubble	Second-stubble	Third-stubble and older	Total
	--------------------	--------------------	%	--------------------	--------------------
CP 70-321	<1	1	1	2	1
LCP 85-384	84	91	92	91	89
HoCP 85-845	1	2	2	4	2
HoCP 91-555	3	5	5	3	4
Ho 95-988	1	<1	0	0	<1
HoCP 96-540	9	2	<1	<1	3
L 97-128	1	<1	<1	0	1
Other	<1	<1	<1	<1	<1
Total acres Percent of total crop	135,480 29.6	125,704 27.5	104,847 22.9	91,425 20.0	457,456

[1] Based on information obtained in variety surveys from 24 parishes by county agents in 2005.

Table 3. Estimated sugarcane distribution by region and crop, 2005[1].

Crop	Bayou Teche	River-Bayou Lafourche	Northern	State Total
Plantcane Area (acres) Percent (%)	58,068 29.2	48,632 30.2	28,780 29.5	135,480 29.6
First-stubble Area (acres) Percent (%)	52,897 26.6	47,344 29.4	25,463 26.1	125,704 27.5
Second-stubble Area (acres) Percent (%)	46,931 23.6	37,038 23.0	20,878 21.4	104,847 22.9
Third-stubble and older Area (acres) Percent (%)	40,966 20.6	28,020 17.4	22,439 23.0	91,425 20.0
Total acres	198,862	161,034	97,560	457,456

[1] Based on information obtained in variety surveys from 24 parishes by county agents in 2005.

Table 4. Estimated area planted to sugarcane in percent by variety and crop for the Bayou Teche region, 2005[1].

Variety	Plantcane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 70-321	<1	1	1	3	1
LCP 85-384	79	88	91	89	86
HoCP 85-845	1	1	2	4	2
HoCP 91-555	5	7	5	3	5
Ho 95-988	1	<1	0	0	<1
HoCP 96-540	11	2	<1	<1	4
L 97-128	2	<1	<1	0	<1
Others	<1	<1	<1	1	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys from 24 parishes by county agents in 2005.

Table 5. Estimated area planted to sugarcane in percent by variety and crop for the River/Bayou Lafourche region, 2005[1].

Variety	Plantcane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 70-321	<1	<1	<1	2	<1
LCP 85-384	85	92	94	90	90
HoCP 85-845	2	3	2	5	3
HoCP 91-555	2	3	4	3	3
Ho 95-988	1	<1	<1	0	<1
HoCP 96-540	8	2	<1	<1	3
L 97-128	2	<1	<1	<1	1
Others	<1	<1	<1	<1	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys from 24 parishes by county agents in 2005.

Table 6. Estimated area planted to sugarcane in percent by variety and crop for the Northern region, 2005[1].

Variety	Plantcane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 70-321	0	<1	<1	1	<1
LCP 85-384	91	94	91	94	93
HoCP 85-845	1	1	1	1	1
HoCP 91-555	2	4	8	3	4
Ho 95-988	1	<1	0	0	<1
HoCP 96-540	4	1	<1	<1	2
L 97-128	1	<1	<1	0	<1
Others	<1	<1	<1	<1	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys from 24 parishes by county agents in 2005.

Table 7. Louisiana sugarcane variety trends, by variety and years, all regions, 2001-2005[1].

	Area planted to sugarcane by variety and years (%)					
Variety	2001	2002	2003	2004	2005	1 yr. Change
CP 70-321	8	5	3	2	1	-1
LCP 85-384	78	85	88	91	89	-2
HoCP 85-845	7	6	4	3	2	-1
HoCP 91-555	1	3	4	3	4	+1
Ho 95-988	0	0	0	<1	<1	0
HoCP 96-540	0	0	<1	1	3	+2
L 97- 128	0	0	0	<1	1	+1
Others	<1	<1	<1	<1	<1	0
Totals	100	100	100	100	100	

[1] Based on annual variety surveys from 24 parishes by county agents, 2001-2005.

TRAP, A NEW TOOL FOR SUGARCANE BREEDING: ITS COMPARISON WITH AFLP AND COEFFICIENT OF PARENTAGE

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Abbreviations: TRAP, Target Region Amplification Polymorphism; AFLP, Amplified Fragment Length Polymorphisms; RFLP, Restriction Fragment Length Polymorphism; RAPD, Randomly Amplified Polymorphic DNA; gSSR, genome-derived Simple Sequence Repeats.

Introduction

Traditional breeding has contributed immensely to the sugar industry. In central Queensland, Australia, for example, the cultivar Q50 was nicked named ‘mortgage buster’ soon after its release because of the wealth it brought to that sugar industry. In Louisiana, the popular cultivar, LCP85-384, increased cane yield by 20-25% and contributed to unprecedented boosts in sugar production. LCP85-384 like most dominant cultivars has enjoyed widespread adoption in the Louisiana sugar industry albeit to the exclusion of other cultivars. It is well known that the over reliance on a single cultivar can result in severe consequences especially in a clonally propagated crop such as sugarcane. Therefore, tremendous effort is being made to release new cultivars that equal or surpass the performance of LCP85-384 to Louisiana growers.

The long duration of a sugarcane selection cycle is one factor limiting the rapid development of competent sugarcane cultivars. It takes about 12-15 years after crossing to complete a selection cycle. Because sugarcane is clonally propagated, during this 12- to 15-year period, no new opportunities exist for sexual recombination or the creation of new genetic variation that the breeder can exploit. The breeder has to rely on the initial variation created during hybridization, and no amount of selection can salvage a good cultivar out of a poor cross. The choice of parents to use in crossing is, therefore, one of the most crucial decisions the breeder has to make.

The complicated genome of cultivated sugarcane (high ploidy levels, aneuploid and multiple alleles at a locus) is another factor limiting progress in sugarcane breeding programs. Cultivated sugarcane was derived by crossing between two species namely, *S. officinarum* (2n = 80) and *S. spontaneum* (2n = 64 to 120) followed by backcrosses to *S. officinarum. Saccharum officinarum* was reported to transmit the somatic chromosome number to its progeny (Bhat and Gill, 1985; Bremer, 1961). Consequently, cultivated sugarcane harbors two genomes with about 80% *S. officinarum* and 20% *S. spontaneum* composition (D’Hont et al., 1996). Furthermore, chromosome numbers within cultivated sugarcane can vary (generally from about 100-130) even among full sib progenies.

Molecular markers are a valuable new tool that can be used to help understand and manipulate a genome as complicated as that of sugarcane. Molecular markers could be used to tag genes for traits of economic importance such that selection for these traits (via Marker Assisted Selection) could occur early in the breeding program. Molecular markers could also be used to facilitate decisions made during crossing by using them (markers) to gain a better understanding of the genetic diversity in the crossing gene pool. That information could then play a vital role in the utilization and management of the genotypes and indeed genes in the breeding gene pool. For example, crosses could be planned between parents from divergent backgrounds to maximize heterosis while increasing genetic diversity in the cultivated gene pool.

In the absence of molecular markers, sugarcane breeders relied upon pedigree records to plan crosses with the aim of increasing genetic diversity among the parent and progeny populations. However, the complicated genealogy of sugarcane and perhaps the inadvertent mislabeling of clones may have aligned with the other factors highlighted above to impede progress. Skinner (1959), for example, found that the weave of the cloth used during crossing by most sugarcane breeding programs at the time was not fine enough to exclude foreign pollen. Recently, molecular markers have been used to question the parentage of certain hybrid progenies (Hack et al., 2002; Pan et al., 2003).

In sugarcane breeding programs, experimental clones are often nominated as parents based upon how they have performed in advanced stage selection trials. Ultimately, most crosses are made between parents with phenotypic superiority in one or more key attributes with the hope of combining all key attributes in the hybrid. It is believed that the probability of recovering superior progeny is higher when both parents are themselves superior. Therefore, one would like to detect genetic diversity among phenotypically superior parents. This can be a very difficult task when relying solely on pedigree records because superior phenotypic characteristics might have been obtained at the expense of genetic diversity at specific loci that have undergone selection. In other words, pedigree-based estimates of genetic diversity may not account for allele frequency changes resulting from selection and genetic drift. By relying on pedigree records to estimate genetic diversity one assumes that all genotypes are unrelated which, may be misleading in cultivated sugarcane where only a handful of clones were used in the original synthesis. Molecular markers on the other hand offer a direct comparison of genetic diversity at the DNA level without the simplifying assumptions inherent with the pedigree-based method.

When used for genetic diversity studies, molecular marker techniques such as RFLP, RAPD, AFLP, gSSR, customarily amplify random (neutral) portions of the genome leading to competent estimates of genetic diversity. However, breeders may be more interested in results from genetic diversity studies when markers that co-segregate with traits of interest are used. However, even after QTLs for traits of interest have been identified, it has been argued that the underlying QTL-trait association is based on relatively large linkage blocks and could easily be lost with recombination. In addition, transferability of QTLs between populations remains a looming question in the minds of many plant breeders. The results from genetic diversity studies may, therefore, be more useful if the segments of the genome sampled or measured correspond to segments bearing genes of interest to the breeder. This may be more important in sugarcane with its large genome size (estimated to be about 6pg, six times larger than that of rice) most of which may be duplicate and redundant (Ma et al., 2004).

Access to increasing numbers of sugarcane gene and EST sequences obtained from diverse cDNA libraries coupled with freely available bioinformatics tools offer new opportunities for achieving a candidate gene approach to molecular markers in sugarcane. Target Region Amplification Polymorphism (TRAP) is a relatively new marker technique which uses the gene/EST sequence information to generate polymorphic bands around targeted/putative candidate gene regions. We previously sequenced TRAP amplicons from sugarcane and showed using Blastx analysis that, the TRAP primers successfully amplified the anticipated candidate gene regions (Alwala et al., 2006). Here, we report on comparisons between TRAP, AFLP and the pedigree-based coefficient of parentage (COP) for estimating genetic diversity and relationships among nine sugarcane genotypes frequently used as parents. The AFLP was chosen for comparison because it has been widely used for genetic diversity studies in sugarcane (Besse et al., 1998; Lima et al., 2002) and other crops such as beans (Bhat et al., 2005), wheat (Tian et al., 2005) and squash (Ferriol et al., 2004). A subsequent study will report on the relative ability of the three genetic diversity measures or combinations of them to predict hybrid performance (mean and viariances).

Materials and Methods

Plant material and DNA extraction

The nine sugarcane parents used in the study are described in Table 1. These genotypes are experimental clones and cultivars adapted to Louisiana's unique temperate climate. TucCP77-42 is a major cultivar in northern Argentina but it too was bred using Louisiana adapted clones as the recurrent parents. This group of genotypes serves as an important parental pool for sugarcane crossing in Louisiana.

Young leaves were collected from each genotype, placed immediately in ice and stored at -80 C. Later, the leaves were ground to powder in liquid nitrogen. Genomic DNA was extracted using the Plant DNeasy Mini Kit (Qiagen, Valencia, Ca.). DNA concentrations were estimated by known concentration of lambda DNA in 1% agarose gel.

TRAP markers

The TRAP is a simple, 2-primer PCR technique. The forward (fixed) primer is designed from genes or EST sequences and accompanied by an arbitrary (reverse) primer designed to target introns or exons. Both primers are usually about 18 bp long.

In this study the fixed primers were designed from four genes believed to be implicated in sucrose metabolism namely, Sucrose Synthase (SuSy), Sucrose Phosphate Synthase (SuPS), Pyruvate Orthophosphate DiKinase (PODK), and Soluble Acid Invertase (SAI). The primers were designed using the Primer3 software (http://frodo.wi.mit.edu/cgi-bin/primer3/primer3_www.cgi) (Rozen and Skaletsky, 2000), out of which only the forward primer was used as a fixed primer. The primer optimum size, maximum size and minimum size were set to 18 nt. The optimum T_m, maximum T_m and minimum T_m were set to 53^{o}C, 55^{o}C and 50^{o}C respectively. The GenBank accession number and designed primer sequence for each gene is given in Table 2.

Arbitrary reverse primer sequences were obtained from Li and Quiros (2001). The basic structure of this primer included three selective nucleotides at the 3' end, 4 nucleotides of AT- or GC-rich content in the core region and 11 nucleotides as filler sequences at the 5' end. The AT and GC sequences are believed to target introns and exons, respectively. In addition, the basic rules of primer design such as self-complementarity and maintenance of 40-60% GC content were upheld in designing both primers (Table 2). The TRAP protocol was performed on an *i-cycler* (BioRad Labs, Hercules, CA) as described in Alwala et al (2006). After PCR, the amplified products were run on 7% polyacrylamide denaturing gel for 1.5 hrs at 110 W. The gel was developed and visualized using the silver staining technique.

AFLP markers

AFLP analysis was performed based on the protocol described by Vos et al (1995). Two hundred nanograms of DNA were double digested with *EcoR*I and *Mse*I and linked to specific adaptors. Primers carrying one selective nucleotide were designed based on adaptor sequence, for pre- selective amplification. *EcoR*I and *Mse*I primers with three selective nucleotides were used for selective amplifications. All the PCR amplifications were carried out on an *i-cycler* (BioRad Labs, Hercules, CA). The amplified products were mixed with equal amount of dye (composition) and 5 ul of each sample was separated by electrophoresis on 6% polyacrylamide denaturing gel for 2 hrs at 110 W. The gels were documented using the silver staining technique. A total of 28 *EcoR*I /*Mse*I AFLP primer combinations were used to screen the nine parents.

Estimation of TRAP- and AFLP-derived genetic diversity and polymorphic information content

The bands from AFLP- and TRAP-derived gels were scored as '1' for presence and '0' for absence. Jaccard-similarity coefficient (1908) was used to estimate genetic diversity (GS) between pairs of genotypes as follows: $GSij = a/(a+b+c)$ where $GSij$ is the genetic similarity measurement between individuals *i* and *j*, the number of polymorphic bands present in both individuals is represented by *a* whereas *b* and *c* are the number of bands present in individual *i* and *j* respectively but not in their counterparts. The bands absent in pairs of individuals were excluded from the calculation.

Allelic diversity at a given locus can be measured by Polymorphism Information Content (PIC) wherein a marker can distinguish two alleles taken at random from a population and it was calculated as follows:

$$PIC = 1- \Sigma f_i^2$$

Where, f_i is the frequency of the i^{th} allele (Weir 1990). Considering the number of alleles at a locus along with their relative frequencies in a given population, an estimate of the discriminatory power of a marker can be obtained by calculating the PIC (Vuylsteke et al 2000).

Coefficient of parentage

The coefficient of parentage (COP), which corresponds to the probability that alleles at a locus in two individuals are identical by descent, was calculated to represent the pedigree-based measure of genetic diversity. The COP was calculated based on Kempthorne (1957) using the "proc inbreeding" procedure in SAS (SAS Inc., 2002). The COP value between remotely related parents was assumed to be 0 and each genotype was assumed to receive half of their genome from each of its parent. All the ancestors were assumed to be heterozygous, since sugarcane is a highly heterozygous crop and in addition, the COP of a genotype with itself was assumed to be 0.5 rather 1.0 as for homozygous inbreds like rice (Kempthorne, 1957; Chiang and Lo, 1993; Deren, 1995).

Cluster and Principal Coordinate Analyses

For ease of interpretation, the GS values for TRAP, AFLP and COP between pairs of genotypes were subjected to both Cluster (CA) and Principal Coordinate (PCoA) Analyses to obtain a graphical representation of the relationships between the nine genotypes. The goodness of fit of the dendrograms formed from the GS matrix was evaluated by means of the cophenetic coefficient of correlation. A minimum-length spanning tree (MST) was superimposed on the PCoA plot to help detect local distortion because pairs of points which look close together in a plot may actually be far apart if other dimensions are taken into account. These analyses were performed using the NTSYS (CA; Rohlf, 2000) and PAST (PCoA; Hammer et al 2001) softwares. Bootstrap analysis with 1000 replications and 50 % consensus rule was performed using the PAUP software (Sinauer Associates, Inc., MA) and the boostrap values superimposed on the CA dendrogram as a measure of the robustness of branches on the dendrogram.

Correlation between COP, TRAP- and AFLP-derived GS

The correlation among pairs of the three genetic diversity measures was compared using two methods. The first method employed the MAXCOMP routine of NTSYSPC software in which two GS matrices are compared by estimating the normalized Mantel statistic Z (Mantel, 1967). The second method estimated the simple or Pearson's correlation coefficient (r) between the measures.

Bootstrap analysis

Bootstrap analysis (Efron, 1981) was carried out to investigate if the number of markers used to generate GS were sufficient to provide precise estimates among the genotypes. Sub samples consisting of different number of polymorphic bands were generated by re-sampling 1000 times, with replacement, to estimate GS between every two pairs of genotypes for each sub-sample. The average coefficient of variation was estimated across sub samples for a given number of polymorphic bands. The analysis was performed using the Dboot software kindly provided by Dr. Cohello (Personal communication).

Results

TRAP Markers

Percent polymorphism and PIC Values

All 12 TRAP primer combinations produced multiple PCR fragments (bands) in each of the nine cultivars which ranged in size from 300 to 700 bp (Fig 1). A total of 444 unambiguous bands were scored of which 242 (55%) were polymorphic (Table 3). The total number of bands amplified by individual primer combinations ranged from 19 (SuPS + Arbi 3) to 69 (SuSy + Arbi 1) with an average of 37 bands per primer combination. These two primer combinations were also responsible for the least (10) and most (41) number of polymorphic bands produced with an average of 20 polymorphic bands per primer combination. The PIC value averaged over all polymorphic loci for individual primer combinations varied from 0.32 to 0.40 with an overall mean of 0.36 ± 0.12. From the polymorphism produced it was possible to distinguish each one of the nine genotypes sometimes with just one of the primer combinations. Bands were found to be uniquely present or absent in some genotypes. TRAP fragments were found to be highly reproducible (Fig 1).

Genetic diversity and relationship among genotypes

The TRAP-GS averaged across all pair-wise combinations of genotypes was generally high, 0.75 ± 0.04, as expected from the shared ancestry among these genotypes (Table 1, Fig 2). The GS ranged from 0.67 (between HoCP91-552 and HoCP92-624) to 0.87 (between LCP85-384 and HoCP96-540) (Table 4, Fig 3). Data from the GS matrix were visualized using two methods, CA and PCoA.

The CA yielded a dendrogram (Fig 3) with a cophenetic coefficient of correlation value of 0.81 which is above the 0.80 generally regarded as a good fit (Rohlf and Sokal, 1981. No distinct clusters were found, however, a subgroup was apparent between LCP85-384, HoCP96-540 and LCP86-454 (Fig 3) which is in agreement with the close relationship known among these genotypes (Table 4). Missing from this subgroup, however, was L99-238 a progeny of LCP85-384. The average GS between members of the group containing LCP85-384, HoCP96-540 and LCP86-454 vs. Ho95-988 is 0.78 while for L99-238 it is 0.77; this might explain why using the clustering technique, Ho95-988 was placed closer to the group compared with L99-238.

The bi-plot from PCoA superimposed with the MST portrayed a slightly different sub-grouping which was composed of LCP85-384 and its two progeny, L99-238 and HoCP96-540 (Fig 4, Table 4). Considering the first principal coordinate, LCP86-454 a half-sibling of LCP85-384 was placed outside of the subgroup (Fig 3) although the MST clearly illustrates the relationship between the two genotypes. Both the CA and PCoA portrayed HoCP91-552 as the genotype most distant from the rest of the group (Figs 3 and 4). In the dendrogram (Fig 3) the split of HoCP91-552 from the rest of the genotypes was only one of two branches supported by a bootstrap value greater than 50 %.

Bootstrap analysis

As expected, the accuracy of distinguishing between the nine genotypes, as measured using the mean coefficient of variation (CV %), increased with increasing numbers of polymorphic TRAP bands. Using all 444 polymorphic bands, the nine genotypes were distinguished with an accuracy level of 2.95% which is very reliable considering most authors have recommended a CV of 10% to be reliable (Fig 5). Only 40 polymorphic TRAP bands would be required to distinguish the nine genotypes with an accuracy level of 10 %.

AFLP Markers

Percent polymorphism and PIC Values

A total of 40 AFLP primer combinations were tested of which 28 were polymorphic enough for use in studying genetic relationships. The 28 primer combinations produced a total of 1375 bands of which 689 (50%) were polymorphic (Table 5). The unambiguous bands ranged in size from 250 to 600bp. The total number of bands per primer combination ranged from 23 (E-AAC+M-CTC) to 81 (E-ACA+M-CTC) with an average of 49 bands per primer combination. These two primer combinations were also responsible for the least (8; E-AAC+M-CTC) and the most (44; E-ACA+M-CTC) number of polymorphic bands produced with an average of 25 polymorphic bands per primer combination. The PIC value averaged over all polymorphic loci for individual primer combinations varied from 0.27 (E-ACA+M-CAC) to 0.45 (E-ACA+M-CAG) with an overall mean 0.35 ± 0.12. As with TRAP markers, it was possible to distinguish each one of the nine genotypes sometimes with just one AFLP primer combination. Also, bands were found to be uniquely present or absent in some genotypes.

Genetic diversity and relationship among genotypes

The AFLP-GS estimates between pairs of genotypes ranged from 0.72 (between HoCP92-624 and Ho95-988) to 0.84 (between HoCP92-624 and LCP85-384) with a mean value of 0.76 ± 0.03 (Table 4, Fig 2). Cluster analysis produced a dendrogram with a cophenetic coefficient of correlation value of 75 (Fig 6). The dendrogram had two distinct clusters although the bifurcation had only marginal (45 %) bootstrap support. The cultivar LCP85-384 was placed in a cluster with both of its progenies, L99-238 and HoCP96-540 but not its half sibling LCP86-454 (Fig 6; Table 1). Surprisingly, the closest and most robust (100 % bootstrap support) relationship was found between LCP85-384 and HoCP92-624 a genotype with which it seemingly does not share a recent lineage (Table 6). Similar results were depicted by the PCoA with the same two groups of genotypes apparent in the first principal coordinate (Fig 7).

Bootstrap analysis

A total of 1375 polymorphic bands were revealed by AFLP markers. However, for comparison with the 444 polymorphic bands revealed by TRAP markers, each of 10 sub samples (with replacement) of 450 AFLP polymorphic bands was subjected to bootstrap analysis. The coefficient of variation was then averaged for each number of bands in the query. Based on the 450 bands, the nine genotypes could be distinguished with an accuracy level of 2.7% (Fig 8). In distinguishing among the nine genotypes, only about 30 polymorphic AFLP bands would be necessary to achieve an accuracy level of 10 %.

COP

Genetic diversity and relationship among genotypes

The COP-GS estimates among the nine genotypes varied from 0.03 (between TUCCP77-042 and Ho95-988 and Ho95-988 and LCP86-454) to 0.36 (between HoCP96-540 and LCP85-384) with a mean of 0.12 ± 0.09 (Table 4; Fig 2). Cluster analysis of the pair-wise COP matrix resulted in a dendrogram with a cophenetic coefficient of correlation value of 0.92 (Fig 9). The COP-derived dendrogram revealed no distinct pattern of diversity. For example, although one could still trace the relationship among genotypes such as LCP85-384, HCP96-540, L99-238 and LCP86-454 which are known to share a common lineage (Table 1), CA (Fig 9) displayed no dichotomy between this group (related) and the non-related genotypes in the study. This dichotomy was clearly revealed by the PCoA-derived bi-plot (Fig10)

Associations between Pedigree-, TRAP-, and AFLP-derived GS estimates

Similar levels of association were estimated by both methods (normalized Mantel Z statistic and Pearson's correlation coefficient) used (Table 6). Similar levels of association were found between COP-GS with TRAP-GS and COP-GS with AFLP-GS. Although the correlation values were significant ($P < 0.05$; N = 36) they were in the moderate to low range (0.40). Both methods (Mantel and Pearson) also calculated a similar level of correlation between the two (TRAP and AFLP) molecular marker-derived GS estimates. The correlation between these two molecular DNA-derived GS estimates was much smaller (0.14) compared with each of their correlations to the COP-GS (0.40).

Discussion

Comparing characteristics of TRAP and AFLP markers

The values for percent polymorphism and PIC reported in this study are typical for sugarcane. Using 21 AFLP primer combinations, Lima et al. (2002) detected an average of 50 % polymorphism among 79 Brazilian cultivars while Selvi et al (2005) reported an average of 52 % among 28 cultivars from India using 12 primer combinations. Selvi et al (2005) reported PIC values for AFLP that ranged from 0.31 to 0.41. TRAP analysis based upon 24 primer combinations among 61 sugarcane cultivars from Canal Point, Florida detected 58% polymorphism and a PIC value of 0.32 (Edme et al., Manuscript in Preparation). The complex polymorphism profile displayed by sugarcane for AFLP (Besse et al., 1998; Lima et al., 2002; Selvi et al., 2005; this study) and TRAP (Arro, 2004; Edme et al., In Press; this study) markers can be attributed to its large genome size and high levels of heterozygosity which is perpetuated via vegetative propagation. The complex polymorphism profile displayed by each of the AFLP and TRAP primer combinations meant that no two of the nine genotypes presented an identical profile. Thus, TRAP markers could also be useful for sugarcane fingerprinting.

The utility of a DNA marker technique can be defined by its multiplex ratio (number of markers that can be generated in one single reaction) and the Polymorphism Information Content (effective number of alleles that can be detected per marker in a set of individuals) (Powell et al., 1996). The ability of the AFLP technique to simultaneously amplify a large number of marker loci throughout the genome has been cited as a major advantage of AFLPs over other marker systems (Vuylsteke et al., 2000). In this study, however, the AFLP was only marginally superior to TRAP with regards to the total number of bands amplified per primer combination and the number of bands necessary to attain an accuracy level of 10 % when differentiating among the nine genotypes. The overall percent polymorphism was actually higher for TRAP (242/444) than AFLP (689/1375). In addition, similar PIC values were found between the two marker systems. Thus, on the basis of these data, a similar level of polymorphism detection efficiency is to be expected from these two dominant markers.

Experience in our lab has shown, however, that the relative polymorphism detection efficiency between AFLP and TRAP is highly dependent upon the type of population being genotyped. For example, dramatically different results were obtained when the same set of TRAP and AFLP markers were used to genotype 88 individuals from an interspecific (*Saccharum officinarum x S. spontaneum*) mapping population. The total number of bands amplified and percent polymorphism revealed by AFLP surpassed that of TRAP by about 3-4 fold (Unpublished Data). Because TRAP primers are designed to target only a small portion of the genome (Hu and Vick, 2003; Alwala et al., 2006), AFLP markers may be more robust for detecting polymorphism among closely related genotypes as they are more likely to sample throughout the genome. In soybeans, Powell et al. (1996) found good correlations between AFLP and other markers (RFLP, RAPD and SSR) at the interspecies level which disappeared at the intraspecies level with the AFLP giving the best resolution among genotypes. It is best to allow research objectives to guide the decision of choosing the appropriate DNA marker technique(s).

Comparing GS estimates

The mean, range and distribution values for TRAP-GS and AFLP-GS were similar, but both were distinct from COP-GS (Table 4; Fig 2). The mean values from TRAP-GS and AFLP-GS highlight the narrow genetic base reported for cultivated sugarcane (Berding and Roach, 1987; Mangelsdorf, 1983; Deren, 1995; Lima et al., 2002; Arro, 2004) whereas, judging from the COP-GS it would appear substantial amounts of genetic diversity exist in sugarcane. Figure 2 shows that up to 55% (20/36) of the COP-GS were less than 0.1 suggesting that only about 45% of the genetic material segregating in the ancestral population was identical by descent between any two genotypes in this study. In calculating TRAP-GS and AFLP-GS only polymorphic bands were taken into consideration yet, lower levels of genetic diversity (high GS) were detected by these methods compared with the COP method. Moreover, of the total bands amplified by TRAP and AFLP markers, 45 % and 49 %, respectively, were monomorphic and therefore identical in state. This tendency for the COP method to overestimate genetic diversity compared to DNA-based methods has been reported by other authors (Cox et al., 1985; Barbosa-Neto et al., 1996; Kim and Ward, 1997).

As with several previous studies (Cox et al., 1985; Graner, 1994; Barbosa-Neto et al., 1996; Kim and Ward, 1997; Sun et al. 2003) this study found low to moderate levels of association between the DNA- and COP-based estimates of GS. In wheat, a low *r* value of 0.27 was observed by Cox et al (1985) between isozyme-based GS and COP. RFLP-based GS with COP in barley generated a low correlation value of 0.27 for winter type and a moderate value of 0.42 for spring type (Graner et al. 1994). Evaluating the correlation between RAPD-based GS with COP resulted in a low *r* value of 0.104 in potatoes (Sun et al. 2003). This disparity stems from the fact that the assumptions inherent in calculating COP are unrealistic for most cultivated species and sugarcane is no exception (Deren, 1995). For example, the COP assumes that both parents contribute equally (half of their alleles) to the offspring essentially ignoring the effect of selection and genetic drift during cultivar development. As evident from Table 4, the relationship between LCP85-384 and its two progenies HOCP96540 and L99238 was not equal for TRAP-GS and AFLP-GS. Furthermore, it is well known that chromosome numbers within cultivated sugarcane can vary (generally from about 100-130) even among full sib progenies. This can substantially affect DNA-based measurements of GS but is yet unaccounted for by currently available models for estimating COP.

Considering that only a handful of clones were used in the original nobilization event to derive modern sugarcane, the assumption that two clones in this study are unrelated (COP = 0) relative to the original ancestors would be unrealistic. Thus, contrary to the DNA-based methods, the COP method ignores alleles that are alike in state but not identical by descent resulting in a disproportionate downward bias of GS estimates. Incomplete pedigree records or errors in annotating parents would help to over emphasize the downward bias of COP estimates. To minimize this bias we recalculated the correlation coefficients after eliminating the values for COP < 0.1. The correlation between COP-GS and TRAP-GS increased ($r = 0.69$; $N = 16$), that for COP-GS with AFLP-GS decreased ($r = 0.31$; $N = 16$), while that between TRAP-GS and AFLP-GS remained unchanged ($r = 0.16$; $N =16$). However, when values for the 3 closest known relatives were removed (i.e., COP = 0.35) the correlations decreased to 0.06 (COP with TRAP), 0.22 (COP with AFLP, and 0.11 (TRAP with AFLP). The lack of congruence and consistency among TRAP-GS, AFLP-GS and COP-GS throughout the range of diversity detected among the genotypes in this study suggests that the three measures detect different aspects of relatedness.

Several authors (Graner, 1994; Barbosa-Neto et al., 1996; Kim and Ward, 1997; Sun et al. 2003) have recommended using molecular marker based estimates of GS over COP. This is largely because molecular markers such as TRAP and AFLP provide a more accurate estimate of GS as they directly measure DNA sequence variation. However, a drawback of markers such as TRAP and AFLP is that the utility of bands produced by these markers can be confounded by lack of locus specificity. Without sequencing it is difficult to discount the fact that bands or alleles that are identical in state may not actually represent co-migrating nonhomologous bands. The lack of adequate genome coverage is another factor that can limit the utility of DNA-based estimates of GS. This can be resolved by using markers for which the genome location is known.

Comparing genetic diversity patterns among genotypes

Following CA the least distinct pattern was obtained from the COP dendrogram while AFLP gave the most distinct pattern although it was easier to explain the TRAP dendrogram based on pedigree records. The genetic resolution and interpretation of the data was enhanced by including the PCoA bi-plots. In general, when the dendrogram and bi-plot were considered together the three measures seemed to depict a somewhat similar pattern of relationship among the genotypes, the major exception being the tight relationship (100% bootstrap support) between LCP85-384 and HoCP92-624. A closer examining of the pedigree tree revealed that the maternal grand parents of LCP85-384 (CP52-068 x L65-69) were indeed the great grand parents of HoCP92-624 (CP52-068 x CP62-258) (CP65-357 x L65-69). One could speculate that AFLP markers may be detecting favorable alleles or blocks of genes from these ancestral parents that were preserved through independent selection for the same trait(s) in the two cultivars. Only sucrose related TRAP markers were exemplified in this study and those may not be the subject of selection being detected by AFLP markers.

Conclusion

The results show that TRAP markers have utility for sugarcane genetic diversity studies. TRAP markers produced percent polymorphism and PIC values similar to that of AFLP markers. A similar low to moderate level of association was found between TRAP-GS and COP-GS as with AFLP-GS and COP-GS. Very low level of association was found between TRAP-GS and AFLP-GS. Violations of the assumptions used in calculating COP was partly responsible for the low level of association between COP and the two DNA-based estimates, as the COP method tends to underestimate GS. However, exclusion of subsets of data along the range of COP-GS estimates led to different levels of association between COP and TRAP, COP and AFLP and TRAP and AFLP suggesting that the three measures were detecting different aspects of GS. Notwithstanding, with a few exceptions, the dendrograms and bi-plots produced using the three measures depicted a somewhat similar pattern of diversity among the genotypes. Therefore, some combination of TRAP, AFLP and COP would likely be more useful in estimating GS as this would compensate for the inaccuracies inherent within each of the methods.

Estimates of GS could be incorporated as a tool to assist sugarcane breeders with selecting the most divergent parents to maximize heterosis and transgressive segregation in the progeny population. The inexpensive COP could be used as a first step to assemble a large diverse group of potential parents. Molecular markers such as TRAP and AFLP which provide a more direct and accurate estimate of allele frequency differences among the parents could be used to decide the best crosses based on pair-wise GS values between the parents. Only loci for which the parents carry different alleles will contribute to genetic variance in the progeny population. If such loci co-locate with genes governing the traits being measured then it may be possible to predict hybrid performance based on GS among parents.

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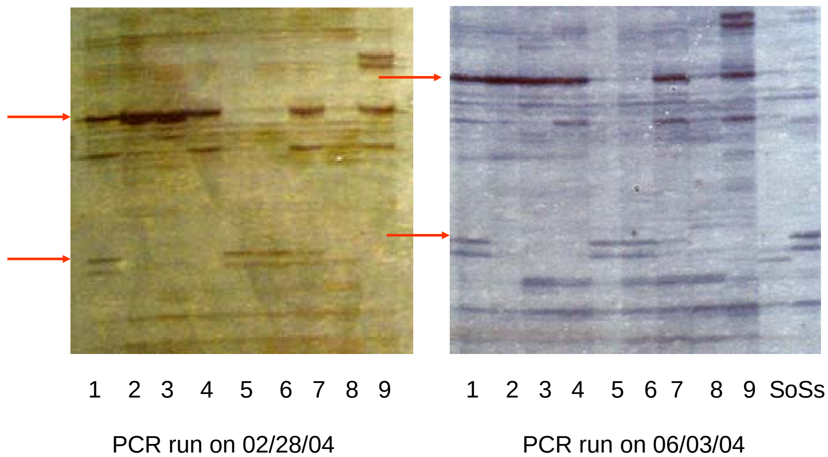

Figure 1. Reproducibility of TRAP markers depicted here by segments from two silver-stained polyacrylamide gels with polymorphic TRAP fragments generated using SuSy + Arbi 3 (see Table 1). Entries 1 to 9 are similar on the two gels but the reactions and gels were run on different dates. Entries: 1= L99-238; 2 = HoCP91-552;
3 = LCP86-454; 4 = HO95988; 5 = LCP85-384; 6 = HoCP96540; 7 = HoCP95951;
8 = TucCP77042; 9 = HoCP92624; So = La Stripe; Ss = SES 147 B. Arrows show identical banding patterns between the two gels

Table 1. Description of cultivars used in the study.

Genotype	Female parent	Male parent	Agronomic characteristics
L99-238	CP79-318	LCP85-384	High sucrose parent
HoCP91-552	LCP81-10	CP72-356	High tonnage; high fiber
LCP86-454	CP77-310	CP69-380	Commercial; early high sucrose content
Ho95-988	CP86-941	US89-12	Commercial; high sugar yields and good ratooning ability
LCP85-384	CP77-310	CP77-407	Commercial; leading commercial cultivar in Louisiana from 1998 to present; high sugar yield, good ratooning ability and recently showing susceptibility to rust disease
HoCP96-540	LCP86-454	LCP85-384	Commercial; released in 2003; high sugar and cane yields; good disease resistance
HoCP95-951	CP85-866	CP85-830	BC_5 of US60-8-3; high cane yield and fiber content
TucCP77-042	CP71-321	US72-19	Commercial cultivar in Argentina; high cane yield and average sucrose content
HoCP92-624	CP81-325	CP71-1038	High sugar and cane yield; dropped due to excessive lodging; used extensively in crossing programs.

Table 2. Sequences of fixed and arbitrary primers used for TRAP markers.

Fixed Primers	Gene	Sequence (5’→ 3’)	Tm (C)
	Sucrose Synthase (SuSy)	GGAGGAGCTGAGTGTTTC	53
	Sucrose Phosphate Synthase (SuPS)	CGACAACTGGATCAACAG	53
	Pyruvate Orthophosphate DiKinase (PODK)	CGTAAAGATTGCTGTGGA	53
	Soluble Acid Invertase (SAI)	AGGACGAGACCACACTCT	53
Arbitrary primers	Arbi 1	GACTGCGTACGAATTAAT	53
	Arbi 2	GACTGCGTACGAATTGAC	53
	Arbi 3	GACTGCGTACGAATTTGA	53

Table 3. Percent polymorphism and PIC values of TRAP markers used in genotyping nine sugarcane parents.

	Primer combination	Bands observed	Polymorphic bands	Percent Polymorphism	PIC
1	SuSy + Arbi 1	69	41	59.42	0.327
2	SuSy + Arbi 2	60	19	31.66	0.376
3	SuSy + Arbi 3	54	38	70.37	0.345
4	SuPS + Arbi 1	25	15	60.00	0.386
5	SuPS + Arbi 2	45	24	53.33	0.377
6	SuPS + Arbi 3	19	10	52.63	0.401
7	PODK + Arbi 1	31	14	45.16	0.320
8	PODK + Arbi 2	28	18	64.28	0.403
9	PODK + Arbi 3	34	15	44.11	0.353
10	SAI + Arbi 1	35	21	60.00	0.363
11	SAI + Arbi 2	20	13	65.00	0.323
12	SAI + Arbi 3	24	14	58.33	0.338
	Total	444	242		
	Average	37	20	55	0.359

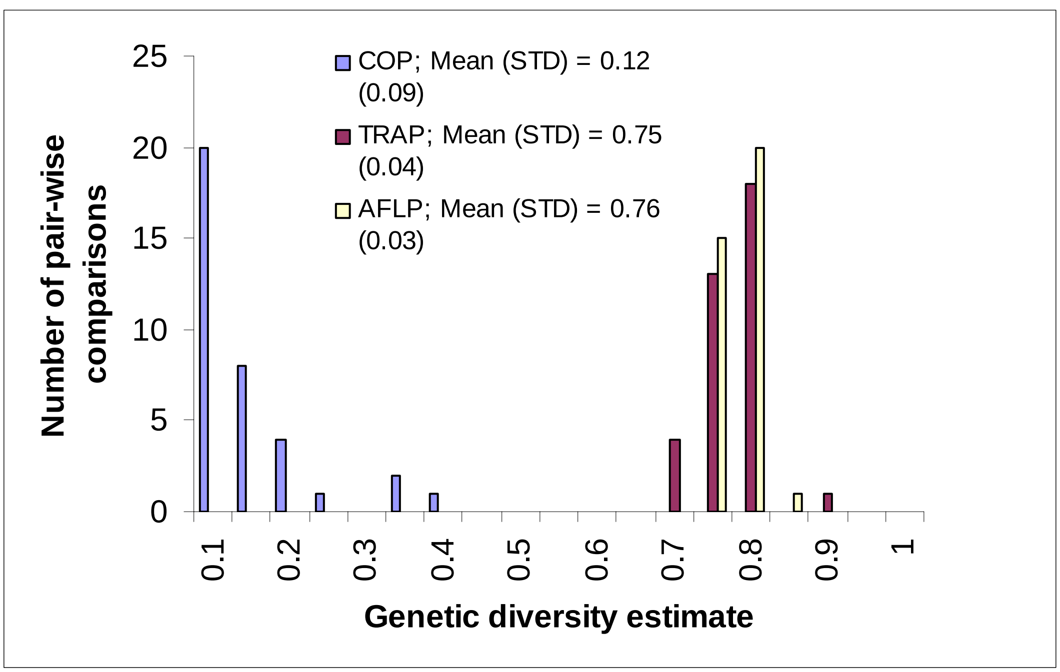

Fig 2. Frequency distribution of genetic similarity estimates based on pedigree (COP), TRAP and AFLP data.

Table 4. Pair-wise genetic similarity estimates for TRAP, AFLP and COP.

	L99238	HOCP91552	LCP86454	HO95988	LCP85384	HOCP96540	HOCP95951	TUCCP77042	HOCP92624
TRAP									
L99238	1								
HOCP91552	0.68	1							
LCP86454	0.76	0.78	1						
HO95988	0.72	0.71	0.78	1					
LCP85384	0.79	0.73	0.79	0.78	1				
HOCP96540	0.78	0.71	0.79	0.79	0.87	1			
HOCP95951	0.69	0.71	0.77	0.75	0.75	0.76	1		
TUCCP77042	0.72	0.72	0.79	0.74	0.78	0.77	0.76	1	
HOCP92624	0.7	0.67	0.76	0.77	0.75	0.75	0.76	0.75	1
AFLP									
L99238	1								
HOCP91552	0.78	1							
LCP86454	0.79	0.8	1						
HO95988	0.73	0.78	0.76	1					
LCP85384	0.8	0.77	0.75	0.76	1				
HOCP96540	0.77	0.75	0.79	0.73	0.77	1			
HOCP95951	0.76	0.75	0.75	0.76	0.74	0.77	1		
TUCCP77042	0.75	0.74	0.76	0.72	0.75	0.74	0.75	1	
HOCP92624	0.77	0.74	0.73	0.72	0.84	0.79	0.72	0.74	1
COP									
L99238	0.50								
HOCP91552	0.10	0.50							
LCP86454	0.15	0.08	0.50						
HO95988	0.05	0.04	0.03	0.50					
LCP85384	0.35	0.08	0.18	0.04	0.50				
HOCP96540	0.25	0.08	0.35	0.04	0.35	0.50			
HOCP95951	0.20	0.11	0.11	0.06	0.20	0.15	0.50		
TUCCP77042	0.07	0.08	0.06	0.03	0.07	0.07	0.08	0.50	
HOCP92624	0.15	0.10	0.11	0.04	0.14	0.13	0.16	0.09	0.50

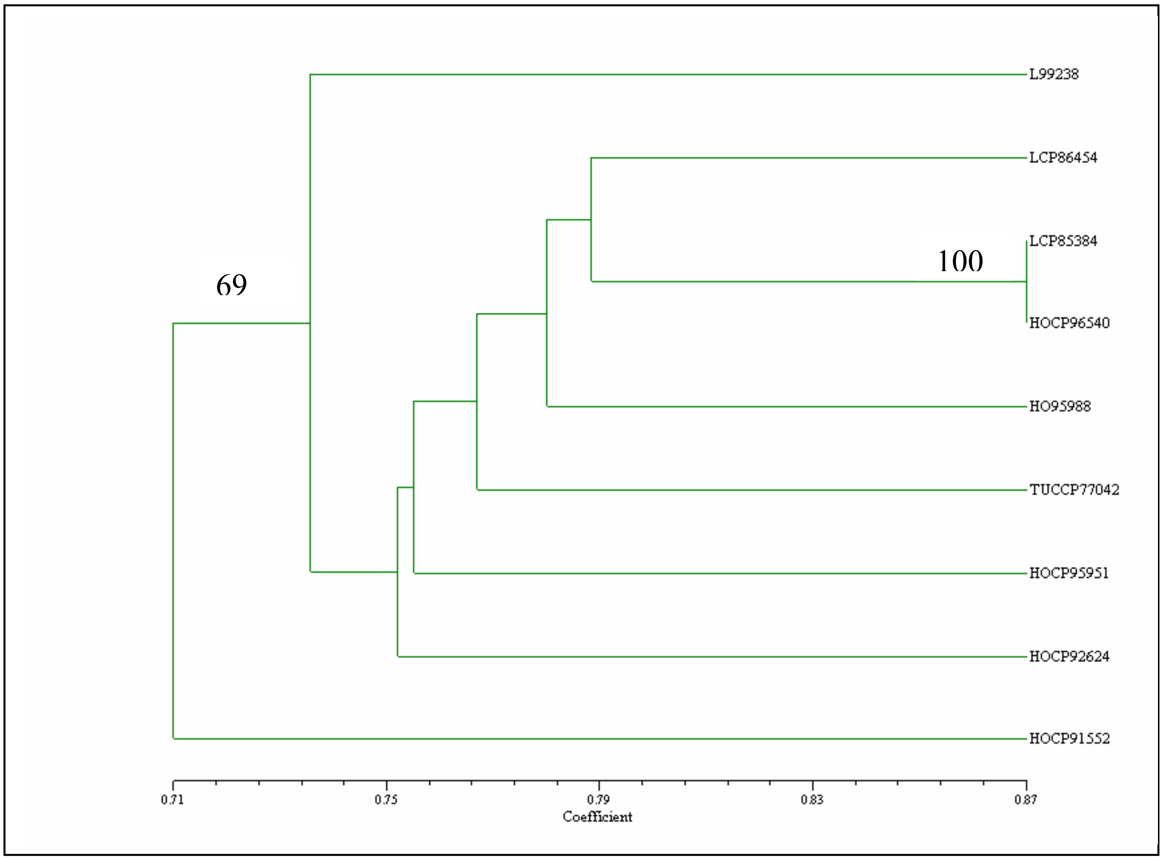

Fig 3. UPGMA dendrogram depicting genetic diversity pattern among nine sugarcane genotypes based on TRAP markers. $r_{Coph.}$ = 0.81. Numbers on dendrogram represent 50% majority rule bootstrap values.

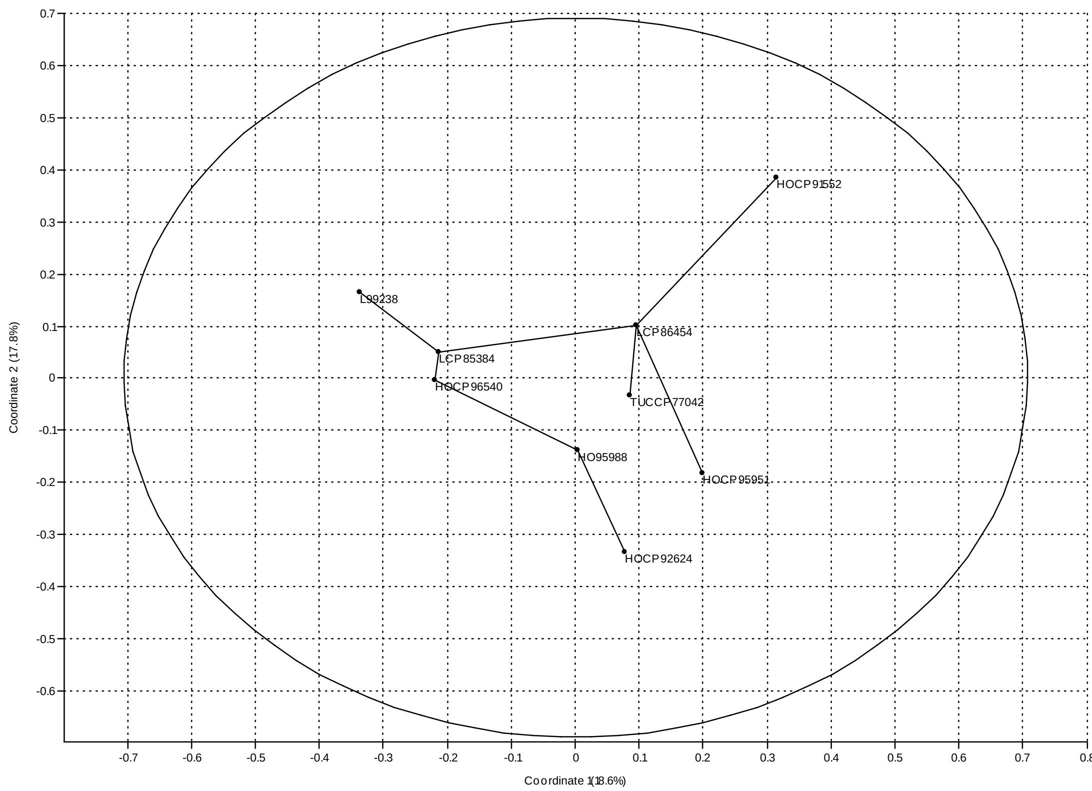

Fig 4. Principal coordinate analysis bi-plot depicting genetic diversity pattern among nine sugarcane genotypes based on TRAP markers.

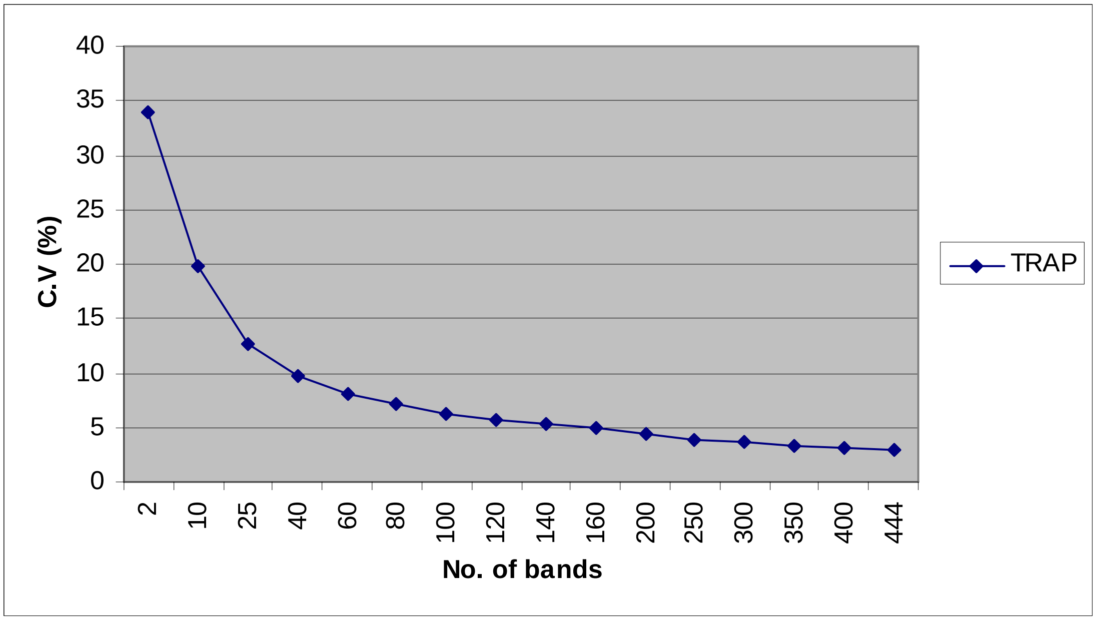

Fig 5. Accuracy (CV, %), estimated using bootstrap analysis, with which nine genotypes can be distinguished using different number of TRAP bands.

Table 5. AFLP primer combinations and the number of total and polymorphic bands observed.

	Primer combination	Bands observed	Polymorphic bands	Percent Polymorphism	PIC
1	E-ACT+M-CAT	64	28	43.75	0.329
2	E-ACT+M-CAA	37	15	40.54	0.332
3	E-ACT+M-CTC	36	35	97.22	0.383
4	E-ACT+M-CTG	53	29	54.71	0.381
5	E-AAC+M-CAA	64	21	32.81	0.345
6	E-AAC+M-CTA	44	26	59.09	0.372
7	E-AAC+M-CTC	23	08	34.78	0.364
8	E-AAC+M-CTG	66	30	45.45	0.393
9	E-ACC+M-CAA	53	17	32.07	0.368
10	E-ACC+M-CTA	55	23	41.81	0.322
11	E-ACC+M-CTC	50	19	38.00	0.332
12	E-ACC+M-CTG	53	22	41.51	0.334
13	E-ACA+M-CAA	39	22	56.41	0.371
14	E-ACA+M-CTA	40	31	77.50	0.288
15	E-ACA+M-CTC	81	44	54.32	0.347
16	E-ACA+M-CTG	68	23	33.82	0.345
17	E-AGC+M-CAT	25	20	80.00	0.345
18	E-AGC+M-CAA	53	18	33.96	0.345
19	E-AGC+M-CTG	46	22	47.82	0.318
20	E-ACG+M-CAT	40	24	60.00	0.390
21	E-ACG+M-CAA	44	27	61.36	0.345
22	E-AAC+M-CAC	45	25	55.55	0.353
23	E-ACC+M-CAC	49	26	53.06	0.387
24	E-ACA+M-CAC	37	26	70.27	0.273
25	E-AGC+M-CAC	40	23	57.50	0.369
26	E-ACC+M-CAG	44	29	65.90	0.357
27	E-ACA+M-CAG	35	21	60.00	0.451
28	E-AGC+M-CAG	41	32	78.04	0.373
	Total	1375	689		
	Average	47	24	50	0.354

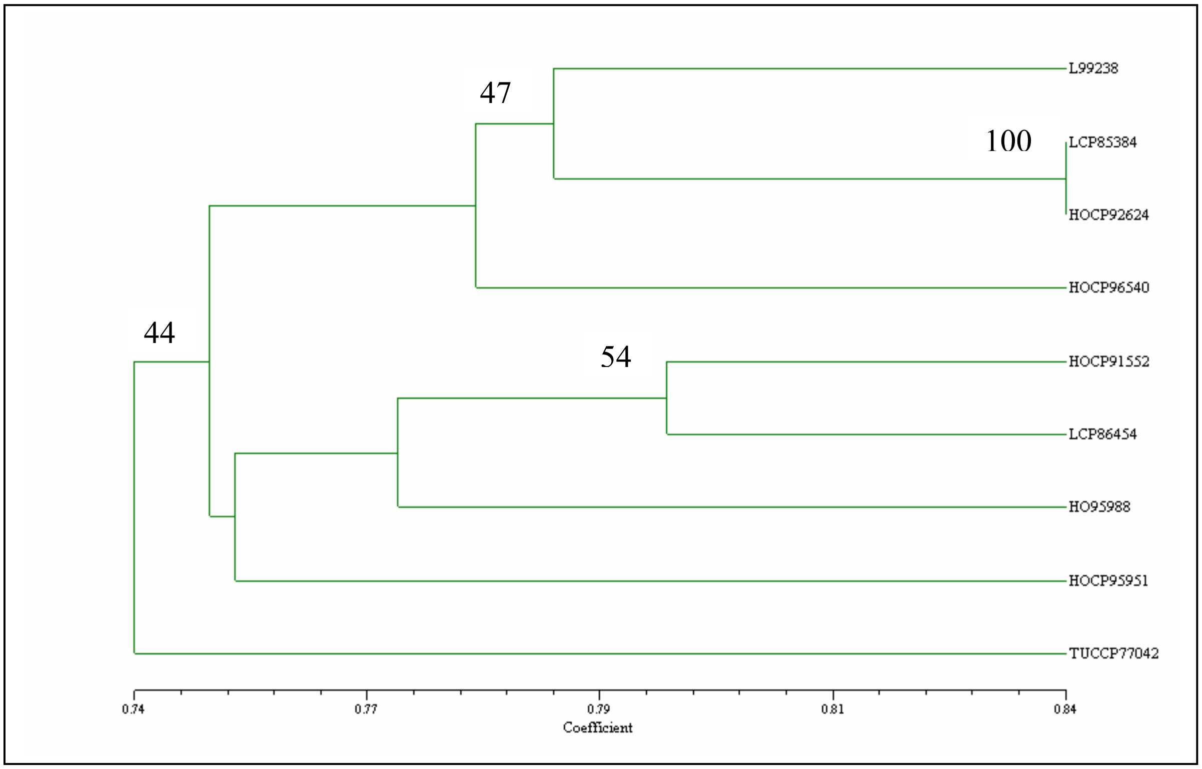

Fig 6. UPGMA dendrogram depicting genetic diversity pattern among nine sugarcane genotypes based on AFLP markers. $r_{Coph.}$ = 0.75. Numbers on dendrogram represent 50% majority rule bootstrap values.

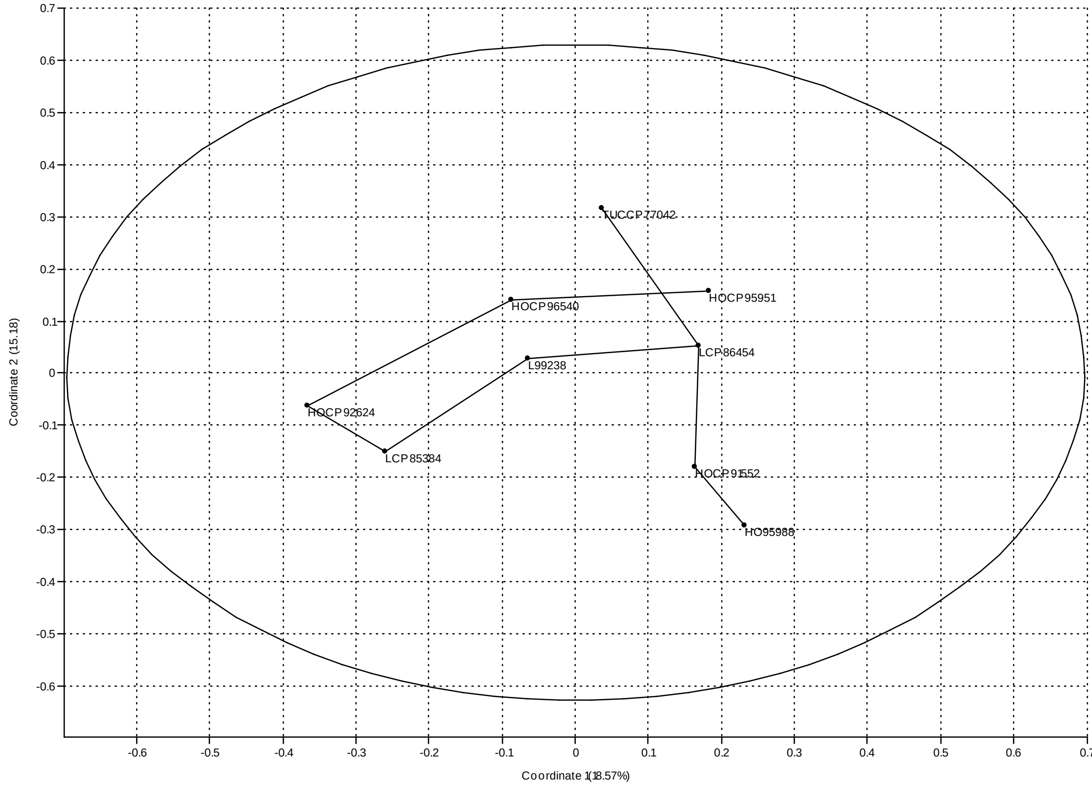

Fig 7. Principal coordinate analysis bi-plot depicting genetic diversity pattern among nine sugarcane genotypes based on AFLP markers.

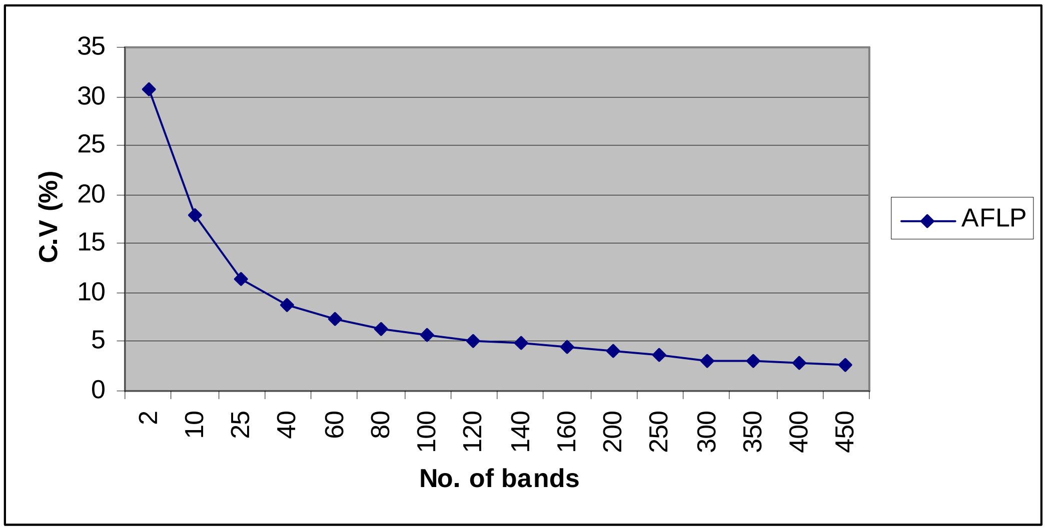

Fig 8. Accuracy (CV, %), estimated using bootstrap analysis, with which nine genotypes can be distinguished using different number of AFLP bands.

Table 6. The Mantel's Z statistic and correlation coefficient for pair-wise comparisons between the COP-, TRAP- and AFLP-derived estimates of genetic similarity.

	Normalized Mantel Z statistic *R*	Correlation Coefficient (*r*)
AFLP vs CoP	0.41	0.42
TRAP vs CoP	0.40	0.41
AFLP vs TRAP	0.14	0.14

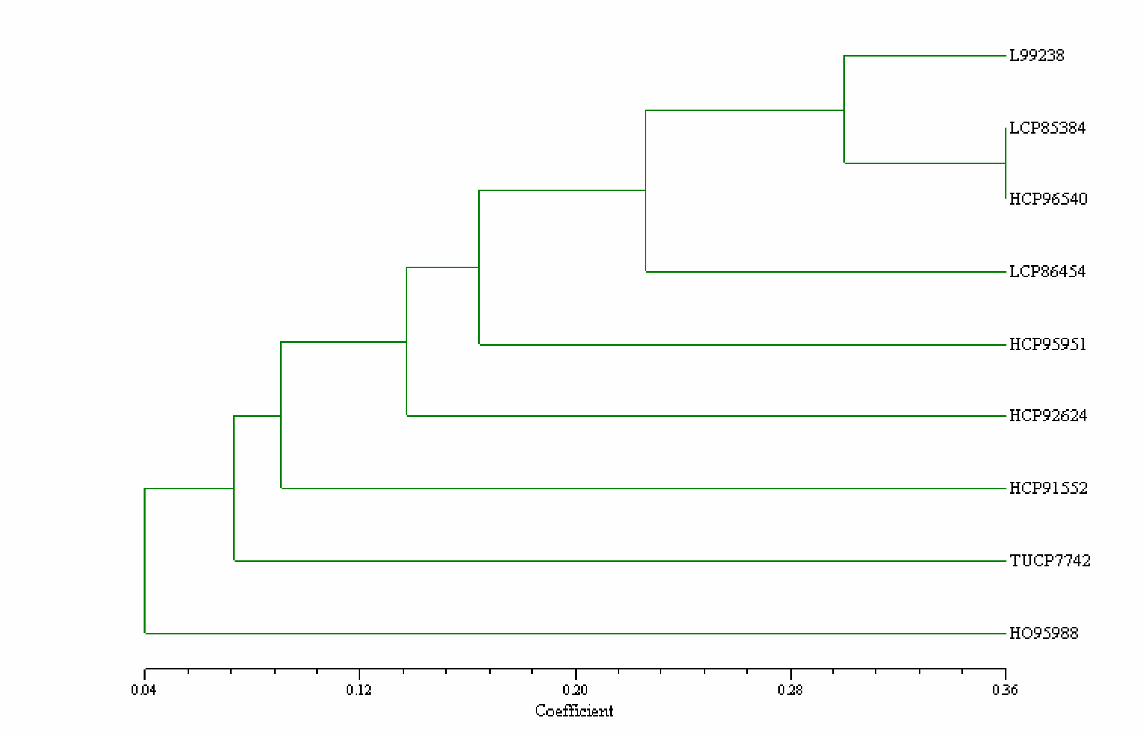

Fig 9. UPGMA dendrogram depicting genetic diversity pattern among nine sugarcane genotypes based on COP. $r_{Coph.} = 0.92$.

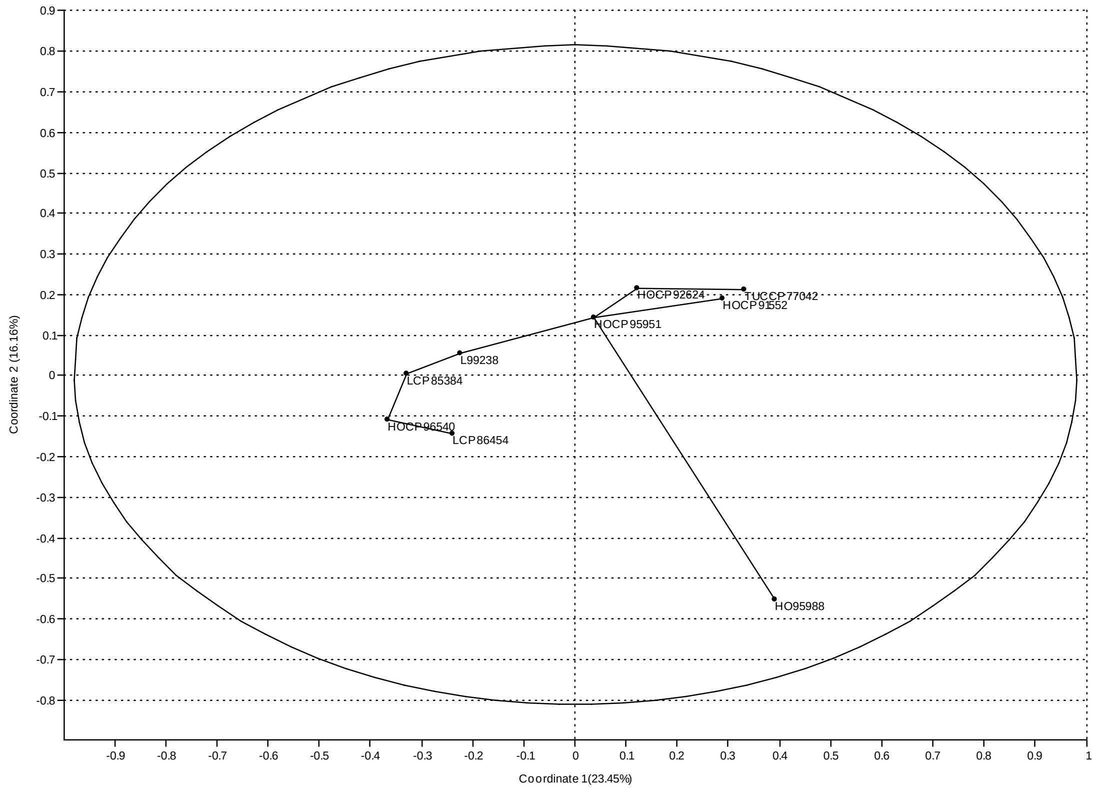

Fig 10. Principal coordinate analysis bi-plot depicting genetic diversity pattern among nine sugarcane genotypes based on COP.