SUGARCANE RESEARCH

ANNUAL PROGRESS REPORT

2003

This report is from 2003 only and should be regarded as preliminary. Complete research is reported in appropriate Louisiana Agricultural Experiment Station and Louisiana Cooperative Extension Service publications and/or other professional publications.

LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER
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FOREWORD

Research on sugarcane in the Louisiana Agricultural Experiment Station is an integral part of the LSU Agricultural Center's research-extension effort to provide the knowledge and technology base for efficient production and processing of sugarcane. Sugarcane research projects are led by scientists in the Sugar Research Station, Audubon Sugar Institute and the departments of Agricultural Economics and Agribusiness, Agronomy, Biological and Agricultural Engineering, Entomology, and Plant Pathology and Crop Physiology.

Members of the Louisiana Agricultural Experiment Station maintain close working relations with colleagues in respective departments of the College of Agriculture and other colleges of the LSU Baton Rouge campus, the Louisiana Cooperative Extension Service, the Agricultural Research Service and Natural Resources Conservation Service of the USDA, the American Sugar Cane League, and the Louisiana Department of Agriculture and Forestry.

A major portion of the resources for production research is linked to the St. Gabriel Research Station and the Sugar Research Station located at St. Gabriel, La. Processing research is linked to the Audubon Sugar Institute located on the LSU campus at Baton Rouge, La. The Iberia Research Station helped to accomplish specific sugarcane research objectives in 2003.

Important parts of the 2003 research effort were conducted on cooperating farms and in cooperating factories. These activities are important and must be continued. The cooperation of individual farms and sugarcane factories in conducting research projects and financial support from the American Sugar Cane League are gratefully acknowledged.

Table of Contents

WEED CONTROL

CULTURAL PRACTICES

SOIL FERTILITY

ENVIRONMENTAL

ECONOMICS

PLANT GROWTH REGULATORS

AN OVERVIEW OF 2003 ACTIVITIES IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

Kenneth A. Gravois
St. Gabriel Research Station

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 (plant cane, 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 2003.

Team Member	Budgetary Unit	Responsibility
Kenneth Gravois	St. Gabriel Research Station	Program Leader
Keith Bischoff	St. Gabriel Research Station	Selection
Collins Kimbeng	Agronomy & Environmental Mgmt.	Molecular Breeding
Gene Reagan	Entomology	Insect Resistance
Jeff Hoy	Plant Pathology & Crop Physiology	Disease Resistance
Jim Griffin	Agronomy & Environmental Mgmt.	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
Al Orgeron	St. Gabriel Research Station	Outfield Variety Testing
Todd Robert	St. Gabriel Research Station	Variety Testing
Joel Hebert	St. Gabriel Research Station	Farm Manager

A total of 73,160 seedlings from 192 crosses from the 2002 crossing series were planted in the field in the spring of 2003. A total of 66,011 seedlings survived transplanting. In addition, 6,164 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 2004 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 2003 was excellent, with 409 crosses being made. Germination tests were conducted in December and January. Seed production for 2003 was more than adequate based on germination test results, with 485,313 true seed produced during 2003.

In the fall of 2003, individual selection was practiced on 46,325 first stubble seedlings that represented the 2001 crossing series. Family selection (top 78% in 2003) was utilized based on information from the cross appraisal study. Of the 46,325 clones, 2,902 were selected and planted to establish the first-line trials.

Established procedures were used to advance superior clones of the 2000 crossing series from first-line trials to second-line trials (699 clones) and of the 1999 crossing series from second-line trials to increase trials (152 clones). After preliminary ratings for cane yield and plant type in August, clones with acceptable ratings were further evaluated for lodging, borer damage, presence of disease, presence of pith/tube, and Brix/sugar per ton.

The best 35 experimental varieties from the 1998 crossing series were assigned permanent variety designations in the fall of 2003. Newly assigned varieties were entered in replicated nursery trials at three locations (St. Gabriel Research Station, USDA Ardoyne Farm, and Iberia Research Station). “L”, “HoCP, or Ho” varieties of the 2003 and 2002 series were exchanged in the fall of 2003 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 2002 series), introduced to the outfield tests (three varieties of the 2001 series), and planted in outfield tests (one variety of the 1997 series; one variety of the 1998 series; two varieties of the 1999 series; one variety of the 2000 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 2003 meeting was held on August 13, 2003, at the American Sugar Cane League office in Thibodaux.

The distribution of “L” and “LCP” experimental clones through stages of testing in 2003 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.

Table 2. Number of "L" varieties by assignment series at the most advanced stage of testing in 2003.

Series	**Stage of Testing**	**Number of experimental varieties**
L 1997	Outfield - Replanted and harvested as plant cane, first stubble, and second stubble	1
L 1998	Outfield – Replanted and harvested as plant cane and first stubble Off-station nurseries – 3rd stubble harvested	1
L 1999	Outfield – Replanted and harvested as plant cane On-station nurseries – 3rd stubble harvested Off-station nurseries – 2nd stubble harvested	2
L 2000	Outfield – Planted On-station nurseries - 2nd stubble harvested Off-station nurseries – 1st stubble harvested.	1
L 2001	Outfield – Introduced On-station nurseries 1st stubble harvested Off-station nurseries plant cane harvested	3
L 2002	On-station nurseries plant cane harvested Off-station nurseries planted.	15
L 2003	Assignment - On-station nurseries planted	35

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.

Rainfall for 2003 at the St. Gabriel Research Station is reported in Table 3. Total rainfall for the year was 49.32 inches, which was 87% of normal annual rainfall. January was an extremely dry month, which helped mitigate the poor harvesting conditions following Tropical Storm Isidore and Hurricane Lily and a wet harvest season. February, March, and early April were wet, which delayed spring field operations. Little rain fell in the remainder of April and May, which allowed for cultivation of rutted fields and good conditions for fertilization. Unlike 2002, the big weather story of the year was nearly ideal harvesting conditions with an erect crop for most of the 2003 harvest.

In 2003, rust continued to be seen in high levels in LCP85-384 throughout the growing season. Pith and leaf scald in experimental varieties were low compared to other years, likely due to more than adequate rainfall during the growing season.

Table 3. 2003 rainfall reported by date at the St. Gabriel Research Station, St. Gabriel, Louisiana.

DATE	**JAN.**	**FEB.**	**MAR.**	**APR.**	**MAY**	**JUN.**	**JUL.**	**AUG.**	**SEP.**	**OCT.**	**NOV.**	**DEC.**
1									0.18			
2						0.67		0.12	0.09			
3		0.04	0.20			0.19	0.03	0.30				
4							0.03		0.29			
5				0.29		0.04	0.80	0.32				
6		0.54	1.69	0.02		0.11	0.09					
7				2.72		0.33	0.05	0.58				
8				2.20								
9		0.24	0.20							0.19		0.10
10							0.04			2.73		
11	0.02					0.64	0.94		0.17	0.02		
12	0.03					0.29		1.33	0.52			
13			0.67					0.02	1.27			0.76
14						0.79						
15		1.62				0.18						
16			0.32		0.04	0.02		0.71			0.04	
17						0.63	0.92				0.02	
18			0.48								1.36	
19						0.07	0.76					
20		0.40		0.02	0.18			0.05				
21		1.76		0.04		0.03		0.12	0.67			
22				0.12			0.81		0.82			
23							0.26				0.52	0.48
24								0.13			0.13	
25		0.31		0.03		0.17				0.24		
26	0.34	0.35	0.06			0.04		0.50				
27						0.33			0.43		3.70	
28								0.06				
29	0.36		0.05			0.05						1.55
30	0.05					1.69		1.14				
31							0.76	0.51				
Totals	0.80	5.26	3.67	5.44	0.22	6.27	5.49	5.89	4.44	3.18	5.77	2.89
% Normal	15	103	78	127	5	107	102	135	102	81	134	56
2003 TOTAL: 49.32 inches (87% Normal)												

Data provide by the Louisiana Agriclimatic Information Service and Dr. Richard Bengtson.

2003 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

C.M. LaBorde, K.A. Gravois, and K.P. Bischoff
St. Gabriel Research Station

Photoperiod induction and crossing are the first stages in the LSU AgCenter's Sugarcane Variety Development Program. For subsequent stages to be successful, success must first be achieved at crossing. The objective of crossing is to produce not only a large number of seed, but viable "true" seed/fuzz 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 2003 crossing season were planted in the fall of 2002. 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 2003, the cuttings were then transferred to can culture. In 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 eight light-tight chambers (six traditional photoperiod bays and two temporary photoperiod bays) were used to improve 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 12 ½ 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, 2003.

Photoperiod treatments require pulling the carts out of the photoperiod bays at the 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 average on the photoperiod carts in 2003 (Table 1-2). Total flowering percentage for the eight bays was 51% which was comprised from 1918 stalks. Total stalk number was exceedingly high due to a research project that caused the crossing greenhouse to be converted into two temporary photoperiod bays (7 & 8). The conversion of the crossing greenhouse consisted of Dura Skrim 8 (two sheets of high strength polyethylene film laminated together with a third layer of molten polyethylene) material draped over cables (creating a box-type enclosure) that were connected to the interior of the crossing greenhouse. This created an additional 90 regular-sized (10 gallon) pots and 72 one-half gallon pots that were subjected to photoperiod treatments. The varieties for the research project consisted of proven parents such as HoCP 85-845, LCP 85-384, and LCP 86-454. For the research project, these three varieties were used predominantly in polycrosses due to their pollen quantity abundance in order to quantify seed production. This resulted in a higher than usual number of polycrosses made in 2003 (Table 3). These varieties were used for both research and seed production purposes. In 2003 as in previous years, seedlings were produced from hybridization techniques that used sugarcane yield components, insect resistance, and disease resistance as some of the criteria to determine which crossing combinations were most ideal.

The flowering season in 2003 began during the second week of September as expected. Crossing began on September 12 and ended on November 21, 2003. The end date is later than usual but can be explained by an addition of the number of total stalks that were subjected to a regulated photoperiod treatment. A total of 972 tassels of 127 varieties was used to produce 409 total crosses yielding 485,310 viable seed with 225,332 seed produced from biparental crosses (Table 3). Germination rate is one of two components that measures 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. The normal flowering had the majority of crosses being made according to the two flowering peaks that were planned; 78% of the crosses were made by October 15, 2003. High temperatures in mid-September made poor seed set. It has been shown that temperatures in excess of 100° F have an adverse effect on pollen viability. This may be the cause for early-season problems, and is supported by the fact that seed set quickly improved with lower temperatures beginning late September and throughout the remainder of the crossing season.

Table 1. Summary of the 2003 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 Peak 1	Days of Declining Photoperiod Peak 2	Mean Flowering Date	Total Stalks	Percent Flowered
1	A	16-Jun	44	30-Jul	72	87	292±14	90	82
1	B	16-Jun	44	30-Jul	72	87	291±11	89	73
1	C	16-Jun	44	30-Jul	72	87	292±13	83	70
2	A	16-Jun	34	20-Jul	72	87	291±15	102	55
2	B	16-Jun	34	21-Jul	72	87	283±13	86	45
2	C	16-Jun	34	22-Jul	72	87	288±17	79	54
3	A	30-May	37	6-Jul	87	102	277±19	85	49
3	B	30-May	37	6-Jul	87	102	274±10	97	42
3	C	30-May	37	6-Jul	87	102	276±15	77	60
4	A	30-May	37	6-Jul	87	102	273±12	94	57
4	B	30-May	37	6-Jul	87	102	275±14	95	40
4	C	30-May	37	6-Jul	87	102	278±14	86	31
5	A	4-Jun	36	10-Jul	82	97	284±15	89	26
5	B	4-Jun	36	10-Jul	82	97	301±19	86	17
5	C	4-Jun	36	10-Jul	82	97	281±6	76	25
6	A	30-May	41	10-Jul	82	97	287±14	84	37
6	B	30-May	41	10-Jul	82	97	284±17	78	40
6	C	30-May	41	10-Jul	82	97	286±14	79	53
7	A	4-Jun	36	10-Jul	82	97	286±10	72	0.13†
7	B	4-Jun	36	10-Jul	82	97	274±7	91	91
7	C	4-Jun	36	10-Jul	82	97	268±10	71	38
8	A	4-Jun	36	10-Jul	82	97	278±14	85	58
8	B	4-Jun	36	10-Jul	82	97	278±14	66	59
8	C	4-Jun	36	10-Jul	82	97	270±19	49	59

† Bay Cart 7 A contained ½ gallon pots for the breeding stock instead of the normal 10 gallon pots.

Table 2. Summary of can, variety, and flower information on bays 1-8 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	-----	-----	-----	-----
127	412	292	1918	972	4.7±1.6	3.33±1.63	4.4±1.7	87±14.5

† 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 2003 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	287	225,332	1087±1314	1087±1314	144±140
Polycross	89	242,439	822±1136	822±1136	106±132
Self	33	17,539	531±1018	531±1018	86±155
Total	409	485,310	985±1265	985±1265	131±141

Table 4. Varietal flowering summary in 2003 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	42±1	279	85±4	6±1	6	3	50
CP73-351	36.5	286	101±3	4±1	10	4	40
CP77-310	36	286	95	5	1	1	100
CP79-348	39±1	300	90±1	6	9	2	22
CP83-644	37	309	118	5	20	1	5
HO01-564	36	279	90±2	7	4	4	100
HO89-889	37	286	95	7	7	1	14
HO91-572	40±2	272	83±7	5±1	8	8	100
HO95-988	37	267	91±2	6	43	15	35
HOCP00-905	36	269	98±5	6	15	10	67
HOCP00-927	36±1	316	105	7	9	1	11
HOCP00-930	39±2	279	77±4	5	10	9	90
HOCP00-933	41±1	265	80±3	5±1	16	12	75
HOCP00-939	37	.	.	.	6	.	.
HOCP00-942	37±2	302	107±4	6	6	6	100
HOCP00-950	39±1	267	94±3	7	27	18	67
HOCP01-500	37	.	.	.	5	.	.
HOCP01-506	37	274	94±4	3±1	5	5	100
HOCP01-517	44	314	103	3	5	1	20
HOCP01-520	36	265	78±2	3±1	6	6	100
HOCP01-523	39±1	276	83±2	5	14	12	86
HOCP01-525	36	272	86±2	5±1	5	4	80
HOCP01-527	36	.	.	.	6	.	.
HOCP01-528	34	272	75±1	4±1	5	5	100
HOCP01-529	34	286	90±5	4±1	3	3	100
HOCP01-531	37	307	120	6	8	1	13
HOCP01-532	34	.	.	.	5	.	.
HOCP01-534	34	.	.	.	4	.	.
HOCP01-535	37	.	.	.	1	.	.
HOCP01-541	34	286	85	7	4	1	25
HOCP01-543	44	286	77±2	3	4	4	100
HOCP01-544	36	283	98±3	6±1	3	3	100
HOCP01-551	37	.	.	.	8	.	.
HOCP01-553	36	286	100±5	4±1	8	3	38
HOCP01-558	37	261	77±1	5±1	9	8	89
HOCP01-561	37	272	92±5	4±1	9	4	44
HOCP85-845	36	270	94±1	3	132	70	53
HOCP88-739	36	279	90±2	7	15	2	13
HOCP89-831	37	272	87±2	5±1	4	2	50
HOCP89-846	39±2	283	90±7	6	10	9	90
HOCP91-552	41±1	261	73±1	4	17	16	94
HOCP91-555	37	.	.	.	27	.	.
HOCP91-572	39±5	.	.	.	2	.	.
HOCP92-618	37	269	85±2	4	14	6	43
HOCP92-624	40±1	255	77±2	7	34	30	88

Table 4. Continued.

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
HOCP92-648	38±1	267	83±3	7	18	10	56
HOCP93-746	42±1	272	61	7	12	3	25
HOCP93-749	37	295	104	5	3	2	67
HOCP93-754	37	302	122±11	6±1	8	2	25
HOCP94-806	37	294	107	3	8	1	13
HOCP95-951	37	255	77±5	4±1	7	3	43
HOCP96-509	36	316	129	5	21	1	5
HOCP96-540	36	265	86±1	3	147	112	76
HOCP96-561	37	267	92±2	4	16	13	81
HOCP97-606	38±1	279	108±4	5	20	11	55
HOCP97-609	36	265	80±1	4	22	12	55
HOCP97-645	37	267	83±2	6±1	7	3	43
HOCP98-741	37	255	78±6	5	6	4	67
HOCP98-781	39±2	269	79±6	4±1	10	6	60
HOCP99-825	37	259	77±2	5	10	10	100
HOCP99-866	39±1	279	69	4	17	6	35
L00-264	34	.	.	.	4	.	.
L00-266	36	324	123	3	20	1	5
L01-281	35±1	269	82	4	8	1	13
L01-283	37	281	106±9	6	8	5	63
L01-292	36	.	.	.	5	.	.
L01-296	37	.	.	.	8	.	.
L01-299	39±1	272	83±4	5±1	16	10	63
L02-233	34	307	112±4	7	4	4	100
L02-316	37	272	82±1	4	7	4	57
L02-319	36	279	88	6	5	1	20
L02-320	37	279	94±4	5±1	6	6	100
L02-322	37	279	107±9	6	8	3	38
L02-323	37	295	122±8	6±1	4	3	75
L02-324	36	.	.	.	3	.	.
L02-325	36	324	133	3	7	2	29
L02-326	36	.	.	.	5	.	.
L02-328	37	279	99±4	5	14	7	50
L02-333	36	276	97±6	6±1	9	5	56
L02-336	37	276	96±3	6±1	6	3	50
L02-338	37	.	.	.	5	.	.
L02-341	37	269	88±2	5±1	6	6	100
L02-342	37	.	.	.	8	.	.
L02-348	37	267	81	6	6	5	83
L02-351	37	267	93±5	4±1	5	5	100
L02-353	36	.	.	.	6	.	.
L02-354	34	267	68±1	7	7	6	86

Table 4. Continued.

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
L02-359	34	.	.	.	2	.	.
L91-255	38±1	300	102±5	6	20	6	30
L91-281	44	286	79±3	4±1	6	6	100
L92-312	37	.	.	.	8	.	.
L92-321	37	.	.	.	6	.	.
L94-424	37	302	111	5	4	1	25
L94-426	36	265	90±7	5	26	7	27
L94-428	37	261	85±5	4	20	7	35
L94-432	37	279	101±11	4	12	4	33
L94-433	37	279	102±8	5±1	10	6	60
L96-040	36±1	269	84±3	6	10	6	60
L96-092	37	300	117±3	5±1	25	5	20
L97-128	38±1	261	80±1	6	51	39	76
L97-137	37	279	100±8	4±1	31	3	10
L98-197	40±2	283	88±5	4±1	11	7	64
L98-207	37±1	265	78±2	3	26	14	54
L98-209	36	267	92±3	5	32	14	44
L99-226	37	265	89±2	4	41	27	66
L99-233	39±1	259	76±3	3	16	13	81
LCP02-337	37	274	95±6	3±1	6	6	100
LCP02-343	36	.	.	.	5	.	.
LCP02-344	34	290	92±3	7	5	2	40
LCP02-345	37	286	103±5	5±1	5	3	60
LCP81-010	39±1	259	77±3	5	24	14	58
LCP82-089	37	286	107±8	6	16	2	13
LCP83-137	37	.	.	.	6	.	.
LCP85-384	37	261	85±1	3	235	127	54
LCP86-454	36	253	71±2	3	91	33	36
N-27	44	295	91±5	7	3	3	100
TUCCP77-042	36	276	101±2	6	25	15	60
US01-039	41±1	269	71±3	7	10	6	60
US01-040	41±2	259	73±3	5±1	5	5	100
US02-095	44	309	107±3	6	6	5	83
US02-096	44	286	75	5	3	3	100
US02-098	44	314	103	3	4	1	25
US02-099	44	.	.	.	1	.	.
US79-010	37	265	84±4	7	6	5	83
US96-002	37	265	78	7	5	2	40
US99-002	44	279	68	5±1	6	6	100
US99-004	44	274	76±8	4±1	3	3	100

Table 5. Crosses and seed made in 2003 sorted by cross number.

Cross	Female	Male	Seed
XL03-001	HOCP92-624	03P1	2385
XL03-002	HOCP98-741	03P1	75
XL03-003	HOCP95-951	03P1	329
XL03-004	LCP86-454	03P1	176
XL03-005	HOCP92-624	US01-040	101
XL03-006	HOCP99-825	US01-040	36
XL03-007	US01-040	US01-040	29
XL03-008	LCP81-010	L99-233	0
XL03-009	HOCP99-825	L99-233	0
XL03-010	HOCP92-624	L99-233	23
XL03-011	L99-233	L99-233	49
XL03-012	HOCP92-624	03P2	1676
XL03-013	LCP86-454	03P2	74
XL03-014	HOCP92-624	L94-428	12
XL03-015	LCP81-010	L94-428	49
XL03-016	L97-128	L94-428	0
XL03-017	HOCP01-558	03P3	0
XL03-018	HOCP91-552	03P3	17
XL03-019	HOCP98-741	03P3	67
XL03-020	HOCP99-825	03P3	43
XL03-021	HOCP01-558	03P4	17
XL03-022	HOCP98-741	03P4	18
XL03-023	LCP85-384	03P4	163
XL03-024	LCP86-454	03P4	569
XL03-025	L97-128	L99-226	26
XL03-026	HOCP00-933	L99-226	101
XL03-027	HOCP00-933	HOCP95-951	102
XL03-028	HOCP01-558	HOCP95-951	11
XL03-029	US79-010	HOCP95-951	0
XL03-030	L94-426	L98-207	0
XL03-031	L97-128	L98-207	7
XL03-032	US96-002	L98-207	83
XL03-033	HOCP01-558	LCP85-384	0
XL03-034	US79-010	LCP85-384	0
XL03-035	US96-002	LCP85-384	112
XL03-036	HOCP01-520	03P5	0
XL03-037	HOCP96-540	03P5	30
XL03-038	HOCP97-609	03P5	0
XL03-039	HOCP99-825	03P5	0
XL03-040	L94-428	03P5	0
XL03-041	HOCP96-540	03P6	271
XL03-042	LCP85-384	03P6	899
XL03-043	LCP86-454	03P6	0
XL03-044	HOCP96-540	03P7	348
XL03-045	LCP86-454	03P7	488
XL03-046	LCP85-384	03P7	468
XL03-047	HO95-988	LCP85-384	59
XL03-048	HOCP92-648	LCP85-384	1118
XL03-049	HOCP97-609	LCP85-384	58
XL03-050	HO95-988	L98-207	196
XL03-051	L94-426	L98-207	19
XL03-052	L02-354	L98-207	67
XL03-053	HOCP97-609	HOCP96-561	127
XL03-054	HOCP97-645	HOCP96-561	0
XL03-055	L98-209	HOCP96-561	53
XL03-056	HOCP96-561	HOCP96-561	18
XL03-057	L98-209	HOCP01-558	0
XL03-058	HOCP00-950	HOCP01-558	58
XL03-059	L02-348	HOCP01-558	80
XL03-060	L02-351	HOCP01-558	0
XL03-061	HOCP01-558	HOCP01-558	11
XL03-062	HOCP01-520	03P8	56
XL03-063	HOCP96-540	03P8	477
XL03-064	HOCP99-825	03P8	40
XL03-065	HOCP91-552	03P8	108
XL03-066	LCP85-384	03P8	2428
XL03-067	LCP86-454	03P8	968
XL03-068	L02-348	HOCP96-540	105
XL03-069	L02-354	HOCP96-540	79
XL03-070	HOCP92-624	LCP85-384	240
XL03-071	US79-010	LCP85-384	8
XL03-072	HOCP92-618	LCP85-384	188
XL03-073	L94-426	LCP85-384	275
XL03-074	L96-040	LCP85-384	10
XL03-075	HO95-988	LCP85-384	39
XL03-076	L99-226	LCP85-384	18
XL03-077	L02-341	LCP85-384	137
XL03-078	HOCP92-618	L99-233	90
XL03-079	L94-426	L99-233	0
XL03-080	L94-428	L99-233	0
XL03-081	L99-233	L99-233	10
XL03-082	HOCP92-618	HOCP96-561	260
XL03-083	HO95-988	HOCP96-561	59
XL03-084	HOCP97-645	HOCP96-561	0
XL03-085	L94-428	HOCP96-540	387
XL03-086	L99-226	HOCP96-540	843
XL03-087	L02-341	HOCP96-540	279
XL03-088	L02-348	HOCP96-540	0
XL03-089	US01-039	HOCP96-540	375
XL03-090	HOCP99-825	HOCP96-540	0
XL03-091	HOCP00-905	HOCP97-609	509
XL03-092	L02-354	HOCP97-609	17
XL03-093	HOCP00-950	HOCP01-520	70
XL03-094	HOCP01-520	HOCP01-520	0
XL03-095	HOCP96-540	03P9	9037
XL03-097	L01-281	03P9	881
XL03-098	HOCP99-825	03P9	0
XL03-099	HOCP98-781	03P9	431
XL03-100	HOCP00-905	03P9	96
XL03-101	LCP85-384	03P10	5526
XL03-102	L99-226	03P10	806
XL03-103	LCP86-454	03P10	185
XL03-104	HOCP96-540	03P10	4283
XL03-105	LCP86-454	03P11	1988
XL03-106	LCP85-384	03P11	2330
XL03-107	HOCP96-540	03P11	4500

Cross	Female	Male	Seed
XL03-108	HOCP93-746	L98-207	0
XL03-109	L94-428	L98-207	293
XL03-110	LCP81-010	L98-207	389
XL03-111	HOCP01-528	L98-207	762
XL03-112	L97-128	L98-207	282
XL03-113	L98-207	L98-207	0
XL03-114	LCP81-010	L02-316	85
XL03-115	L98-209	L02-316	35
XL03-116	L97-128	L02-316	61
XL03-117	L02-316	L02-316	8
XL03-118	HOCP91-552	L99-226	770
XL03-119	L99-226	L99-226	53
XL03-120	HOCP96-540	L99-226	2706
XL03-121	HOCP00-933	03P12	2326
XL03-122	HOCP01-525	03P12	256
XL03-123	HOCP01-561	03P12	2092
XL03-124	HOCP89-831	03P12	477
XL03-125	HOCP96-540	03P12	8798
XL03-126	HOCP93-746	LCP85-384	1798
XL03-127	HOCP95-951	LCP85-384	210
XL03-128	HOCP96-540	LCP85-384	4231
XL03-129	HOCP93-746	HOCP85-845	680
XL03-130	L97-128	HOCP85-845	107
XL03-131	HOCP92-648	L99-233	1593
XL03-132	HO95-988	L99-233	593
XL03-133	US79-010	L99-233	0
XL03-134	L01-299	L99-233	122
XL03-135	HOCP00-905	HOCP92-618	269
XL03-136	L02-354	HOCP92-618	9
XL03-137	HO91-572	HOCP92-618	23
XL03-138	HOCP92-618	HOCP92-618	77
XL03-139	L99-226	03P13	1279
XL03-140	HOCP96-540	03P13	2200
XL03-141	LCP85-384	03P13	6282
XL03-142	HOCP97-609	03P13	606
XL03-143	HOCP01-561	03P13	511
XL03-144	L02-351	03P13	135
XL03-145	HOCP97-645	LCP85-384	182
XL03-146	L94-426	LCP85-384	183
XL03-147	HOCP01-561	LCP85-384	262
XL03-148	HOCP96-540	LCP85-384	5453
XL03-149	US99-004	LCP85-384	0
XL03-150	L01-299	LCP85-384	802
XL03-151	HOCP00-950	HOCP01-506	1017
XL03-152	HOCP96-540	HOCP01-506	3532
XL03-153	HOCP01-561	L02-316	0
XL03-154	L01-299	L02-316	38
XL03-155	HOCP96-540	L02-316	4848
XL03-156	L02-316	L02-316	45
XL03-157	HOCP96-540	HOCP96-540	1907
XL03-158	HOCP85-845	03P14	9110
XL03-159	LCP85-384	03P14	6289
XL03-160	HOCP96-540	03P14	5152
XL03-161	LCP02-337	03P14	447
XL03-162	LCP86-454	03P14	109
XL03-163	HOCP01-525	HOCP01-506	2792
XL03-164	L97-128	HOCP01-506	68
XL03-165	HOCP85-845	HOCP01-506	1976
XL03-166	HOCP89-831	LCP85-384	834
XL03-167	L97-128	LCP85-384	330
XL03-168	HOCP85-845	LCP85-384	1300
XL03-170	HOCP01-528	HOCP01-528	0
XL03-171	HOCP01-523	HOCP01-523	0
XL03-172	HOCP92-624	HOCP00-905	1610
XL03-172.5	HOCP01-558	HOCP00-905	1048
XL03-173	L96-040	HOCP00-905	424
XL03-174	LCP81-010	L98-207	2980
XL03-175	HOCP99-825	L98-207	68
XL03-176	L97-128	L98-207	384
XL03-177	HOCP85-845	L98-207	1242
XL03-178	TUCCP77-042	L02-336	0
XL03-179	L02-333	L02-336	0
XL03-180	L97-128	L02-336	79
XL03-181	L02-336	L02-336	0
XL03-182	L02-333	L02-341	86
XL03-183	HOCP96-561	L02-341	613
XL03-184	HOCP85-845	L98-209	1543
XL03-185	L97-128	L98-209	368
XL03-186	CP65-357	LCP85-384	2123
XL03-187	HOCP88-739	LCP85-384	1225
XL03-188	HOCP92-624	LCP85-384	4378
XL03-189	HOCP92-648	LCP85-384	297
XL03-190	LCP81-010	LCP85-384	4713
XL03-191	HO01-564	LCP85-384	1128
XL03-192	HOCP01-523	LCP85-384	3195
XL03-193	HOCP01-525	LCP85-384	3369
XL03-194	L01-299	LCP85-384	1054
XL03-195	L02-351	LCP85-384	2163
XL03-196	L02-320	HOCP85-845	1377
XL03-197	L02-322	HOCP85-845	1426
XL03-198	HOCP92-624	HOCP91-552	3945
XL03-199	L94-426	HOCP91-552	835
XL03-200	HOCP00-930	HOCP91-552	2769
XL03-201	HOCP00-950	HOCP91-552	1575
XL03-202	L02-328	HOCP91-552	3705
XL03-203	L02-341	HOCP91-552	1385
XL03-204	LCP81-010	L98-207	4320
XL03-205	L98-209	L98-207	1845
XL03-206	HOCP98-781	L98-207	1187
XL03-207	HOCP00-905	L94-432	795
XL03-208	L96-040	L94-432	1414
XL03-209	L97-137	L94-432	2698
XL03-210	HOCP97-606	HOCP96-540	1585
XL03-211	HOCP97-609	HOCP96-540	3591
XL03-212	L02-319	HOCP96-540	1053
XL03-213	L02-320	HOCP96-540	2285
XL03-214	L02-333	HOCP96-540	1101
XL03-215	LCP02-337	HOCP96-540	1961
XL03-216	TUCCP77-042	HOCP96-540	45
XL03-217	L02-320	L99-226	898

Cross	Female	Male	Seed
XL03-218	L02-328	L99-226	2526
XL03-219	L96-040	L99-226	1216
XL03-220	LCP02-337	L99-226	2291
XL03-221	HOCP01-523	HO91-572	2320
XL03-222	L94-433	HO91-572	4065
XL03-223	L97-128	HO91-572	298
XL03-224	LCP81-010	HO91-572	3753
XL03-225	TUCCP77-042	HO91-572	15
XL03-226	US01-039	HO91-572	770
XL03-227	US01-040	HO91-572	1270
XL03-228	HO01-564	03P15	381
XL03-229	HOCP01-528	03P15	293
XL03-230	HOCP97-609	03P15	346
XL03-231	L97-128	03P15	451
XL03-232	LCP81-010	03P15	3943
XL03-233	LCP86-454	03P16	3125
XL03-234	LCP85-384	03P16	1510
XL03-235	HOCP85-845	03P16	6693
XL03-236	HOCP91-552	03P16	2669
XL03-237	HOCP92-624	L02-320	2176
XL03-238	LCP81-010	L02-320	1558
XL03-239	HOCP98-741	L02-320	845
XL03-240	L02-320	L02-320	307
XL03-241	HOCP92-624	LCP85-384	3233
XL03-242	L94-432	LCP85-384	3180
XL03-243	LCP81-010	LCP85-384	3466
XL03-244	L94-433	LCP85-384	1586
XL03-245	L96-040	LCP85-384	957
XL03-246	US01-039	LCP85-384	760
XL03-247	US99-002	LCP85-384	902
XL03-248	HOCP92-624	HOCP91-552	2922
XL03-249	L94-432	HOCP91-552	4117
XL03-250	LCP81-010	HOCP91-552	3177
XL03-251	L02-341	HOCP91-552	1002
XL03-252	L98-209	HOCP91-552	556
XL03-253	L97-128	HOCP91-552	316
XL03-254	L97-128	L02-333	38
XL03-255	HOCP92-618	L02-333	415
XL03-256	L01-283	L02-333	219
XL03-257	HOCP88-739	LCP85-384	419
XL03-258	HOCP92-648	LCP85-384	1773
XL03-259	HOCP00-905	LCP85-384	507
XL03-260	L01-283	LCP85-384	708
XL03-261	HOCP89-846	HOCP96-540	2106
XL03-262	HOCP00-930	HOCP96-540	2310
XL03-263	L97-128	L98-197	357
XL03-264	HOCP01-544	L98-197	475
XL03-265	L98-207	L98-197	422
XL03-266	L99-226	L98-197	1752
XL03-267	L98-197	L98-197	1184
XL03-268	HOCP85-845	03P17	999
XL03-269	LCP85-384	03P17	195
XL03-270	HOCP89-846	HOCP85-845	1181
XL03-271	L97-128	HOCP85-845	343
XL03-272	US02-096	HOCP85-845	639

Cross	Female	Male	Seed
XL03-273	HOCP92-624	LCP85-384	1285
XL03-274	LCP82-089	LCP85-384	4524
XL03-275	HOCP00-905	LCP85-384	855
XL03-276	HOCP01-523	LCP85-384	1185
XL03-277	L97-128	LCP85-384	236
XL03-278	US01-039	LCP85-384	1118
XL03-279	US02-096	LCP85-384	1293
XL03-280	US79-010	LCP85-384	34
XL03-281	US99-004	LCP85-384	1101
XL03-282	HOCP92-624	L91-281	1815
XL03-283	HOCP00-905	L91-281	597
XL03-284	L02-336	L91-281	260
XL03-285	L97-128	L91-281	92
XL03-286	HOCP92-624	HOCP96-540	1912
XL03-287	CP73-351	HOCP96-540	936
XL03-288	HOCP00-950	HOCP96-540	2338
XL03-289	HOCP01-541	HOCP96-540	743
XL03-290	L97-128	HOCP96-540	269
XL03-291	LCP02-345	HOCP96-540	1214
XL03-292	HO89-889	L98-209	376
XL03-293	HOCP92-624	L98-209	1805
XL03-294	HOCP92-648	L98-209	1200
XL03-294.5	L97-128	L98-209	57
XL03-295	HO01-564	L99-226	700
XL03-296	HO95-988	L99-226	201
XL03-297	L99-226	L99-226	513
XL03-298	HOCP00-950	HOCP91-552	603
XL03-299	L01-283	HOCP91-552	1362
XL03-300	L02-328	HOCP91-552	2146
XL03-301	L02-336	HOCP91-552	414
XL03-302	L97-128	HOCP91-552	754
XL03-303	CP77-310	HOCP91-552	1284
XL03-304	L98-207	HOCP01-553	2945
XL03-305	US02-096	HOCP01-553	4637
XL03-306	HOCP01-553	HOCP01-553	2622
XL03-307	HOCP89-846	L98-209	1562
XL03-308	HOCP92-648	L98-209	1660
XL03-309	HOCP97-606	L98-209	1092
XL03-310	HOCP96-540	L98-209	2262
XL03-311	L98-209	L98-209	373
XL03-312	HOCP89-846	LCP85-384	2506
XL03-313	HOCP92-648	LCP85-384	1680
XL03-314	L02-328	L99-233	1644
XL03-315	L99-233	L99-233	6
XL03-316	HOCP85-845	03P18	14633
XL03-317	LCP02-337	03P18	837
XL03-318	HOCP96-540	03P18	1990
XL03-319	CP65-357	LCP85-384	4731
XL03-320	HOCP85-845	LCP85-384	3487
XL03-321	HOCP89-846	HOCP96-540	2863
XL03-322	HOCP92-648	HOCP96-540	4069
XL03-323	HOCP96-561	HOCP96-540	2619
XL03-324	L98-209	HOCP96-540	2267
XL03-325	LCP02-344	HOCP96-540	816
XL03-326	L98-197	L98-197	2965

Cross	Female	Male	Seed
XL03-327	LCP81-010	L98-197	8534
XL03-328	TUCCP77-042	L98-197	242
XL03-329	L97-128	L98-197	351
XL03-330	L02-328	L02-328	4406
XL03-331	TUCCP77-042	L02-328	277
XL03-332	HOCP85-845	L02-328	2990
XL03-333	HOCP89-846	L02-328	5720
XL03-334	HOCP92-624	HOCP85-845	368
XL03-335	HOCP00-950	HOCP01-506	1260
XL03-336	HOCP01-506	HOCP01-506	371
XL03-337	HO95-988	03P19	299
XL03-338	HOCP96-540	03P19	4785
XL03-339	HOCP96-561	03P19	1407
XL03-340	CP65-357	HO95-988	465
XL03-341	HOCP89-846	HO95-988	421
XL03-342	N-27	HO95-988	4474
XL03-343	HOCP92-624	L02-323	566
XL03-344	LCP02-344	L02-323	49
XL03-345	TUCCP77-042	L02-323	66
XL03-346	L02-323	L02-323	62
XL03-347	HOCP93-749	L98-209	245
XL03-349	HOCP93-749	L99-226	1935
XL03-350	L97-128	L99-226	568
XL03-351	LCP02-345	L99-226	1135
XL03-352	CP77-407	L99-226	216
XL03-353	LCP85-384	03P20	1679
XL03-354	HOCP85-845	03P20	349
XL03-355	LCP86-454	03P20	245
XL03-356	HOCP01-531	HOCP96-540	798
XL03-357	L02-322	HOCP96-540	441
XL03-358	HOCP00-905	HOCP96-540	808
XL03-359	L91-255	HOCP96-540	1773
XL03-360	L02-322	L99-226	618
XL03-361	HOCP00-950	L99-226	277
XL03-362	HOCP97-606	L99-226	455
XL03-363	HO95-988	L99-226	666
XL03-364	HOCP92-624	L99-226	539
XL03-365	HOCP00-946	LCP85-384	296
XL03-366	HOCP92-624	LCP85-384	518
XL03-367	L01-299	LCP85-384	204
XL03-368	L97-137	L96-092	694
XL03-369	L02-233	L96-092	648

Cross	Female	Male	Seed
XL03-370	L96-092	L96-092	401
XL03-371	LCP85-384	03P21	2395
XL03-372	HOCP85-845	03P21	7584
XL03-373	CP83-644	HOCP97-606	1093
XL03-374	HOCP01-523	HOCP97-606	1059
XL03-375	TUCCP77-042	HOCP97-606	120
XL03-376	HOCP97-606	HOCP97-606	41
XL03-377	HOCP85-845	03P22	4454
XL03-378	LCP85-384	03P22	233
XL03-379	N27	03P22	916
XL03-380	US02-095	HO91-572	112
XL03-381	L98-197	HO91-572	0
XL03-382	L02-328	HO91-572	700
XL03-383	HOCP00-905	HOCP00-930	561
XL03-384	HOCP00-942	HOCP00-930	2618
XL03-385	HOCP97-606	HOCP00-930	0
XL03-386	HOCP00-930	HOCP00-930	130
XL03-387	HOCP92-624	L96-092	866
XL03-388	L99-233	L96-092	662
XL03-389	L96-092	L96-092	195
XL03-390	LCP85-384	LCP85-384	24
XL03-391	L91-255	LCP85-384	1379
XL03-392	HOCP98-781	LCP85-384	772
XL03-393	HO95-988	LCP85-384	573
XL03-395	LCP86-454	03P23	930
XL03-396	LCP85-384	03P23	848
XL03-397	HOCP85-845	03P23	416
XL03-398	HOCP85-845	LCP85-384	297
XL03-400	US02-095	LCP85-384	144
XL03-401	HOCP00-942	LCP85-384	0
XL03-402	HOCP89-846	HOCP96-540	420
XL03-403	HOCP97-606	HOCP96-540	127
XL03-404	HOCP93-754	L98-197	10
XL03-405	L98-197	L98-197	1100
XL03-406	L91-255	L00-266	3413
XL03-407	HOCP00-942	L00-266	752
XL03-408	HOCP00-950	L00-266	742
XL03-409	L00-266	L00-266	110
XL03-410	L94-433	L94-433	522
XL03-411	L94-432	03P24	1716
XL03-412	LCP85-384	03P24	595

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2003

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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 73,160 seedlings from 192 crosses was planted in the field in the spring of 2003. The majority of these seedlings are progeny of crosses among commercial and elite experimental varieties. In the fall of 2003, family selection was practiced on the 46,325 (top 78%) stubble seedlings surviving the winter. This selection resulted in the planting of 2,902 eight-foot first-line trial plots. At the same time, superior clones were also selected and advanced through subsequent stages (699 to second line trials, 152 to the increase stage). Assignment of permanent AL03" numbers were given to the 35 best clones of the 1998 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 73,160 seedlings from 192 crosses of the 2002 crossing series was planted to the field in the spring of 2003 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2003, individual selection was practiced on the 46,325 (top 78%) stubble single stools of the 2001 crossing series that survived the winter. The 2,902 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.

Over 4,000 first-line trial plots of the 2000 crossing series were rated for cane yield and pest resistance in August of 2003 (Table 3). After screening for cane yield rating, acceptable clones were further evaluated for pest resistance (diseases and borer injury) stalk quality, and brix (Table 3). This second stage of advancement was concluded with the planting of 700 clones in single row 16-foot second-line trials plots.

Stalk counts were made on the 394 first stubble first-line trial plots of the 1999 crossing series in August 2003. Based on these counts and sucrose lab data collected in 2002, 152 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 2004. Of the 331 candidates from the first stubble crop of the second-line trials, the best 35 clones from the 1998 crossing series were assigned permanent AL03" numbers (Table 5). These newly assigned AL03" varieties were then planted in replicated nursery trials at three on station locations (St. Gabriel Research Station, Iberia Research Station, USDA Ardoyne Farm).

The advancement summary of clones from crosses made in 1998 through 2001 is shown in Table 6. Crosses are sorted by female parent in ascending order, with the percentile ranking given for each cross in each stage of the program. The results of the 2001 crossing series cross appraisal in 2003 are presented in Table 7.

Table 1. Summary of selections, advancements and assignments made during 2002 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 (L02 Assignments)
			-------------------------------- number of clones	--------------------------------------				
X98	125	193	64467	54794	3012	759	331	35
X99		312	74263	46783	3371	0*	152	
X00	76	211	98371	75973	4158	699		
X01	218	247	93019	46325	2902			
X02	200	192	72061					

* These plots were not planted because of extremely wet conditions in 2002.

Table 2. Dates of seedling and line trials planted or harvested in 2003.

Crossing Series	Test	Crop	Date Planted	Date Harvested
X02	Seedlings	Planted	4/4 – 4/15/03	
X02	Progeny Test	Planted	4/14/03	
X01	Seedlings	First Stubble	4/16 -4/24/02	
X01	Progeny Test	First Stubble	4/24/02	
X01	First Line Trials	Planted	9/11 – 9/17/03	
X00	First Line Trials	Plant Cane	9/5 – 9/12/02	
X99	First Line Trials	First Stubble	9/14 - 9/17/01	11/6 – 11/7/03
X99	Second Line Trials	Planted	10/1/03	
X98	Second Line Trials	First Stubble	9/26/01	10/6/03
X97	Second Line Trials	Second Stubble	9/20/00	10/20/03
X99	Light Soil Increase	Planted	10/2/03	
X98	Light Soil Increase	Plant Cane	10/17/02	12/1/03
X97	Light Soil Increase	First Stubble	10/2/01	11/11/03
X96	Light Soil Increase	Second Stubble	9/26/00	10/13/03
X99	Heavy Soil Increase	Planted	10/2/03	
X97	Heavy Soil Increase	First Stubble	10/2/01	11/3/03
X96	Heavy Soil Increase	Second Stubble	9/26/00	10/13/03

Table 3. Numbers of experimental clones dropped for identified faults in the 2000 crossing series first-line trials.

Trait	Fault Frequency	Fault Percent
------------------------- 4158 clones enter first round of evaluation ------------------------------		
Initial Selection (Rating)	2642	63.5
------------------------ 1516 clones enter second round of evaluation ----------------------------		
Rust	3	0.1
Borers	63	1.5
Lodged	400	9.6
Pith / Tube	42	1.0
Short	16	0.4
Diameter	20	0.5
Smut	8	0.2
Other	39	0.9
-- 3233 clones dropped --		
-----------------------------925 clones enter third round of evaluation ---------------------------		
Brix	225	5.4
Clones advanced	699	16.8

Table 4. Number of experimental clones dropped for identified faults in the 1999 crossing series of the first stubble first-line trials prior to advancement to the increase stage.

Trait	Fault Frequency	Fault Percent
--------------------------- 394 clones enter first round of evaluation -----------------------------		
Stalk count <41 per plot	186	47.2
Lodged	49	12.4
Pith / Tube	4	1.0
Diameter	1	0.3
Smut	1	0.3
Borers	1	0.3
Other	1	0.3
-- 242 clones dropped --------------------------------------		
Clones advanced to Increase stage	152	38.6

Table 5. Mean yield data of 2003 "L" assignments from 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	7341	42.8	171	1.8	47493
HOCP85-845	CP72-370	CP77-403	6036	34.9	167	1.99	34788
HOCP91-555	CP83-644	LCP82-094	6705	38.4	175	1.96	39779
L2003-362	L96-040	L96-044	7573	41.0	185	1.85	44468
L2003-363	CP83-644	LCP81-010	6651	35.7	186	1.81	39476
L2003-364	L96-060	LCP82-089	8641	47.1	183	1.96	48098
L2003-365	CP83-644	LCP82-089	8237	49.2	168	2.36	41745
L2003-366	HOCP92-624	LCP85-384	7054	38.9	181	2.17	35846
L2003-367	US93-016	L96-045	7487	36.5	205	1.9	38569
L2003-368	LCP85-384	L96-045	6648	36.5	182	1.37	53543
L2003-369	CP83-644	HOCP92-624	10446	58.7	178	2.33	50366
L2003-371	CP83-644	LCP82-089	9057	54.4	166	2.02	53996
L2003-372	CP83-644	LCP81-010	8409	41.0	205	1.99	41291
L2003-373	CP83-644	L95-477	7325	39.5	186	1.71	46283
L2003-374	CP83-644	L95-477	10203	54.0	189	2.17	49913
L2003-375	CP83-644	L95-477	9348	49.9	187	2.12	47190
L2003-376	CP83-644	L95-477	8166	45.0	181	1.74	51728
L2003-377	CP83-644	L95-477	8568	54.3	158	2.63	41291
L2003-378	LCP81-010	L97-149	7853	44.6	176	1.68	53089
L2003-379	MISC	HOCP92-624	6906	36.6	188	2.13	34485
L2003-380	HOCP92-624	LCP85-384	6435	37.5	172	1.64	45829
L2003-381	CP83-644	L95-477	7835	38.4	204	1.86	41291
L2003-382	CP83-644	L95-477	7726	40.6	190	2.3	35393
L2003-385	CP83-644	L95-477	6697	39.9	168	2.05	39023
L2003-386	LCP85-384	LCP82-089	7673	36.4	211	1.79	40838
L2003-387	HOCP92-624	LCP85-384	9397	55.2	170	2.28	48551
L2003-388	HOCP92-648	L97-133	7775	43.4	179	2.28	38115
L2003-389	LCP85-384	LCP82-089	6933	30.0	231	1.79	33578
L2003-390	LCP81-010	HOCP96-550	9847	58.7	168	2.02	58080
L2003-391	MISC	CP78-317	8434	46.3	182	2.43	38115
L2003-392	CP83-644	HOCP85-845	6638	34.1	195	1.65	41291
L2003-393	CP83-644	L95-477	7930	47.9	166	2.27	42199
L2003-394	HO96-566	HOCP92-624	8870	49.4	179	2.4	41291
L2003-395	HO95-988	L89-113	7611	37.9	201	2.35	32216
L2003-396	HOCP92-624	L96-045	8695	47.0	185	2.25	41745
L2003-397	HOCP92-624	L96-045	7102	40.1	177	1.82	44014
L2003-398	L91-255	LCP85-384	7666	41.6	184	1.31	63525
L2003-399	LCP85-384	LCP82-089	7809	35.7	219	1.68	42653

Table 6. Advancement summary of crosses in the 1998 through 2001.

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
1998 Crossing Series										
CP65-357	98P1	234	20	76	0	14	0	22	0	43
CP78-357	HOCP92-624	448	43	84	11	80	5	85	0	43
CP78-357	HOCP96-561	351	24	64	7	71	3	77	0	43
CP79-318	98P3	85	9	86	3	92	0	22	0	43
CP79-318	HOCP85-845	461	7	25	1	30	1	47	0	43
CP79-318	HOCP89-846	207	14	64	1	41	0	22	0	43
CP79-318	HOCP94-836	351	5	24	0	14	0	22	0	43
CP79-318	HOCP95-947	79	0	11	0	14	0	22	0	43
CP79-318	L95-495	593	44	68	2	34	2	50	0	43
CP79-318	LCP82-089	187	16	77	1	43	1	63	0	43
CP79-318	LCP82-089	242	36	96	9	93	2	73	0	43
CP79-318	LCP85-384	251	34	95	16	98	9	98	0	43
CP79-348	US96-006	657	25	41	2	33	0	22	0	43
CP82-550	L96-045	62	0	11	0	14	0	22	0	43
CP83-644	CP79-318	211	9	44	1	40	0	22	0	43
CP83-644	HO94-856	231	0	11	0	14	0	22	0	43
CP83-644	HOCP85-845	964	27	32	3	34	3	49	1	87
CP83-644	HOCP92-624	245	29	90	9	93	4	92	1	94
CP83-644	HOCP95-947	237	0	11	0	14	0	22	0	43
CP83-644	HOCP96-538	246	29	90	5	72	2	69	0	43
CP83-644	L89-113	93	0	11	0	14	0	22	0	43
CP83-644	L95-477	1616	107	62	49	90	26	92	9	98
CP83-644	L95-495	540	0	11	0	14	0	22	0	43
CP83-644	L96-044	225	0	11	0	14	0	22	0	43
CP83-644	LCP81-010	1306	51	42	18	63	6	60	2	88
CP83-644	LCP81-010	232	7	34	2	48	1	58	0	43
CP83-644	LCP82-089	1328	80	56	34	82	20	90	2	88
CP83-644	US80-004	101	8	72	0	14	0	22	0	43
CP85-803	L89-113	221	21	83	9	96	2	80	0	43
HO95-985	HOCP85-845	250	28	88	5	71	1	52	0	43
HO95-985	HOCP85-845	397	7	26	2	42	2	63	0	43
HO95-985	L96-040	227	37	98	6	85	0	22	0	43
HO95-985	LCP81-010	452	9	28	3	44	2	60	0	43
HO95-985	LCP81-010	340	21	57	3	49	1	49	0	43
HO95-985	LCP82-089	238	12	48	3	58	0	22	0	43
HO95-985	LCP85-384	106	12	88	7	98	2	95	0	43
HO95-988	HOCP85-845	250	6	30	1	36	0	22	0	43
HO95-988	L89-113	230	17	68	6	83	4	93	1	97
HO95-988	L94-426	105	14	94	4	95	2	95	0	43
HO95-988	L95-495	109	7	59	1	52	0	22	0	43
HO96-566	HOCP92-624	240	22	82	4	65	2	74	1	95
HO96-566	HOCP96-538	394	48	92	5	58	4	84	0	43
HOCP92-618	LCP81-010	689	0	11	0	14	0	22	0	43
HOCP92-624	HO96-565	91	3	36	0	14	0	22	0	43
HOCP92-624	HOCP85-845	249	20	73	10	95	3	87	0	43
HOCP92-624	HOCP85-845	944	71	69	22	78	8	76	0	43

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	HOCP96-509	103	10	85	3	86	0	22	0	43
HOCP92-624	L89-113	427	32	69	10	79	3	68	0	43
HOCP92-624	L96-040	241	35	96	9	94	7	98	0	43
HOCP92-624	L96-045	643	22	38	7	55	6	82	2	92
HOCP92-624	L96-045	240	19	72	1	38	1	55	0	43
HOCP92-624	L97-121	220	17	71	3	62	0	22	0	43
HOCP92-624	LCP85-384	344	24	65	10	86	8	96	2	99
HOCP92-624	LCP85-384	1146	69	56	30	84	7	66	1	86
HOCP92-648	L96-040	234	15	59	5	76	1	58	0	43
HOCP92-648	L97-121	1179	16	24	2	29	1	46	0	43
HOCP92-648	L97-133	242	16	62	1	38	1	55	1	95
HOCP92-648	LCP81-010	564	29	49	3	43	2	51	0	43
HOCP92-648	LCP82-089	92	7	70	2	76	1	85	0	43
HOCP92-654	98P3	621	0	11	0	14	0	22	0	43
HOCP92-654	HOCP85-845	473	0	11	0	14	0	22	0	43
HOCP92-654	L94-426	1215	0	11	0	14	0	22	0	43
HOCP92-654	L96-083	480	0	11	0	14	0	22	0	43
HOCP94-836	HOCP95-998	1135	0	11	0	14	0	22	0	43
HOCP96-500	L89-113	543	20	39	11	72	2	52	0	43
HOCP96-500	LCP81-010	497	17	38	2	36	0	22	0	43
HOCP96-500	LCP81-010	470	30	59	8	66	3	67	0	43
HOCP96-500	LCP85-384	901	47	50	12	61	6	68	0	43
HOCP96-515	HO96-565	227	14	57	4	68	1	59	0	43
HOCP96-519	HOCP95-998	591	42	66	15	82	7	87	0	43
HOCP96-519	HOCP96-538	333	9	31	1	33	0	22	0	43
HOCP96-522	HOCP95-947	236	9	41	1	38	1	56	0	43
HOCP96-522	LCP82-089	508	24	46	8	65	3	65	0	43
HOCP96-538	CP78-317	226	0	11	0	14	0	22	0	43
HOCP96-538	HOCP85-845	455	0	11	0	14	0	22	0	43
HOCP96-538	HOCP92-624	233	0	11	0	14	0	22	0	43
HOCP96-538	LCP82-089	1074	45	44	20	69	9	74	0	43
HOCP96-546	HOCP85-845	395	19	47	1	31	0	22	0	43
HOCP96-546	L96-044	665	0	11	0	14	0	22	0	43
HOCP96-561	L96-045	85	0	11	0	14	0	22	0	43
L89-113	LCP82-089	713	27	41	10	63	6	75	0	43
L89-163	HOCP94-836	111	6	51	0	14	0	22	0	43
L89-163	HOCP95-947	430	60	95	13	89	4	81	0	43
L89-163	LCP81-010	1296	14	23	2	28	1	45	0	43
L91-255	HOCP96-561	650	0	11	0	14	0	22	0	43
L91-255	L89-113	384	0	11	0	14	0	22	0	43
L91-255	LCP85-384	533	35	62	9	66	6	86	1	90
L94-428	LCP86-454	234	0	11	0	14	0	22	0	43
L95-461	HO94-856	500	52	85	15	88	3	65	0	43
L95-461	HOCP92-624	244	8	36	3	57	0	22	0	43
L95-461	HOCP94-836	247	7	32	1	36	1	53	0	43
L95-495	CP78-2114	93	5	51	0	14	0	22	0	43
L95-495	HO96-565	220	13	55	2	51	0	22	0	43

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
L95-495	HOCP85-845	374	0	11	0	14	0	22	0	43
L95-495	HOCP96-500	224	0	11	0	14	0	22	0	43
L95-495	L89-113	414	45	87	13	90	4	82	0	43
L95-495	L96-045	196	0	11	0	14	0	22	0	43
L95-495	L96-083	77	10	93	1	61	0	22	0	43
L96-040	L96-044	694	58	75	12	67	7	84	1	87
L96-040	L97-149	229	0	11	0	14	0	22	0	43
L96-040	LCP82-089	567	67	90	17	88	9	91	0	43
L96-040	US96-006	245	22	81	5	73	2	70	0	43
L96-045	HOCP85-845	108	8	68	2	69	1	80	0	43
L96-060	HOCP95-998	227	0	11	0	14	0	22	0	43
L96-060	L95-495	349	6	26	1	32	0	22	0	43
L96-060	LCP82-089	344	14	43	3	49	3	78	1	91
L96-072	HOCP85-845	234	12	49	2	47	0	22	0	43
L96-072	HOCP89-846	100	0	11	0	14	0	22	0	43
L96-072	LCP82-089	392	32	74	13	91	5	88	0	43
L96-078	HOCP95-947	107	9	75	1	53	0	22	0	43
L97-104	L97-146	444	29	60	4	50	1	48	0	43
L97-104	LCP82-089	241	21	79	6	81	3	88	0	43
L97-113	L96-044	97	3	34	2	74	0	22	0	43
L97-113	LCP81-010	244	1	23	0	14	0	22	0	43
L97-121	HOCP92-624	101	17	98	7	99	4	99	0	43
L97-121	HOCP96-561	882	40	45	8	51	5	64	0	43
L97-121	LCP81-010	237	26	87	5	75	2	76	0	43
L97-128	HOCP95-998	235	8	38	0	14	0	22	0	43
L97-128	LCP81-010	899	17	27	6	45	2	47	0	43
L97-146	LCP85-384	219	18	74	9	96	3	90	0	43
L97-149	LCP81-010	225	0	11	0	14	0	22	0	43
LCP81-010	HOCP96-550	235	8	38	3	59	1	57	1	96
LCP81-010	L95-495	225	5	29	0	14	0	22	0	43
LCP81-010	L97-149	343	24	65	6	68	3	79	1	92
LCP81-010	LCP82-089	1194	4	22	2	29	1	46	0	43
LCP82-089	HOCP96-527	427	0	11	0	14	0	22	0	43
LCP82-089	L89-113	746	0	11	0	14	0	22	0	43
LCP82-089	LCP86-454	166	0	11	0	14	0	22	0	43
LCP85-384	CP78-2114	314	23	66	6	70	2	66	0	43
LCP85-384	L96-045	221	28	92	6	85	4	94	1	98
LCP85-384	LCP82-089	1223	192	97	28	77	10	71	2	89
LCP85-384	LCP82-089	237	40	99	7	87	5	96	1	96
LCP85-384	LCP86-454	211	7	36	2	53	1	61	0	43
LCP86-429	L94-428	753	16	28	2	31	0	22	0	43
LCP87-492	CP78-2114	203	26	93	7	92	2	83	0	43
MISC	98P2	231	13	52	3	61	2	77	0	43
MISC	CP78-317	245	21	77	2	46	1	53	1	94
MISC	HOCP85-845	600	35	54	14	78	8	89	0	43
MISC	HOCP92-624	404	35	79	10	80	7	93	1	90
MISC	HOCP96-500	219	19	79	2	51	0	22	0	43

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
MISC	L89-113	486	25	49	5	54	4	72	0	43
MISC	L89-163	251	23	82	1	36	0	22	0	43
MISC	L94-426	243	23	83	11	97	6	97	0	43
MISC	L95-495	198	8	42	3	64	0	22	0	43
MISC	L96-044	229	13	53	5	77	2	79	0	43
MISC	L96-045	243	29	91	5	74	1	54	0	43
MISC	L97-146	241	14	54	2	46	2	73	0	43
MISC	LCP81-010	101	9	80	0	14	0	22	0	43
MISC	LCP85-384	243	16	62	3	57	2	72	0	43
MISC	LCP86-454	214	5	30	1	40	1	61	0	43
US77-017	HOCP85-845	235	7	34	3	59	1	57	0	43
US77-017	HOCP92-624	247	20	73	3	56	0	22	0	43
US93-015	CP78-2114	228	0	11	0	14	0	22	0	43
US93-015	L96-044	252	0	11	0	14	0	22	0	43
US93-016	CP78-2114	203	12	55	1	42	1	62	0	43
US93-016	L95-495	583	28	47	5	48	2	50	0	43
US93-016	L96-045	247	11	45	3	56	2	69	1	93
US93-016	LCP86-454	38	1	31	1	84	0	22	0	43
US96-006	CP78-2114	234	0	11	0	14	0	22	0	43
US96-006	L97-121	241	0	11	0	14	0	22	0	43
US96-006	L97-155	102	0	11	0	14	0	22	0	43
US96-006	US96-006	206	18	79	1	42	0	22	0	43
1999 Crossing Series										
CP65-357	L95-482	407	16	50	.	.	1	71	.	.
CP65-357	LCP85-384	94	20	99	.	.	3	99	.	.
CP65-357	LCP85-384	190	24	95	.	.	3	97	.	.
CP70-321	LCP82-089	176	3	31	.	.	0	33	.	.
CP72-370	HO95-988	469	24	62	.	.	0	33	.	.
CP77-405	HOCP92-618	185	0	12	.	.	0	33	.	.
CP77-405	HOCP95-931	178	0	12	.	.	0	33	.	.
CP77-405	HOCP97-621	393	17	56	.	.	0	33	.	.
CP77-405	L90-191	197	0	12	.	.	0	33	.	.
CP77-405	L94-426	207	1	25	.	.	0	33	.	.
CP77-405	L94-428	377	0	12	.	.	0	33	.	.
CP77-405	L94-428	354	0	12	.	.	0	33	.	.
CP77-405	L96-040	377	0	12	.	.	0	33	.	.
CP77-405	LCP85-384	176	0	12	.	.	0	33	.	.
CP77-405	US90-018	182	0	12	.	.	0	33	.	.
CP78-357	HOCP92-618	207	23	92	.	.	0	33	.	.
CP78-357	L94-432	1106	75	73	.	.	4	79	.	.
CP78-357	L96-030	214	21	90	.	.	1	82	.	.
CP78-357	US90-018	188	6	41	.	.	0	33	.	.
CP79-318	HO95-988	375	0	12	.	.	0	33	.	.
CP79-318	HOCP94-806	232	2	26	.	.	0	33	.	.
CP79-318	HOCP95-931	162	0	12	.	.	0	33	.	.

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
CP79-318	L97-137	544	20	47	.	.	0	33	.	.
CP79-318	LCP81-010	214	0	12	.	.	0	33	.	.
CP79-318	LCP85-384	698	32	58	.	.	2	75	.	.
CP79-318	LCP85-384	407	17	55	.	.	0	33	.	.
CP79-318	LCP85-384	161	28	98	.	.	1	89	.	.
CP79-348	HOCP92-618	211	0	12	.	.	0	33	.	.
CP79-348	L94-426	1079	18	31	.	.	1	66	.	.
CP82-550	LCP81-010	84	3	45	.	.	0	33	.	.
CP83-644	HOCP97-621	93	2	35	.	.	0	33	.	.
CP83-644	L91-255	194	14	75	.	.	0	33	.	.
CP83-644	L91-255	399	27	73	.	.	0	33	.	.
CP83-644	L96-030	64	12	98	.	.	0	33	.	.
CP83-644	L96-040	140	11	80	.	.	1	91	.	.
CP83-644	L96-063	435	33	77	.	.	3	90	.	.
CP83-644	L98-207	141	7	60	.	.	0	33	.	.
CP83-644	LCP81-010	384	16	55	.	.	0	33	.	.
CP83-644	LCP82-089	347	23	71	.	.	0	33	.	.
CP83-644	LCP85-384	398	0	12	.	.	0	33	.	.
CP88-702	HOCP92-618	179	6	43	.	.	2	94	.	.
CP88-702	L94-428	243	7	39	.	.	0	33	.	.
CP88-702	LCP86-454	86	2	36	.	.	0	33	.	.
CP89-879	HOCP92-618	213	9	55	.	.	1	83	.	.
CP89-879	L91-255	347	24	74	.	.	0	33	.	.
CP89-879	L94-426	212	6	38	.	.	1	83	.	.
CP89-879	L94-428	413	51	94	.	.	3	91	.	.
CP89-879	L94-428	148	0	12	.	.	0	33	.	.
CP89-879	L96-030	221	18	81	.	.	1	81	.	.
CP89-879	LCP81-010	237	12	62	.	.	0	33	.	.
CP89-879	LCP81-010	210	4	32	.	.	0	33	.	.
HO89-889	LCP85-384	730	42	67	.	.	1	67	.	.
HO95-985	CP77-405	232	18	79	.	.	0	33	.	.
HO95-985	HOCP85-845	163	9	65	.	.	1	89	.	.
HO95-985	HOCP95-931	190	3	31	.	.	0	33	.	.
HO95-985	L91-255	376	29	78	.	.	1	72	.	.
HO95-985	L94-426	200	15	76	.	.	0	33	.	.
HO95-985	L94-428	190	10	63	.	.	0	33	.	.
HO95-985	L98-209	236	12	62	.	.	2	91	.	.
HO95-985	LCP85-384	168	27	97	.	.	2	95	.	.
HO95-988	LCP82-089	181	0	12	.	.	0	33	.	.
HO96-565	HOCP92-618	206	14	73	.	.	1	86	.	.
HO96-565	LCP85-384	152	21	96	.	.	1	89	.	.
HOCP85-845	99P3	194	0	12	.	.	0	33	.	.
HOCP85-845	L97-137	209	18	83	.	.	0	33	.	.
HOCP89-846	L94-428	374	20	63	.	.	1	73	.	.
HOCP92-618	LCP85-384	218	9	53	.	.	0	33	.	.
HOCP92-624	99P4	170	7	53	.	.	0	33	.	.
HOCP92-624	HO89-889	431	53	94	.	.	6	96	.	.

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	HOCP85-845	238	15	69	.	.	0	33	.	.
HOCP92-624	HOCP92-618	83	3	45	.	.	0	33	.	.
HOCP92-624	HOCP95-931	206	0	12	.	.	0	33	.	.
HOCP92-624	L75-056	453	0	12	.	.	0	33	.	.
HOCP92-624	L91-255	366	35	89	.	.	2	87	.	.
HOCP92-624	L94-426	185	12	70	.	.	0	33	.	.
HOCP92-624	L94-428	168	9	64	.	.	0	33	.	.
HOCP92-624	L95-482	433	16	47	.	.	1	70	.	.
HOCP92-624	L97-137	407	23	66	.	.	0	33	.	.
HOCP92-624	LCP81-010	789	17	35	.	.	1	67	.	.
HOCP92-624	LCP85-384	86	7	81	.	.	2	98	.	.
HOCP92-624	LCP86-454	634	48	77	.	.	0	33	.	.
HOCP92-648	HOCP95-931	233	37	97	.	.	1	80	.	.
HOCP92-648	HOCP96-509	362	0	12	.	.	0	33	.	.
HOCP92-648	L91-255	204	7	43	.	.	0	33	.	.
HOCP92-648	L96-063	359	27	76	.	.	0	33	.	.
HOCP92-648	LCP85-384	625	64	91	.	.	9	97	.	.
HOCP92-648	LCP85-384	627	29	58	.	.	2	78	.	.
HOCP92-648	US90-018	219	9	53	.	.	2	92	.	.
HOCP94-806	HOCP85-845	453	34	76	.	.	1	69	.	.
HOCP94-806	HOCP92-618	389	34	84	.	.	1	71	.	.
HOCP94-806	HOCP97-621	91	1	27	.	.	0	33	.	.
HOCP94-806	HOCP97-621	420	36	83	.	.	4	93	.	.
HOCP95-931	L75-056	638	35	65	.	.	3	83	.	.
HOCP96-509	HO89-889	170	7	53	.	.	0	33	.	.
HOCP96-509	HOCP92-618	227	5	35	.	.	0	33	.	.
HOCP96-509	L75-056	460	56	93	.	.	5	94	.	.
HOCP96-509	L94-428	204	8	50	.	.	0	33	.	.
HOCP96-509	L94-432	352	10	38	.	.	1	75	.	.
HOCP96-509	L95-482	151	14	87	.	.	1	90	.	.
HOCP96-509	L97-117	523	44	82	.	.	1	68	.	.
HOCP96-509	LCP85-384	351	7	33	.	.	0	33	.	.
HOCP96-518	LCP85-384	306	0	12	.	.	0	33	.	.
HOCP96-519	L94-428	213	1	25	.	.	0	33	.	.
HOCP96-519	LCP86-454	239	0	12	.	.	0	33	.	.
HOCP96-522	HO95-988	392	19	59	.	.	0	33	.	.
HOCP96-522	HOCP92-618	83	0	12	.	.	0	33	.	.
HOCP96-522	L91-255	76	7	86	.	.	1	96	.	.
HOCP96-522	L95-482	332	5	30	.	.	1	77	.	.
HOCP96-522	L96-026	215	0	12	.	.	0	33	.	.
HOCP96-522	L98-209	155	9	67	.	.	0	33	.	.
HOCP96-522	LCP82-089	325	14	56	.	.	1	78	.	.
HOCP96-522	LCP85-384	219	21	89	.	.	0	33	.	.
HOCP96-522	LCP85-384	1031	71	74	.	.	0	33	.	.
HOCP96-522	US96-001	203	32	97	.	.	0	33	.	.
HOCP96-525	L94-428	394	0	12	.	.	0	33	.	.
HOCP96-525	L94-432	344	0	12	.	.	0	33	.	.

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
HOCP96-525	LCP85-384	460	0	12	.	.	0	33	.	.
HOCP97-609	HOCP85-845	224	19	82	.	.	4	97	.	.
HOCP97-609	HOCP97-621	431	40	87	.	.	0	33	.	.
HOCP97-609	L94-426	140	0	12	.	.	0	33	.	.
HOCP97-609	LCP86-454	211	15	75	.	.	1	84	.	.
HOCP97-620	LCP81-030	355	28	80	.	.	0	33	.	.
HOCP97-621	HOCP85-845	389	0	12	.	.	0	33	.	.
HOCP97-621	LCP85-384	1086	40	47	.	.	2	67	.	.
HOCP97-641	HOCP94-806	234	11	58	.	.	0	33	.	.
HOCP97-646	L75-056	361	7	32	.	.	1	74	.	.
HOCP97-646	L95-482	170	2	28	.	.	0	33	.	.
HOCP97-670	L94-432	229	13	66	.	.	0	33	.	.
HOCP97-670	L94-432	173	19	91	.	.	1	88	.	.
HOCP97-697	L94-426	194	7	45	.	.	0	33	.	.
L75-056	L98-207	243	19	79	.	.	0	33	.	.
L89-113	HO95-988	388	26	72	.	.	4	94	.	.
L89-113	HOCP85-845	178	6	43	.	.	0	33	.	.
L89-113	HOCP92-618	435	17	50	.	.	1	69	.	.
L89-113	L91-255	399	0	12	.	.	0	33	.	.
L89-113	L94-428	462	0	12	.	.	0	33	.	.
L89-113	L94-428	423	17	51	.	.	0	33	.	.
L89-113	L94-432	366	0	12	.	.	0	33	.	.
L89-113	LCP82-089	197	4	33	.	.	0	33	.	.
L90-191	HOCP94-806	85	3	44	.	.	2	98	.	.
L90-191	LCP82-089	222	0	12	.	.	0	33	.	.
L91-255	HO89-889	375	6	31	.	.	0	33	.	.
L91-255	HOCP95-931	167	5	40	.	.	0	33	.	.
L91-255	L94-428	195	3	30	.	.	0	33	.	.
L91-255	LCP82-089	413	0	12	.	.	0	33	.	.
L91-255	LCP82-089	359	28	79	.	.	1	74	.	.
L91-255	LCP85-384	646	79	93	.	.	6	93	.	.
L91-255	US90-018	207	5	37	.	.	0	33	.	.
L94-426	HOCP85-845	175	5	39	.	.	0	33	.	.
L94-426	LCP82-089	224	3	28	.	.	0	33	.	.
L94-426	LCP85-384	225	17	77	.	.	1	81	.	.
L94-428	LCP86-454	150	0	12	.	.	0	33	.	.
L94-432	CP78-357	326	28	83	.	.	1	77	.	.
L94-432	HO95-988	176	0	12	.	.	0	33	.	.
L94-432	HOCP85-845	183	7	48	.	.	1	87	.	.
L94-432	HOCP92-618	407	0	12	.	.	0	33	.	.
L94-432	HOCP97-621	323	14	56	.	.	1	78	.	.
L94-432	HOCP97-670	221	0	12	.	.	0	33	.	.
L94-432	L91-255	203	8	50	.	.	0	33	.	.
L94-432	L98-209	342	23	72	.	.	1	76	.	.
L94-432	LCP85-384	690	64	87	.	.	6	92	.	.
L94-432	US93-015	189	7	47	.	.	0	33	.	.
L95-482	LCP82-089	542	13	37	.	.	0	33	.	.

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
L96-026	CP83-644	158	0	12	.	.	0	33	.	.
L96-026	HO95-988	504	33	70	.	.	1	68	.	.
L96-026	HOCP85-845	198	0	12	.	.	0	33	.	.
L96-026	HOCP85-845	302	12	51	.	.	1	79	.	.
L96-026	HOCP97-670	421	28	72	.	.	2	84	.	.
L96-026	L91-255	340	11	41	.	.	0	33	.	.
L96-026	LCP81-010	237	0	12	.	.	0	33	.	.
L96-026	LCP82-089	190	0	12	.	.	0	33	.	.
L96-030	HO95-988	193	18	87	.	.	0	33	.	.
L96-030	HOCP96-525	208	9	56	.	.	0	33	.	.
L96-040	HOCP95-931	404	0	12	.	.	0	33	.	.
L96-040	L94-426	206	7	43	.	.	1	86	.	.
L96-092	HOCP96-525	160	0	12	.	.	0	33	.	.
L97-113	HOCP85-845	167	24	96	.	.	2	95	.	.
L97-113	L91-255	188	0	12	.	.	0	33	.	.
L97-113	LCP81-010	205	16	79	.	.	1	86	.	.
L97-113	US96-005	425	5	28	.	.	0	33	.	.
L97-117	L94-432	197	0	12	.	.	0	33	.	.
L97-121	L94-428	231	3	28	.	.	1	81	.	.
L97-121	L94-432	158	18	92	.	.	0	33	.	.
L97-121	US90-018	227	9	51	.	.	0	33	.	.
L97-128	HO95-988	420	37	85	.	.	1	70	.	.
L97-128	L91-255	473	0	12	.	.	0	33	.	.
L97-128	LCP85-384	859	0	12	.	.	0	33	.	.
L97-137	US96-001	194	6	41	.	.	0	33	.	.
L97-142	HO95-988	390	0	12	.	.	0	33	.	.
L97-142	HO95-988	215	0	12	.	.	0	33	.	.
L97-142	LCP82-089	195	0	12	.	.	0	33	.	.
L97-143	L94-428	166	6	45	.	.	0	33	.	.
L97-147	L94-432	165	15	85	.	.	0	33	.	.
L98-191	HOCP97-621	87	10	93	.	.	0	33	.	.
L98-207	HOCP85-845	200	6	40	.	.	0	33	.	.
L98-207	HOCP92-618	329	17	63	.	.	0	33	.	.
L98-207	L94-428	372	0	12	.	.	0	33	.	.
L98-207	L94-432	816	41	60	.	.	2	70	.	.
L98-207	LCP81-010	379	24	69	.	.	1	72	.	.
LCP81-010	HOCP95-931	208	0	12	.	.	0	33	.	.
LCP81-010	HOCP97-621	402	8	33	.	.	0	33	.	.
LCP81-010	L91-255	417	24	67	.	.	2	85	.	.
LCP81-010	L94-432	1029	0	12	.	.	0	33	.	.
LCP81-010	LCP81-030	208	0	12	.	.	0	33	.	.
LCP81-010	LCP85-384	1113	110	91	.	.	0	33	.	.
LCP81-010	LCP85-384	1564	64	53	.	.	1	66	.	.
LCP81-030	L94-432	112	0	12	.	.	0	33	.	.
LCP82-089	HOCP97-621	182	11	68	.	.	0	33	.	.
LCP85-384	99P3	387	37	89	.	.	1	72	.	.
LCP86-454	99P4	238	7	39	.	.	0	33	.	.

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
LCP86-454	HO95-988	599	13	35	.	.	0	33	.	.
LCP86-454	L96-040	146	0	12	.	.	0	33	.	.
LCP86-454	LCP85-384	207	19	86	.	.	1	85	.	.
LCP86-454	LCP85-384	1098	103	88	.	.	4	80	.	.
LHO83-153	LCP82-089	192	10	63	.	.	0	33	.	.
LHO83-153	LCP85-384	189	18	89	.	.	0	33	.	.
TUCCP77-042	LCP85-384	6	6	99	.	.	6	99	.	.
US79-010	HOCP85-845	348	20	66	.	.	1	75	.	.
US79-010	HOCP92-618	219	14	70	.	.	0	33	.	.
US79-010	L94-426	206	0	12	.	.	0	33	.	.
US79-010	LCP85-384	186	9	59	.	.	0	33	.	.
US79-010	LCP86-454	439	56	95	.	.	2	82	.	.
US80-004	HOCP92-618	71	1	29	.	.	0	33	.	.
US80-004	L94-428	188	7	47	.	.	0	33	.	.
US90-018	HOCP85-845	409	2	25	.	.	0	33	.	.
US90-018	L94-428	364	13	45	.	.	1	73	.	.
US90-018	L94-428	515	12	36	.	.	0	33	.	.
US90-021	LCP81-010	179	11	68	.	.	1	88	.	.
US90-021	LCP81-030	206	0	12	.	.	0	33	.	.
US93-016	L94-426	192	9	58	.	.	0	33	.	.
US93-016	L94-428	267	0	12	.	.	0	33	.	.
US93-016	L94-428	205	10	60	.	.	0	33	.	.
US93-016	LCP85-384	101	2	33	.	.	0	33	.	.
US93-016	LCP85-384	181	2	27	.	.	0	33	.	.
US96-001	US90-018	340	30	85	.	.	1	76	.	.
US96-005	L94-428	379	15	51	.	.	0	33	.	.
<u>2000 Crossing Series</u>										
CP65-357	L91-255	429	30	79	2	55	.	.	.	.
CP65-357	LCP85-384	984	40	53	6	58	.	.	.	.
CP77-405	L96-040	249	8	42	1	38	.	.	.	.
CP77-405	L98-197	242	16	77	3	80	.	.	.	.
CP77-405	L98-209	483	7	18	1	31	.	.	.	.
CP77-405	LCP85-384	940	20	29	3	35	.	.	.	.
CP78-317	L98-209	496	14	37	2	38	.	.	.	.
CP78-317	L99-229	245	22	91	3	77	.	.	.	.
CP78-317	LCP85-384	493	21	55	1	29	.	.	.	.
CP79-318	HOCP92-618	251	8	42	0	13	.	.	.	.
CP79-318	L96-040	243	16	77	0	13	.	.	.	.
CP79-318	L98-207	254	10	50	1	37	.	.	.	.
CP79-318	L98-209	249	5	27	3	75	.	.	.	.
CP79-318	L99-233	962	18	25	5	56	.	.	.	.
CP79-318	LCP85-384	727	9	18	0	13	.	.	.	.
CP83-644	HOCP97-609	251	10	51	4	89	.	.	.	.
CP89-846	LCP85-384	249	12	61	4	90	.	.	.	.
HO91-572	L94-428	250	2	16	0	13	.	.	.	.

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
HO91-572	LCP85-384	688	41	72	4	57	.	.	.	.
HO91-572	LCP87-492	244	0	6	0	13	.	.	.	.
HO95-988	HOCP85-845	241	11	59	1	41	.	.	.	.
HO95-988	HOCP96-561	249	5	27	0	13	.	.	.	.
HO95-988	L90-191	227	14	74	1	51	.	.	.	.
HO95-988	L94-433	426	27	75	9	93	.	.	.	.
HO95-988	L96-040	480	0	6	0	13	.	.	.	.
HO95-988	L98-207	733	31	54	4	56	.	.	.	.
HO95-988	L98-209	247	6	31	1	38	.	.	.	.
HO95-988	LCP85-384	1047	77	82	9	70	.	.	.	.
HOCP85-845	HOCP92-624	241	15	74	5	92	.	.	.	.
HOCP85-845	HOCP96-540	507	21	53	1	29	.	.	.	.
HOCP85-845	L89-113	254	1	14	0	13	.	.	.	.
HOCP85-845	L91-255	220	5	30	0	13	.	.	.	.
HOCP85-845	L98-209	470	0	6	0	13	.	.	.	.
HOCP85-845	LCP85-384	2348	129	68	11	55	.	.	.	.
HOCP91-522	US80-004	194	14	81	2	73	.	.	.	.
HOCP91-552	L90-191	182	3	21	0	13	.	.	.	.
HOCP91-552	L91-255	476	34	80	5	74	.	.	.	.
HOCP91-552	L94-432	211	9	55	1	55	.	.	.	.
HOCP91-552	L99-233	912	26	39	3	36	.	.	.	.
HOCP92-618	HOCP96-540	697	63	91	9	82	.	.	.	.
HOCP92-618	L99-233	245	3	18	0	13	.	.	.	.
HOCP92-624	HOCP85-845	477	16	45	2	45	.	.	.	.
HOCP92-624	HOCP92-618	251	17	79	2	64	.	.	.	.
HOCP92-624	HOCP96-522	241	9	47	3	80	.	.	.	.
HOCP92-624	HOCP96-540	977	82	88	10	73	.	.	.	.
HOCP92-624	HOCP96-561	473	2	14	0	13	.	.	.	.
HOCP92-624	HOCP97-601	249	11	56	2	64	.	.	.	.
HOCP92-624	HOCP97-609	498	46	92	16	96	.	.	.	.
HOCP92-624	HOCP97-621	486	14	39	3	59	.	.	.	.
HOCP92-624	L89-113	735	44	72	5	61	.	.	.	.
HOCP92-624	L91-255	1185	106	90	26	94	.	.	.	.
HOCP92-624	L91-281	239	29	98	2	67	.	.	.	.
HOCP92-624	L98-197	483	40	87	7	85	.	.	.	.
HOCP92-624	L98-209	236	8	45	2	69	.	.	.	.
HOCP92-624	L99-226	239	8	43	2	67	.	.	.	.
HOCP92-624	LCP85-384	2371	110	59	20	67	.	.	.	.
HOCP92-624	LCP85-384	715	32	57	3	45	.	.	.	.
HOCP92-624	LCP86-454	665	26	50	4	57	.	.	.	.
HOCP92-624	US80-004	252	7	37	1	38	.	.	.	.
HOCP92-648	HOCP85-845	243	6	33	4	90	.	.	.	.
HOCP92-648	HOCP92-624	228	8	46	3	84	.	.	.	.
HOCP92-648	L91-281	246	23	92	3	77	.	.	.	.
HOCP92-648	L93-363	238	7	39	2	67	.	.	.	.
HOCP92-648	L96-040	230	15	76	2	71	.	.	.	.
HOCP92-648	L98-209	238	2	16	0	13	.	.	.	.

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	LCP85-384	700	34	62	5	62	.	.	.	.
HOCP94-867	L99-226	227	36	99	3	84	.	.	.	.
HOCP95-950	LCP85-384	482	10	29	2	41	.	.	.	.
HOCP95-951	HOCP96-540	247	0	6	0	13	.	.	.	.
HOCP95-951	LCP85-384	732	24	43	5	61	.	.	.	.
HOCP96-522	CP78-317	501	20	51	1	29	.	.	.	.
HOCP96-522	HOCP96-561	453	38	88	6	84	.	.	.	.
HOCP96-522	L91-255	498	28	70	3	57	.	.	.	.
HOCP96-522	L94-432	223	9	51	2	72	.	.	.	.
HOCP96-522	LCP85-384	973	78	86	8	64	.	.	.	.
HOCP96-522	LCP85-384	615	0	6	0	13	.	.	.	.
HOCP96-540	HOCP85-845	222	10	57	0	13	.	.	.	.
HOCP96-540	HOCP91-552	232	26	95	6	95	.	.	.	.
HOCP96-540	HOCP92-624	245	0	6	0	13	.	.	.	.
HOCP96-540	L91-281	398	0	6	0	13	.	.	.	.
HOCP96-540	L92-312	248	0	6	0	13	.	.	.	.
HOCP96-540	L94-433	243	0	6	0	13	.	.	.	.
HOCP96-540	L99-229	219	0	6	0	13	.	.	.	.
HOCP96-540	US96-001	216	0	6	0	13	.	.	.	.
HOCP96-561	HOCP92-624	244	21	89	9	97	.	.	.	.
HOCP96-561	L99-229	251	19	84	4	89	.	.	.	.
HOCP96-561	L99-233	776	26	45	6	63	.	.	.	.
HOCP97-601	HOCP92-618	245	11	57	3	77	.	.	.	.
HOCP97-606	LCP85-384	486	9	25	2	41	.	.	.	.
HOCP97-609	HOCP85-845	229	6	34	3	83	.	.	.	.
HOCP97-609	HOCP92-624	469	0	6	0	13	.	.	.	.
HOCP97-609	HOCP97-621	215	13	72	1	55	.	.	.	.
HOCP97-609	L91-255	483	19	50	4	65	.	.	.	.
HOCP97-609	LCP81-010	235	1	14	0	13	.	.	.	.
HOCP97-609	LCP85-384	227	9	51	1	51	.	.	.	.
HOCP97-621	HOCP96-540	249	0	6	0	13	.	.	.	.
HOCP97-621	LCP85-384	946	26	36	7	62	.	.	.	.
HOCP97-645	L98-197	234	12	65	5	94	.	.	.	.
HOCP97-645	L99-226	469	37	85	1	31	.	.	.	.
HOCP98-743	L98-209	675	0	6	0	13	.	.	.	.
HOCP98-743	L99-226	236	0	6	0	13	.	.	.	.
HOCP98-776	HOCP97-621	240	16	78	1	45	.	.	.	.
HOCP98-776	L91-281	250	4	21	0	13	.	.	.	.
HOCP98-776	LCP81-010	711	15	29	2	34	.	.	.	.
L89-113	L96-040	230	32	99	13	99	.	.	.	.
L89-113	LCP85-384	482	32	77	10	92	.	.	.	.
L90-191	LCP85-384	239	18	83	2	67	.	.	.	.
L90-191	US96-001	236	0	6	0	13	.	.	.	.
L91-255	HOCP85-845	481	12	33	1	31	.	.	.	.
L91-255	L96-040	447	0	6	0	13	.	.	.	.
L91-255	LCP85-384	710	36	65	2	34	.	.	.	.
L91-281	L91-255	242	18	82	1	41	.	.	.	.

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
L91-281	L96-040	247	4	21	0	13	.	.	.	.
L91-281	L98-197	476	17	47	3	60	.	.	.	.
L91-281	L98-209	461	35	84	5	75	.	.	.	.
L91-281	L99-237	238	23	93	5	92	.	.	.	.
L91-281	LCP85-384	1205	60	63	5	41	.	.	.	.
L93-363	HOCP92-618	239	0	6	0	13	.	.	.	.
L93-363	L96-040	477	24	63	4	67	.	.	.	.
L93-363	LCP85-384	243	7	39	3	78	.	.	.	.
L93-399	HOCP85-845	489	24	62	6	78	.	.	.	.
L93-399	HOCP91-552	237	12	65	3	81	.	.	.	.
L93-399	L99-226	233	6	34	1	49	.	.	.	.
L94-426	L96-040	248	7	37	3	76	.	.	.	.
L94-426	L98-209	249	11	56	0	13	.	.	.	.
L94-426	L99-224	234	13	70	1	49	.	.	.	.
L94-426	L99-233	234	9	48	0	13	.	.	.	.
L94-426	LCP85-384	947	25	34	3	35	.	.	.	.
L94-426	LCP86-454	237	19	86	5	93	.	.	.	.
L94-428	HOCP97-601	472	16	45	2	45	.	.	.	.
L94-428	L91-281	241	32	98	10	98	.	.	.	.
L94-428	L94-433	234	18	85	1	49	.	.	.	.
L94-428	L99-226	226	12	67	1	51	.	.	.	.
L94-428	LCP81-010	675	16	31	0	13	.	.	.	.
L94-428	LCP85-384	712	39	68	1	28	.	.	.	.
L94-432	HOCP85-845	244	5	27	1	41	.	.	.	.
L96-040	HOCP98-776	471	0	6	0	13	.	.	.	.
L96-040	LCP81-010	242	15	74	3	80	.	.	.	.
L96-040	LCP85-384	1193	36	41	4	37	.	.	.	.
L97-128	HOCP85-845	237	2	16	0	13	.	.	.	.
L97-128	HOCP92-618	237	15	75	0	13	.	.	.	.
L97-128	L91-281	993	119	97	13	83	.	.	.	.
L97-128	L93-363	479	52	94	18	98	.	.	.	.
L97-128	L99-229	471	53	96	6	81	.	.	.	.
L97-128	L99-233	199	22	95	3	87	.	.	.	.
L97-128	LCP81-010	699	33	60	3	49	.	.	.	.
L97-128	LCP87-492	468	40	89	4	69	.	.	.	.
L97-128	US80-004	236	12	65	0	13	.	.	.	.
L97-128	US96-001	476	32	78	3	60	.	.	.	.
L98-158	L99-233	225	11	62	1	51	.	.	.	.
L98-197	HOCP96-522	204	0	6	0	13	.	.	.	.
L98-197	US99-002	225	0	6	0	13	.	.	.	.
L98-198	HOCP97-621	445	26	71	5	75	.	.	.	.
L98-198	US79-010	474	35	82	2	45	.	.	.	.
L98-207	CP79-318	702	11	21	2	34	.	.	.	.
L98-207	L92-312	250	25	93	4	89	.	.	.	.
L98-209	L94-428	238	0	6	0	13	.	.	.	.
L98-209	L99-233	476	9	25	3	60	.	.	.	.
L98-209	LCP85-384	461	0	6	0	13	.	.	.	.

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
L99-224	L99-226	240	14	71	2	65	.	.	.	.
L99-224	L99-233	234	8	45	2	69	.	.	.	.
L99-226	HOCP96-522	231	23	93	2	71	.	.	.	.
L99-226	L99-233	711	14	27	3	45	.	.	.	.
L99-226	LCP85-384	688	0	6	0	13	.	.	.	.
L99-229	LCP81-010	240	11	59	1	45	.	.	.	.
L99-229	LCP85-384	474	19	51	7	87	.	.	.	.
L99-233	LCP85-384	838	52	74	25	95	.	.	.	.
LCP81-010	CP78-317	458	1	13	0	13	.	.	.	.
LCP81-010	HOCP85-845	439	8	24	1	33	.	.	.	.
LCP81-010	HOCP96-561	186	7	48	0	13	.	.	.	.
LCP81-010	HOCP97-609	475	11	30	7	86	.	.	.	.
LCP81-010	HOCP97-621	229	4	23	1	51	.	.	.	.
LCP81-010	L92-312	243	13	67	3	78	.	.	.	.
LCP81-010	L94-428	239	13	67	1	45	.	.	.	.
LCP81-010	L96-040	239	6	33	0	13	.	.	.	.
LCP81-010	L98-207	705	12	23	1	28	.	.	.	.
LCP81-010	L99-233	817	13	21	1	27	.	.	.	.
LCP81-010	LCP85-384	1687	122	81	26	88	.	.	.	.
LCP81-010	US96-001	236	7	41	0	13	.	.	.	.
LCP81-010	US99-002	221	11	63	0	13	.	.	.	.
LCP81-030	HOCP85-845	249	7	37	1	38	.	.	.	.
LCP85-384	CP79-318	243	0	6	0	13	.	.	.	.
LCP85-384	HOCP92-624	236	0	6	0	13	.	.	.	.
LCP85-384	HOCP96-540	720	53	82	22	96	.	.	.	.
LCP85-384	L93-363	224	18	86	2	72	.	.	.	.
LCP85-384	L94-433	712	21	39	3	45	.	.	.	.
LCP85-384	L99-226	757	0	6	0	13	.	.	.	.
LCP85-384	LCP86-454	943	18	25	1	27	.	.	.	.
LCP86-454	L99-226	710	26	47	5	62	.	.	.	.
LCP86-454	L99-234	252	6	31	0	13	.	.	.	.
LCP86-454	LCP85-384	1861	157	88	27	85	.	.	.	.
LCP87-492	HOCP97-609	241	29	97	12	99	.	.	.	.
LCP87-492	L89-113	219	6	36	0	13	.	.	.	.
LCP87-492	L91-281	487	25	65	5	73	.	.	.	.
LCP87-492	L94-432	224	0	6	0	13	.	.	.	.
LCP87-492	L98-209	481	8	23	1	31	.	.	.	.
LCP87-492	L99-233	446	41	92	16	97	.	.	.	.
TUCCP77-042	LCP85-384	716	82	96	12	91	.	.	.	.
US79-010	HOCP96-540	237	13	68	3	81	.	.	.	.
US79-010	L98-209	236	13	68	1	45	.	.	.	.
US79-010	LCP85-384	700	19	36	3	49	.	.	.	.
US79-010	LCP87-492	246	4	21	1	41	.	.	.	.
US80-004	LCP85-384	664	7	17	3	53	.	.	.	.
US92-010	L91-281	201	9	57	3	87	.	.	.	.
US96-001	LCP85-384	948	15	21	2	31	.	.	.	.
US96-002	L94-432	221	3	18	1	53	.	.	.	.

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
US96-002	LCP85-384	468	19	53	1	31	.	.	.	.
2001 Crossing Series										
CP65-357	L92-312	240	10	61	.	.	.	.	.	.
CP77-405	L98-207	187	0	21	.	.	.	.	.	.
CP77-405	LCP85-384	394	0	21	.	.	.	.	.	.
CP78-317	HOCP91-552	191	0	21	.	.	.	.	.	.
CP79-318	L98-209	229	0	21	.	.	.	.	.	.
CP79-318	L98-209	225	0	21	.	.	.	.	.	.
CP83-644	HOCP96-540	430	15	57	.	.	.	.	.	.
CP83-644	HOCP96-561	210	7	55	.	.	.	.	.	.
CP83-644	HOCP97-621	218	0	21	.	.	.	.	.	.
CP83-644	HOCP98-778	212	0	21	.	.	.	.	.	.
CP83-644	L98-209	402	24	78	.	.	.	.	.	.
CP83-644	L99-226	398	0	21	.	.	.	.	.	.
CP83-644	L99-238	175	0	21	.	.	.	.	.	.
CP89-846	HOCP97-621	229	0	21	.	.	.	.	.	.
CP89-846	L98-209	385	0	21	.	.	.	.	.	.
HO89-889	HOCP85-845	219	11	68	.	.	.	.	.	.
HO89-889	HOCP96-561	69	0	21	.	.	.	.	.	.
HO89-889	L99-233	235	0	21	.	.	.	.	.	.
HO95-988	HOCP96-540	930	45	65	.	.	.	.	.	.
HO95-988	HOCP96-561	237	12	69	.	.	.	.	.	.
HO95-988	HOCP97-609	419	17	60	.	.	.	.	.	.
HO95-988	L89-113	452	19	61	.	.	.	.	.	.
HO95-988	L98-207	625	65	95	.	.	.	.	.	.
HO95-988	L99-226	464	0	21	.	.	.	.	.	.
HO95-988	L99-238	197	11	75	.	.	.	.	.	.
HO95-988	LCP85-384	432	49	96	.	.	.	.	.	.
HO95-988	TUCCP77-042	424	9	47	.	.	.	.	.	.
HOCP85-845	HO95-988	197	10	69	.	.	.	.	.	.
HOCP85-845	HOCP96-540	955	31	53	.	.	.	.	.	.
HOCP85-845	HOCP97-609	228	12	72	.	.	.	.	.	.
HOCP85-845	L96-092	215	0	21	.	.	.	.	.	.
HOCP85-845	L98-207	1325	41	52	.	.	.	.	.	.
HOCP85-845	L99-233	208	11	72	.	.	.	.	.	.
HOCP85-845	LCP85-384	656	39	77	.	.	.	.	.	.
HOCP88-739	LCP85-384	208	15	85	.	.	.	.	.	.
HOCP89-846	HOCP98-741	167	17	94	.	.	.	.	.	.
HOCP89-846	LCP85-384	203	2	44	.	.	.	.	.	.
HOCP89-846	LCP85-384	178	4	48	.	.	.	.	.	.
HOCP89-846	LCP85-384	198	7	57	.	.	.	.	.	.
HOCP89-846	TUCCP77-042	201	15	86	.	.	.	.	.	.
HOCP90-941	L97-137	226	7	52	.	.	.	.	.	.
HOCP90-941	LCP85-384	223	0	21	.	.	.	.	.	.
HOCP91-552	01P1	456	15	55	.	.	.	.	.	.

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
HOCP91-552	HOCP96-540	543	12	48	.	.	.	.	.	.
HOCP91-552	HOCP97-609	90	0	21	.	.	.	.	.	.
HOCP91-555	HOCP00-955	200	0	21	.	.	.	.	.	.
HOCP91-555	HOCP96-509	210	10	65	.	.	.	.	.	.
HOCP91-555	HOCP96-540	198	0	21	.	.	.	.	.	.
HOCP91-555	HOCP96-540	723	22	50	.	.	.	.	.	.
HOCP91-555	HOCP98-776	149	9	78	.	.	.	.	.	.
HOCP91-555	L99-226	429	38	91	.	.	.	.	.	.
HOCP91-555	LCP85-384	203	0	21	.	.	.	.	.	.
HOCP91-555	LCP86-454	195	0	21	.	.	.	.	.	.
HOCP92-618	HOCP96-540	709	32	63	.	.	.	.	.	.
HOCP92-618	LCP85-384	429	0	21	.	.	.	.	.	.
HOCP92-618	TUCCP77-042	430	0	21	.	.	.	.	.	.
HOCP92-624	HOCP00-961	232	19	88	.	.	.	.	.	.
HOCP92-624	HOCP91-552	219	0	21	.	.	.	.	.	.
HOCP92-624	HOCP96-540	242	12	68	.	.	.	.	.	.
HOCP92-624	HOCP96-561	373	24	81	.	.	.	.	.	.
HOCP92-624	L00-257	442	21	65	.	.	.	.	.	.
HOCP92-624	L89-113	231	14	79	.	.	.	.	.	.
HOCP92-624	L94-426	181	0	21	.	.	.	.	.	.
HOCP92-624	L94-428	218	4	46	.	.	.	.	.	.
HOCP92-624	L98-207	560	18	53	.	.	.	.	.	.
HOCP92-624	L98-209	468	35	86	.	.	.	.	.	.
HOCP92-624	L99-226	232	0	21	.	.	.	.	.	.
HOCP92-624	L99-233	401	37	92	.	.	.	.	.	.
HOCP92-624	LCP85-384	144	12	89	.	.	.	.	.	.
HOCP92-648	HOCP96-540	369	18	66	.	.	.	.	.	.
HOCP92-648	HOCP96-561	210	12	76	.	.	.	.	.	.
HOCP92-648	HOCP97-609	222	0	21	.	.	.	.	.	.
HOCP92-648	HOCP97-621	196	0	21	.	.	.	.	.	.
HOCP92-648	L99-226	345	0	21	.	.	.	.	.	.
HOCP92-648	L99-226	175	6	56	.	.	.	.	.	.
HOCP92-648	L99-234	238	0	21	.	.	.	.	.	.
HOCP92-648	LCP85-384	455	60	98	.	.	.	.	.	.
HOCP92-648	LCP85-384	198	20	94	.	.	.	.	.	.
HOCP94-806	HOCP97-621	72	0	21	.	.	.	.	.	.
HOCP94-806	L99-226	245	0	21	.	.	.	.	.	.
HOCP94-806	L99-233	236	14	77	.	.	.	.	.	.
HOCP95-951	CP79-348	420	54	98	.	.	.	.	.	.
HOCP95-951	HOCP96-540	422	22	70	.	.	.	.	.	.
HOCP95-951	HOCP96-540	232	10	62	.	.	.	.	.	.
HOCP95-951	L97-137	465	33	84	.	.	.	.	.	.
HOCP95-951	LCP82-089	450	28	79	.	.	.	.	.	.
HOCP96-509	HOCP96-561	368	25	82	.	.	.	.	.	.
HOCP96-509	L92-312	243	0	21	.	.	.	.	.	.
HOCP96-509	L99-226	226	0	21	.	.	.	.	.	.
HOCP96-509	LCP85-384	184	17	92	.	.	.	.	.	.

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
HOCP96-522	HOCP89-846	225	12	72	.	.	.	.	.	.
HOCP96-522	HOCP96-561	184	6	55	.	.	.	.	.	.
HOCP96-522	L91-255	207	11	72	.	.	.	.	.	.
HOCP96-522	L98-209	410	20	66	.	.	.	.	.	.
HOCP96-522	LCP85-384	203	7	56	.	.	.	.	.	.
HOCP96-540	HOCP89-846	623	0	21	.	.	.	.	.	.
HOCP96-540	HOCP96-561	237	0	21	.	.	.	.	.	.
HOCP96-540	L89-113	190	0	21	.	.	.	.	.	.
HOCP96-540	L91-255	371	0	21	.	.	.	.	.	.
HOCP96-540	L99-226	449	0	21	.	.	.	.	.	.
HOCP96-540	LCP85-384	392	0	21	.	.	.	.	.	.
HOCP96-561	HOCP85-845	452	14	52	.	.	.	.	.	.
HOCP97-606	L96-092	237	7	50	.	.	.	.	.	.
HOCP97-609	HO91-572	207	0	21	.	.	.	.	.	.
HOCP97-609	HOCP97-621	167	0	21	.	.	.	.	.	.
HOCP97-609	HOCP98-741	231	0	21	.	.	.	.	.	.
HOCP97-609	L89-113	250	0	21	.	.	.	.	.	.
HOCP97-609	L99-226	417	0	21	.	.	.	.	.	.
HOCP97-609	L99-233	142	4	50	.	.	.	.	.	.
HOCP97-609	LCP82-089	448	31	82	.	.	.	.	.	.
HOCP97-621	L98-207	452	0	21	.	.	.	.	.	.
HOCP98-741	HOCP92-618	236	0	21	.	.	.	.	.	.
HOCP98-741	L94-432	239	0	21	.	.	.	.	.	.
HOCP98-741	LCP85-384	413	43	95	.	.	.	.	.	.
HOCP98-776	CP79-348	210	2	44	.	.	.	.	.	.
HOCP98-776	HOCP96-540	177	0	21	.	.	.	.	.	.
HOCP98-776	L91-255	203	9	63	.	.	.	.	.	.
HOCP98-776	L99-226	236	0	21	.	.	.	.	.	.
HOCP98-776	L99-233	218	6	50	.	.	.	.	.	.
HOCP98-778	CP79-318	219	0	21	.	.	.	.	.	.
HOCP98-778	HOCP97-621	93	0	21	.	.	.	.	.	.
HOCP98-781	HOCP96-540	442	38	90	.	.	.	.	.	.
HOCP99-825	L91-281	217	0	21	.	.	.	.	.	.
HOCP99-833	L98-209	180	13	85	.	.	.	.	.	.
L00-249	L94-432	236	0	21	.	.	.	.	.	.
L00-254	HOCP97-609	430	0	21	.	.	.	.	.	.
L00-254	L98-209	244	0	21	.	.	.	.	.	.
L00-254	LCP85-384	416	0	21	.	.	.	.	.	.
L00-260	HOCP97-621	232	0	21	.	.	.	.	.	.
L00-260	L99-233	400	0	21	.	.	.	.	.	.
L00-264	L94-432	145	0	21	.	.	.	.	.	.
L00-264	LCP85-384	226	7	52	.	.	.	.	.	.
L00-264	LCP85-384	202	7	57	.	.	.	.	.	.
L00-268	HOCP96-540	971	63	81	.	.	.	.	.	.
L00-271	HOCP96-540	194	11	76	.	.	.	.	.	.
L91-255	HOCP96-509	141	0	21	.	.	.	.	.	.
L91-255	L98-207	427	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
L91-255	LCP85-384	386	18	64	.	.	.	.	.	.
L91-281	HOCP96-561	442	53	97	.	.	.	.	.	.
L91-281	L97-137	246	12	66	.	.	.	.	.	.
L91-281	L99-234	218	12	74	.	.	.	.	.	.
L91-281	LCP85-384	226	0	21	.	.	.	.	.	.
L93-386	HOCP96-540	363	0	21	.	.	.	.	.	.
L93-391	L98-209	215	0	21	.	.	.	.	.	.
L93-391	L99-226	206	0	21	.	.	.	.	.	.
L93-391	LCP85-384	97	0	21	.	.	.	.	.	.
L93-399	HOCP85-845	176	0	21	.	.	.	.	.	.
L93-399	HOCP85-845	326	12	58	.	.	.	.	.	.
L93-399	LCP85-384	171	0	21	.	.	.	.	.	.
L94-426	HOCP97-621	174	0	21	.	.	.	.	.	.
L94-426	L99-233	185	7	59	.	.	.	.	.	.
L94-426	LCP85-384	224	11	66	.	.	.	.	.	.
L94-426	LCP85-384	184	22	97	.	.	.	.	.	.
L94-426	LHO92-314	234	0	21	.	.	.	.	.	.
L94-428	HOCP96-540	354	32	91	.	.	.	.	.	.
L94-428	MISC	178	8	63	.	.	.	.	.	.
L94-432	HOCP96-540	209	36	99	.	.	.	.	.	.
L94-432	L89-113	208	0	21	.	.	.	.	.	.
L94-432	L91-281	195	0	21	.	.	.	.	.	.
L94-432	L98-207	337	0	21	.	.	.	.	.	.
L94-432	LCP85-384	194	0	21	.	.	.	.	.	.
L94-432	TUCCP77-042	383	13	56	.	.	.	.	.	.
L96-040	HOCP92-618	228	22	93	.	.	.	.	.	.
L96-040	HOCP96-540	227	13	76	.	.	.	.	.	.
L96-040	L99-233	211	0	21	.	.	.	.	.	.
L96-040	L99-233	393	26	82	.	.	.	.	.	.
L97-128	HOCP85-845	224	14	80	.	.	.	.	.	.
L97-128	L91-281	174	15	90	.	.	.	.	.	.
L97-128	L99-233	228	25	96	.	.	.	.	.	.
L97-128	LCP82-089	416	29	83	.	.	.	.	.	.
L97-128	LHO92-314	205	0	21	.	.	.	.	.	.
L97-128	TUCCP77-042	191	32	99	.	.	.	.	.	.
L97-137	HOCP94-806	219	13	77	.	.	.	.	.	.
L97-137	L94-428	406	20	66	.	.	.	.	.	.
L98-197	HOCP00-961	227	0	21	.	.	.	.	.	.
L98-207	01P5	473	2	43	.	.	.	.	.	.
L98-207	CP79-318	388	0	21	.	.	.	.	.	.
L98-207	HOCP85-845	736	45	79	.	.	.	.	.	.
L98-209	01P4	416	38	92	.	.	.	.	.	.
L98-209	HOCP97-621	474	17	58	.	.	.	.	.	.
L98-209	HOCP98-741	205	0	21	.	.	.	.	.	.
L98-209	L92-312	182	0	21	.	.	.	.	.	.
L98-209	LHO92-314	457	18	59	.	.	.	.	.	.
L98-209	TUCCP77-042	427	24	75	.	.	.	.	.	.

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
L99-214	HOCP97-621	235	0	21	.	.	.	.	.	.
L99-214	L99-233	207	17	88	.	.	.	.	.	.
L99-221	HOCP96-540	433	0	21	.	.	.	.	.	.
L99-226	01P4	676	12	46	.	.	.	.	.	.
L99-226	HOCP92-618	436	0	21	.	.	.	.	.	.
L99-226	HOCP96-540	757	0	21	.	.	.	.	.	.
L99-226	L89-113	204	0	21	.	.	.	.	.	.
L99-226	L99-233	754	5	43	.	.	.	.	.	.
L99-226	LCP82-089	464	19	60	.	.	.	.	.	.
L99-226	LCP85-384	843	42	68	.	.	.	.	.	.
L99-226	TUCCP77-042	621	11	46	.	.	.	.	.	.
L99-231	HOCP85-845	195	3	45	.	.	.	.	.	.
L99-231	HOCP97-621	194	0	21	.	.	.	.	.	.
L99-231	L92-312	147	0	21	.	.	.	.	.	.
L99-233	HOCP97-621	173	0	21	.	.	.	.	.	.
L99-233	L94-428	205	16	87	.	.	.	.	.	.
L99-234	HOCP96-540	216	0	21	.	.	.	.	.	.
L99-234	L98-207	365	0	21	.	.	.	.	.	.
L99-238	L94-432	220	0	21	.	.	.	.	.	.
LCP81-010	L89-113	208	0	21	.	.	.	.	.	.
LCP81-010	L91-281	209	11	72	.	.	.	.	.	.
LCP81-010	L92-312	143	0	21	.	.	.	.	.	.
LCP81-010	L92-312	124	0	21	.	.	.	.	.	.
LCP81-010	L94-428	460	6	45	.	.	.	.	.	.
LCP81-010	L98-207	617	39	80	.	.	.	.	.	.
LCP81-010	L98-207	1095	35	53	.	.	.	.	.	.
LCP81-010	L98-209	605	24	60	.	.	.	.	.	.
LCP81-010	L99-233	898	28	52	.	.	.	.	.	.
LCP81-010	LCP82-089	384	0	21	.	.	.	.	.	.
LCP81-010	LCP85-384	844	85	94	.	.	.	.	.	.
LCP81-010	LCP85-384	937	17	46	.	.	.	.	.	.
LCP82-089	LCP85-384	381	20	70	.	.	.	.	.	.
LCP83-137	HOCP96-561	404	34	89	.	.	.	.	.	.
LCP85-313	HOCP96-509	342	24	83	.	.	.	.	.	.
LCP85-313	HOCP97-609	415	29	83	.	.	.	.	.	.
LCP85-384	01P4	597	0	21	.	.	.	.	.	.
LCP85-384	HOCP89-846	240	19	87	.	.	.	.	.	.
LCP85-384	HOCP92-618	230	0	21	.	.	.	.	.	.
LCP85-384	HOCP97-621	471	53	96	.	.	.	.	.	.
LCP85-384	L91-281	378	0	21	.	.	.	.	.	.
LCP85-384	L99-233	609	13	47	.	.	.	.	.	.
LCP86-454	L99-233	591	32	74	.	.	.	.	.	.
LCP86-454	LCP85-384	636	45	84	.	.	.	.	.	.
LCP86-454	LCP85-384	1475	64	62	.	.	.	.	.	.
LCP86-454	TUCCP77-042	335	0	21	.	.	.	.	.	.
LHO83-153	L99-233	180	14	87	.	.	.	.	.	.
LHO83-153	LCP85-384	213	5	49	.	.	.	.	.	.

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
LHO92-314	L99-226	207	0	21	.	.	.	.	.	.
LHO92-314	LCP85-384	229	0	21	.	.	.	.	.	.
L00-273	LCP82-089	198	0	21	.	.	.	.	.	.
TUCCP77-042	L98-209	162	14	90	.	.	.	.	.	.
TUCCP77-042	L99-238	232	12	70	.	.	.	.	.	.
TUCCP77-042	LCP85-384	476	25	72	.	.	.	.	.	.
US96-002	LCP85-384	229	22	93	.	.	.	.	.	.

Table 7. Plant weight and rank summary statistics from the 2001 crossing series first stubble cross appraisal test at the St. Gabriel Research Station in 2003.

Female	Male	Plant Weight Kg/Plant	Plant Weight Pcnt'l
HOCP89-846	HOCP98-741	11.73	98
L99-226	01P4	10.40	97
L99-231	HOCP91-552	9.68	96
L99-221	HOCP96-540	9.66	95
L99-226	L89-113	9.42	93
L00-254	HOCP97-609	9.36	92
L96-040	L89-113	9.27	91
LCP81-010	LCP82-089	9.05	90
L99-226	L99-233	9.04	89
LCP81-010	LCP85-384	8.82	88
US99-004	L98-209	8.96	88
L94-426	TUCCP77-042	8.80	87
LCP81-010	L98-207	8.73	86
LHO83-153	HOCP96-561	8.67	85
LCP83-137	HOCP96-561	8.54	84
HOCP94-806	L99-233	8.54	83
L99-226	LCP85-384	8.52	82
LCP81-010	L94-428	8.46	81
L99-221	HOCP96-540	8.36	80
L96-040	L99-233	8.25	79
LCP81-010	L92-312	8.22	78
L89-113	L98-209	8.19	77
HOCP96-522	L98-209	8.20	77
LCP81-010	L99-233	8.17	76
HOCP92-624	L99-233	8.14	75
L99-214	L99-233	8.13	74
HO95-988	L94-428	8.13	73
HOCP89-846	TUCCP77-042	8.09	72
HO95-988	L99-238	8.02	71
HOCP98-776	L91-281	7.94	70
LCP85-313	LCP85-384	7.90	69
L96-040	L99-233	7.77	68
L94-426	LHO92-314	7.69	67
HOCP92-624	L99-226	7.55	66
HOCP85-845	LCP85-384	7.58	66
HOCP92-648	HOCP96-561	7.49	65
HOCP99-825	L92-312	7.48	64
L99-234	L99-233	7.44	63
HOCP85-845	L99-233	7.43	62
HOCP95-951	L97-137	7.42	61
L00-260	L99-233	7.35	60
HOCP96-522	HOCP89-846	7.35	59
L93-386	HOCP96-540	7.33	58
HOCP92-624	L00-257	7.32	57
L91-281	L97-137	7.31	56
HOCP92-624	HOCP98-741	7.28	55
LCP81-010	L91-281	7.12	54
HOCP85-845	L98-207	7.08	53
CP83-644	L98-209	7.08	52
L97-137	L99-234	7.03	51
L00-249	L94-428	6.99	50
L91-255	LCP85-384	6.96	49
L92-321	L99-226	6.95	48
L00-273	HOCP96-540	6.94	47
LCP86-454	TUCCP77-042	6.86	46
HOCP97-609	L99-226	6.80	45
L00-271	LCP85-384	6.75	44
L94-432	L98-207	6.77	44
HO89-889	HOCP85-845	6.72	43
L94-426	L98-207	6.72	42
HOCP91-555	L99-226	6.72	41
HOCP97-606	L94-428	6.70	40
L99-226	TUCCP77-042	6.66	39
LOO-273	LCP82-089	6.63	38
LHO92-314	L99-226	6.63	37
L00-264	L94-428	6.62	36
HOCP96-540	L91-255	6.61	35
L93-391	L98-209	6.60	34

Female	Male	Plant Weight	
		Kg/Plant	Pcnt'l
HOCP95-951	LCP82-089	6.59	33
HOCP97-609	HOCP98-741	6.52	33
LHO92-314	L98-209	6.47	32
HOCP99-825	L91-281	6.38	31
HOCP96-509	L99-226	6.30	30
L00-264	LCP85-384	6.27	29
L97-128	L94-426	6.26	28
HOCP92-618	HOCP96-540	6.20	27
HOCP98-741	LCP85-384	6.07	26
CP77-405	L98-207	6.03	25
LCP85-384	HOCP89-846	6.02	24
HOCP98-776	HOCP00-961	5.98	23
HOCP92-648	L99-226	5.96	22
HOCP92-648	LCP85-384	5.88	21
HOCP92-618	TUCCP77-042	5.75	20
LCP85-384	01P4	5.68	19
L00-254	LCP85-384	5.67	18

Female	Male	Plant Weight	
		Kg/Plant	Pcnt'l
LHO83-153	LCP85-384	5.63	17
HOCP92-624	L98-207	5.59	16
HOCP92-648	L99-234	5.53	15
L99-233	L94-428	5.52	14
L99-234	L98-207	5.52	13
L98-209	01P4	5.50	12
HOCP98-781	LCP85-384	5.27	11
L99-226	LCP82-089	5.44	11
HOCP99-833	L98-209	5.19	10
HOCP98-781	L99-226	5.06	9
HO95-988	L99-226	5.02	8
HOCP98-778	CP79-318	4.99	7
L93-399	L98-209	4.98	6
L94-426	L99-226	4.76	5
L91-281	L99-234	4.69	4
HOCP97-621	L98-207	4.37	3
L00-259	LCP85-384	4.12	2
L99-234	HOCP96-540	3.94	1
L96-040	HOCP92-618	3.70	0

2003 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 AgCenter 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. The 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) were planted with both the LSU and USDA 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 5-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. Three commercial check varieties, LCP85-384, HoCP91-555, and, HoCP85-845, were planted in tests for comparison. In 2003, HoCP96-540 replaced HoCP85-845 as a check.

A combine harvester/weigh wagon system was used to cut and weigh plots for the infield tests. This system worked extremely well, with the immediate benefit of the amount of labor required for the collection of the data being reduced. The accuracy of data collection was improved because of the absence of internal sugarcane jams in the combine harvester (soldier harvesters frequently jam), the absence of errors in topper height adjustment between plots, and the minimization of errors in terms of sugarcane missed and not weighed. The infield variety trials are also important for screening experimental varieties for suitability to mechanical combine harvesting.

Millable stalk counts for both nursery and infield tests were made in late July and August. During the harvest season, 10-stalk samples were harvested by hand and stripped of leaves for the nursery tests. A 15-stalk sample was taken for the infield tests and sent to the USDA Ardoyne Farm and analyzed using the pre-breaker press. Samples from the nursery tests were weighed and milled at the sucrose laboratory in St. Gabriel 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 were estimated as the product of stalk weight and stalk number. Cane yield for the infield tests were determined from the plot weights and reduce 14% to account for extraneous trash. Sugar per acre was calculated as the product of sugar per ton and cane yield.

The 2003 sugarcane crop experienced good growing conditions, although the year began with rutted fields caused by the difficult 2002 harvest. January was dry, but excessive rain fell in February and March, making early season cultivation and herbicide application difficult. April and May were much drier and enabled growers to cultivate fields properly. The planting season had adequate rainfall, which allowed for good planting conditions. Unlike the 2002 harvest, the 2003 harvest was ideal. Dry conditions, an erect crop, and excellent cane maturity provided growers with excellent harvesting conditions. Cane tonnage was lower than anticipated, but sucrose recovery at the factories was the second highest on record for Louisiana. All experimental locations were harvested before the first freeze. Recommended cultural practices were followed at all test locations.

LCP85-384 has been the leading variety in Louisiana since 1998. Approximately, 88% of Louisiana's harvested sugarcane acreage was in LCP85-384 for 2003. 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. 2003 Location, soil texture, and planting and harvest dates for the nursery and infield tests.

					Harvest Date	Varieties	
Series	Location†	Stage	Soil Texture	Planting Date	2003	No. Planted	No. Harvested
1998	Blackberry Farms	Infield	Commerce silt loam	08/24/99	10/08	65	4
1998	Ulysee Gonsoulin & Sons, Inc.	Nursery	Patout silt loam	08/13/99	09/29	44	4
1998	D & N Farm	Nursery	Baldwin silty clay	08/20/99	09/29	13	4
1998	Landry Farms	Nursery	Commerce silt loam	08/17/99	09/29	44	4
1999	Ardoyne Farm -U.S.D.A	Nursery	Commerce silt loam	10/20/99	10/17	34	2
1999	Iberia Research Station	Nursery	Baldwin silty clay	10/19/99	10/23	34	2
1999	Blackberry Farms	Infield	Commerce silt loam	08/17/00	10/08	39	2
1999	Newton Cane, Inc.	Nursery	Moreland silt loam	08/24/00	10/23	39	2
1999	D & N Farm	Nursery	Baldwin silty clay	08/18/00	10/07	16	2
1999	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/23/00	10/27	39	2
1999	Landry Farms	Nursery	Commerce silt loam	08/21/00	10/01	39	2
2000	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/12/00	10/17	33	1
2000	Iberia Research Station	Nursery	Baldwin silty clay	10/13/00	10/23	33	1
2000	St. Gabriel Research Station	Nursery	Sharkey clay	10/12/00	10/14	33	1
2000	Blackberry Farms	Infield	Commerce silt loam	08/21/01	12/03	48	5
2000	Newton Cane, Inc.	Nursery	Moreland silt loam	08/24/01	10/23	48	4
2000	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/22/01	10/28	47	5
2000	Landry Farms	Nursery	Commerce silt loam	09/18/01	10/01	48	4
2001	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/18/01	11/04	37	3
2001	Iberia Research Station	Nursery	Baldwin silty clay	10/22/01	11/17	37	3
2001	St. Gabriel Research Station	Nursery	Sharky clay	10/09/01	11/04	37	3
2001	Blackberry Farms	Infield	Commerce silt loam	08/27/02	12/03	38	15
2001	Newton Cane, Inc.	Nursery	Moreland silt loam	08/21/02	10/29	38	15
2001	D & N Farm	Nursery	Baldwin silty clay	08/22/02	11/04	12	15
2001	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/09/02	11/20	38	15
2001	Landry Farms	Nursery	Commerce silt loam	08/29/02	11/19	38	15
2002	St. Gabriel Research Station	Nursery	Sharkey clay	11/01/02	11/25	38	14
2002	Newton Cane, Inc.	Nursery	Moreland silt loam	08/15/03		41	
2002	Sugarland Acres, Inc.	Infield	Coteau silt loam	08/19/03		41	
2002	Blackberry Farms	Infield	Commerce silt loam	08/20/03		41	
2002	Landry Farms	Nursery	Commerce silt loam	08/21/03		41	
2002	D & N Farm	Nursery	Baldwin silty clay	08/26/03		14	
2003	St. Gabriel Research Station	Nursery	Sharkey clay	10/09/03		35	
2003	Ardoyne Farm-U.S.D.A	Nursery	Commerce silt loam	10/16/03		35	
2003	Iberia Research Station	Nursery	Baldwin silty clay	10/21/03		35	

† Ardoyne-U.S.D.A. Ardoyne Farm (Chacahoula), Blackberry Farms (Vacherie), Ulysee Gonsoulin & Sons, Inc. (New Iberia), 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. 2003 Infield third-stubble means of the 1998 "L" assignment series in light soil at Blackberry Farms, Vacherie, LA.

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	6584	24.9	262	1.67	30976	11.7
TucCP77-042	9025	34.5	260	1.73	40195	14.0 +
LCP85-384	7528	25.6	294	1.52	33846	12.2
HoCP85-845	9344	34.3	274	1.62	42552	12.7
HoCP96-540	10804	36.7 +	294	1.51	48779	12.5
L97-128	9922	34.3	289	1.69	41035	12.1
L98-209	7872	26.7	294	1.57	34317	12.6

Table 3. 2003 Nursery third-stubble means of the 1998 "L" assignment series in light soil at Ulysee Gonsoulin & Sons, Inc., New Iberia, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	6427	31.2 -	208	2.04 +	30492 -
TucCP77-042	5550	28.1 -	199	1.54	36300 -
LCP85-384	7125	41.3	173	1.53	53906
HoCP85-845	6618	34.9	190	1.89 +	36663 -
L98-209	9819	47.8	204	1.89 +	50457

Table 4. 2003 Nursery third-stubble means of the 1998 "L" assignment series in heavy soil at D & N Farm, Cecilia, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	3437 -	14.3 -	241	1.39	20510 -
LCP85-384	8907	35.9	248	1.42	50639
HoCP85-845	6304 -	30.4 -	207 -	1.45	39386 -
L98-209	8467	34.2	247	1.47	46827

Table 5. 2003 Nursery third-stubble means of the 1998 "L" assignment series in light soil at Landry Farms, Paincourtville, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	5901 -	24.9	237	1.70	29403 -
TucCP77-042	8844	46.2	192 -	1.86	49731
LCP85-384	8809	37.7	233	1.42	53543
HoCP85-845	6330 -	30.5	208	1.69	36119 -
L98-209	6673 -	32.9	205 -	1.66	39386 -

Table 6. 2003 Infield second-stubble means of the 1999 "HoCP" and "L" assignment series in light soil at Blackberry Farms, Vacherie, LA.

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	4947 -	22.8 -	217	1.84	24826 -	11.7
LCP85-384	7234	33.6	216	1.63	41392	14.0
HoCP85-845	8038	33.3	242 +	1.64	40654	12.3
L99-226	9359 +	36.0	259 +	2.12 +	33964 -	12.8
L99-233	7670	35.7	215	1.63	43833	13.8

Table 7. 2003 Nursery second-stubble means of the 1999 "L" assignment series in light soil at Newton Cane, Inc., Bunkie, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	10719	44.3	242	2.28	38841 -
LCP85-384	15374	68.5	224	2.02	66611
HoCP85-845	9286	41.4	224	2.10	39930 -
L99-226	21733	84.6	255 +	3.30 +	51183 -
L99-233	16548	70.7	234	2.17	64977

Table 8. 2003 Nursery second-stubble means of the 1999 "L" assignment series in heavy soil at D & N Farm, Cecilia, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	4986	22.6	220	1.92	23777
LCP85-384	5459	26.4	206	1.76	30674
HoCP85-845	5588	25.8	216	1.59	32489
L99-226	9567 +	44.7 +	214	2.12	42471
L99-233	7445	37.8 +	196	1.51	50276 +

Table 9. 2003 Infield second-stubble means of the 1999 "HoCP" and "L" assignment series in light soil at Sugarland Acres, Inc., Youngsville, LA.

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	9532	42.0	227	2.05	41683	11.5
LCP85-384	10948	43.2	257	1.71	50471	12.1
HoCP85-845	9605	37.8	255	1.88	40267	13.4
L99-226	11220	40.0	280	2.34	37575	12.9
L99-233	7378	32.4	228	1.58	40578	12.9

Table 10. 2003 Nursery second-stubble means of the 1999 "L" assignment series in heavy soil at Landry Farms, Paincourtville, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	5591	21.2 -	263	1.78	23958 -
LCP85-384	10235	39.5	259	1.56	50820
HoCP85-845	9630	41.4	233	1.70	48824
L99-226	12078	43.7	276	2.14 +	40475
L99-233	11400	48.7	234	1.61	60984

Table 11. 2003 Nursery third-stubble means of the 1999 "L" assignment series in light soil at U.S.D.A-Ardoyne Farm, Chacahoula, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	5944	25.5	234	1.97 +	25864
LCP85-384	7820	31.8	245	1.48	44014
HoCP85-845	8396	33.6	250	1.72	39023
L99-226	13754 +	53.1	259	2.42 +	44241
L99-233	9283	37.3	247	1.61	46283

Table 12. 2003 Nursery third-stubble means of the 1999 "L" assignment series in heavy soil at Iberia Research Station, Jeanerette, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	7288	33.6	216	2.29 +	29494
LCP85-384	8942	37.8	235	1.63	45375
HoCP85-845	8039	36.0	223	1.75	41064
L99-226	13737	53.7	258	2.22 +	48324
L99-233	9106	38.8	234	1.75	44694

Table 13. 2003 Infield first-stubble means of the 2000 "HoCP" and "L" assignment series in light soil at Blackberry Farms, Vacherie, LA.

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	11764	43.1	273	1.84	47564	11.2
HoCP85-845	11382	41.8	274	1.86	44757	12.1
HoCP91-555	12731	45.5	280	1.68	54368	12.0
L00-266	12545	47.7	263	1.70	56238	12.4 +
HoCP00-927	12999	47.2	275	1.61	59050	11.5
HoCP00-930	12184	43.6	279	2.21	39683	12.5 +
HoCP00-950	13755	44.8	307 +	1.94	45742	12.1

Table 14. 2003 Nursery first-stubble means of the 2000 “HoCP” and “L” assignment series in light soil at Newton Cane, Inc., Bunkie, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	11249	47.8	237	1.91	49913
HoCP85-845	10410	43.5	240	2.21	39749 -
HoCP91-555	10908	42.7	256	1.80	47553
L00-266	15193 +	65.0 +	234	2.16	60621 +
HoCP00-927	9107	38.6	236	1.80	43016
HoCP00-930	10642	42.9	247	2.09	41201
HoCP00-950	12226	47.7	256	2.11	45375

Table 15. 2003 Infield first-stubble means of the 2000 “HoCP” and “L” assignment series in light soil at at Sugarland Acres, Inc., Youngsville, LA.

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	8490	34.7	246	1.94	35331	11.7
HoCP85-845	7393	28.6	260	1.81	31543	12.8
HoCP91-555	7027	24.7	285 +	1.62	32082	12.6
L00-266	9202	34.8	264	1.79	38835	13.1
HoCP00-927	9813	36.6	268	1.99	37028	11.5
HoCP00-930	8852	32.9	270	1.93	33952	11.2
HoCP00-950	8458	32.2	261	1.88	34757	11.0
HoCP00-960	7567	29.4	265	1.95	29341	11.9

Table 16. 2003 Nursery first-stubble means of the 2000 “HoCP” and “L” assignment series in heavy soil at Landry Farms, Paincourtville, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7940	29.9	266	1.29	46646
HoCP85-845	6443	30.0	214 -	1.56	38297
HoCP91-555	9560	37.5	254	1.42	52817
L00-266	10066	40.6 +	248	1.68 +	48279
HoCP00-927	8747	33.4	261	1.32	51002
HoCP00-930	8417	31.1	270	1.52	41382
HoCP00-950	12394 +	44.1 +	281	1.80 +	49187

Table 17. 2003 Nursery second-stubble means of the 2000 "L" assignment series in light soil at U.S.D.A-Ardoyne Farm, Chacahoula, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	7379 -	31.4	235	1.89	33351 -
LCP85-384	10240	42.3	242	1.66	51047
HoCP85-845	8664	37.8	230	1.75	42879
L00-266	7861	34.3	230	1.55	44014

Table 18. 2003 Nursery second-stubble means of the 2000 "L" assignment series in heavy soil at Iberia Research Station, Jeanerette, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	7839 -	33.1 -	237	1.94	34258 -
LCP85-384	12169	48.2	252	1.81	53543
HoCP85-845	8901 -	37.4 -	238	1.88	39930 -
L00-266	11309	46.8	242	1.48	63979

Table 19. 2003 Nursery second-stubble means of the 2000 "L" assignment series in light soil at Sugar Research Station, St. Gabriel, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	9396	40.4	233	1.81	44694
LCP85-384	10156	46.6	217	1.68	55584
HoCP85-845	5981 -	34.6 -	173	1.85	37661 -
L00-266	7575	43.5	174	1.70	51728

Table 20. 2003 Infield plant cane means of the 2001 "HoCP" and "L" assignment series in light soil at Blackberry Farms, Vacherie, LA.

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	10936	40.4	269	1.79	45573	11.5
HoCP85-845	14233 +	52.6 +	271	2.58 +	40808	12.3
HoCP91-555	12227	44.3	276	1.96	45406	13.7 +
L01-283	13919 +	48.7 +	287	2.21	44110	11.8
L01-292	13052	46.6	280	2.62 +	35693	13.4 +
L01-299	12930	47.8	270	2.69 +	35824	12.5
HoCP01-517	14429 +	48.4 +	299 +	2.60 +	37308	12.1
HoCP01-520	10966	47.3	232 -	2.52 +	39093	13.4 +
HoCP01-523	14776 +	55.0 +	269	2.52 +	44101	12.1
HoCP01-529	12751	47.4	269	2.74 +	34619	10.4
HoCP01-534	12747	42.8	298 +	2.30	37160	10.2 -
HoCP01-541	13749 +	51.2 +	268	2.15	48510	12.3
HoCP01-544	13166	48.8 +	270	2.65 +	36847	12.4
HoCP01-551	12182	44.0	277	2.55 +	34539	13.7 +
HoCP01-553	13820 +	51.3 +	269	3.62 +	28765 -	13.6 +
HoCP01-558	14800 +	51.7 +	285	2.04	50888	11.2
HoCP01-561	11322	40.5	279	2.69 +	30078 -	10.9
HoCP01-564	14532 +	51.0 +	285	2.07	50314	10.8

Table 21. 2003 Nursery plant cane means of the 2001 "HoCP" and "L" assignment series in heavy soil at Newton Cane, Inc., Bunkie, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	10871	44.2	246	2.30	38478
HoCP85-845	7398 -	33.1 -	224	2.19	30311 -
HoCP91-555	9634	37.3	258	2.29	32670
L01-283	13905 +	55.9 +	248	2.58	43560
L01-292	12506	47.5	262	2.54	37389
L01-299	11362	44.6	255	2.70 +	33215
HoCP01-517	9454	40.3	234	2.53	32307
HoCP01-520	9586	46.1	208 -	1.98	46464 +
HoCP01-523	12096	48.7	249	2.90 +	33578
HoCP01-529	11366	45.5	250	2.66	34304
HoCP01-534	11944	39.0	306 +	2.17	36119
HoCP01-541	10082	43.6	231	1.77 -	49550 +
HoCP01-544	11225	45.1	249	2.77 +	32670
HoCP01-551	10770	41.3	262	2.52	32670
HoCP01-553	12858	51.4	249	3.16 +	32670
HoCP01-558	10957	47.7	230	1.92 -	49731 +
HoCP01-561	13923 +	51.1	273	2.94 +	34848
HoCP01-564	11916	40.5	294 +	2.33	34848

Table 22. 2003 Nursery plant cane means of the 2001 "L" assignment series in heavy soil at D & N Farm, Cecilia, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	12509	44.1	283	2.06	43379
HoCP85-845	6041 -	23.4 -	258 -	1.83	25592 -
HoCP91-555	8797 -	31.8 -	277	1.96	32489 -
L01-283	11303	39.1	289	2.30	34485 -
L01-292	11034	36.3 -	303 +	2.37	30674 -
L01-299	11960	40.0	299 +	2.34	34304 -

Table 23. 2003 Infield plant cane means of the 2001 "HoCP" and "L" assignment series in light soil at at Sugarland Acres, Inc., Youngsville, LA.

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	9440	34.6	273	2.15	32603	11.3
HoCP85-845	11385 +	40.6 +	280	2.47	32888	13.0 +
HoCP91-555	10019	32.8	306 +	2.44	27433	12.5
L01-283	12242 +	41.5 +	295	2.65	31503	10.9
L01-292	11500 +	37.9	304 +	2.33	32698	11.8
L01-299	11837 +	43.2 +	274	2.82 +	30846	12.9 +
HoCP01-517	10932	43.1 +	255	3.11 +	27745	10.2
HoCP01-520	9320	35.6	261	1.86	38415	11.4
HoCP01-523	10756	37.2	289	2.34	32053	12.3
HoCP01-529	10051	36.1	280	2.65	27179	10.1
HoCP01-534	8701	28.3 -	307 +	2.22	25536 -	9.9 -
HoCP01-541	10729	39.2	274	1.70	46297 +	12.8 +
HoCP01-544	11244 +	36.8	306 +	2.69 +	27433	12.5
HoCP01-551	10478	34.9	300	2.79 +	25083 -	13.5 +
HoCP01-553	10609	37.3	284	3.28 +	22884 -	12.1
HoCP01-558	9773	35.4	276	1.97	35975	10.4
HoCP01-561	13285 +	43.2 +	307 +	2.65	32743	10.8
HoCP01-564	10689	33.9	315 +	2.41	28160	11.3

Table 24. 2003 Nursery plant cane means of the 2001 “HoCP” and “L” assignment series in light soil at Landry Farms, Paincourtville, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	14770	57.8	257	2.13	54269
HoCP85-845	10062 -	43.6	231	2.77 +	31581 -
HoCP91-555	16532	63.6	260	2.16	58988
L01-283	18414	72.3 +	256	2.55 +	56628
L01-292	15542	60.3	258	2.57 +	47009
L01-299	11811	52.7	221	2.15	48279
HoCP01-517	16579	65.3	254	3.06 +	42834
HoCP01-520	10859	55.1	196 -	2.15	50639
HoCP01-523	11824	46.9	253	2.36	39749 -
HoCP01-529	10968	50.8	216 -	2.98 +	34122 -
HoCP01-534	13499	53.7	251	2.35	46101
HoCP01-541	15660	58.8	266	1.93	61166
HoCP01-544	17631	65.9	267	2.74 +	48098
HoCP01-551	13148	50.9	258	2.60 +	39204 -
HoCP01-553	15649	65.7	237	3.06 +	43016
HoCP01-558	12237	51.3	239	2.04	51183
HoCP01-561	12143	53.7	226	2.66 +	40475 -
HoCP01-564	13003	50.4	258	2.06	49187

Table 25. 2003 Nursery first-stubble means of the 2001 “L” assignment series in light soil at U.S.D.A-Ardoyne Farm, Chacahoula, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	16416	60.1	273	1.98	60803
HoCP85-845	11232 -	43.5 -	258 -	2.08	41745 -
HoCP91-555	13915	50.3	277	1.99	50593
L01-283	17114	61.7	277	2.36 +	52408
L01-292	14543	52.6	277	2.59 +	40611 -
L01-299	16525	59.8	277	2.48 +	48551

Table 26. 2003 Nursery first-stubble means of the 2001 “L” assignment series in heavy soil at Iberia Research Station, Jeanerette, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	13350	52.2	255	2.05	51047
HoCP85-845	8667	34.3	253	2.03	33804
HoCP91-555	12822	46.6	275	1.97	47417
L01-283	11599	44.7	260	2.08	43106
L01-292	11090	42.0	263	2.48	34485
L01-299	14962	56.9	260	2.29	50366

Table 27. 2003 Nursery first-stubble means of the 2001 "L" assignment series in heavy soil at Sugar Research Station, St. Gabriel, LA.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	11460	50.7	226	2.01	50593
HoCP85-845	9863	49.0	200 -	2.67 +	36754 -
HoCP91-555	9014	43.2	209	1.95	44241
L01-283	9812	46.1	213	2.54 +	36527 -
L01-292	9454	41.1	230	2.74 +	29948 -
L01-299	13305	60.0	222	2.44 +	49232

Table 28. 2003 Infield plant cane means of the 2002 "L" assignment series in light soil at Sugar Research Station, St. Gabriel, LA.

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	7424	31.7	235	1.88	33578	12.1
HoCP85-845	8524	36.2	235	2.37	30628	12.9
HoCP91-555	9464	40.1	237	2.34	34485	12.8
L02-316	9058	36.1	251	2.07	34939	14.8 +
L02-320	10726	45.9	233	2.08	44241 +	11.1
L02-322	8289	33.1	250	2.24	29494	13.2
L02-323	7320	29.4	247	2.26	26091	9.6 -
L02-324	12414 +	51.1 +	243	2.61 +	39249	14.5 +
L02-325	9405	39.5	239	2.44	31989	14.2 +
L02-326	8159	35.1	232	2.25	31309	12.5
L02-333	12559 +	50.8 +	248	2.67 +	38115	13.5
L02-336	6477	27.4	236	2.11	25864	12.4
L02-341	6413	26.1	246	1.89	27679	12.9
L02-342	12178 +	49.2 +	248	2.72 +	37208	11.0
L02-343	8562	35.3	234	2.30	30628	11.9
L02-353	13234 +	49.6 +	264	2.43	40384	12.1
L02-354	7771	38.4	202	2.03	37888	9.7 -

Table 29. 2003 Nursery third-stubble means of the 1998 "L" assignment series across locations.

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	6304	27.0	236	1.80 +	30290 -	11.7
TucCP77-042	7806	36.3	217	1.71	42075	14.0
LCP85-384	7821	34.9	234	1.49	47098	12.2
HoCP85-845	7431	33.2	224	1.73	38445	12.7
HoCP96-540	10690	38.3	248	1.53	49193	12.5
L97-128	9808	35.9	242	1.71	41450	12.1
L98-209	8121	35.8	235	1.71	41386	12.6

Table 30. 2003 Infield and Nursery second-stubble means of the 1999 "HoCP" and "L" assignment series across locations.

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	7697	32.6	237	1.99	32327 -	11.6
LCP85-384	10948	46.2	239	1.73	52323	13.0
HoCP85-845	9140	38.5	238	1.83	42419	12.8
L99-226	13598	51.1	268 +	2.47 +	40799 -	12.8
L99-233	10749	46.9	228	1.75	52593	13.3

Table 31. 2003 Nursery third-stubble means of the 1999 "L" assignment series across locations.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	6616	29.6	225	2.13 +	27679
LCP85-384	8381	34.8	240	1.55	44694
HoCP85-845	8218	34.8	237	1.73	40043
L99-226	13746 +	53.4 +	258	2.32 +	46283
L99-233	9195	38.0	241	1.68	45488

Table 32. 2003 Infield and Nursery first-stubble means of the 2000 "HoCP" and "L" assignment series across locations.

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	9861	38.9	255	1.74	44863	11.5
HoCP85-845	8907	36.0	247	1.86	38586 -	12.4
HoCP91-555	10056	37.6	269	1.63	46705	12.3
L00-266	11751 +	47.0 +	252	1.83	50993	12.8 +
HoCP00-927	10167	39.0	260	1.68	47524	11.5
HoCP00-930	10024	37.6	267	1.94	39054	11.8
HoCP00-950	11708 +	42.2	276 +	1.93	43765	11.5

Table 33. 2003 Nursery second-stubble means of the 2000 "L" assignment series across locations.

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	8205	35.0 -	235	1.88	37434 -
LCP85-384	10855	45.7	237	1.71	53391
HoCP85-845	7849 -	36.6 -	214	1.82	40157 -
L00-266	8915	41.6	215	1.57	53240

Table 34. 2003 Infield and Nursery plant cane means of the 2001 “HoCP” and “L” assignment series across locations.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar Per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)	Fiber (%)
LCP85-384	11504	44.3	261	2.09	42731	11.7
HoCP85-845	10769	42.5	251	2.50 +	33897 -	13.9 +
HoCP91-555	12103	44.5	275	2.21	41124	12.2
L01-283	14620 +	54.6 +	271	2.50 +	43950	11.0
L01-292	13150	48.1	276	2.51 +	38197	12.6
L01-299	11985	47.1	255	2.59 +	37041	12.7
HoCP01-517	12849	49.3	260	2.82 +	35049 -	9.5 -
HoCP01-520	10183	46.0	224 -	2.13	43653	11.6
HoCP01-523	12363	47.0	265	2.53 +	37370	12.1
HoCP01-529	11284	44.9	254	2.76 +	32556 -	10.2
HoCP01-534	11723	41.0	291 +	2.26	36229 -	10.0
HoCP01-541	12555	48.2	260	1.89	51381 +	12.0
HoCP01-544	13316	49.1	273	2.71 +	36262 -	12.8
HoCP01-551	11645	42.8	274	2.61 +	32874 -	13.8 +
HoCP01-553	13234	51.5	260	3.28 +	31834 -	12.3
HoCP01-558	11942	46.5	258	1.99	46944	11.1
HoCP01-561	12668	47.1	271	2.73 +	34536 -	11.6
HoCP01-564	12535	43.9	288 +	2.21	40627	11.7

Table 35. 2003 Nursery first-stubble means of the 2001 “L” assignment series across locations.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar Per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
LCP85-384	13742	54.3	252	2.01	54148
HoCP85-845	9921 -	42.2 -	237 -	2.26	37434 -
HoCP91-555	11917	46.7	254	1.97	47417
L01-283	12842	50.9	250	2.33 +	44014 -
L01-292	11696	45.2 -	257	2.60 +	35014 -
L01-299	14931	58.9	253	2.40 +	49383

2003 LOUISIANA "HoCP" NURSERY & INFIELD VARIETY TRIALS

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The first replicated tests in the USDA sugarcane breeding program are called nurseries. These tests are typically planted in the fifth year after crossing. Experimental varieties that exceed or equal yields of commercial varieties in the plant cane and first stubble second line trials are assigned permanent "HoCP" or "Ho" numbers. Because a major objective of the sugarcane breeding program is to select varieties that give consistent yields across a range of environmental conditions, nursery yield trials are normally planted in several different regions of the Louisiana sugarcane industry.

USDA nursery tests are customarily planted the year of assignment at Ardoyne Farm near Chacahoula, Iberia Research Station in Jeanerette, and St.Gabriel Research Station in St. Gabriel. Plots in these two-replication tests are one row wide (6 feet) and 16 feet long with a 4-foot alley between plots. At least three commercial varieties (CP 70-321, HoCP 85-845, LCP 85-384, HoCP 91-555, and/or HoCP 96-540) are included in each replication as controls. Varieties from the USDA program advanced for further testing in the year following assignment are combined with varieties from the LSU AgCenter program and replanted in two nurseries on commercial farms. Plot length in these two-replication nursery tests have been increased to 20 feet, with a 4-foot alley between plots. In addition to these nurseries, two infield tests are also planted on commercial farms the year following assignment. These infield tests also include varieties from the USDA and LSU program.

Infield variety tests were usually replanted at Ardoyne Farm two years after assignment. Varieties in this test are introduced to outfield locations and primary stations this same year. Because of a lack of seed, these infield tests have not been replanted in the last two years. Infield tests at Ardoyne Farm were planted in plots three rows wide by 16 feet long, compared to the two rows wide by 24-feet-long plots used in off-station infield tests. Because all infield tests are now harvested with a combine harvester, the two row plot size will be utilized in future infield tests planted at Ardoyne Farm. Infield tests are planted in a randomized complete block design with two replications and include at least three commercial varieties (CP 70-321, HoCP 85-845, LCP 85-384, HoCP 91-555, and/or HoCP 96-540) for use as checks.

Nursery plots are rated for stand (population) and vigor in both the spring (May) and summer (August). 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. Combined nurseries are taken to the Juice Laboratory at either Ardoyne Farm or St. Gabriel. Brix and pol are then used to estimate the yield of theoretical recoverable sugar (TRS) per ton of cane. Results from these analyses, along 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 adequate yields (both tonnage and sugar per ton) and disease and insect resistance are advanced for further testing.

Varieties from the 2000 through the 2002 HoCP & Ho series were harvested from "HoCP" nursery trials in 2003. Because of excessive rainfall and poor field conditions, the 2002 HoCP & Ho assignment series were planted only at one location in 2002. Varieties from the 2002 HoCP & Ho series were combined with varieties from the 2002 LSU AgCenter series and replanted on four commercial farms (two nursery trials and two infield trials). Test locations, planting dates, and harvest dates of "HoCP" series nursery tests can be found in Table 1.

Two infield tests at Ardoyne Farm were harvested mechanically with a combine harvester. Two samples (10 stalks for sucrose analysis and five stalks for fiber analysis) were hand-cut from each plot just prior to harvesting and sent to the sucrose lab at Ardoyne Farm for processing. Plots were weighed with a tractor-pulled hydraulic weigh wagon. Plot weights and sucrose analysis were 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 was also obtained. Planting and harvest dates of these two tests can be found in Table 1.

Statistical analyses were conducted for each test and for each series using PROC MIXED procedures in SAS (version 8.02). For purposes of comparison, LCP 85-384 is highlighted in each table. Yield estimates that are significantly higher or lower (P=0.05) than estimates for LCP 85-384 are noted with a "+" or "-" respectively. Results from trials harvested in 2003, along with combined analyses where applicable, can be found in Tables 2 to 12.

Table 1. 2003 Planting and harvest dates of "HoCP" infield and nursery tests.

					Harvest Dates		
Series	Location[2/]	Soil Texture[3/]	Test type	Planting Date	2001	2002	2003
1998	AFH	Sc	Infield	10/2/00	11/15	11/26	10/8
1999	AFH	Sc	Infield	9/27/01		11/26	10/8
2000	AFL	Csl	Nursery	10/27/00	11/21	10/31	11/10
2000	IRS	Bsc	Nursery	10/31/00	11/26	11/01	11/12
2000	STG	Csl	Nursery	10/30/00	12/07	12/13	10/24
2001	AFL	Csl	Nursery	10/18/01		12/06	11/10
2001	IRS	Bsc	Nursery	10/23/01		12/11	11/12
2001	STG	Csl	Nursery	10/19/01		12/13	10/24
2002	AFL	Csl	Nursery	11/8/02			11/24
2003	AFL	Csl	Nursery	10/20/03			
2003	IRS	Bsc	Nursery	10/21/03			
2003	STG	Csl	Nursery	10/17/03			

[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. Means of the 1998 HoCP and L series second-stubble infield variety test on heavy soil at Ardoyne Farm in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	5802	25.4	227	1.99 +	25286 -	11.8
LCP 85-384	7419	32.3	229	1.31	49341	11.6
HoCP 85-845	7060	30.0	235	1.77	34400	12.5 +
TucCP 77-042	6493	29.8	219	1.51	40498	13.9 +
L 98-209	8012	35.4	227	1.77	39973	11.0

Table 3. Means of the 1999 Ho series first-stubble infield variety test on heavy soil at Ardoyne Farm in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
LCP 85-384	10030	39.7	253	1.51	54105	13.5
HoCP 85-845	7759	32.3	240	1.73	37772	14.8
HoCP 91-555	8067	34.0	235	1.40	48694	13.5
L 99-226	10380	42.0	248	1.89	44323	13.4
L 99-233	8136	34.8	234	1.81	38508	14.9

Table 4. Means of the 2000 HoCP and Ho series second-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA, in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 70-321	9356	33.4	279	2.14 +	30855 -
LCP 85-384	14211	52.1	274	1.61	63979
HoCP 85-845	11504	41.2	278	1.95	41972 -
HoCP 00-927	10514	40.3	261	1.59	50593
HoCP 00-930	10609	39.7	268	1.79	44468 -
HoCP 00-950	15073	50.1	299	2.03	49005

Table 5. Means of the 2000 HoCP and Ho series second-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 70-321	13953	50.8	275	2.22 +	45829 -
LCP 85-384	12712	50.4	252	1.58	63979
HoCP 85-845	10248	40.6	252	1.89	42879 -
HoCP 00-927	14654	57.9	253	1.95	59441
HoCP 00-930	11189	39.8	281 +	1.78	44694 -
HoCP 00-950	11032	40.8	271	1.56	52408 -

Table 6. Means of the 2000 HoCP and Ho series second-stubble nursery variety trial on a Commerce silt loam soil at St. Gabriel Research Station in St. Gabriel, LA, in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 70-321	11583	48.8	237	2.40	40611 -
LCP 85-384	11808	53.9	217	1.83	58534
HoCP 85-845	7565	35.3 -	212	1.82	38796 -
HoCP 00-927	10352	47.7	217	1.99	48098 -
HoCP 00-930	11461	49.1	233	1.90	51728
HoCP 00-950	11143	43.6	255 +	1.75	50593

Table 7. Combined means of the 2000 HoCP and Ho series second-stubble nursery variety trials in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 70-321	11631	44.3	264 +	2.25 +	39098 -
LCP 85-384	12910	52.1	248	1.67	62164
HoCP 85-845	9772	39.0	247	1.88	41216 -
HoCP 00-927	11840	48.6	244	1.84	52711 -
HoCP 00-930	11087	42.9	261	1.82	46963 -
HoCP 00-950	12416	44.8	275 +	1.78	50669 -

Table 8. Means of the 2001 HoCP and Ho series first-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA, in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	11881	41.3	288	1.66	50366
HoCP 85-845	12926	47.2	274	2.19 +	43106
HoCP 91-555	13100	45.5	288	1.74	52408
HoCP 01-517	13863	46.8	296	2.61 +	35846 -
HoCP 01-520	11041	42.8	258 -	1.64	52181
HoCP 01-523	13907	51.4	269 -	2.20 +	46736
HoCP 01-529	13886	51.1	272	2.18 +	46963
HoCP 01-534	12856	42.2	305	2.07 +	40838 -
HoCP 01-541	11116	41.7	267 -	1.51	55358
HoCP 01-544	12107	43.4	279	2.19 +	39703 -
HoCP 01-551	12539	42.5	295	2.11 +	40384 -
HoCP 01-553	14243	53.4 +	267 -	2.91 +	36754 -
HoCP 01-558	12008	44.2	272	1.66	53543
HoCP 01-561	13689	49.5	277	2.37 +	41745 -
Ho 01-564	14294	49.6	290	2.17 +	45375

Table 9. Means of the 2001 HoCP and Ho series first-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10638	40.2	264	2.26	35619
HoCP 85-845	8782	35.1	250	2.02	34939
HoCP 91-555	11439	42.6	268	1.81	47417
HoCP 01-517	12939	49.2	260	3.04 +	32443
HoCP 01-520	12354	50.5	244	1.89	53769 +
HoCP 01-523	12163	45.3	269	2.33	38569
HoCP 01-529	9276	38.2	243	2.41	31763
HoCP 01-534	10243	34.9	290	2.15	32443
HoCP 01-541	12827	53.3	241	1.72	62164 +
HoCP 01-544	10344	41.6	249	2.63	31763
HoCP 01-551	11448	42.2	268	2.19	38569
HoCP 01-553	12486	49.2	254	2.91 +	33804
HoCP 01-558	8590	35.6	242	1.98	36754
HoCP 01-561	9799	36.6	267	2.48	29721
Ho 01-564	10383	38.6	269	1.92	40157

Table 10. Means of the 2001 HoCP and Ho series first-stubble nursery variety trial on a Commerce silt loam soil at St. Gabriel Research Station in St. Gabriel, LA, in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10950	44.8	244	1.85	48324
HoCP 85-845	9620	41.5	232	2.05	40384
HoCP 91-555	11556	43.7	265 +	1.90	46283
HoCP 01-517	12578	44.8	280 +	3.04 +	29494 -
HoCP 01-520	13640	62.4 +	219 -	2.21	56946
HoCP 01-523	11819	48.8	242	2.00	49005
HoCP 01-529	11646	49.9	233	2.28	43787
HoCP 01-534	9125	32.0 -	286 +	1.71	37661 -
HoCP 01-541	11046	46.4	238	1.71	54677
HoCP 01-544	12230	49.5	246	2.47 +	40157
HoCP 01-551	12793	49.4	259	2.17	45602
HoCP 01-553	12347	52.1	237	2.97 +	34939 -
HoCP 01-558	11995	46.5	258	1.97	47417
HoCP 01-561	12460	50.7	245	2.52 +	40384
Ho 01-564	13530	52.4	258	2.19	47871

Table 11. Combined means of the 2001 HoCP and Ho series first-stubble nursery variety trials in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	11157	42.1	266	1.92	44770
HoCP 85-845	10443	41.3	252 -	2.09	39476
HoCP 91-555	12031	43.9	274	1.82	48703
HoCP 01-517	13127	46.9	279	2.89 +	32594 -
HoCP 01-520	12345	51.9 +	241 -	1.91	54299 +
HoCP 01-523	12630	48.5	260	2.18	44770
HoCP 01-529	11603	46.4	249 -	2.29 +	40838
HoCP 01-534	10741	36.3	293 +	1.97	36981 -
HoCP 01-541	11663	47.1	249 -	1.64 -	57399 +
HoCP 01-544	11561	44.8	258	2.43 +	37208 -
HoCP 01-551	12260	44.7	274	2.15	41518
HoCP 01-553	13025	51.6 +	252	2.93 +	35166 -
HoCP 01-558	10864	42.1	257	1.87	45904
HoCP 01-561	11983	45.6	263	2.45 +	37283 -
HoCP 01-564	12735	46.8	272	2.09	44468

Table 12. Means of the 2002 HoCP and Ho series plant-cane nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA, in 2003.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	9284	34.2	271	2.22	30855
HoCP 85-845	8066	30.0	269	2.49	24276
HoCP 91-555	12596	44.6	281	2.33	38342
HoCP 02-600	11644	39.2	297 +	2.13	36754
HoCP 02-601	8111	30.8	263	1.94	31763
HoCP 02-603	7113	29.3	243 -	1.96	29721
HoCP 02-610	9918	37.8	264	2.64	28586
HoCP 02-612	11887	41.9	283	2.71	31309
HoCP 02-615	8497	30.4	280	1.86	32670
HoCP 02-618	12175	47.0	259	2.07	45602 +
HoCP 02-620	11490	41.5	278	2.14	39476
HoCP 02-621	10787	37.2	290	2.20	33804
HoCP 02-622	10008	40.9	244 -	2.20	37434
HoCP 02-623	11099	38.3	290	2.02	38569
HoCP 02-624	9613	39.1	246 -	2.04	38569
HoCP 02-625	9005	32.2	279	2.03	32216
HoCP 02-626	13805	48.0	287	2.65	36754
HoCP 02-629	11034	41.4	267	2.00	41518 +
HoCP 02-631	10556	38.9	272	2.60	29948
HoCP 02-632	11174	40.0	279	2.20	36527
HoCP 02-634	11841	44.8	264	2.28	39476
HoCP 02-636	11408	44.1	259	2.43	36527
HoCP 02-637	9077	38.7	235 -	2.01	38342
HoCP 02-639	12463	44.5	280	2.37	37661
HoCP 02-640	12670	43.3	293 +	2.20	39476
HoCP 02-642	12034	43.3	276	2.53	33578
HoCP 02-646	11333	44.4	256	3.17 +	28133
HoCP 02-648	12182	45.8	266	2.78	32897
HoCP 02-652	9069	35.3	255	2.40	29267
Ho 02-653	11115	42.5	260	2.64	32216

2003 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM OUTFIELD VARIETY TRIALS[1]

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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 2003 outfield tests. Also included are multi-year yield analyses for appropriate test varieties.

The experimental design used at each outfield location was a randomized complete block design with three replications per location. To reflect industry practices, all locations were harvested with a combine harvester. Second- and third-stubble plots were three rows wide (6-foot rows) and 32 feet long with 5-foot alleys between plots, with the exception of Glenwood and Alma. Plant cane, first stubble and all Glenwood and Alma test plots harvested were two rows wide and 50 feet long with 5-foot alleys between plots. All tests planted in 2003 had two-row plots that were 50 feet long with 5-foot alleys. Test plots harvested by the combine were weighed with an electronic weigh wagon 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 lab. 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.

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[1]Data 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.

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

LCP85-384 has been the leading variety in Louisiana since 1998, with about 88% of the sugarcane acreage in 2003 grown to this variety. For comparison, LCP85-384 is highlighted in the tables. To adjust for missing data, the analysis calculated least square means (SAS 8.01 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.

Fifteen experimental varieties were introduced to the outfield locations for seed increase in 2003 (Table 1). Nine experimental and three commercial varieties were planted at nine outfield locations. Allains was not planted in 2003 because introductions were not planted in 2002 because of extremely wet conditions. Introductions were planted at Allains in 2003. Twenty-eight tests were harvested in 2003 including eight plant cane, eight first-stubble, eight 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 plant cane, first-, second-, and third-stubble crops averaged over several years to aid in the evaluation of commercial and experimental varieties.

Ho95-988 is eligible for release in 2004. The new variety is a product of the basic breeding program from the USDA-ARS in Houma, whose goal is to broaden the genetic base of sugarcane in Louisiana. Ho95-988 was dropped in 2000 because of smut. However, data collection for breeding purposes was agreed to. After reviewing the 2001 data, all three organizations agreed to reinstate the variety into the active breeding program. The variety was replanted at the secondary stations in 2003. Ho95-988 is an early maturing sugarcane variety that has maintained equal and sometimes higher yield potential than LCP85-384. Smut data indicate the variety is moderately susceptible. The variety has better erectness than LCP85-384

L97-128 is also eligible for release in 2004. The variety begins maturing very early in the harvest season and maintains high levels of recoverable sugar throughout the growing season. L97-128 has a very good erect growth habit, making it well suited to combine harvesting. L97-128 has a larger stalk diameter and a lower population than LCP85-384. Its smut rating is moderately susceptible. The parents of L97-128 are LCP81-10 X LCP85-384.

L98-209, L99-226, and L99-233 performed well in outfield testing in 2003. L98-209 is eligible for release in 2005, with L99-226 and L99-233 eligible for release in 2006.

Table 1. 2003 Commercial and experimental varieties planted in the outfield.

Commercial Varieties	Experimental Varieties		Experimental Varieties Introduced to the Outfield		
LCP85-384	L97-128	L00-268	L01-283	HOCP01-523	HOCP01-551
HOCP91-555	L98-209	HOCP00-927	L01-292	HOCP01-529	HOCP01-553
HOCP96-540	L99-226	HOCP00-930	L01-299	HOCP01-534	HOCP01-558
	L99-233	HOCP00-950	HOCP01-517	HOCP01-541	HOCP01-561
	L00-266		HOCP01-520	HOCP01-544	HO01-564

Table 2. Harvest and planting dates for all outfield locations harvested in 2003.

Location	Parish	2003 Date Planted	Plant cane		First-stubble		Second-stubble		Third-stubble	
			2003 Harvest Date	2002 Plant Date	2003 Harvest Date	2001 Plant Date	2003 Harvest Date	2000 Plant Date	2003 Harvest Date	1999 Plant Date
Allain	St. Mary	09/12¯	—	———	11/06	09/19	11/06	09/27	—	9/14
Alma	Pointe Coupee	09/11	11/03	09/04	11/03	09/14	10/23	08/30	—	———
Bon Secour	St. James	09/05	12/03	09/03	12/03	09/08	11/05	08/24	11/05	09/13
Georgia	Lafourche	09/18	12/16	09/21	12/16	09/15	12/16	09/19	—	8/24
Glenwood	Assumption	08/27	11/10	08/29	10/27	09/25	10/27	08/23	—	8/26
Lanaux	St. John	09/03	11/19	09/11	11/18	09/05	10/09	09/06	—	9/15
Levert-St.John	St. Martin	08/26	11/17	09/11	10/29	09/19	10/29	09/01	—	8/18
Magnolia	Terrebonne	10/09	10/28	08/16	10/28	10/04	10/28	10/04	—	8/23
R. Hebert	Iberia	09/12	12/09	09/18	12/12	09/27	11/07	09/05	11/07	08/25
A. Landry	Iberville	09/17	—	—	—	—	—	—	—	———

* Introductions only.

** No test harvested at this location.

——— No test planted.

Table 3. Plant cane sugar per acre for four commercial and four experimental varieties at eight outfield locations in 2003.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/A)				
LCP85-384	6513	5264	8661	7870	9899	8434	7982	7636	7782
HOCP85-845	6235	4828	8599	6743	10432	8244	7859	6443 -	7423
HOCP91-555	7185	6012	7969	6965	10387	7856	7261	7649	7660
HOCP96-540	6734	6658	9831	7738	9572	8756	8761	9700 +	8469 +
L97-128	6424	7124 +	8579	7535	11082	10046	8132	8299	8402
L98-209	7621 +	6476	8578	7003	9624	7420	8736	9104 +	8070
L99-226	9193 +	7032 +	9362	7940	10374	10955 +	8980	9400 +	9154 +
L99-233	7101	6755	9352	8436	9865	9665	7510	8552	8405

Table 4. Plant cane yield for four commercial and four experimental varieties at eight outfield locations in 2003.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(tons/A)				
LCP85-384	24.3	20.3	32.6	27.5	36.5	30.9	29.7	26.1	28.5
HOCP85-845	24.1	19.6	35.7	26.1	41.4	34.2	35.6	24.7	30.2
HOCP91-555	25.0	21.7	29.8	24.3	36.5	29.8	27.4	26.2	27.6
HOCP96-540	27.6 +	23.3	35.2	28.7	36.9	33.2	33.2	32.5 +	31.3 +
L97-128	23.2	25.2	31.9	25.4	41.6	37.2	33.4	29.6	30.9
L98-209	27.5 +	22.7	30.8	24.7	34.9	27.1	32.6	29.3	28.7
L99-226	33.4 +	26.6 +	33.1	26.8	33.8	35.3	32.4	29.5	31.4 +
L99-233	26.3	24.7	37.1	29.6	38.0	36.5	29.8	31.9 +	31.7 +

Table 5. Plant cane sugar per ton for four commercial and four experimental varieties at eight outfield locations in 2003.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs/ton)					
LCP85-384	268	260	265	286	271	273	269	293	273
HOCP85-845	260	246	241	258 -	252	240	223 -	261 -	248 -
HOCP91-555	287 +	277	267	286	285	265	265	292	278
HOCP96-540	245 -	287 +	279	269	258	264	263	298	271
L97-128	278	284 +	268	297	266	270	244	281	274
L98-209	277	287 +	279	283	276	273	267	311 +	282
L99-226	276	264	283	296	307 +	311 +	277	319 +	292 +
L99-233	270	274	254	285	260	265	256	268 -	267

Table 6. Plant cane stalk weight for four commercial and four experimental varieties at eight outfield locations in 2003.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs)					
LCP85-384	1.93	2.25	2.02	2.41	2.14	2.25	2.57	1.77	2.17
HOCP85-845	2.25	2.09	2.19	2.25	2.34	2.28	2.87	1.80	2.26
HOCP91-555	1.91	2.52	2.13	2.05	1.99	2.49	2.25	1.50	2.11
HOCP96-540	2.84 +	2.68 +	2.90 +	2.62	2.77 +	2.38	3.52 +	2.07	2.72 +
L97-128	2.16	2.56	2.55 +	2.20	2.64 +	2.50	3.15 +	2.01	2.47 +
L98-209	2.39 +	2.50	2.70 +	2.79	2.57	2.83	3.44 +	2.11	2.67 +
L99-226	2.96 +	2.82 +	3.30 +	2.96 +	3.06 +	3.10 +	3.60 +	1.63	2.93 +
L99-233	2.05	2.20	1.87	2.26	1.94	2.07	2.33	1.40	2.01

Table 7. Plant cane stalk number for four commercial and four experimental varieties at eight outfield locations in 2003.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(stalks/A)					
LCP85-384	25783	18044	32550	23038	35460	27586	23116	32536	27264
HOCP85-845	21511	18838	33099	23402	35445	30239	24959	27792	26911
HOCP91-555	26515	17374	27904	23923	36870	23877	24169	35320	26994
HOCP96-540	19429 -	17370	24476	22135	26723 -	28702	19096	37540	24434
L97-128	21594	19948	25081	23457	31782	30063	21259	29370	25319
L98-209	23172	18199	22892 -	17775	27508 -	19174 -	19232	28106	22007 -
L99-226	22530	18890	20240 -	18327	22132 -	23588	18105 -	38931	22843 -
L99-233	26143	22780	40479	26203	39206	35191	25706	49613	33165 +

Table 8. First-stubble sugar per acre for four commercial and three experimental varieties at nine outfield locations in 2003.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/A)					
TucCP77-042	6033	6750	8332	8979	7833	7433	10756 +	9079	7540	8082
LCP85-384	6157	6988	8209	8450	8397	7729	8626	8847	7881	7920
HOCP85-845	5436	7598	7395	7052 -	7478	6764	9122	8061	7801	7412
HOCP91-555	6236	7051	6727	8333	6608	6357	9204	6469 -	7432	7157 -
HOCP96-540	6698	7164	7941	8480	7584	5329 -	8221	8456	7227	7455
L97-128	6299	6672	10319 +	8222	7493	7226	10095	7506 -	8033	7985
L98-209	7506 +	7867	9513	8285	8132	7781	8411	8440	8349	8254

Table 9. First-stubble yield for four commercial and three experimental varieties at nine outfield locations in 2003.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(tons/A)					
TucCP77-042	26.0	26.8	32.9	35.9 +	30.6	32.4	41.4 +	35.0 +	32.0	32.6 +
LCP85-384	25.7	25.8	29.5	31.0	28.6	30.6	29.4	29.3	28.6	28.7
HOCP85-845	22.1	28.1	27.2 -	30.0	26.5	26.3 -	34.8	29.8	31.4	28.5
HOCP91-555	22.5	25.9	22.9 -	30.3	22.5 -	24.6 -	32.1	22.5 -	26.6	25.5 -
HOCP96-540	26.8	26.1	28.1 -	30.8	26.7	21.3 -	30.0	29.2	26.9	27.3
L97-128	22.4	23.3	33.8	30.2	25.0 -	24.9 -	34.9	25.0 -	30.5	27.8
L98-209	28.1	28.5	31.5	29.8	26.8	28.6	28.5	28.2	29.7	28.9

Table 10. First-stubble sugar per ton for four commercial and three experimental varieties at nine outfield locations in 2003.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/ton)					
TucCP77-042	233	252 -	253	250 -	256 -	229 -	260 -	260 -	235 -	248 -
LCP85-384	240	272	279	273	294	252	293	302	276	276
HOCP85-845	246	271	271	235 -	283	258	262 -	271 -	250 -	261 -
HOCP91-555	277 +	272	294	275	294	259	288	287	279	281
HOCP96-540	250	274	283	275	284	249	273	290	269	272
L97-128	281 +	286	305	272	300	290 +	290	301	264	288 +
L98-209	28.1	28.5	31.5	29.8	26.8	28.6	28.5	28.2	29.7	28.9

Table 11. First-stubble stalk weight for four commercial and three experimental varieties at nine outfield locations in 2003.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs)					
TucCP77-042	2.08	2.16 +	2.62 +	2.38 +	2.50 +	1.99	2.56	2.40	2.05 +	2.30 +
LCP85-384	1.96	1.66	1.96	1.66	1.80	1.86	2.37	2.22	1.53	1.89
HOCP85-845	1.90	1.83	2.30	2.32 +	2.04	1.76	2.10	2.46	1.77	2.05 +
HOCP91-555	1.57 -	2.07 +	2.44 +	1.92	2.03	1.68	2.04 -	2.05	1.45	1.92
HOCP96-540	2.20	1.98	2.50 +	2.26 +	2.19 +	1.95	2.48	2.63 +	1.74	2.21 +
L97-128	2.09	1.92	2.48 +	2.33 +	2.16 +	1.96	2.47	2.40	2.09 +	2.21 +
L98-209	2.03	2.01	2.41 +	2.09 +	2.21 +	2.03	2.24	2.27	1.53	2.09 +

Table 12. First-stubble stalk number for four commercial and three experimental varieties at nine outfield locations in 2003.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(stalks/A)					
TucCP77-042	25061	24901	25451	30273 -	24610 -	33670	32671 +	29433	31747	28646
LCP85-384	26163	32859	30920	37821	31797	33437	25352	26236	37541	31347
HOCP85-845	23798	31385	23789	25846 -	26109	30319	33467 +	24327	35583	28292 -
HOCP91-555	28769	25084	18922	31641 -	22204 -	29273	31423 +	21910 -	37877	27456 -
HOCP96-540	24586	27101	22521	27292 -	24598 -	22104 -	24231	22251 -	30666	25039 -
L97-128	21439	24534	27342	25916 -	23039 -	25520 -	28244	20785 -	29276	25122 -
L98-209	28168	28373	26410	28856 -	24423 -	28039	25457	24964	40167	28318 -

Table 13. Second-stubble sugar per acre for five commercial varieties and one experimental variety at eight outfield locations in 2003.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/A)				
CP70-321	5293 -	2638 -	5371 -	5043 -	5152 -	3282 -	7761	6594	5142 -
LCP85-384	7753	3435	7744	6813	6751	4445	6927	6516	6298
HOCP85-845	5445 -	4201	6833	6286	6499	4085	6835	6448	5829
HOCP91-555	6662	4675 +	7402	6631	6759	5416 +	7685	6915	6518
HOCP96-540	6695	3456	8338	6049	4741 -	4829	8429	8148 +	6335
L97-128	7078	3664	6835	7639	7220	5177 +	8284	8247 +	6768

Table 14. Second-stubble yield for five commercial varieties and one experimental variety at eight outfield locations in 2003.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(tons/A)				
CP70-321	21.1 -	9.1	22.4 -	19.6	22.5 -	14.4 -	29.2	24.5	20.4 -
LCP85-384	29.9	11.6	29.6	23.0	26.8	20.9	25.7	24.8	24.0
HOCP85-845	21.7 -	15.5	29.7	22.7	27.8	19.4	28.8	26.6	24.0
HOCP91-555	23.4 -	16.0	28.0	22.5	25.2	22.6	28.5	24.4	23.8
HOCP96-540	26.0	12.0	33.3 +	21.2	19.4 -	23.6 +	30.9	29.6	24.5
L97-128	23.9 -	11.8	28.6	24.5	27.7	19.8	29.3	30.0	24.5

Table 15. Second-stubble sugar per ton for five commercial varieties and one experimental variety at eight outfield locations in 2003.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/ton)				
CP70-321	251	292	240	258 -	229	229	265	270	254
LCP85-384	259	296	262	296	252	213	269	262	264
HOCP85-845	251	271	230	278 -	234	211	236 -	243	244 -
HOCP91-555	285 +	293	264	295	268	241	270	284	275 +
HOCP96-540	257	291	250	286	244	205	273	275	260
L97-128	296 +	311	238	312	261	262 +	284	274	280 +

Table 16. Second-stubble stalk weight for five commercial varieties and one experimental variety at eight outfield locations in 2003.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs)				
CP70-321	1.63	1.68 +	2.11 +	1.73	1.74	1.79	2.13	2.15 +	1.87 +
LCP85-384	1.52	1.21	1.78	1.57	1.59	1.75	1.78	1.55	1.59
HOCP85-845	1.60	1.81 +	2.11 +	1.70	1.81	1.93	2.17	2.02	1.89 +
HOCP91-555	1.55	1.46	1.79	1.47	1.53	1.89	1.78	1.58	1.63
HOCP96-540	1.91	1.54 +	2.31 +	1.77	1.81	1.99	1.83	1.75	1.86 +
L97-128	1.57	1.87 +	2.23 +	1.87 +	1.82 +	2.06	2.11	1.76	1.91 +

Table 17. Second-stubble stalk number for five commercial varieties and one experimental variety at eight outfield locations in 2003.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(stalks/A)				
CP70-321	26133 -	10842 -	21332 -	22877	25772 -	16027 -	27744	22838 -	21696 -
LCP85-384	40177	19227	33218	28962	33689	23811	29071	33574	30216
HOCP85-845	27158 -	17324	28534 -	26808	30755	20319	26600	26641	25518 -
HOCP91-555	30665 -	22110	31251	30604	33078	24198	33094	31237	29530
HOCP96-540	27172 -	15352	28875 -	24376	21688 -	24152	33990	34955	26320 -
L97-128	30437 -	12712 -	25647 -	26202	30542	19201 -	27876	35936	26069 -

Table 18. Third-stubble sugar per acre for five commercial varieties and one experimental variety at two outfield locations in 2003.

Variety	Light: Bon Secour		Light: R.Hebert	Mean
	(lbs/A)			
CP70-321	4641	-	7211	5926 -
LCP85-384	6648		8486	7567
HOCP85-845	6041		7314	6678
HOCP91-555	5919		7791	6855
HO95-988	6329		8579	7454
HOCP96-540	6463		9149	7806

Table 19. Third-stubble yield for five commercial varieties and one experimental variety at two outfield locations in 2003.

Variety	Light: Bon Secour		Light: R.Hebert	Mean
	(tons/A)			
CP70-321	19.4	-	27.7	23.5 -
LCP85-384	27.3		32.5	29.9
HOCP85-845	25.8		27.6	26.7
HOCP91-555	23.4		28.2	25.8
HO95-988	24.6		30.5	27.6
HOCP96-540	28.4		32.4	30.4

Table 20. Third-stubble sugar per ton for five commercial varieties and one experimental variety at two outfield locations in 2003.

Variety	Light: Bon Secour	Light: R.Hebert		Mean
	(lbs/ton)			
CP70-321	239	261		250
LCP85-384	244	262		253
HOCP85-845	234	266		250
HOCP91-555	252	277		264
HO95-988	257	281	+	269
HOCP96-540	228	283	+	255

Table 21. Third-stubble stalk weight for five commercial varieties and one experimental variety at two outfield locations in 2003.

Variety	Light: Bon Secour	Light: R.Hebert	Mean
	(lbs)		
CP70-321	1.99 +	2.01 +	2.00 +
LCP85-384	1.55	1.31	1.43
HOCP85-845	1.67	1.65	1.66
HOCP91-555	1.74	1.62	1.68
HO95-988	1.75	1.85 +	1.80 +
HOCP96-540	1.99 +	2.13 +	2.06 +

Table 22. Third-stubble stalk number for five commercial varieties and one experimental variety at two outfield locations in 2003.

Variety	Light: Bon Secour	Light: R.Hebert	Mean
	(stalks/A)		
CP70-321	19440 -	27591 -	23516 -
LCP85-384	35444	55178	45311
HOCP85-845	31529	33365 -	32447 -
HOCP91-555	27749 -	35501	31625 -
HO95-988	28154 -	33767 -	30961 -
HOCP96-540	29104	30419 -	29762 -

Table 23. 2003 plant cane means from eight outfield locations: Alma, Bon Secour, Georgia, Glenwood, Lanaux, 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	7782	28.5	273	2.17	27264
HOCP85-845	7423	30.2	248 -	2.26	26911
HOCP91-555	7660	27.6	278	2.11	26994
HOCP96-540	8469 +	31.3 +	271	2.72 +	24434
L97-128	8402	30.9	274	2.47 +	25319
L98-209	8070	28.7	282	2.67 +	22007 -
L99-226	9154 +	31.4 +	292 +	2.93 +	22843 -
L99-233	8405	31.7 +	267	2.01	33165 +

Table 24. 2003 first stubble means from nine outfield locations: Allain, Alma, Bon Secour, Georgia, Glenwood, Lanaux, 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)
TucCP77-042	8082	32.6 +	248 -	2.30 +	28646
LCP85-384	7920	28.7	276	1.89	31347
HOCP85-845	7412	28.5	261 -	2.05 +	28292 -
HOCP91-555	7157 -	25.5 -	281	1.93	27297 -
HOCP96-540	7455	27.3	272	2.21 +	25039 -
L97-128	7985	27.8	288 +	2.21 +	25122 -

L98-209	8254	28.9	286 +	2.09 +	28318 -

Table 25. 2003 second-stubble means from eight outfield locations: Allain, Bon Secour, Georgia, Glenwood, Lanaux, 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)
CP70-321	5142 -	20.3 -	254	1.87 +	21696 -
LCP85-384	6298	24.0	264	1.59	30216
HOCP85-845	5829	24.0	244 -	1.89 +	25518 -
HOCP91-555	6518	23.8	275 +	1.63	29530
HOCP96-540	6335	24.5	260	1.86 +	26320 -
L97-128	6768	24.4	280 +	1.91 +	26069 -

Table 26. 2003 third-stubble means from two outfield locations: Bon Secour 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)
CP70-321	5926 -	23.5 -	250	2.00 +	23516 -
LCP85-384	7567	29.9	253	1.43	45311
HOCP85-845	6678	26.7	250	1.66	32447 -
HOCP91-555	6855	25.8	264	1.68	31625 -
HOCP96-540	7806	30.4	255	2.06 +	29762 -
HO95-988	7454	27.6	269	1.80 +	30961 -

Table 27. Combined plant cane means across outfield locations from 2000 to 2003.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7810	29.7	263	2.13	28360
HOCP85-845	7239 -	29.6	245 -	2.42 +	24532 -
HOCP91-555	7820	29.9	262	2.17	28002
HOCP96-540	8945 +	33.9 +	263	2.69 +	25724 -

Table 28. Combined plant cane means across outfield locations from 2001 to 2003.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7714	29.4	262	2.16	27743
HOCP85-845	7241 -	29.3	248 -	2.38 +	24769 -
HOCP91-555	7647	29.0	264	2.17	27314
HOCP96-540	8730 +	32.9 +	265	2.70 +	24948 -
L97-128	8643 +	32.3 +	267	2.67 +	24410 -

Table 29. Combined plant cane means across outfield locations from 2002 to 2003.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
LCP85-384	7664	29.3	262	2.17	27642
HOCP85-845	7287	29.6	248 -	2.33 +	25737
HOCP91-555	7613	28.7	266	2.19	26974
HOCP96-540	8503 +	32.1 +	265	2.71 +	24473 -
L97-128	8249 +	31.3 +	263	2.57 +	24572 -
L98-209	8041	29.8	271 +	2.52 +	24214 -

Table 30. Combined first-stubble means across outfield locations from 2001 to 2003.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
LCP85-384	7680	28.4	271	1.81	31998
HOCP85-845	6932 -	26.7 -	260 -	2.05 +	26458 -
HOCP91-555	7243 -	26.2 -	276 +	1.81	29603 -
HOCP96-540	7987	30.1 +	266	2.21 +	27631 -

Table 31. Combined first-stubble means across outfield locations from 2002 to 2003.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
LCP85-384	7606	28.0	272	1.80	31772
HOCP85-845	7099 -	27.3	261 -	2.04 +	27316 -
HOCP91-555	7117	25.8 -	276	1.84	28813 -
HOCP96-540	7756	28.9	270	2.21 +	26577 -
L97-128	7725	27.8	280 +	2.20 +	25177 -

Table 32. Combined second-stubble means across outfield locations from 2002 to 2003.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
CP70-321	5070 -	20.3 -	250 -	1.93 +	21098 -
LCP85-384	6806	26.5	260	1.60	33231
HOCP85-845	6353	25.4	251 -	1.85 +	27711 -
HOCP91-555	6845	25.3	272 +	1.62	31740
HOCP96-540	7359	28.7	258	1.96 +	29295 -

Table 33. Combined third-stubble means across outfield locations from 2002 to 2003.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
CP70-321	6032 -	24.2 -	249	2.08 +	23698 -
LCP85-384	7622	29.8	256	1.46	43022
HOCP85-845	6375 -	25.5 -	249	1.81 +	28825 -
HOCP91-555	6469 -	24.2 -	267	1.65	29807 -
HOCP95-988	7620	28.3	269	1.83 +	31229 -

SUCROSE LABORATORY AT ST. GABRIEL

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

More than 2,900 samples were processed at the St. Gabriel Sucrose Laboratory during the 2003 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 use of the ABC Clarifier was discontinued because of inconsistencies in clarifying 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 2932 samples. Fiber analysis was done on 34 samples using a pre-breaker to shred the sample. A new computer program was developed for the sucrose laboratory that assigned 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 2003 to December 2003.

Table 1. Number of sugarcane samples processed at the St. Gabriel Sucrose Laboratory during the 2003 harvest season.

Project Area	Leader	Number of Samples
Agronomy & Environmental Mmgt.	James Griffin	324
	Chuck Kennedy	467
	Magdi Selim	6
	Jim Wang	80
Iberia Research Station	William Hallmark	462
	Howard Viator	12
Plant Pathology and Crop Physiology	Jeff Hoy	213
	Clayton Hollier	8
LCES	Ben Legendre	246
USDA	Jim Fouss	36
St. Gabriel Research Station	Line Trials	288
	Increase	88
	Nursery	250
	Nursery (fiber)	34
	Cross Appraisal	8
	Harvestibility Study	300
	Planting Rate	144
TOTAL		2966

LAES SUGARCANE TISSUE CULTURE LABORATORY

Q.J.Xie, J.L Flynn, and K.A.Gravois
Certis USA, LLC and St. Gabriel Research Station

During the 2003-2004 production season, about 30,000 sugarcane plantlets were regenerated in the Louisiana Agricultural Experiment Station Sugarcane Tissue Culture Laboratory. A total of 29,247 plantlets were turned over to Certis USA, LLC, Kleentek Div., for transplanting into the greenhouse at Houma. The number of plantlets transplanted for each cultivar are listed in Table one.

Table 1. The number of tissue-culture-derived plantlets of different cultivars transplanted in the greenhouse.

Cultivar	Number of plantlets
LCP85-384	5,328
Ho98-988	6,396
HoCP96-540	8,118
L97-128	4,298
HoCP91-555	1,152
L99-233	525
CP89-2143	634
L99-226	922
L00-266	1500
L98-209	374
Total	29,247

THE 2003 LOUISIANA SUGARCANE VARIETY SURVEY

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A sugarcane variety survey was conducted during the summer of 2003 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 growers in their respective parishes. Eight varieties, CP 65-357, CP 70-321, CP 72-370, LCP 82-89, LHo 83-153, LCP 85-384, HoCP 85-845 and HoCP 91-555, were listed along with "Others" in the survey. The category of others included, but was not limited to, small acreages of CP 67-412, CP 74-383, CP 76-331, CP 79-318 and LCP 86-454. Crop was divided into four categories, which included plant-cane, first-stubble, second-stubble and third-stubble and older crops. Additional information was collected as needed from the local Farm Service Agency (FSA) offices regarding acres of sugarcane grown in the parishes.

Actual acreages covered by this survey for each parish, region and the statewide total are shown in Table 1. Figure 1 shows the parishes where sugarcane is grown. Statewide, the area planted to sugarcane reported in this survey was 475,873 acres. This is 99.0% of the total acres planted to sugarcane as reported in Louisiana Agricultural Summary for 2003 (Anonymous 2003). Total area planted to sugarcane for the three regions, Bayou Teche, River-Bayou Lafourche and Northern, and parishes (counties) are shown in Table 1. The Bayou Teche region has the largest area planted to sugarcane, with 202,792 acres reported (42.6% of the total acreage), followed by the River-Bayou Lafourche region with 165,441 acres (34.8%) and the Northern area with 107,640 acres (22.6%).

The estimated statewide sugarcane acreage in percent by variety and crop is shown in Table 2. The leading variety for 2003 was LCP 85-384, with 88% of the total acreage followed by HoCP 85-845, HoCP 91-555 and CP 70-321 and with 4, 4 and 3% of the total acreage, respectively. These are the only four varieties recommended for commercial planting in Louisiana (Legendre 2001), although a fifth variety, HoCP 96-540, was released for commercial use during 2003 (Knipling et al. 2003). LCP 85-384 continues to increase in popularity among growers since its release in 1993. No other variety occupied more than 1% of the total acreage in the current survey. Although LCP 85-384 was planted on 88% of the total area in the state, it occupied 90% of the plant-cane crop and 89% of the first-stubble crop in 2003.

As in previous years (Legendre & Gravois 2003), the Northern region tends to plant less cane each year and to keep more of its acreage in stubble crops, especially third and older (Table 3). For the current survey, the Northern area had 23.2% in plant cane compared to 34.3% in third and older stubble. On the other hand, the River-Bayou Lafourche region tends to plant more cane each year, with less of its area committed to stubble crops. However, for the current year the River-Bayou Lafourche region had only 23.3% of its area in plant cane while 23.6% of its area was in third stubble and older. This reduced planting occurred because of Tropical Storm Isidore and Hurricane Lilly and the rainy weather that followed throughout the harvest. More cane was planted in the Bayou Teche region (24.3%), while the acreage reported in third and older stubble was intermediate between the other two regions (25.6%). In recent years, there has been a general tendency by the industry statewide to plant less cane while keeping more acreage in older stubble. Two of the four recommended varieties, LCP 85-384 and HoCP 85-845, are listed as very good stubbling varieties, and HoCP 91-555 is listed as moderate to good in its stubble behavior (Legendre 2001).

LCP 85-384 was the preferred variety in all regions (Tables 4, 5 and 6). In the Bayou Teche region, LCP 85-384 was the leading variety with 87% of the total area followed by CP 70-321 with 5% and HoCP 85-845 and HoCP 91-555 with 4% each (Table 4). LCP 85-384 occupied 89% of the area in the River-Bayou Lafourche region (Table 5). HoCP 85-845 was the second most popular variety with 6% of the planted area followed by 3% for HoCP 91-555 and only 1% for CP 70-321. For the Northern region, LCP 85-384 occupied 89% of the planted area (Table 6). HoCP 85-845 and HoCP 91-555 were next with 4% each followed by CP 70-321 with 3%. Again, there was a tendency for even higher percentages for LCP 85-384 in the plant-cane and first-stubble crops in all three regions, indicating that the variety has yet to reach its peak.

Only two varieties, LCP 85-384 and HoCP 91-555, showed an increase in the acreage occupied in 2003 when compared to the previous year (Table 7) (Legendre & Gravois 2003). LCP 85-384 increased by 3%, and HoCP 91-555 increased by 1%. All other varieties in the survey either decreased in area or remained the same from the previous year. CP 70-321 continues its decline in popularity with a decrease of 2% from crop year 2002. CP 70-321 occupied 49% of the planted acreage as late as 1995; however, with the release of LCP 85-384 in 1993, its acreage has been steadily declining. Only one other variety, CP 65-357, released in 1973, reached more than 70% of the total acreage with a high of 71% in 1980. LCP 85-384 now occupies 17 percentage points more than CP 65-357 when that variety was at its peak. LCP 85-384 is a high-yielding, excellent-stubbling variety; however, after lower cane yields experienced during the 2003 crop, skeptics feel that the variety is in “decline.” However, much of this so-called decline can be attributed to the greater than normal amount of third and older stubble as well as the residual effect of the horrendous harvest conditions in 2002 following the two tropical systems and record rainfall that fell during the harvest. Most all fields were rutted to the point that drainage was severely impaired. Further, because of the cane’s tendency to lodge and the poor harvesting conditions, combine operators set bottom blades at below ground level to reduce the amount of scrap (loss) at harvest. LCP 85-384 produces a large number of small stalks and consistently outyields the other three recommended varieties in tons of cane and sugar per acre (Garrison et al. 2003).

It is anticipated that LCP 85-384 will continue to gain in popularity for the near term because of its superior yielding ability in tons of cane and sugar per acre and will remain the top variety in the state until comparable or superior varieties are released for commercial production from the breeding program. HoCP 96-540 was released for commercial use in 2003 (Knipling et al. 2003). This variety has the potential to replace significant acreage now occupied by LCP 85-

384, depending on its productivity under commercial field conditions. It is further anticipated that the remaining varieties will continue to decrease in total acreage, with the possible exception of HoCP 91-555. HoCP 91-555 is being considered as a possible alternative to LCP 85-384 by some growers; however, it appears that the increase in acreage in future years, if any, will be minimal. It is not anticipated that this variety will ever become a major variety statewide (exceeding 25% of the planted area).

Over 90% of the Louisiana sugarcane crop is now harvested by combine to take advantage of the superior yielding ability of LCP 85-384; however, with the lower yields experienced in 2003, many growers reverted to the whole-stalk "soldier" system for harvesting their crops. Time will tell if this trend continues. From all the data thus far, it appears that HoCP 96-540 is a better harvesting variety when compared to LCP 85-384, and some growers might switch to HoCP 96-540 to take advantage of this one characteristic so long as they are not sacrificing yield of sugar per acre.

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 will outweigh potential risk considerations (Tew 1987).

In Louisiana, LCP 85-384 is now considered susceptible to rust as well; however, it appears that rust is not causing a significant reduction in its yield. Another disease was found in LCP 85-384 in recent years, sugarcane yellow leaf virus (Grisham et al. 2001); however, it appears that the variety is also tolerant to this disease as well. In a continuing effort to lessen the dependence of the industry on one variety, the Louisiana variety development program is constantly striving to develop other new, superior varieties that are as good as or better than LCP 85-384; however, the task has not been an easy one. Besides the recent release of HoCP 96-540, there are two additional varieties, Ho 95-988 and L 97-128, that equal or exceed the yield of LCP 85-384 and are candidates for commercial release in 2004 (Ken Gravois, personal communication).

ACKNOWLEDGMENTS

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.

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Table 1. Total area planted to sugarcane in Louisiana by region and parish (county), 2003[1].

Bayou Teche region		River-Bayou Lafourche region		Northern region	
Parish	Acres	Parish	Acres	Parish	Acres
Acadia	3,174	Ascension	14,215	Avoyelles	21,286
Calcasieu	4,244	Assumption	41,541	East Baton Rouge	560
Cameron	404	Iberville	36,033	Evangeline	3,115
Iberia	63,300	Lafourche	31,426	Pointe Coupee	32,876
Jeff Davis	5,450	St. Charles	2,196	Rapides	13,380
Lafayette	15,859	St. James	24,900	St. Landry	21,063
St. Martin	34,283	St. John	4,035	West Baton Rouge	15,360
St. Mary	43,140	Terrebonne	11,095		
Vermilion	32,938				
Total	202,792	Total	165,441	Total	107,640
Total all regions: 475,873					

[1] Estimates are based on information obtained in variety surveys in 2003 by the county agents.

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

Table 2. Estimated Statewide Sugarcane Acreage Percentage by Variety and Crop Year, 1999[1].

Variety	Plant Cane	1st Stubble	2nd Stubble	3rd Stubble And Older	Total
	--% --				
CP 65-357	<1	2	3	4	1
CP 70-321	9	17	30	40	20
CP 72-370	2	3	4	2	3
CP 74-383	<1	<1	1	1	<1
CP 76-331	0	0	<1	<1	<1
CP 79-318	<1	1	1	1	1
LCP 82-89	2	6	6	5	5
LHO 83-153	2	2	3	3	3
LCP 85-384	75	60	44	39	58
HOCP 85-845	9	9	7	4	8
LCP 86-454	1	1	1	1	1
Others	<1	<1	<1	<1	<1
Total Acres Percent Total Crop (%)	133,759 31.7	129,229 30.6	120,690 28.6	38,906 9.2	422,584

[1]Based on 1999 variety survey information from county agents.

Table 3. Estimated Sugarcane Distribution by Region and Crop Year, 1999[1].

Crop Year	Teche	River Bayou Lafourche	Northern	State Total
Plant Cane Acres %	 51,633 31	 52,695 26	 29,431 34	 133,759 29.2
1st Stubble Acres %	 50,733 30	 53,524 26	 24,972 29	 129,229 28.2
2nd Stubble Acres %	 44,697 27	 50,363 25	 25,630 29	 120,690 26.3
3rd Stubble and Older Acres %	 19,907 12	 12,149 7	 6,850 8	 38,906 9.2
Total Acres	166,970	168,731	86,883	422,584

[1]Based on 1999 variety survey information from county agents.

Table 4. Estimated Teche Region Acreage Percentage by Variety and Crop Year, 1999[1].

Variety	Plant Cane	1st Stubble	2nd Stubble	3rd Stubble And Older	Total
CP 65-357	<1	<1	<1	<1	4
CP 70-321	13	24	39	42	27
CP 72-370	1	1	2	1	1
CP 74-383	0	0	<1	0	0
CP 79-318	<1	<1	1	1	<1
LCP 82-89	2	4	7	6	4
LHO 83-153	1	1	2	1	1
LCP 85-384	77	63	44	46	60
HOCP 85-845	6	6	5	2	5
LCP 86-454	<1	<1	<1	<0	<1
Others	<1	1	<1	1	<1

[1]Based on 1999 variety survey information from county agents.

Table 5. Estimated River-Bayou Lafourche Region Sugarcane Acreage Percentage by Variety and Crop Year, 1999[1].

Variety	Plant Cane	1st Stubble	2nd Stubble	3rd Stubble And Older	Total
CP 65-357	<1	2	4	5	2
CP 70-321	6	11	18	26	13
CP 72-370	3	4	8	5	5
CP 74-383	<1	<1	1	2	1
CP 79-318	<1	1	1	1	1
LCP 82-89	3	8	8	6	6
LHO 83-153	3	4	5	5	4
LCP 85-384	67	55	44	41	54
HOCP 85-845	15	14	10	9	13
LCP 86-454	1	1	2	1	1
Others	<1	<1	<1	1	<1

[1]Based on 1999 variety survey information from county agents.

Table 6. Estimated Northern Region Sugarcane Acreage Percentage by Variety and Crop Year, 1999[1].

Variety	Plant Cane	1st Stubble	2nd Stubble	3rd Stubble And Older	Total
CP 65-357	<1	3	8	14	4
CP 70-321	4	17	36	57	21
CP 72-370	0	1	2	1	1
CP 74-383	<1	1	2	1	1
CP 76-331	0	0	<1	<1	<1
CP 79-318	<1	<1	2	<1	1
LCP 82-89	1	4	2	2	2
LHO 83-153	1	1	1	6	1
LCP 85-384	88	67	45	16	64
HOCP 85-845	4	5	3	4	4
LCP 86-454	2	1	<1	0	1
Others	0	0	0	0	0

[1]Based on 1999 variety survey information from county agents.

Table 7. Louisiana Sugarcane Variety Trends 1995-1999[1].

	% of state total acreage by year					
Variety	1995	1996	1997	1998	1999	1 yr. Change
CP 65-357	15	10	6	3	1	-2
CP 70-321	49	40	35	29	20	-9
CP 72-370	9	9	7	5	3	-2
CP 74-383	4	3	2	1	<1	-1
CP 76-331	<1	<1	<1	<1	<1	0
CP 79-318	2	3	3	2	1	-1
LCP 82-89	13	16	10	7	5	-2
LHO 83-153	4	4	4	3	3	0
LCP 85-384	3	13	29	43	58	+15
HOCP85-845	<1	2	4	6	8	+2
LCP 86-454	<1	<1	<1	1	1	0
Others	<1	<1	<1	1	<1	-1

[1]Based on annual variety survey reports from county agents in sugarcane-producing parishes, 1995-1999.

Table 8. Estimated statewide sugarcane acreage percentage by variety and crop, all regions, 2003[1].

Variety	Plant-cane	First-stubble	Second-stubble	Third-stubble and older	Total
	--%				--
CP 65-357	<1	<1	<1	<1	<1
CP 70-321	2	3	4	4	3
CP 72-370	<1	<1	<1	<1	<1
LCP 82-89	<1	<1	<1	1	<1
LHo 83-153	<1	<1	<1	<1	<1
LCP 85-384	90	89	87	86	88
HoCP 85-845	2	3	5	7	4
HoCP 91-555	6	4	3	1	4
Others	<1	<1	<1	<1	<1
Total acres	112,782	117,065	118,016	128,010	475,873
Percent total crop (%)	23.7	24.6	24.8	26.9	

[1] Based on information obtained in variety surveys in 2003 by county agents.

Table 9. Estimated sugarcane distribution by region and crop, 2003[1].

Crop	Bayou Teche	River-Bayou Lafourche	Northern	State total
Plant-cane				
Area (acres)	49,250	38,571	25,004	112,825
Percent (%)	24.3	23.3	23.2	23.7
First-stubble				
Area (acres)	52,538	43,638	21,057	117,233
Percent (%)	25.9	26.4	19.6	24.6
Second-stubble				
Area (acres)	49,107	44,180	24,703	117,990
Percent (%)	24.2	26.7	22.9	24.8
Third-stubble and older				
Area (acres)	51,897	39,052	36,876	127,825
Percent (%)	25.6	23.6	34.3	26.9
Total acres	202,792	165,441	107,640	475,873

[1] Based on information obtained in variety surveys in 2003 by county agents.

Table 10. Estimated area planted to sugarcane in percent by variety and crop for the Bayou Teche region, 2003[1].

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 65-357	<1	<1	<1	<1	<1
CP 70-321	3	5	6	6	5
CP 72-370	<1	<1	<1	<1	<1
LCP 82-89	<1	<1	<1	1	<1
LHo 83-153	0	<1	0	<1	<1
LCP 85-384	86	87	86	87	87
HoCP 85-845	3	3	3	5	4
HoCP 91-555	8	5	4	1	4
Others	<1	<1	<1	<1	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys in 2003 by county agents.

Table 11. Estimated area planted to sugarcane in percent by variety and crop for the River/Bayou Lafourche region, 2003[1].

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 65-357	<1	0	<1	<1	<1
CP 70-321	<1	1	1	2	1
CP 72-370	0	<1	<1	<1	<1
LCP 82-89	0	0	<1	2	1
LHo 83-153	<1	<1	1	1	<1
LCP 85-384	94	92	88	82	89
HoCP 85-845	2	3	6	12	6
HoCP 91-555	4	3	3	1	3
Others	<1	<1	<1	<1	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys in 2003 by county agents.

Table 12. Estimated area planted to sugarcane in percent by variety and crop for the Northern region, 2003[1].

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
CP 65-357	0	0	0	<1	<1
CP 70-321	1	2	5	5	3
CP 72-370	0	0	0	<1	<1
LCP 82-89	0	<1	0	1	<1
LHo 83-153	0	0	<1	<1	<1
LCP 85-384	92	89	88	87	89
HoCP 85-845	<1	3	5	5	4
HoCP 91-555	7	6	2	2	4
Others	<1	0	0	0	<1
Totals	100	100	100	100	100

[1] Based on information obtained in variety surveys in 2003 by county agents.

Table 13. Louisiana sugarcane variety trends, by variety and years, all regions, 1999-2003[1].

	Area planted to sugarcane by variety and years (%)					
Variety	1999	2000	2001	2002	2003	1 yr. Change
CP 65-357	1	1	1	<1	<1	0
CP 70-321	20	13	8	5	3	-2
CP 72-370	3	2	1	1	<1	-1
LCP 82-89	5	2	1	<1	<1	0
LHo 83-153	3	2	1	<1	<1	0
LCP 85-384	58	71	78	85	88	+3
HoCP 85-845	8	8	7	6	4	-2
HoCP 91-555	<1	<1	1	3	4	+1
Others	<1	<1	1	<1	<1	0
Totals	100	100	100	100	100	

[1] Based on annual variety surveys from county agents in sugarcane-producing parishes, 1999-2003.

PERFORMANCE OF CP 89-2143 IN LOUISIANA

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T. Tew
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The Florida sugarcane variety 'CP 89-2143' was released for commercial production in the fall of 1996 (1). The new variety has performed well in Florida and is characterized as having high early sucrose content with excellent population. Based on this information, a study was initiated at the LSU AgCenter, St. Gabriel Research Station and the USDA-ARS Sugarcane Research Unit's Ardoyne Farm in 2002.

In 2002, tissue culture derived plants were obtained from Certis U.S.A. (Kleentek). Plots were established with plantlets on paired rows. The plantlets were planted with a mechanical transplanter and were spaced 16 inches apart. There were 16 plantlets on each of two rows, and the test was replicated two times. Because the tests were established with plantlets, the plantcane data was not obtained.

The test was harvested in the first stubble crop on December 3, 2003, in St. Gabriel and on November 20, 2003, at Chacahoula. A combine harvester was used along with a weigh wagon fitted with load cells to measure plot weight. Cane yield was derived from the plot weight. A 10-stalk sample was hand cut and sent to the sucrose laboratory for quality analysis. The quality analysis determined Brix and pol, which were used to derive the pounds of sugar per ton of cane. Sugar per acre was derived as the product of cane yield and sugar per ton of cane. Stalk weight was estimated from the 10-stalk sample, and stalk number was derived based on counting millable stalks in the plot during August 2003. The statistical analysis calculated least square means (SAS 8.01 Proc Mixed). Mean separation used least square mean probability differences (P=0.05). Varieties that have the same letter are not statistically different from each other.

Table 1. First-stubble harvest data for 2003 for the test conducted at the St. Gabriel Research Station, St. Gabriel, Louisiana.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP 70-321	5196 A	19.2 A	270 AB	1.86 B	20285 A
LCP 85-384	7224 A	26.1 A	277 A	2.12 B	24337 A
CP 89-2143	7806 A	30.2 A	259 B	2.75 A	21981 A
HoCP 91-555	6812 A	24.8 A	273 AB	2.01 B	24711 A

Table 2. First-stubble harvest data for 2003 for the test conducted at the USDA-ARS Sugarcane Research Unit Ardoyne Farm, Chacahoula, Louisiana.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP 70-321	11969 B	38.8 B	308 B	1.21 AB	64191 B
LCP 85-384	12812 B	42.7 AB	300 B	1.25 A	69287 B
CP 89-2143	13245 AB	44.0 A	301 B	1.38 A	64859 B
HoCP 91-555	14300 A	44.5 A	322 A	1.06 B	86516 A

In the St. Gabriel test, varieties were not significantly different for sugar per acre, cane yield, and stalk number. CP 89-2143 produced significantly less sugar per ton of cane than LCP 85-384, but not less than CP 70-321 and HoCP 91-555. The Florida variety produced a larger stalk weight than the three Louisiana varieties. It was noted in this test that after four nights with temperatures below 32 F (27 F being the coldest night temperature), CP 89-2143 exhibited excellent cold tolerance. It was also observed that the Florida variety appears to have some resistance to the sugarcane borer.

In the Chacahoula test, CP 89-2143 produced as much sugar and cane per acre as the newer cultivars LCP 85-384 and HoCP 91-555, and greater cane yield than CP 70-321. The Florida variety produced a higher cane yield than CP 70-321. CP 89-2143 had similar sugar per ton of cane to both CP 70-321 and LCP 85-384, but significantly less sugar per ton of cane than HoCP 91-555.

Based on these two preliminary tests and observations, the new Florida variety, CP 89-2143, warrants further testing in the Louisiana sugarcane variety development program.

1. Glaz, B., J.D. Miller, C.W. Deren, P.Y.P. Tai, J.M. Shine, and J.C. Comstock. 2000. Registration of 'CP 89-2143'. Crop Sci. 40:577.

GENETIC DIVERSITY AND RELATIONSHIPS AMONG PARENTS IN THE LSU AGCENTER SUGARCANE CROSSING PROGRAM

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Genetic diversity is an essential ingredient in any crop improvement program. The genetic diversity among parents is what determines the level of segregation and genetic variability among the progeny on which selection is performed. Therefore, a basic understanding of the genetic diversity among the parents used for breeding is fundamental to the success of the breeding program. This knowledge is important for the conservation, management and utilization of genotypes and indeed genes in the breeding gene pool. For example, crosses could be planned between genotypes from divergent backgrounds to maximize genetic variability and segregation among the progenies, and the progenies from different crosses could be selected to increase genetic diversity in the cultivated gene pool.

Sugarcane breeders commonly use pedigree records to plan crosses between divergent parents. However, the complex genome structure (interspecific polyploid and aneuploid) and genealogy, coupled with accidental mislabeling of clones, may complicate this effort. In addition, one would like to detect genetic diversity among phenotypically superior parents. This could be a very difficult task considering that superior phenotypic characteristics are often obtained at the expense of genetic diversity.

Molecular markers can be especially useful in assessing genetic diversity among adapted germ plasm because they measure allele frequency differences at the DNA level. As such, molecular markers offer direct comparison of genetic diversity without some simplifying assumptions inherent with the pedigree-based method. In this study we measured genetic diversity among a random set of parents from the LSU AgCenter sugarcane breeding gene pool using the Amplified Fragment Length Polymorphism (AFLP) marker technique.

Our preliminary results using four AFLP primer combinations showed that the technique could be useful in detecting genetic differences among parents in the collection (Fig. 1). More important, the results revealed the narrow level of genetic diversity among parents in the collection, suggesting that concerted efforts have to be made to broaden the genetic base of our parent collection. This is being addressed by crossing among germplasm derived from recent wide crosses between commercial cultivars and wild *Sacharum spontaneum* clones. For example, the cultivars LCP85-384 and HoCP85-845 were derived from such recent wide crosses. Several backcrosses to existing commercial cultivars are required to reconstitute the commercial phenotype. Unfortunately, only a few clones from such wide crosses make it to advanced selection stages. The promiscuousness of the few clones that are derived from wide crosses (e.g LCP85-384) seems to negate the base broadening effort (Fig 2).

The relationships revealed between clones in this study were mostly in agreement with what is known from their pedigree history (Fig 2). However, there were instances where the relationships failed to conform to known pedigree information. While the mislabeling of clones is not being discounted, the non-conformity is hardly surprising, given the complex genome structure and mode of inheritance (chromosomal mosaics are possible within the same cross) of sugarcane. This underscores why molecular markers maybe more informative for assessing genetic diversity among parents in the crossing program.

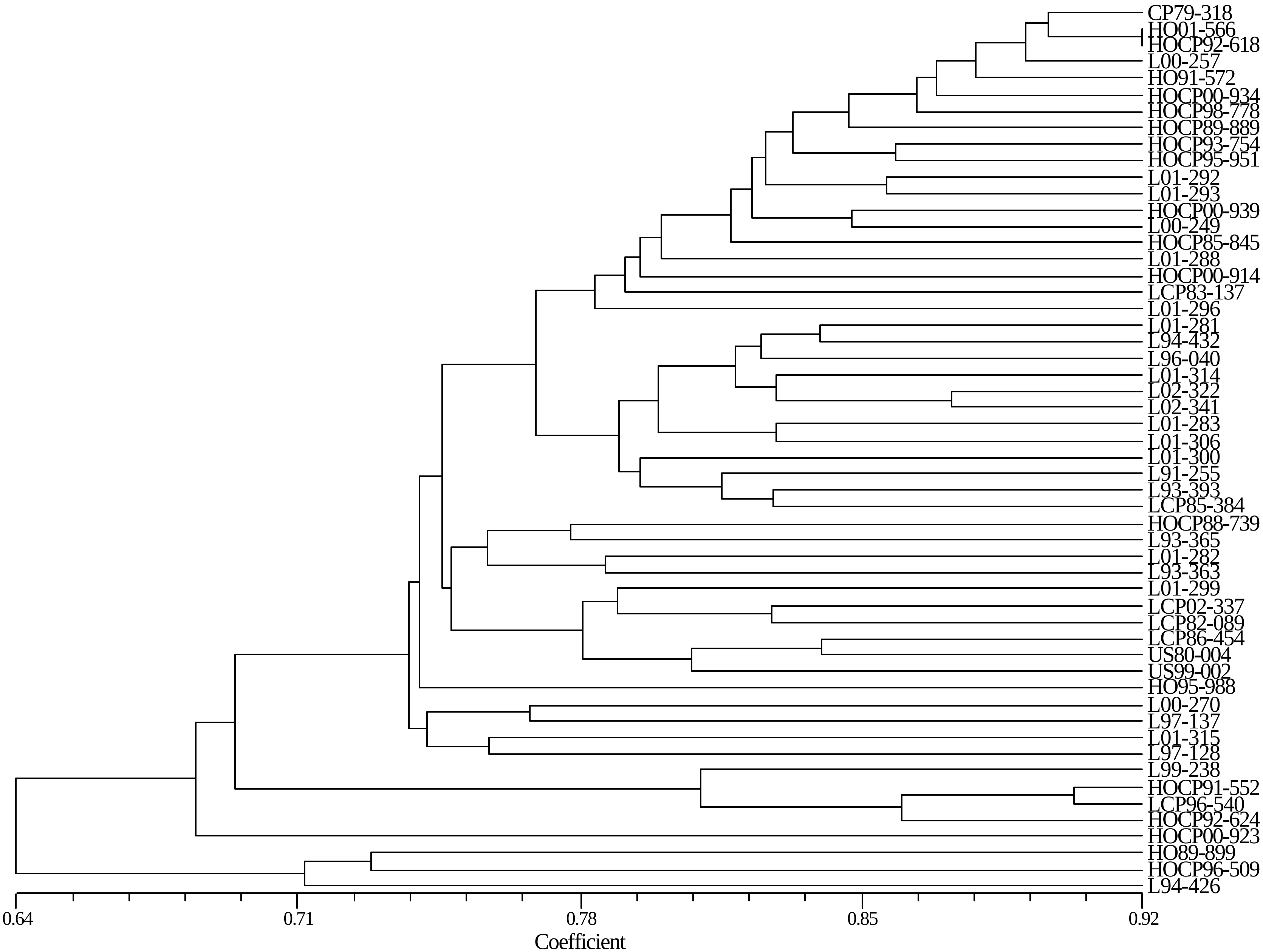
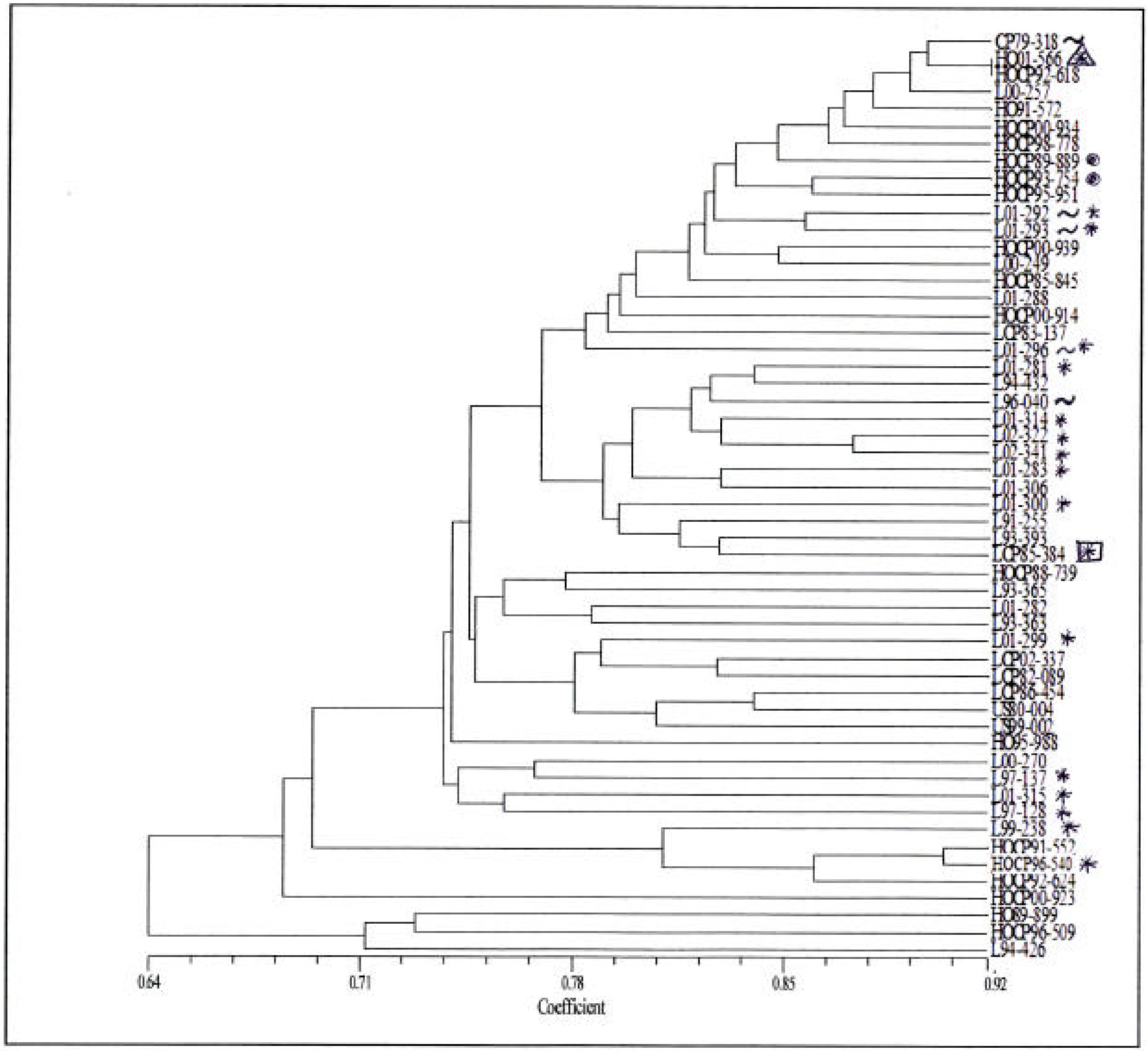


Fig. 1 Cluster analysis of genetic similarity (Dice coefficient) between sugarcane parental clones as revealed by 4 AFLP primer combinations.



Cultivar	Female	Male
CP79-318	CP65-357	L65-069
HO01-566	LCP85-384	L75-020
HOCP92-618	CP78-304	LCP81-030
L00-257	LCP85-313	CP76-331
HO91-572		
HOCP00-934	HOCP91-542	HOCP91-552
HOCP98-778	HO89-889	CP90-956
HOCP89-889	CP79-318	US80-024
HOCP93-754	CP79-318	CP83-657
HOCP95-951	CP85-868	CP85-830
L01-292	CP65-357	LCP85-384
L01-293	CP65-357	LCP85-384
HOCP00-939	LCP86-454	CP89-825
L00-249	L91-281	LHO92-314
HOCP85-845	CP72-370	CP77-403
L01-288	L93-363	LCP85-384
HOCP00-914	CP89-837	CP86-901
LCP83-137	CP72-0356	CP73-0343
L01-296	CP65-357	LCP85-384
L01-281	LCP86-429	LCP85-384
L94-432	LCP81-010	LCP82-089
L96-040	CP65-357	HOCP85-845
L01-314	HoCP88-739	LCP85-384
L02-322	LCP85-336	LCP85-384
L02-341	L96-071	LCP82-089
L01-283	L93-365	LCP85-384
L01-306	HoCP93-767	L94-431
L01-300	LCP86-422	LCP85-384
L91-255	CP73-340	86P1
L93-393	CP80-328	CP70-321
LCP85-384	CP77-310	CP77-407
HOCP88-739	CP79-302	CP80-323
L93-365	CP78-304	CP72-2086
L01-282		
L93-363	LCP85-313	LCP85-336
L01-299	L93-365	LCP85-384
LCP02-337		
LCP82-089	CP52-068	CP72-370
LCP86-454	CP77-310	CP69-380
US80-004	US73-079	CP77-410
US99-002		
HO95-988	CP86-941	US89-012
L00-270	CP70-330	L92-312
L97-137	LCP81-010	LCP85-384
L01-315	HoCP93-746	LCP85-384
L97-128	LCP81-010	LCP85-384
L99-238	CP79-318	LCP85-384
HOCP91-552	LCP81-010	CP72-356
HOCP96-540	LCP86-454	LCP85-384
HOCP92-624	CP81-325	CP71-1038
HOCP00-923	CP87-644	HOCP92-614
HOCP96-509	CP83-644	CP84-722
L94-426	CP81-332	LCP81-010

MONITORING THE MOVEMENT OF THE MEXICAN RICE BORER TOWARD SUGARCANE AND RICE IN THE UPPER TEXAS RICE BELT AND WESTERN LOUISIANA

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Pheromone trap sampling for the Mexican rice borer (MRB), *Eoreuma loftini* (Dyar) (Lepidoptera: Crambidae), was continued during 2003 adjacent to sugarcane or rice fields in Southeast Texas and Southwest Louisiana. These cooperative studies between Texas A&M and the LSU AgCenter were initiated in 2000 to define the insect's range and assess its increasing threat to Louisiana.

In May 2003, two bucket-type MRB pheromone traps were set up in each county of the Texas Rice Belt (Chambers, Liberty, Jefferson, Orange, Waller, Austin, Colorado, Wharton, Brazoria, Galveston and Jackson). Extensive monitoring was also conducted in two western Louisiana parishes (Calcasieu and Jefferson Davis) adjacent to sugarcane fields. Traps were additionally placed at two sugarcane mills in Iberia and St. Mary parishes. The synthetic female *E. loftini* sex pheromone (Luresept®) was used as lure and periodically replaced every four to six weeks. An insecticidal strip (Vaportape ® II) was placed in each bucket to kill all trapped insects and prevent them from damaging each other. Insecticidal strips were replaced every six weeks. The traps were attached to a metal pole at a height of 3 to 4 feet above ground. Traps were monitored every week from May to November in 2003 in Texas, and every two weeks from June to December in Louisiana. Trap collections were placed in plastic bags and frozen for identification and enumeration.

E. loftini did not infest any new counties in 2003, however trap counts at the same location in the county of Galveston in Texas increased by 70% compared to 2002 (3755 vs. 2308). The insect is still not known to occur in Louisiana, but these high populations in Galveston are now within 50 - 60 miles of the new sugarcane production area near Beaumont, Texas, and 120 miles of sugarcane in Southwest Louisiana. In addition to extensive participation by Texas rice belt county agents and western Louisiana sugarcane parish agents, personnel from both the Texas Department of Agriculture (S.S. Nilakhe) and the Louisiana Department of Agriculture and Forestry (Tad Hardy) supervised collection efforts.

Table 1. Pheromone trap collections of Mexican rice borer (*Eoreuma loftini*) moths in Southeast Texas during 2003[1].

Texas Counties	May	June	July	August	September	October	November	December	Total
Austin		103	112	29	-	1044	-	375	1663
Brazoria	854	682	205	432	315	1389	786-	-	4663
Colorado	120	166	300	256	501	2048	187	133	3711
Galveston	195	661	735	507	651	647	293	66	3755
Jackson	120	235	227	236	78	135	-		1031
Waller	-	486	359	242	462	1656	305	9	3519
Wharton	171	38	38	268	102	160	142	-	919
No MRB Collected									
Chambers	0	0	0	0	0	0	0		0
Jefferson	0	0	0	0	0	0	0		0
Liberty	0	0	0	0	0	0	0		0
Orange	0	0	0	0	0	0	0		0

[1]Number of moths per two traps per month. Moths were removed from traps twice weekly; pheromone lures and insecticide strips replaced monthly.

EFFECTS OF DROUGHT STRESS AND SUGARCANE VARIETY ON RESISTANCE TO THE MEXICAN RICE BORER

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The Mexican rice borer (MRB), *Eoreuma loftini* (Dyar), is a serious threat to rice and sugarcane in Texas and potentially also to Louisiana. The MRB was first detected in the Lower Rio Grande Valley (LRGV) of Texas in 1980 and very rapidly became the dominant pest of sugarcane. By the end of the decade, its range had expanded into the rice production area of Texas. The MRB is now the major insect pest of sugarcane in the LRGV of Texas. With MRB established only 50-60 miles from new sugarcane production near Beaumont, TX, the invasion of Louisiana sugarcane fields is expected in the near future. Efforts are under way to develop more adequate management strategies in both Louisiana and Texas. Previous MRB studies have shown that LCP 85-384 was among the more susceptible varieties, and HoCP 85-845 the more resistant.

A field experiment was initiated in the Fall 2002 to evaluate the effect of variety (LCP 85-384 and HoCP 85-845), insecticide (seven applications of tebufenozide at 8-9oz [AI]/acre rate) and irrigation to reduce plant stress. Results from our first year of data showed a substantial reduction in percentage of bored internodes (from 71.4 to 40.9% for untreated LCP 85-384) and moth emergence per acre in irrigated plots (Tables 1 and 2). However, both irrigation and frequent insecticide applications were needed to lower injury below 10% bored internodes for both varieties. Yield data were not available; however, stressed plants showed a strong trend for being lighter and shorter (Table 1 and 2)

Greenhouse oviposition studies showed that drought stress increased the oviposition of MRB on both susceptible (HoCP 85-845) and resistant (LCP 85-384) sugarcane varieties (Table 3). Dry leaves were also significantly affected by water stress and were positively correlated with eggs laid. MRB is known to oviposit in cryptic sites on dried sugarcane leaves located on the lower part of the plant, i.e. between ground level and 80 cm height (van Leerdam et al. 1984). In our study, 100% of the eggs were laid on dry leaves or dry tips of leaves. Enhanced MRB injury under stress conditions may partially be explained by increased oviposition on stressed sugarcane plants via increased dry leaves.

Appreciation is also expressed to Dr. José Amador (TAES Center Director, Wesalco) and Dr. Allan T. Showler (USDA-ARS-Wesalco) for cooperation and participating in this research.

Table 1. Mean percentage of bored internodes, adult moth emergence, and sugarcane stalk height and weight at Ganado, Jackson County, TX, 2003.

Treatment			% bored internodes	Moth emergence/A[a]	Plant height (inch)	Plant weight (lb./plant)
Irrigated	LCP 85-384	T	6.6	3009	53.8	1.264
		U	40.9	55513	50.5	1.083
	HoCP 85-845	T	2.8	0	56.5	1.453
		U	23.2	25947	58.1	1.514
Non-irrigated	LCP 85-384	T	35.4	34027	39.4	0.740
		U	71.4	84177	34.6	0.693
	HoCP 85-845	T	17.9	12307	53.1	1.279
		U	44.7	47766	45.5	0.943

[a] Based on a ratio of *E. loftini* exit holes to bored internodes.
[b] Estimated as the product of the mean number of exit holes and the number of stalks per hectare

Table 2. Statistical comparison of *E. loftini* percentage of bored internodes, adult moth emergence, and sugarcane stalk height and weight at Ganado, Jackson County, TX, 2003.

Effect	% Bored internodes		Moth emergence/A		Plant height		Plant weight	
	F	*P > F*	*F*	*P > F*	*F*	*P > F*	*F*	*P > F*
Irrigation[1]	65.94	0.015	13.53	0.066	13.34	0.067	9.47	0.091
Variety[1]	66.38	0.015	13.36	0.067	27.88	0.034	29.39	0.032
Irrigation*Variety[1]	7.78	0.11	1.08	0.41	4.46	0.17	0.42	0.58
Insecticide[2]	212.81	0.0001	43.15	0.0028	4.70	0.096	3.75	0.13
Variety*Insecticide[2]	8.24	0.045	2.67	0.18	0.12	0.74	0.03	0.86
Irrigation*Insecticide[2]	0.094	0.39	0.07	0.80	2.47	0.19	1.02	0.37
Irrigation*Variety*Insecticide[2]	0.35	0.58	0.24	0.65	1.40	0.30	4.20	0.11

[1] df = 1, 2 for % bored internodes, moth emergence/ac, plant height and plant weight.
[2] df = 1, 4 for % bored internodes, moth emergence/ac, plant height and plant weight.

Table 3. Effects of sugarcane variety and drought stress on E. loftini oviposition. Greenhouse studies conducted at the Texas A&M Research and Extension Center at Weslaco, TX June-August 2003.

Treatment	No. eggs/plant	No. egg masses/plant	No. dry leaves/plant	Water potential (bar)	Plant height (cm)
LCP 85-384	277.6	11.2	7.2	8.7	115.3
LCP 85-384 stressed	521.2	21.6	11.2	29.3	86.5
HoCP 85-845	160.2	9.9	4.7	8.1	86.6
HoCP 85-845 stressed	355.25	19.0	8.9	23.0	69.5
Effect	P-value	P-value	P-value	P-value	P-value
Variety	0.110	0.592	0.0015	0.211	< 0.0001
Stress	0.040	0.027	< 0.0001	0.0001	< 0.0001
Variety × Stress	0.817	0.909	0.946	0.350	0.021

COMPARISON OF DIFFERENT STRAINS OF SUGARCANE BORER FOR RESISTANCE TO TEBUFENOZIDE (CONFIRM®)

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The sugarcane borer (SCB), *Diatraea saccharalis* (F.), is responsible for more than 90% of injury by arthropods to sugarcane in Louisiana. Insecticides are the major management tool used to maintain yield losses below economic thresholds. The continuous use of the same insecticide or same class of insecticide for a long period of time will result in development of resistance in the target pest, especially if other management practices do not help reduce pest populations. Monitoring the development of resistance may help to make timely changes in control strategies and help prevent resistant genes from being fixed in the population. The average number of insecticide applications for sugarcane borer control in Louisiana sugarcane more than doubled between 1999 and 2003. Confirm® (Tebufenozide), a biorational insecticide, is an ecdysone agonist that causes the larvae to produce a malformed cuticle. Advantages of this compound include a strong specificity to certain Lepidopterous pests, and little to no toxicity to most beneficial parasitoids and predators in sugarcane fields. Combined with the heavy selection pressure due to its widespread use across Louisiana since 1997, assessing early resistance among field populations is indispensable to try to preserve the efficiency of this insecticide in the sugarcane industry.

SCB larvae were collected from three different locations in both 2002 and 2003 (Iberville, St. Mary, and Avoyelles-Rapides) and an additional location in 2003 (Lake Charles). Locations were chosen as representative of SCB tebufenozide selection pressure. An SCB strain mass-reared on an artificial diet at the USDA (ARS) Research Unit in Houma constituted a non-selected reference. Additionally reported in Table 1 and 2 is the 1995 baseline susceptibility data from the "Louisiana Mixed" culture of SCB prior to any Confirm use in the Louisiana sugarcane industry. This culture was made up of borer collections obtained from several places in the sugarcane area. The larvae were placed individually on artificial diet and reared until pupation (23 ± 1°C, 40 ± 5% RH, L:D 12:12). Pupae from each strain were left to incubate in containers in the same standard rearing conditions. The resulting eggs were sterilized with 50% ethanol and allowed to air dry. The eggs were left to hatch in an inflated plastic bag (10 by 5 by 30 cm) with moist filter paper. Larvae less than 24 hrs old were used for the initiation of the mortality baseline studies. The larvae for all locations were checked at seven days post treatment for mortality, which was defined as the absence of movement of the larvae when prodded. LD_{50} and LD_{90} dosages or concentrations necessary to kill 50 or 90% of the population sample are reported in Tables 1 and 2.

The "Louisiana Mixed" strain data was used as a baseline susceptibility strain for which LD_{50} and LD_{90} resistance ratios are computed to assess recent changes in susceptibility. Rapides / Avoyelles in 2002 had the lowest LD_{50} value. A significant increase in LD_{50} was determined at this location in 2003 when heavier tebufenozide selection pressure occurred. Iberia / St. Mary had relatively low LD_{50} values in both years, with a trend for an increase in 2003. Iberville had the highest LD_{50} value in 2002 when multiple applications of tebufenozide occurred on the St.

Gabriel Research Station where the strain was collected. LD_{50} values in 2003 at this location did not show a significant decrease despite no use of tebufenozide. No field resistance impacting control has yet been observed among SCB strains in the Louisiana sugarcane industry. However these results do show varying levels of resistance among strains brought in to test in the laboratory, suggesting the need for implementing resistance management strategies. Figure 1 shows the continuing increase of insecticide use in the Louisiana sugarcane industry, now approximately 2 applications, annually. The increasing acreage of LCP 85-384 building up area-wide populations also affects pest management.

Table 1. LD_{50} (ppm) and resistance ratio for several strains of *D. saccharalis*.

Parish Locations	Year	LD_{50} ppm[a]	95% Confidence Interval LCL	95% Confidence Interval UCL	Resistance Ratio[b]
Iberville	2002	0.454	0.277	0.780	2.70*
Iberville	2003	0.396	0.344	0.462	2.36*
Lake Charles	2003	0.350	0.238	0.455	2.08*
Rapides / Avoyelles	2003	0.301	0.265	0.345	1.79*
Iberia / St. Mary	2003	0.298	0.260	0.343	1.77*
Iberia / St. Mary	2002	0.198	0.179	0.226	NS
Houma	2003	0.162	0.067	0.330	NS
Rapides / Avoyelles	2002	0.161	0.137	0.185	NS
[c]Louisiana Mixed	1995	0.168	0.151	0.189	-

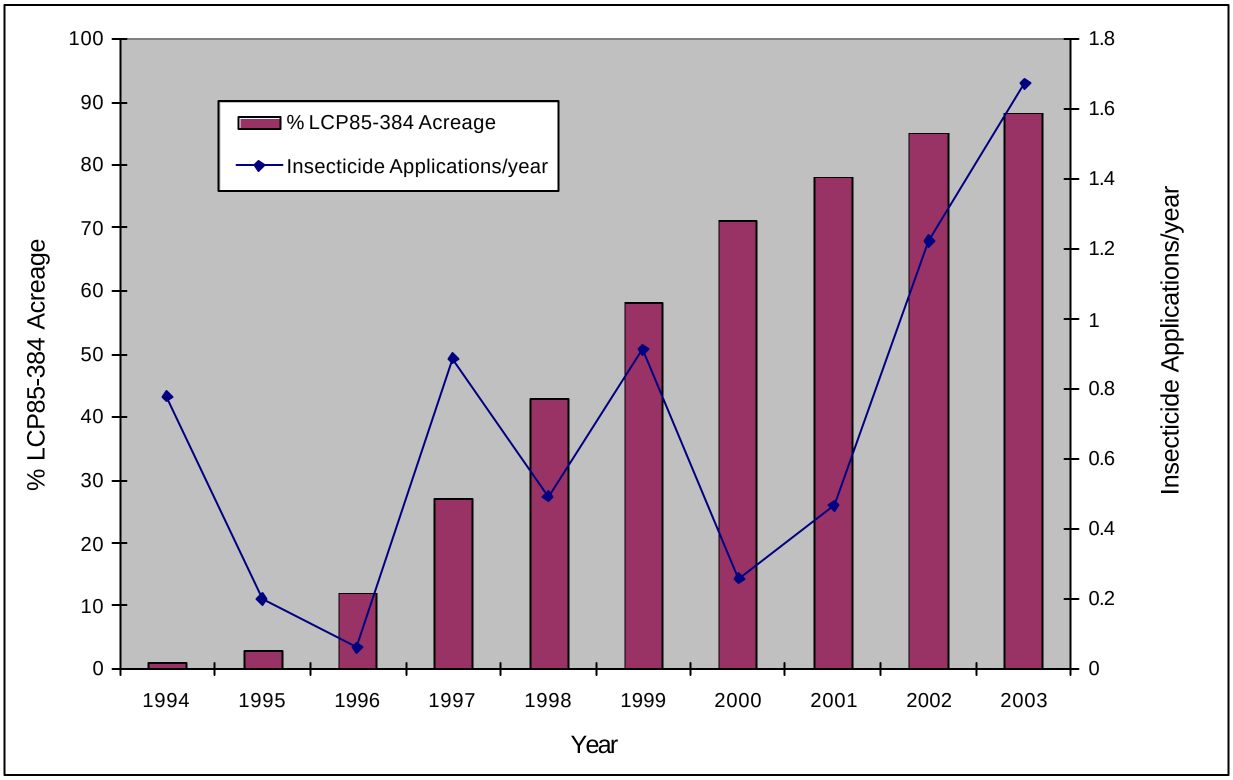
[a]Dose in milligrams of Confirm insecticide per kg of treated diet necessary to kill 50% of the 1st instar larvae.
[b]Resistance ratio determined in comparison to "Louisiana Mixed" strain.
[c]Rodriguez, L.M., T.E. Reagan, and J.A. Ottea. 2001. Susceptibility of *Diatraea saccharalis* (Lepidoptera: Crambidae) to
tebufenozide. Journal of Economic Entomology 94(6): 1464-1470.
*$P \leq 0.05$.

Table 2. LD_{90} (ppm) and resistance ratio for several strains of *D. saccharalis*.

Parish Locations	Year	LD_{90} ppm[a]	95% Confidence Interval LCL	95% Confidence Interval UCL	Resistance Ratio[b]
Lake Charles	2003	1.612	0.885	7.597	3.91*
Iberville	2003	1.362	1.045	1.991	3.31*
Iberville	2002	1.357	0.787	16.391	3.29*
Iberia / St. Mary	2003	1.026	0.816	1.398	2.49*
Rapides / Avoyelles	2003	0.799	0.657	1.042	1.94*
Houma	2003	0.790	0.371	15.393	NS
Rapides / Avoyelles	2002	0.458	0.370	0.637	NS
Iberia / St. Mary	2002	0.431	0.351	0.602	NS
[c]Louisiana Mixed	1995	0.412	0.326	0.620	-

[a]Dose in milligrams of Confirm insecticide per kg of treated diet necessary to kill 90% of the 1st instar larvae.
[b]Resistance ratio determined in comparison to "Louisiana Mixed" strain.
[c]Rodriguez, L.M., T.E. Reagan, and J.A. Ottea. 2001. Susceptibility of *Diatraea saccharalis* (Lepidoptera: Crambidae) to
tebufenozide. Journal of Economic Entomology 94(6): 1464-1470.
*$P \leq 0.05$.

Fig. 1. Average number of insecticide applications per acre for control of the sugarcane borer each year and the proportion of acreage in the variety LCP85-384.



ASSESSMENT OF VARIETAL RESISTANCE TO THE SUGARCANE BORER

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Sugarcane resistance to the sugarcane borer (SCB), *Diatraea saccharalis*, is categorized as a combination of physical characteristics that hinder boring (i.e. rind hardness, leaf-sheath appression), variety specific tolerance to boring, and antibiosis mechanisms that contribute to differences in survival in larvae that have bored into the stalks. The extent of this resistance also is influenced by the severity of infestations. Heavy borer pressure results in more bored internodes even in varieties considered highly resistant. Several factors contributing to seasonal area-wide SCB infestation levels include weather conditions, predator and parasite numbers, indigenous borer populations, and effectiveness of insecticidal controls. Expansive acreage of varieties with elevated moth production increases endemic SCB populations and imposes additional pressure on the remaining acreage of more resistant varieties. A minimal component in the practice of host plant resistance in entomology involves the encouragement of breeding programs not to release varieties more susceptible to key insect pests than those varieties already commonly grown. This is particularly important when there is evidence that the susceptible variety has the potential to enhance pest populations. For this reason, we also report moth production for each variety in these tests.

Twelve sugarcane varieties of the L01, HoCP00 series, and Ho95-988 kept in the variety development program were evaluated for resistance/susceptibility to SCB during 2003. All varieties were planted on November 15, 2002, at the Lanaux farm in St. John Parish in a randomized complete block design with four replications, except the additional standard varieties with eight replications each (HoCP 91-555, LCP 85-384, HoCP 85-845, and HoCP 96-540). No chemical controls for SCB were applied in the test, and natural control from fire ants was suppressed by applying granular Lorsban in late June. A 16-stalk sample was cut from each plot on November 10, 2004 (four replications = 64 stalks of L01, HoCP00 series, and Ho95-988, and 128 stalks per commercial variety). Sample stalks were examined to determine the number of bored internodes, moth emergence holes, and the total number of internodes at the end of the season.

Significant differences among the varieties were detected, with Ho95-988 (31.6% bored internodes) being the most susceptible, and nearly twice as susceptible as LCP 85-384 (16.52% bored internodes), the most widely planted variety. Emergence per acre from each variety also differed significantly, with the highest numbers emerging from Ho95-988 (91,643), and the lowest number (13,687) emerging from the most resistant commercial variety to sugarcane borer, HoCP 85-845. These results are presented in Table 1.

Table 1. Sugarcane borer injury and moth production in plant cane L01, HoCP00 series, and Ho95-988 varieties and four commercial varieties during 2003, Lanaux Farm near Edgard, LA. Test was planted November 15, 2002, samples harvested November 10, 2003.

Variety	% Bored internodes	Stalks/acre*	Moths/acre production
Ho95-988	31.64a	43,126	91,643a
HoCP 91-555	24.48ab	45,829	76,288ab
HoCP 00-950	19.20abc	44,054	48,184abc
HoCP 00-930	18.64bc	44,054	45,634bcd
LCP 85-384	16.52bc	46,373	43,837bcd
HoCP 00-927	14.02bc	43,127	37,332cd
L01-292	12.27c	42,199	32,789cd
L01-283	11.94c	50,094	32,091cd
HoCP 00-960	11.98c	39,379	26,212cd
HoCP 96-540	8.51c	42,199	23,078cd
L01-299	12.05c	40,747	14,813d
HoCP 85-845	8.85c	30,946	13,687d

Means within columns followed by the same letter are not significantly different ($P \leq 0.05$, LSD).

*Stand counts provided by Dr. Kenneth Gravois, Sugar Station.

Acknowledgment: The sugarcane entomology program would like to express appreciation for help from other members of the sugarcane variety development and breeding program for their assistance in cutting the seed-cane and helping to select the varieties for evaluation. Additionally, Dr. W. H. White (USDA-ARS) provided the USDA varieties used in these studies.

SMALL PLOT ASSESSMENT OF INSECTICIDES AGAINST THE SUGARCANE BORER

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A study was conducted at the Louisiana State University AgCenter Sugar Research Station, St. Gabriel, LA (Iberville Parish). Eight different insecticide treatments, in addition to an untreated check, were evaluated for season-long control of the sugarcane borer (SCB) *Diatraea saccharalis* (F.) (Lepidoptera: Crambidae) in a randomized complete block design with five replications in a field of HoCP91-555 plant cane planted in August 2002. Insecticide treatments were applied to three-row plots (6 ft x 30 ft) on 19 Jul and 17 Aug using a CO_2 sprayer mounted on an all-terrain vehicle with an 8005 flat-fan nozzle (one per row) delivering 10 gpa at 35 psi. Prior to test initiation, Lorsban 15G (15lb/acre) was applied to suppress fire ant predation on SCB larvae. SCB damage to sugarcane was assessed by counting the number of bored internodes and total number of internodes from 80 randomly selected stalks from each of eight treatments and the untreated check (16 stalks per plot) from each plot at the time of harvest (1 Dec). Data were analyzed using a one-way analysis of variance (Proc Mixed) with means separated with Tukey's HSD ($P<0.05$).

All of the insecticide-treated plots resulted in less than 10% bored internodes (economic injury level) and were significantly different from the untreated check of 28.8% bored internodes as shown in Table 1. None of the insecticides differed significantly from each other.

Table 1. Results of small plot test on (SCB) *Diatraea saccharalis* (F.), St. Gabriel Research Station, 2003.

Treatment/ Formulation[a]	Rate (oz/A)	% Bored Internodes[b]
Karate Z	1.92	5.9b
Diamond 0.83EC	6.00	5.6b
Mustang Max 0.8EC	4.00	4.8b
GF-317	0.017	4.1b
Confirm 2F	8.00	3.3b
Diamond 0.83EC	12.00	2.3b
Baythroid 2E	2.10	2.1b
Diamond 0.83EC	9.00	2.0b
Check	--	28.8a
F-value		20.3

[a]All treatments were applied with Latron CS-7 at 0.25% vol/vol.

[b]Means within column followed by the same letter are not significantly different (P<0.05, Tukey's HSD).

SUGARCANE YELLOW LEAF AND THE SUGARCANE APHID IN LOUISIANA

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Sugarcane yellow leaf virus (SCYLV) causes yellow leaf, a serious disease of sugarcane in some parts of the world, that was first detected in Louisiana in 1996. The sugarcane aphid, *Melanaphis sacchari* (Zehntner), is primarily responsible for vectoring SCYLV. This aphid was first discovered in Louisiana in 1999. In the tropics, the visible symptom of infection is that the midvein of upper leaves on mature sugarcane stalks turns bright yellow. The yellowing may spread to the leaf blade, and the upper surface of the midvein may turn reddish-pink. However, in Louisiana, symptoms are seldom observed because of the short growing season, frosts, and ripener application. Heavy infestations of sugarcane aphids often result in copious amounts of honeydew production, which results in senescence of lower leaves. The yellow sugarcane aphid, *Sipha flava* (Forbes), also occurs on sugarcane and other cereal crops grown in the Western Hemisphere. Damage by the yellow sugarcane aphid is characterized by reddish marks on the leaf and early leaf senescence. Objectives of this research were to (1) to determine the spread and rate of increase of SCYLV in fields of sugarcane and (2) to determine population dynamics of both *Melanaphis sacchari* and *Sipha flava.*

During the summer of 2002, 42 fields located throughout the sugarcane-growing region were sampled for incidence of SCYLV. During the summer of 2003, a subset of 17 of the previously sampled fields was selected to determine the rate of increase from 2002 to 2003. Fifty leaves were sampled in each field and processed in the laboratory using a tissue-blot, enzyme-immunoassay for virus detection. Infection level increased in only five of 17 (29 %) fields that were re-sampled, and incidence of SCYLV increased from 0-3 x in these fields.

Another series of field studies was continued to determine the spread and rate of increase over time in four selected sugarcane fields. Fields were located in Rapides, Iberville (two fields), and Iberia parishes. Single plant cane fields in both Iberville and Rapides parishes were selected in November 2001 and monitored through August 2003. Second ratoon fields in both Iberville and Iberia parishes were selected in April 2002 and monitored through August 2003 and October 2003, respectively. A contiguous grid was set up in each field resulting in 144 quadrat plots. In each of the 144 plots, four leaves per plot (two leaves on each of the two plot rows) were randomly sampled at different times. Leaves were processed with the same tissue-blot, enzyme-immunoassay used in the statewide survey. Initial infection levels were low in three fields and increased to only 1-2% during the subsequent ratoon crop. One field for which monitoring began in second ratoon had an initial infection level of 12% that increased to 25%. However, the plot infection frequency began at 35% and increased to 70%. The rate of infection increase was highest between the April and June sampling dates at three locations. The increase of SCYLV infection over time at one location is shown in Figure 1.

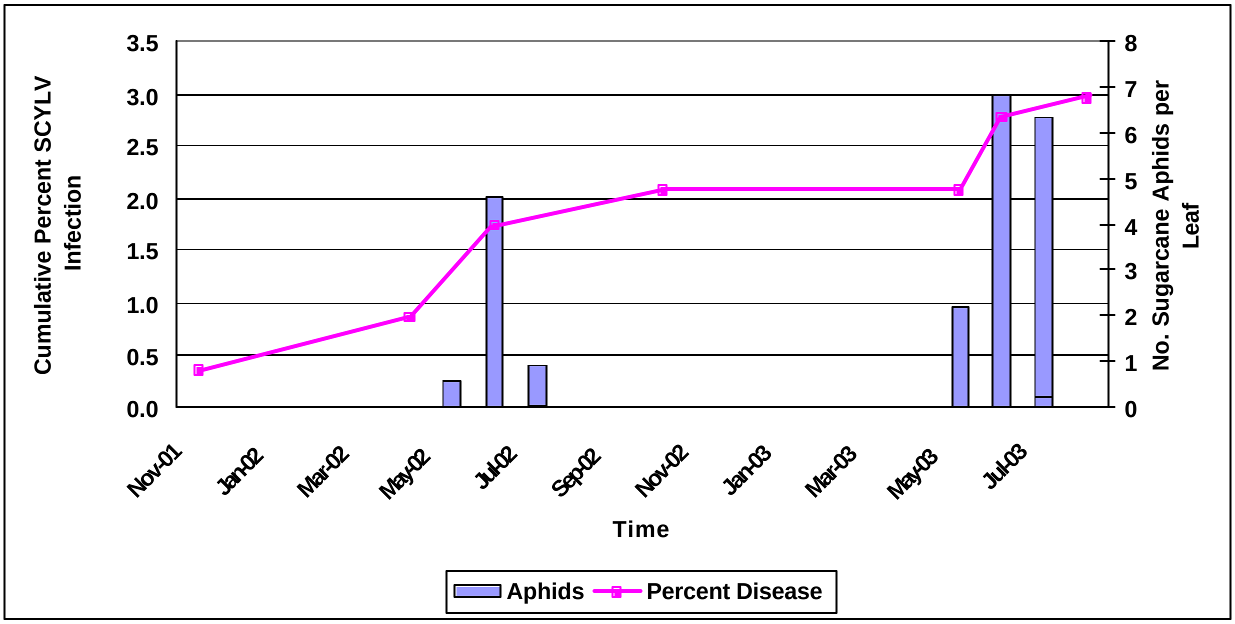
M. sacchari and *S. flava* infestations were monitored bi-weekly during April through July in 2002 and 2003. Infestations were monitored in each plot on the 3rd or 4th leaf down from the whorl on four randomly selected plants (two leaves on each of the two-plot rows). Both aphids infested all test locations each season. The aphid survey data at each location during two seasons suggests sugarcane aphids migrate to sugarcane fields in the spring then colonize and increase to peak population densities during the summer. The initial migration may be responsible for the rise in incidence of virus detected during the June sampling in study fields in each of two years (Figure 1). The lower rates of infection increase detected in some fields during late summer and fall suggests that, as the aphids settle to reproduce, they do not move extensively and spread infection from plant to plant.

The generally slow rate of SCYLV infection increase in both the survey fields and the extensively monitored study fields is encouraging. Infection levels were low in three study fields after two seasons despite annual infestions with the sugarcane aphid. This suggests that many aphids migrating into the fields were not carrying the virus, and inoculum levels in the industry must still be low. SCYLV was added to the tissue culture seedcane certification standards beginning in 2004. It is hoped that by providing sources of seedcane with little or no virus infection, yellow leaf disease levels in the industry can be kept low.

Table 1. Statewide survey for SCYLV in 17 sugarcane fields in 2002 and 2003.

Parish	2002 Infection	2003 Infection	Magnitude increase
Ascension	0%	0%	0
Calcasieu	2%	0%	0
Calcasieu	0%	0%	0
Iberia	0%	0%	0
Iberville	8%	8%	0
Jefferson Davis	24%	26.5%	1.1x
Lafourche	0%	0%	0
Pointe Coupee	0%	0%	0
Rapides	0%	0%	0
St. James	2%	0%	0
St. John	10%	12%	1.2x
St. Martin	2%	6%	3x
St. Mary	2%	2%	0
St. Mary	0%	0%	0
Terrebonne	4%	8%	2x
Vermilion	0%	0%	0
West Baton Rouge	14%	24%	1.7x

Figure 1. Progression of Sugarcane Yellow Leaf Virus infection and sugarcane aphid population dynamics in a field of LCP85-384 in Iberville Parish during plant cane (2002) and first rattoon (2003).



PATHOLOGY RESEARCH

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Pathology research addresses the important diseases affecting sugarcane in Louisiana. The overall program goal is to minimize losses to diseases in the most cost-effective manner possible. Projects receiving major emphasis during 2003 were billet planting, ratoon stunting disease (RSD) management; assessing the threat posed by our newest disease, sugarcane yellow leaf; improving our understanding of root disease; and breeding and selection of disease-resistant varieties. Research on billet planting and results concerning the spread and increase of yellow leaf are reported separately.

RATOON STUNTING DISEASE

RSD testing was conducted by the Sugarcane Disease Detection Lab for the seventh year during 2003. RSD was monitored in fields on commercial farms, in the American Sugar Cane League Variety Release Program, in the Local Quarantine (to provide healthy source material for commercial seedcane production), and at all levels of Kleentek® seedcane production (Table 1). In 1997, the first year of on-farm testing, the number of farms with RSD detected in at least one field, the frequency of fields with RSD-infected cane (across the entire industry), and the frequency of stalks within a field with RSD averaged 83, 51, and 12%, respectively. In 2003, these statistics had decreased to 32, 9, and 1%, respectively. These numbers had been declining progressively each season; the statistics were 10% and 5% for farms and fields, respectively, with RSD in 2002. However, more testing was conducted during 2003, and effort was made to test more fields per farm and different varieties. RSD no longer exhibits a typical pattern for a disease spread mechanically during planting and harvest, in which infection levels increase progressively with more harvests, and higher levels of disease are detected in ratoon or stubble crops (Table 2). The incidence of RSD was lowest in recent progeny of tissue culture produced seedcane (Table 3). However, many of the fields listed as "field run" were LCP 85-384 from Kleentek® seedcane that had been increased more than three times. There is very little heat-treated progeny in the industry any more. Factors associated with reductions in RSD are planting of certified healthy seedcane and widespread planting of LCP 85-384, a variety with some resistance to RSD spread. The testing results are encouraging. However, the sample size (20 stalks per field) used for RSD testing on farms is too small to reliably detect low levels of RSD infection. The results suggest that RSD is persisting on many farms in the industry at a low level. This could lead to a resurgence of RSD, if a susceptible variety becomes widely planted in the future. If farmers continue to use a healthy seedcane program, they have the opportunity to eliminate RSD from their farms.

Results were collected from second stubble of an RSD spread experiment comparing rates of disease spread in different varieties caused by harvest with a whole stalk or chopper harvester. The highest rates of RSD spread occurred in LCP 82-89 and HoCP 91-555. Rates of RSD spread caused by the whole stalk and chopper harvesters were similar.

SUGARCANE YELLOW LEAF

Sugarcane yellow leaf virus (SCYLV) causes yellow leaf, our most recent disease in Louisiana. Research is under way to determine the potential impact under Louisiana conditions. Results have been obtained from two experiments to determine the effect of SCYLV on yield of LCP 85-384 (conducted in cooperation with Dr. Mike Grisham at the USDA-ARS Sugarcane Research Unit Ardoyne experimental farm). No significant yield loss was detected in plant cane or two stubble crops in one experiment and plant cane in a second experiment. A tissue-blot immunoassay using imprints from leaf mid-ribs was used in the Sugarcane Disease Detection Lab for the detection of SCYLV (Table 4). Sources of Kleentek® seedcane were monitored for SCYLV for the fourth year, and very little virus was detected. The results from the yield loss experiment with LCP 85-384 suggest that yellow leaf may not significantly reduce yield. Nonetheless, if a problem was detected in a Kleentek® seedcane field, cane was not sold from that field. LCP 85-384 will become infected with the virus, and varieties grown in the future may be adversely affected by yellow leaf. Therefore, the decision was made to include yellow leaf in the seedcane certification standards. Louisiana Department of Agriculture and Forestry inspectors will collect leaves from seedcane fields during the June inspection, and the LSU AgCenter Sugarcane Disease Detection Lab will test the samples for SCYLV. It is hoped that providing the industry with near-virus-free seedcane will prevent a buildup of virus infection levels in commercial fields and help to manage this disease in the future.

A graduate student project conducted by Chris McAllister under the supervision of Dr. T. E. Reagan and Dr. J. W. Hoy is investigating the entomological and pathological factors affecting the spread and increase of sugarcane yellow leaf. A followup to a statewide survey was conducted during 2003 to evaluate disease increase, and rates of increase and patterns of disease spread were determined in two plant cane and two ratoon fields of LCP 85-384. The results of this research are reported separately.

ROOT DISEASE

A basic research project is in progress addressing the effects of root pathogens and disease on sugarcane growth and productivity. Pythium root rot and nematodes are known to be constraints to sugarcane growth and yield. However, evidence suggests that long-term cultivation of sugarcane can result in the development of a total soil microorganism community that is detrimental to sugarcane growth. Indirect evidence for this can be seen in the high yields obtained when cane is planted in “new ground” with no recent history of sugarcane cultivation. Three sites with paired fields, one with a long-term sugarcane cultivation history and one with no recent cultivation history, were compared for culturable microorganisms present in the rhizoshere soil (soil in close proximity to roots exposed to root exudates). Differences in the pattern of utilization of multiple substrates (potential food sources) were detected between soils from fields with and without a recent sugarcane cropping history. However, fields with a long-term sugarcane cropping history from different sites showed differences in substrate utilization profiles. Differences also were detected between soil microbial communities from fields with and without a sugarcane cropping history in the quantity and type of culturable microorganisms. These differences provide information about the possible changes in microbial community make-up that can result from sugarcane monoculture. We are attempting to identify the organisms that account for the differences in community make-up in soil from "new" and "old" ground fields. The hope is that improved understanding of the effects of the total soil microbial community on sugarcane root development will allow us to determine ways to manipulate or manage the community to promote root system health and improve plant growth.

SELECTION OF DISEASE-RESISTANT VARIETIES

Experimental varieties in the selection program are screened and rated for resistance to mosaic, smut, and leaf scald. Natural mosaic infection levels were determined in breeding program outfield yield trials. Little infection was detected in experimental varieties during 2003. Smut resistance in experimental varieties was evaluated in an inoculated test in which stalks were dipped in a smut spore suspension then planted during August 2001. Smut infection levels were determined during July 2003 and compared to infection levels in varieties with known resistance reactions. Within the experimental varieties, 17 (50%), 16 (47%), and 1 (11%) of 34 were rated as resistant, moderately susceptible, and highly susceptible to smut, respectively (Table 5). Leaf scald also was evaluated in experimental varieties using an inoculated test. During June, shoots were cut above the growing point and sprayed with leaf scald bacteria. Symptoms were evaluated later in the growing season, and clones were rated for their resistance level (Table 6). Ten (29%), 22 (65%), and 2 (6%) of 34 experimental varieties were rated as resistant, moderately susceptible, and highly susceptible to leaf scald.

Table 1. RSD testing summary for 2003.

Source	Location	No. of fields	No. of varieties	No. of samples
Louisiana growers	Statewide	443	10	8830
Variety Release Program	1° & 2° stations	-	17	1244
Goosecreek®	Foundation stock	-	1	8
Helena®	Foundation stock	-	4	25
Kleentek®	Foundation stock	-	6	26
Kleentek®	1° increase farms	13	3	250
Kleentek®	2° increase farms	30	3	600
Local Quarantine	LSUAC	-	14	89
Research	LSUAC	-	-	1379
Totals		486		12,451

Table 2. RSD field and stalk infection frequencies in different crop cycle years for all varieties combined during 2003.

Crop Year	Total number of fields	Average field infection (%)	Total number of stalks	Average stalk infection (%)
Plant cane	97	9.3	1934	2.1
First stubble	73	5.5	1453	0.5
Second stubble	118	10.2	2352	1.5
Older stubble	148	9.5	2951	1.1
Totals	436	8.9	8690	1.3

Table 3. RSD field and stalk infection frequencies as affected by healthy seedcane programs for all varieties combined during 2003.

Seedcane program	Total number of fields	Average field infection (%)	Total number of stalks	Average stalk infection (%)
Heat-treated	4	25	80	2.5
Kleentek®	260	8	5179	1.1
Goosecreek®	34	12	677	0.7
Field-run	123	11	2454	2.1

Table 4. Sugarcane yellow leaf virus testing summary for 2003.

Source	Location	No. of fields	No. of varieties	No. of samples
Louisiana growers	State-wide	2	1	102
LSUAC	St. Gabriel & Iberia	-	41	541
Kleentek®	Foundation stock	-	9	39
Kleentek®	1° increase farms	30	7	597
Kleentek®	2° increase farms	45	3	983
Local Quarantine	LSUAC	-	14	89
Research	LSUAC	-	-	8189
Totals		77		11,593

Table 5. Smut infection level and resistance ratings for experimental varieties determined from an inoculated test during 2003.

Variety	Infection (%)	Rating[x]	Variety	Infection (%)	Rating[x]
CP 65-357	50	9	HoCP 00-933	0	1
CP 73-351	50	9	HoCP 00-934	0	1
CP 74-383	27	6	HoCP 00-939	0	1
CP 81-335	15	4	HoCP 00-942	1	2
Ho 95-988	15	4	HoCP 00-945	9	4
HoCP 96-540	5	3	HoCP 00-950	0	1
L 97-128	17	5	HoCP 00-951	0	1
L 98-209	9	4	HoCP 00-960	0	1
L 99-226	31	6	L 01-280	0	1
L 99-233	25	6	L 01-281	0	1
HoCP 99-825	8	4	L 01-283	1	2
HoCP 99-866	7	3	L 01-290	3	2
L 00-247	14	4	L 01-292	0	1
L 00-259	10	4	L 01-296	19	5
L 00-266	24	6	L 01-299	68	9
L 00-268	16	5	L 01-300	2	2
L 00-270	29	6	L 01-306	14	4
HoCP 00-905	7	3	L 01-312	0	1
HoCP 00-927	11	4	L 01-314	16	4
HoCP 00-930	23	5	L 01-315	0	1

[x]Resistance ratings assigned on a 1-9 scale in which 1-3 = resistant, 4-6 = moderately susceptible, and 7-9 = highly susceptible.

Table 6. Leaf scald resistance ratings for experimental varieties determined from an inoculated test during 2003.

Variety	Rating[x]	Variety	Rating[x]	Variety	Rating[x]
CP 65-357	6	L 00-266	5	L 01-280	6
CP 73-351	5	L 00-268	3	L 01-281	7
CP 74-383	8	L 00-270	2	L 01-283	4
CP 81-335	4	HoCP 00-905	2	L 01-290	3
Ho 95-988	5	HoCP 00-927	5	L 01-292	5
HoCP 96-540	4	HoCP 00-930	3	L 01-296	6
L 97-128	4	HoCP 00-933	3	L 01-299	5
L 98-209	4	HoCP 00-934	4	L 01-300	5
L 99-226	5	HoCP 00-939	5	L 01-306	4
L 99-233	5	HoCP 00-942	6	L 01-312	2
HoCP 99-825	5	HoCP 00-945	3	L 01-314	3
HoCP 99-866	5	HoCP 00-950	7	L 01-315	5
L 00-247	5	HoCP 00-951	6		
L 00-259	2	HoCP 00-960	4		

[x]Resistance ratings assigned on a 1-9 scale in which 1-3 = resistant, 4-6 = moderately susceptible, and 7-9 = highly susceptible.

WEED CONTROL RESEARCH WITH LABELED AND NEW HERBICIDES

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For the 2003 growing season, research was conducted at the St. Gabriel Research Station and in Assumption, Lafayette, Iberia, St. James, St. Martin, St. Mary, and West Baton Rouge parishes.

Sugarcane Response and Weed Control with Herbicides Applied From Planting through Layby

At 90 days after application of herbicides at planting in 2002, bermudagrass was controlled 90 to 93% with Dupont K4 (4 lb/A) and Command (3.33 or 2.67 pt/A) plus Direx and 80% with Command (3.33 pt/A) plus Spartan. Bermudagrass control was only 20 to 40% with Prowl plus Sencor, Prowl plus atrazine, Sencor alone, and Sencor plus Direx. Weed control was impressive considering that on September 25 and October 3, 2002, heavy rainfall was received from two tropical systems, Tropical Storm Isidore and Hurricane Lili.

Two studies were conducted using LCP 85-384 to evaluate injury potential with Dupont K4 (4 lb/A) compared with Direx applied in late March and with Dupont K4 applied sequentially in spring followed by a directed application at layby in late May. Sugarcane and sugar yield were not negatively affected by the herbicide treatments. Another study evaluated sugarcane injury potential with Dupont K4 (4 lb/A), Prowl plus Direx, or atrazine applied postemergence overtop in March, April, or May. For the March application maximum air temperature for the period seven days before and seven days after application ranged from 59^{o} to 81^{o} F with an average of 73.2^{o}. For the April application maximum air temperature for the 15-day period ranged from 78^{o} to 86^{o} with an average of 82.8^{o}. For the May application, maximum air temperature for the 15-day period ranged from 83^{o} to 92^{o} with an average of 88.2^{o}. Significant injury to LCP 85-384 and reduced sugarcane and sugar yield occurred only for the mid-May application of Dupont K4 and Direx. It can be concluded that the response is temperature related and, if temperature at the time of application is around 85^{o}, Dupont K4 or Direx should not be applied over the top of sugarcane.

For Valor applied at 8 oz/A in late March, sugarcane was injured around 30% 21 days after treatment. Injury consisted of reddening of foliage and stunting. Sugarcane was able to recover from the early season injury and, even when Valor was applied at layby following a previous March application, sugarcane growth was not affected negatively. Entire leaf morningglory control 24 days after layby was around 94% for Valor at 4 oz/A compared with 81% for atrazine at 2 qt/A. Differences in sugarcane and sugar yield among treatments were not observed.

In-crop Johnsongrass Control Research

Johnsongrass was controlled 34 days after treatment 33% with Asulox at 2 qt/A and 86% with Asulox at 2 qt/A plus Envoke at 0.3 oz/A. This compares with around 65% for Asulox at 4 qt/A or Envoke at 0.3 oz/A applied alone. Sugarcane injury was no more than 10% where Envoke was applied alone or with Asulox, and height differences among herbicide treatments were not observed. The combination of 2 qt/A Asulox (half rate) plus Envoke provided greater johnsongrass control than 4 qt/A Asulox (full rate) applied alone. In another study, injury to LCP 85-384 following an April application of Envoke was no more than 11% and consisted of stunting and white banding on newly emerging leaves. By 43 days after application, sugarcane height was not affected negatively. Sugarcane and sugar yields were equivalent for the Envoke and the standard treatments.

Red Morningglory Control Research

Red morningglory was controlled 91 to 96% 43 days after soil application at layby of Spartan at 4 to 8 oz/A. Atrazine at 4 qt/A controlled morningglory 76%. For Dupont K4, 4 lb/A controlled morningglory 96% and 3 lb/A provided 88% control, but control was 59% when the rate was reduced to 2 lb/A. Sencor provided no more than 82% morningglory control. Control with Valor was 97% at 8 oz/A, 86% at 6 oz/A, and 76% at 4 oz/A.

Harvest Aid Research

Pitted morningglory with 3- to 4-foot runners was controlled three days after application in August 85 to 90% with Aim at 1, 1.5, and 2 oz/A and around 35% with ET-751 at 0.5 and 1 oz/A. In contrast, red morningglory control was 75 to 80% with the Aim treatments and around 40% with the ET-751 treatments. Indications are that pitted morningglory may be more sensitive than red morningglory to Aim. In standing sugarcane with red morningglory as tall as the crop, weed control 13 days after a September application was 93% with 2,4-D, 73% with Aim at 1.9 oz/A, and 65% with atrazine at 3 qt/A. By 34 days after treatment, red morningglory was controlled 83 to 87% with atrazine at 3 qt/A, Aim at 1.9 oz/A, and Clarity at 16 oz/A compared with 98% with 2,4-D. In contrast the ET-751 treatments and the lower rates of atrazine and Aim controlled red morningglory 33 to 55%.

Note: Specific data and comments for all experiments conducted are presented in the Weed Science 2003 Annual Research Report and can be viewed at www.lsuagcenter.com/weedscience under the category "Weed Science Related Publications."

EVALUATION OF REDUCED TILLAGE IN PLANT AND STUBBLE SUGARCANE

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In 2002 preliminary studies at three locations in both plant and stubble sugarcane were conducted to evaluate the feasibility of eliminating the off-bar tillage operation. The experimental design was a randomized complete block with a factorial arrangement of treatments. Factor A represented tillage or no tillage in March. Factor B was herbicide treatments, which included Velpar plus Direx (11 oz/A + 2.25 lb/A), Prowl plus Direx (4 qt/A + 2.25 lb/A), Prowl plus Sencor (4 qt/A + 1.5 lb/A), Command plus Direx (2.7 pt/A + 2.25 lb/A), and atrazine (2 qt/A). Results showed that spring herbicide application and reduced tillage were not limiting factors to early-season sugarcane growth, and at one location sugarcane growth was improved by eliminating the off-bar tillage operation.

Experiments were conducted in St. Gabriel, La. in 2002 and 2003 and in Glencoe, La. in 2003 to evaluate the effect of tillage throughout the growing season on weed control and sugarcane growth. Early-season herbicide application method was also evaluated to determine the effect on weed control when tillage was reduced or eliminated. The experimental design was a randomized complete block with a factorial treatment arrangement and four replications. Factor A was off-bar tillage (with or without) and factor B was layby tillage (with or without). Factor C represented early-season herbicide application method (band or broadcast). The sugarcane variety used in the study was 'LCP 85-384,' and the herbicide used in the study was Dupont K4 (4 lb/A). Data collected included soil temperature, shoot and stalk population, plant height, and sugarcane yield and sugar yield. Weed control was not a detriment to sugarcane growth or yield in the three experiments. Soil temperature in the sugarcane drill was not affected by spring tillage. Early-season sugarcane shoot population and late-season stalk population in both years were each equivalent for the full tillage (off-bar plus layby) and the no tillage program. Sugarcane tonnage and sugar yield were not affected negatively when tillage operations were eliminated.

ALTERNATIVE WEED CONTROL PROGRAMS USING REDUCED TILLAGE PRACTICES IN FALLOWED SUGARCANE FIELDS

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Weed problems, especially the perennial weeds bermudagrass [*Cynodon dactylon* (L.) Pers.] and johnsongrass [*Sorghum halapense* (L.) Pers.], increase in the successive crops and, over time, sugarcane plant populations are reduced to the point that replanting is warranted. Sugarcane fields are then fallowed, and tillage and glyphosate programs are used to reduce weed infestation levels. A study was conducted in Donaldsonville, Louisiana, to evaluate various weed control programs in fallowed sugarcane fields, specifically to compare mechanical destruction of sugarcane stubble followed by tillage, soil-applied herbicide, and/or Roundup UltraMAX applications (conventional programs) with a no-till system where Roundup UltraMAX was used to kill sugarcane stubble. Another similar study was conducted in Henderson, Louisiana, to evaluate only the conventional programs. At planting, at both locations, DuPont K4 (4 lb/A) was applied broadcast across all treatments to evaluate the effects of the various weed control programs implemented during the fallow period.

At the Donaldsonville location, 14 days prior to planting on August 28, weeds were present in all plots, with the population depending on when a tillage or Roundup UltraMAX application was performed. The most important determinant of the effectiveness of the various fallow programs, however, would be the level of weed reinfestation that would occur after sugarcane was planted. One month after planting, as expected, differences in sugarcane shoot emergence were observed, and results showed fewer shoot emergence for the conventional system where only tillage was used or when only tillage and one Roundup UltraMAX application was used. At 50 d after planting (DAP) purple nutsedge (*Cyperus rotundus* L.), bermudagrass, and johnsongrass were controlled 72 to 82% for the no-till programs compared with less than 60% purple nutsedge and bermudagrass control for the conventional programs. These data suggest that a no-till system can be used in fallow fields to manage weeds equal to or better than conventional tillage programs without affecting soil preparation negatively prior to planting or sugarcane stand establishment.

At the Henderson location, bermudagrass present at planting where only tillage operations were performed resulted in some difficulty in opening rows and in covering planted sugarcane stalks. However, sugarcane shoot emergence 36 DAP was not affected negatively by any of the conventional fallow programs. Bermudagrass ground cover 36 and 86 DAP showed that tillage alone provided little control of bermudagrass. Bermudagrass control, however, was excellent where tillage was followed by Roundup UltraMAX 7, 28, or 47 days ahead of planting. Results also show that even though DuPont K4 programs were effective in controlling bermudagrass when used in conjunction with Roundup UltraMAX, they were no more effective than when DuPont K4 was substituted by a tillage operation. However, use of a soil treatment such as DuPont K4 may offer advantages in years when wet soil would prevent field activities.

BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet planting. During 2003, results were obtained from billet planting experiments conducted at the St. Gabriel Research Station at St. Gabriel, La. The experiments included LCP 85-384 plant cane, first and second stubble experiments comparing billet date and rate of planting and an experiment in first stubble comparing billet and whole stalk planting in HoCP 85-845 and HoCP 91-555.

Yield differences were detected in the plant cane date of planting test (Table 1). An early August planting date was not included in this experiment. Instead, a late planting date during mid-October was included. The mid-August planting date produced higher yields than the mid-September and October planting dates. The stalk population for the mid-August planting date was higher than for the late-August planting date, but the tonnage and sugar per acre yields were similar. Yield components for the October planting date were lower than yields obtained from the mid-September planting date. Sugar per ton was higher for the late-August planting date than for the September and October planting dates (data not shown). Yield differences were not detected in plant cane or first stubble of the date of planting test planted in 2001 (Table 2), except that sugar per ton was higher for the late-August planting date than for the mid-August and late-September dates (data not shown). The yield differences detected in plant cane for the experiment planted in 2000 were no longer evident in first stubble or second stubble (Table 3).

In the plant cane of the rate of billet planting experiment, the lowest stalk population was obtained from the one billet planting rate for both planting dates (Table 4). The maximum stalk population was achieved by the six billet planting rate for the August planting date and by the nine billet planting rate for the September planting date. Fewer treatment differences were detected for tonnage and sugar per acre (Table 4). More differences were detected for the September planting date than for the August date. Tonnage was higher for the six or more billet planting rates than for the one billet planting rate for the August date, whereas the highest sugar per acre yield was obtained from the 12 and nine billet planting rates for the September date. Stalk weight was highest for the one and three billet planting rates for the September date (data not shown). Yield differences detected in plant cane during 2002 were still evident for the August planting date in first stubble (Table 5). Tonnage and sugar per acre were higher for the six billet planting rate than for the three and one billet planting rates. The nine or 12 billet planting rates did not provide any additional yield. Stalk weight was higher for the one billet planting rate than for the 12 billet rate (data not shown). The one billet planting rate produced the lowest tonnage yield in the experiment planting during 2000, yields were similar for all planting rates in first stubble, and the nine billet planting rate treatment produced the highest tonnage in second stubble (Table 6). Sugar per acre yields were similar (data not shown).

HoCP 85-845 and HoCP 91-555 responded well to billet planting in plant cane and first stubble (Table 7). No differences were detected in tonnage or sugar per acre yield between billet and whole stalk plantings in first stubble.

The results obtained during 2003 were similar to those from experiments in previous years. A planting date outside the traditional planting period (in this case, an October planting date) produced lower yield. Stubble yields were similar for billet plantings made from mid-August to late-September. Low billet planting rates produced reduced stalk populations and lower yields, and the differences associated with planting rate were more pronounced with the September planting date. Lower yield associated with low planting rate persisted into first stubble in one case. As long as large gaps do not occur in the plant cane stand, the ratooning ability of LCP 85-384 provides some ability to recover during the subsequent stubble crops. It is not certain whether future varieties will respond the same way. Early results with HoCP 91-555 and HoCP 85-845 are promising. Experimental varieties being considered for release to the industry will need to be evaluated for billet planting tolerance.

It is very important to do a good job of planting billets. Billets are more sensitive than whole stalks to any planting problem. The research results from this and previous years suggests that practices to maximize the chance of success with billet planting include: providing a well-prepared seedbed, planting long (20-24 inch) billets with a low level of physical damage, planting at a high rate (approximately six running billets in the furrow), covering with a uniform layer of no more than 3 inches of packed soil, and providing good drainage and careful weed control.

Table 1. Effect of date of planting on 2003 plant cane yield of billet planted LCP 85-384.

Date of planting	Stalks/acre (x1000)	Tons cane per acre	Sugar per acre (lbs.)
August 18	49,268 a	36.9 a	7116 a
August 27	44,268 b	34.1 ab	6534 ab
September 13	43,946 b	32.3 b	6285 b
October 18	37,054 c	26.8 c	5072 c

Average values for the different yield components followed by the same letter were not significantly different (P = 0.05).

Table 2. Effect of date of planting on 2002 plant and 2003 first stubble yields of billet planted LCP 85-384 at the St. Gabriel Research Station.

Date of planting	Tons cane per acre		Sugar per acre (lbs.)	
	Plant cane	First stubble	Plant cane	First stubble
August 23	44.0	30.5	8943	5192
August 28	42.1	29.3	8496	5259
September 17	46.0	31.2	9199	5323
September 28	45.4	31.5	8854	5351

Yield values within columns were not significantly different (P = 0.05).

Table 3. Effect of date of planting on 2001 plant, 2002 first stubble, and 2003 second stubble yields of billet planted LCP 85-384 at the St. Gabriel Research Station.

Date of planting	Tons cane per acre			Sugar per acre (lbs.)		
	Plant cane	First stubble	Second stubble	Plant cane	First stubble	Second stubble
August 3	43.3 b	43.4	27.8	8972 b	9006	4397
August 15	44.5 b	41.9	28.1	9296 b	8582	4231
August 31	49.8 a	42.6	25.6	10402 a	8675	4425
September 18	49.7 a	42.1	35.4	9607 ab	8203	5886
September 28	45.0 b	40.0	27.6	9200 b	8111	4439

Average values for the different yield components within a crop cycle year followed by the same letter were not significantly different (P = 0.05).

Table 4. Effect of rate of planting on 2003 plant cane yield of LCP 85-384 planted as billets on two dates at the St. Gabriel Research Station.

Rate	Stalks/acre		Tons cane per acre		Sugar per acre (lbs)	
	Aug 15	Sep 16	Aug 15	Sep 16	Aug 15	Sep 16
1 billet	36313 c	31938 d	36.6 b	33.8 c	7074 b	6421 c
3 billets	44896 b	42604 c	41.2 ab	45.1 ab	8034 ab	8508 b
6 billets	50271 a	47875 b	45.4 a	43.6 b	8811 ab	8616 b
9 billets	51146 a	54667 a	46.1 a	46.6 ab	9275 a	9133 ab
12 billets	49646 ab	58354 a	45.3 a	53.0 a	9172 ab	10854 a

Average values for different yield components within a date of planting followed by the same letter were not significantly different among the different planting rates (P = 0.05).

Table 5. Effect of rate of planting on 2002 plant cane and 2003 first stubble yields of LCP 85-384 planted as billets at five rates on two dates.

	Plant cane tons per acre		First stubble tons per acre		Plant cane sugar/acre		First stubble sugar/acre	
Rate	Aug 23	Sep 17	Aug 23	Sep 17	Aug 23	Sep 17	Aug 23	Sep 17
1 billet	34.8 b	34.3 c	31.6 c	33.4	6734 b	6442 c	5787 ab	6051
3 billets	40.0 ab	38.7 bc	30.4 c	35.8	8355 a	6913 bc	5489 b	6136
6 billets	42.0 ab	43.5 ab	35.4 a	35.4	8773 a	8747 a	6454 a	6027
9 billets	43.1 ab	47.1 a	34.7 ab	35.0	8656 a	8068 abc	6083 ab	6105
12 billets	46.2 a	45.8 ab	32.4 bc	33.2	9525 a	8383 ab	5895 ab	5682

Average values for tons of cane per acre within a column (crop cycle year and date) followed by the same letter were not significantly different (P = 0.05).

Table 6. Effect of rate of planting on 2001 plant cane, 2002 first stubble, and 2003 second stubble yields of LCP 85-384 planted as billets at five rates on two dates.

	Plant cane tons per acre		First stubble tons per acre		Second stubble tons per acre	
Rate	Aug 22	Sep 18	Aug 22	Sep 18	Aug 22	Sep 18
1 billet	56.1 b	46.9 b	48.5	38.8	5302 b	30.5 ab
3 billets	66.9 a	57.9 a	50.4	41.0	5130 b	28.9 b
6 billets	65.4 a	63.6 a	46.8	42.2	5243 b	28.1 b
9 billets	65.2 a	58.3 a	45.9	44.5	6431 a	33.2 a
12 billets	66.7 a	62.5 a	45.8	42.0	5188 b	27.7 b

Average values for tons of cane per acre within a column (crop cycle year and date) followed by the same letter were not significantly different (P = 0.05).

Table 7. Comparison of yields obtained from 2002 plant cane and 2003 first stubble for two varieties, HoCP 91-555 and HoCP 85-845, planted as billets and whole stalks at the St. Gabriel Research Station.

Variety	Treatment	Tons cane/acre 2002	Tons cane/acre 2003	Sugar/acre (lbs.) 2002	Sugar/acre (lbs.) 2003
HoCP 91-555	Billet	49.4	34.4	8786	6923
	Whole stalk	43.5	33.8	7519	7003
HoCP 85-845	Billet	39.1	36.2	7901	6839
	Whole stalk	35.8	39.2	7037	7469

Yields were not significantly different (P = 0.05).

CULTURAL PRACTICES RESEARCH IN SUGARCANE IN 2003

Chuck Kennedy and Allen Arceneaux

in cooperation with
St. Gabriel Research Station, USDA, ARS, MSA Soil and Water Research, Baton Rouge, LA,
and USDA, ARS, MSA Sugarcane Research, Houma, LA

SUMMARY

Field experiments were conducted in 2003 to test the effects of management practices on yield and yield components of sugarcane.

The residual effect of harvesting a plant cane crop in early October vs early December resulted in 30-34% less cane for the subsequent ratoon crop when harvested in October, 20-30% when harvested in November, and 18-25% when harvested in December. The apparent quality of seed material (plant cane vs ratoon cane) of LCP85-384 and depth of soil cover over billets interacted for cane and sugar yield response. Yields were lower from the ratoon source and were exacerbated by a cover depth of 2 to 3 inches. Best yields across planting sources occurred at a cover depth of 4 to 5 inches. Cane and sugar yield of 2nd ratoon LCP85-384 following burning the previous harvest=s residue was not significantly different than any other residue management program, including leaving the residue undisturbed and untreated. Plant population, however, was lower for management programs that left the crop stubble covered.

OBJECTIVES

This research is designed to provide information on cultural practices in an effort to help cane growers produce maximum economic yields and thereby a more profitable production system. This annual progress report is presented to provide the latest available data on certain practices and not as a final recommendation for growers to use all of these practices. Recommendations are based on several years of research data.

RESULTS

Harvest Date on Subsequent Yields

It is well established that later harvest of sugarcane often results in higher natural sugar yield. Date of harvest for plant cane crops also can affect subsequent stubble yields. As expected, lowest tonnage stubble crops occurred with an October harvest, and this was exacerbated by an early harvest of the previous plant cane (Fig.1). LCP85-384 was slightly more responsive and outperformed HoCP -555 when plant cane was harvested later.

Residue Management/Stubble Protection

Soil temperature ~3.5 inches deep in the cane bed of second stubble LCP85-384 was only moderately affected by residue management. When average daily air temperature (ADAT) was below 50, leaving the residue mat resulted in slightly warmer average daily soil temperature (ADST). When ADAT was above 50, ADST became increasingly higher for treatments that removed the residue from the cane bed (Fig. 2). The differences in ADST between treatments during winter were relatively small, amounting to only 1-2 F on average.

With an average of 4 T of residue/acre remaining on the field into spring, we did not find a significant difference in residue from Jan. 2003 to March 2003 for residue plots amended with UAN, stabilized urea, or molasses compared to the untreated check(Fig. 3). Shoot population averaged about 40,000 millable stalks/acre by August. Plots where residue was removed had about 26% more stalks than plots where residue was treated or left undisturbed (Fig.4). Yield ranged from 25.5 to 28.2 T/acre, whole-stalk sample CRS ranged from 161.5 to 176.8 lbs/T and Lbs sugar/acre ranged from 4288 to 4764. Plots where residue was treated with N during the winter had lower to significantly lower cane yields than plots where residue was removed (Fig. 5), but there were no statistical differences among treatments for sugar yields (Fig.6).

Depth of Cover and Seed Source

Using a potentially weaker seed source (ratoon stock vs plant cane stock) resulted in lower sugar yields when less soil cover was employed at planting (Fig.7). This interaction occurred primarily through cane yield differences with a slight interaction in CRS (Fig. 8).

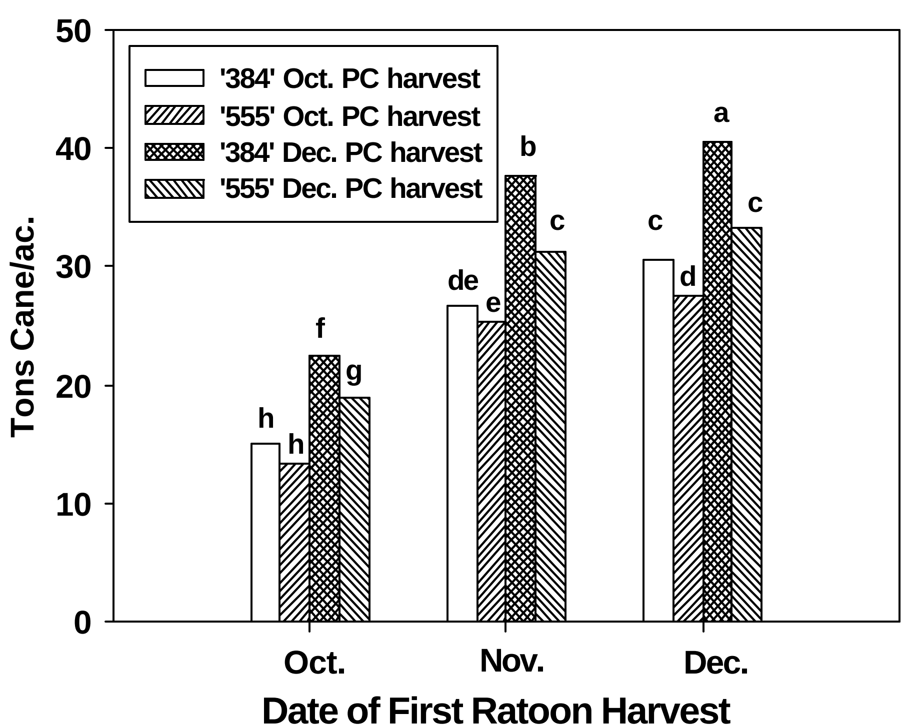


Fig. 1. The effect of harvest date and previous harvest date on first ratoon cane yield of two varieties. Bars with the same letter are NS at *P≤0.05*.

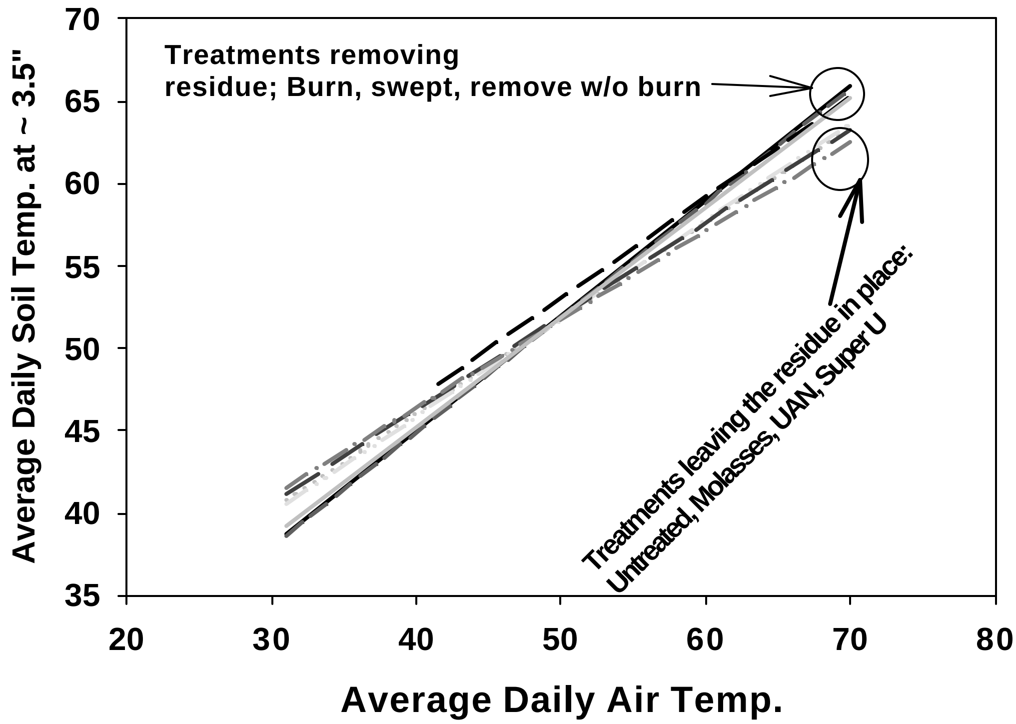


Fig.2. Relationship between air temp. and soil temp. changes with residue treatment.

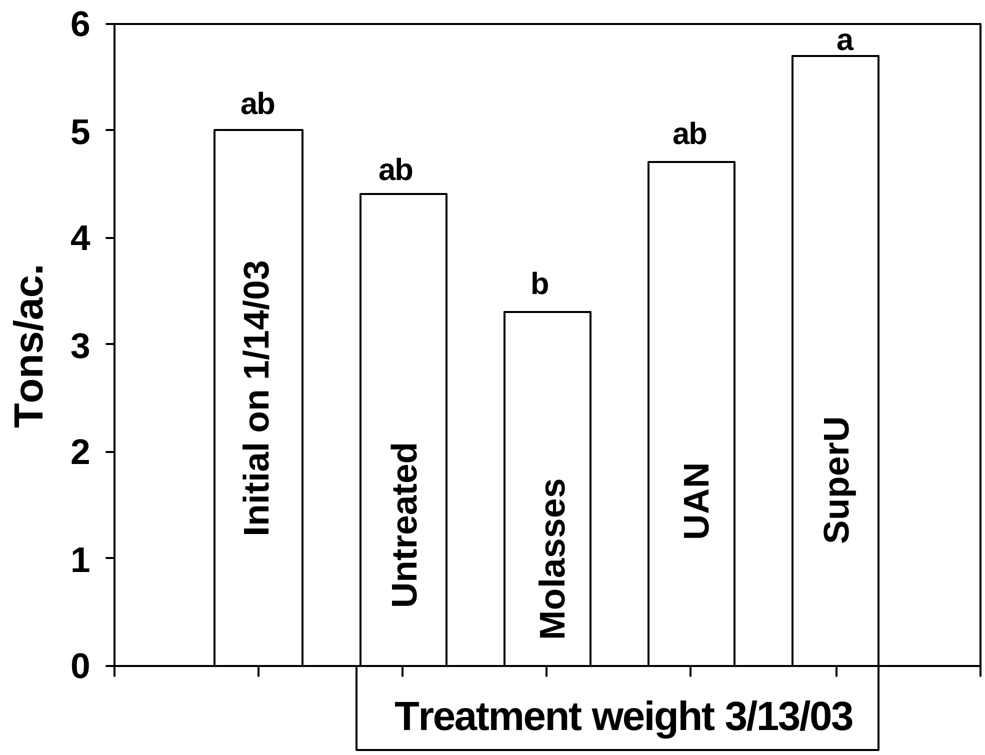


Fig.3. The effect of residue treatments applied in Winter on residue remaining in the Spring

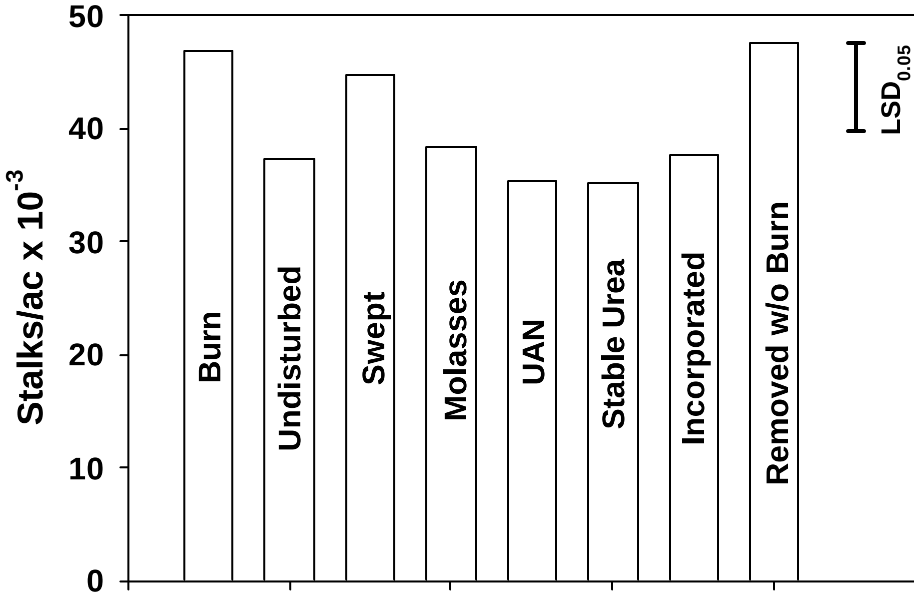


Fig. 4. The effect of harvest residue management on stalk population of 2nd ratoon LCP85-384.

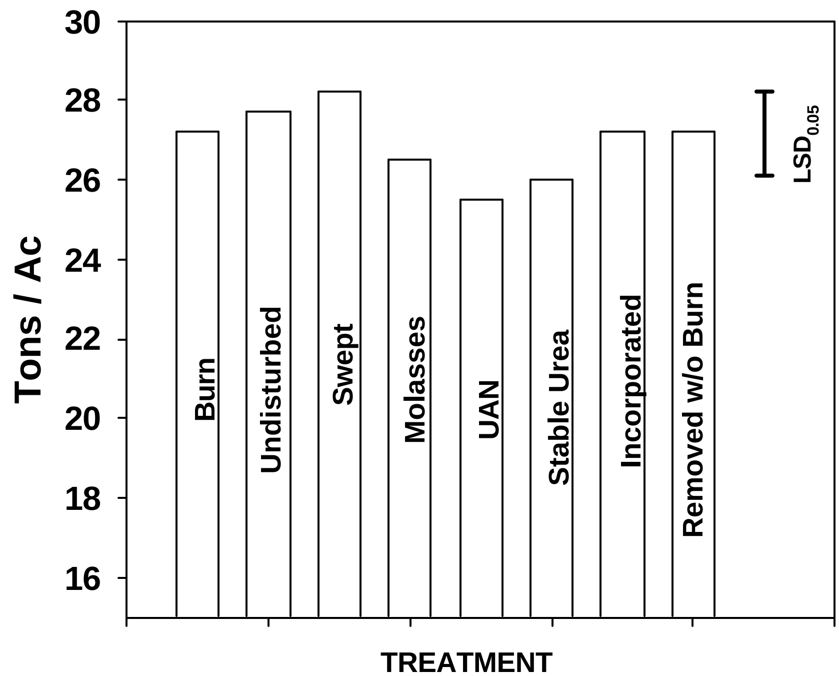


Fig. 5. The effect of residue management treatment on cane yield of 2nd stubble LCP85-384.

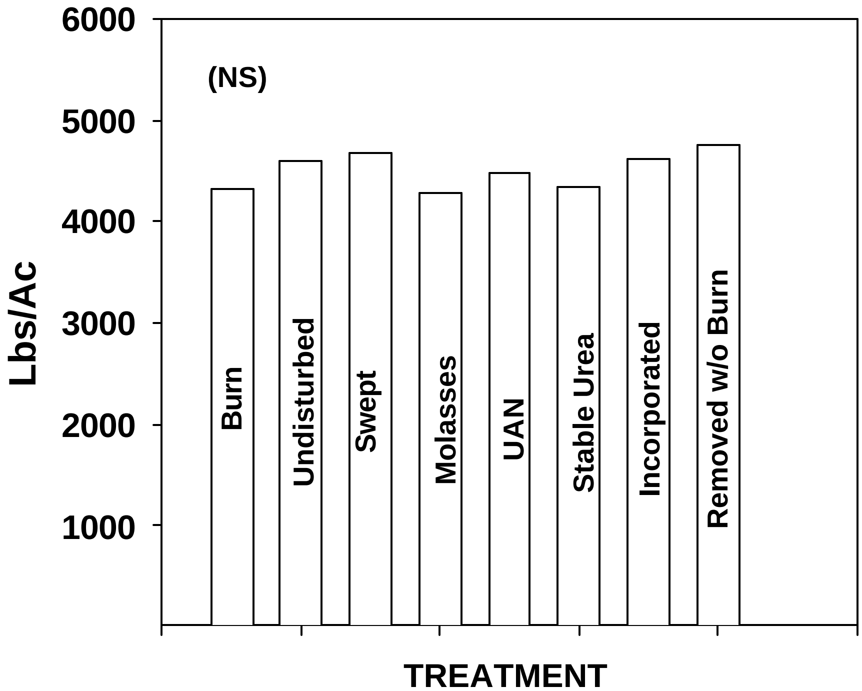


Fig.6. The effect of residue management of 2nd ratoon LCP85-384 on sugar yield.

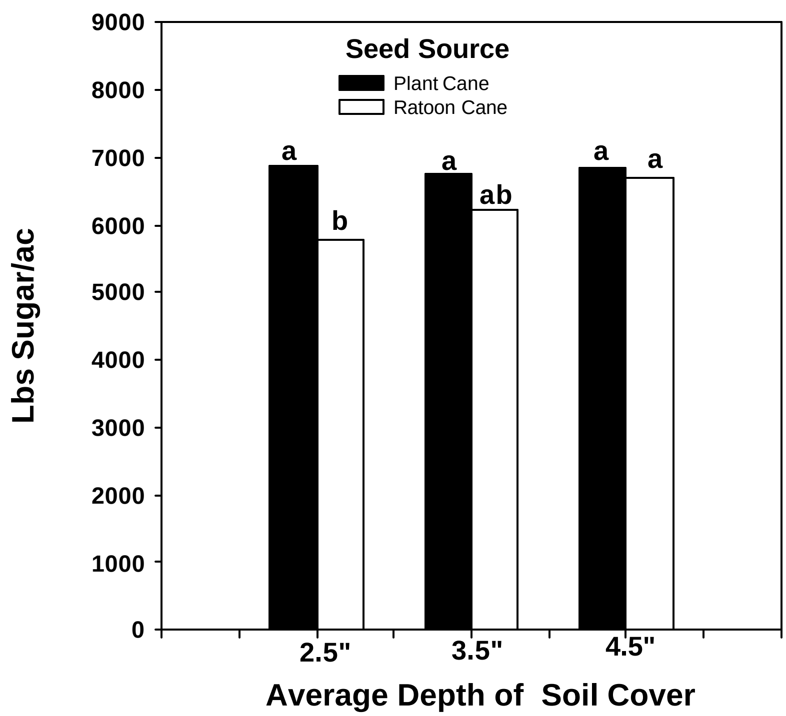


Fig. 7. The effect of seed source and depth of soil cover on yield of LCP85-384. Bars with the same letter are NS at *P≤0.05.*

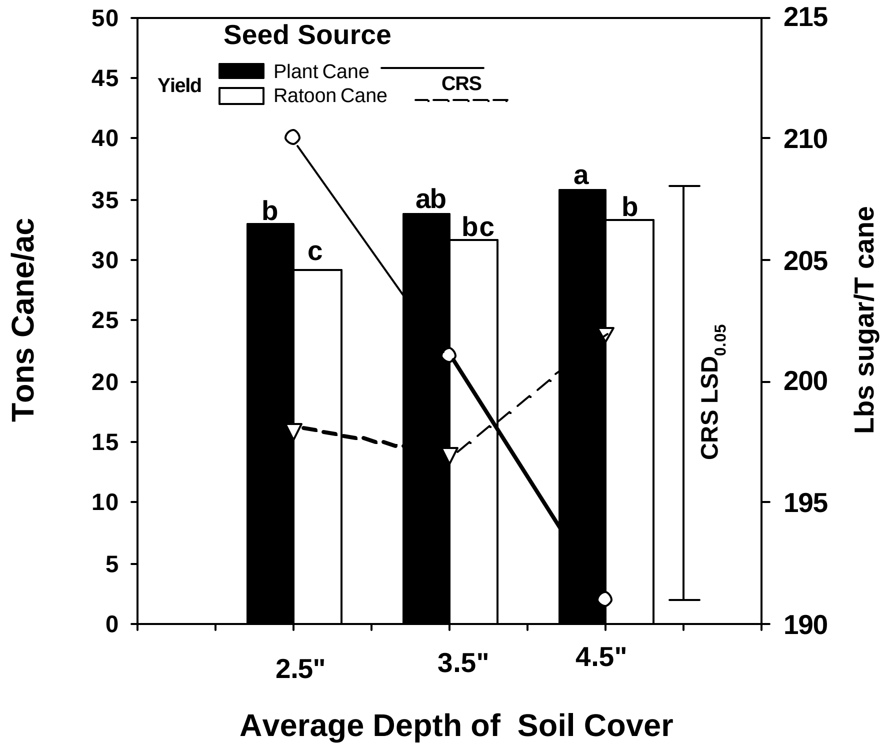


Fig. 8. The effect of seed source and depth of soil cover on yield and CRS of LCP85-384. Bars with the same letter are NS at *P≤0.05.*

ACKNOWLEDGMENTS

The authors wish to express appreciation for the financial support by the American Sugar Cane League.

LONG-TERM EVALUATION OF THE EFFECTS OF COMBINE TRASH BLANKET ON SUGARCANE YIELDS
(Cycle No. Two – First Stubble Results)

Howard P. Viator
Iberia Research Station

SUMMARY

A study designed to evaluate the long-term consequences and benefits of the trash blanket generated by combine harvesting was initiated using LCP 85-384 plant cane in 1997. Each cane cycle, beginning with the plant cane harvest, three treatments are established for all ratoon crops in the cycle: ratoon cane grown on rows with the trash blanket (GCTB); ratoon cane grown on rows from which the trash blanket will be repositioned in the furrow in the fall (TBR); and ratoon cane grown on rows with residue from the combining of cane burned standing (BSTB). First stubble of cycle no. two was harvested in the fall of 2003. Sugar/acre yields for GCTB, TBR and BSTB were 4,920, 4,958 and 6,649 pounds/acre (P=.10), respectively. When comparing treatment means as an average of the five crops to date (three in cycle one and two in cycle two) , cane plots on which residue was retained averaged over 500 pounds of sugar per acre (P=.005) less than the other residue management treatments.

INTRODUCTION

Research under Louisiana conditions has consistently shown a two to four tons of cane per acre decrease in yield when combine residue is not removed from the field before springtime. Waiting to remove trash in February or March by either burning, raking or shaving has not produced consistent positive results relative to fall removal. The trash blanket influences ratoon yields negatively by trapping soil moisture, lowering soil temperature and possibly liberating allelopathic chemicals. The positive effects of the green cane trash blanket include moisture conservation, reduction in soil erosion, cold protection and the suppression of weeds. A longer-term effect may be the enhancement of soil organic matter. South African research under tropical conditions has shown that long-term trash retention (green-cane harvesting) allowed for lower N and K fertilizer rates after a number of years. The primary objective of this research effort is to evaluate the impact of residue management on cane yield and soil organic properties on a long-term basis.

PROCEDURES

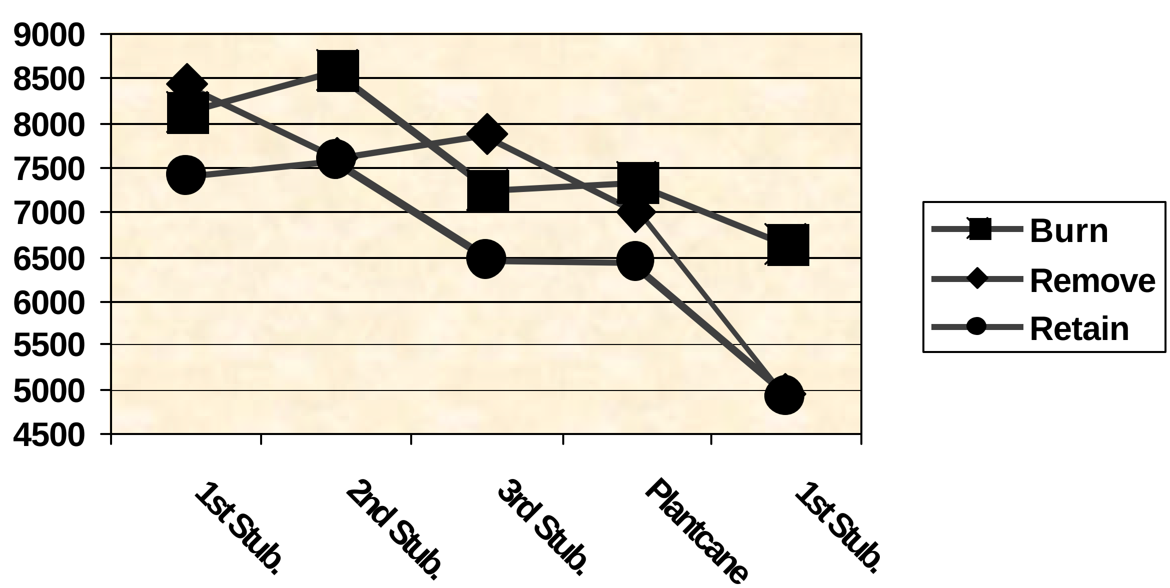
In November 1997, a field of LCP 85-384 plant cane was divided in two and the cane on a third of the rows in each half was burned standing prior to combining. The rows of cane in the remaining two-thirds of each half were green chopped and the leafy trash residue was broadcast evenly over the field by the combine. Shortly after harvest, the trash blanket was removed from the tops of half of the rows receiving the combine residue in each half of the field. The resultant three treatments are: 1) ratoon cane grown on rows with residue from the combining of cane burned standing; 2) ratoon cane grown on rows with residue from the combining of green cane; and 3) ratoon cane grown on rows from which combine residue was removed. These same treatments will be initiated with plant cane and imposed for each ratoon crop of at least two cropping cycles (three ratoon crops per cycle). Standard herbicide and cultural practices will be employed for all treatments.

Treatment plots are three rows wide and 365 feet in length, arranged in a randomized block design and replicated twice. Long-term effects of residue management will be ascertained by measuring the direct effects on cane and sugar yield over time. Additionally, changes in organic matter content and fertility status of the soil will be monitored. An appropriate analysis of variance will be used to determine significant differences among the treatment means.

RESULTS

The graph below shows sugar per acre yields for the three residue management treatments for all five crops across two cycles. A clear trend has emerged, with the standing burn treatment consistently yielding the best and the retained residue treatment the worst. While all yields appear to be lower with each successive harvest, it is believed to be a year effect and not a carryover effect of the imposed treatments.

Research is partially supported by a financial grant from the American Sugar Cane League.



Sugar/acre yields for five stubble crops harvested across two cycles.

SOIL FERTILITY RESEARCH IN SUGARCANE IN 2003

Chuck Kennedy, Allen Arceneaux, Bill Hallmark, Ben Legendre, JimmyFlanagan, JimmyGarrett, Alfred Guidry, Barton Joffrion, and Rick Louque

in cooperation with
St. Gabriel Research Station, the Louisiana Cooperative Extension Service and Sugarcane Farmers

SUMMARY

Six different field experiments were conducted in 2003 to test the effects of fertilizer inputs on the yield and yield components of current sugarcane varieties.

Results of a multi-location outfield test to determine the optimum rate of N fertilizer for LCP 85-384 indicated the optimum rate was on the low end of present recommendations. Results of ratoon crop response to N application rates were similar to those of previous years in this large outfield study. Cane yield optimized between 80 and 100 lb N/acre on light soils and 100 to 120 lb N/acre on heavy soils. Sugar yields were optimized at slightly lower rates. Overall, the data indicate optimal response occurs for the variety LCP85-384 at rates 20 to 40 lb N/acre less than now recommended. Nitrogen fertilizer rates from 60 to 180 lb N/ac had minimal effect on cane or sugar yield of first ratoon crops for three varieties. Nitrogen use efficiency for biomass declined with increasing N rate, but tended to be higher across rates for LCP85-384 than the other varieties. Applying a range of N fertilizer rates in early April vs late May for 3rd ratoon LCP85-384 harvested in late September resulted in a slight N rate x timing interaction for cane yield. When applied in April, cane yield from 40 lb N/ac application was less than 80 lbs and above. There were no significant differences among N application rates applied in May. Sugar yield and CRS were unaffected. Broadcasting full or split applications of stabilized urea (Super U) in early February and/or sidedressing full or split applications of regular urea in April into plots where harvest residue remained, was swept to middles, or burned resulted in interaction. Yield of 3rd ratoon LCP85-384 was generally significantly lower when grown where the harvest residue remained. However, the application of 120 lb N/acre as Super U in February resulted in yields statistically equivalent to the check (120 lb N/acre applied as sidedressed urea in April). The best yields occurred on burned residue with a split application of 60 lb N/acre as broadcast Super U followed by the same rate as sidedressed urea in April. Cane yields were 8% more than the check, and sugar yields were 29% more. The use of starter fertilizer applications at planting did not produce a response in plant cane nor any consistent response in first ratoon for LCP85-384. The use of 4 or 6 T/acre silica slag on cane that was subsequently used for planting resulted in significantly lower yields than when cane supplied for planting was grown without slag. Results may have been confounded by billet planting rate differences among the plant material.

OBJECTIVES

This research was designed to provide information on soil fertility in an effort to help cane growers to produce maximum economic yields and to increase profitability in sugarcane production. This annual progress report is presented to provide the latest available data on certain practices and not as a final recommendation for growers to use all of these practices. Recommendations are based on several years of research data.

RESULTS AND DISCUSSION

Starter fertilizers

Averaged across two planting dates, the use of some starter fertilizers on billet-planted LCP 85-384 improved first ratoon cane yield compared to others(Fig.1). The reason partial starter fertilizers were numerically to statistically better than complete starters this year is not known. The year-to-year variability in response makes it difficult to make a recommendation for the use of starter fertilizers.

Rates of spring-applied N fertilizer:

The effect of N fertilizer rate on yield of LCP 85-384 was tested at four large outfield locations. The N rate for optimum yield ($\geq$ 90% of maximum yield and not statistically different) was below the lower end of the recommended range (Fig.2) and reflected what has been found in the previous two years of this study. The response of CRS varied with location. Sugar yield response reflected that of tonnage with optimization at a slightly lower N rate than cane yield (Fig. 3).

The variety LCP85-384 produced numerically but generally not significantly higher cane yield than CP70-321 and HoCP91-555 (Fig.4). This indicated a trend for higher average (but not statistically significant) N-use efficiency relative to the other two varieties (Fig.5). LCP85-384, however, had a slower growth rate than the other varieties through much of the growing season (data not shown), which would suggest the reason for the lack of significantly higher NUE this year.

N applied later in the season (late May) had less response to differences in rate than when N was applied in early April for 3rd ratoon LCP85-384. When applied in April, cane yield from 40lb N/acre application was less than 80lb and above. There were no significant differences among N application rates applied in May (Fig.6). The differences in sugar yield were not significant.

N application and Harvest Residue Management :

Cane yield of 3rd stubble LCP85-384 tended to be lower when grown under the previous harvest's residue. The winter application of stabilized urea ('SuperU'™) did improve the response under those conditions to an equivalent with the check (120lb spring-applied N, burned residue)(Fig.7). The split application of stabilized urea in winter and regular urea in spring on burned residue resulted in the highest sugar yield (Fig. 8).

Silicon application to seed stock:

Application of Calcium Silicate slag at planting to cane earmarked for future seed stock was hypothesized as a way to improve planting efficiency when using billets. The results indicated the hypothesis was not true. Yields and population declined as Si application increased to the seed stock (Fig.9). This may have been confounded by a biased difference in planting rate for each treatment. Even if this is the case, it points out that billet planting efficiency is not improved by increasing the amount of Si available to seed stock.

Acknowledgements

The authors wish to express appreciation for the financial support by the American Sugar Cane League.

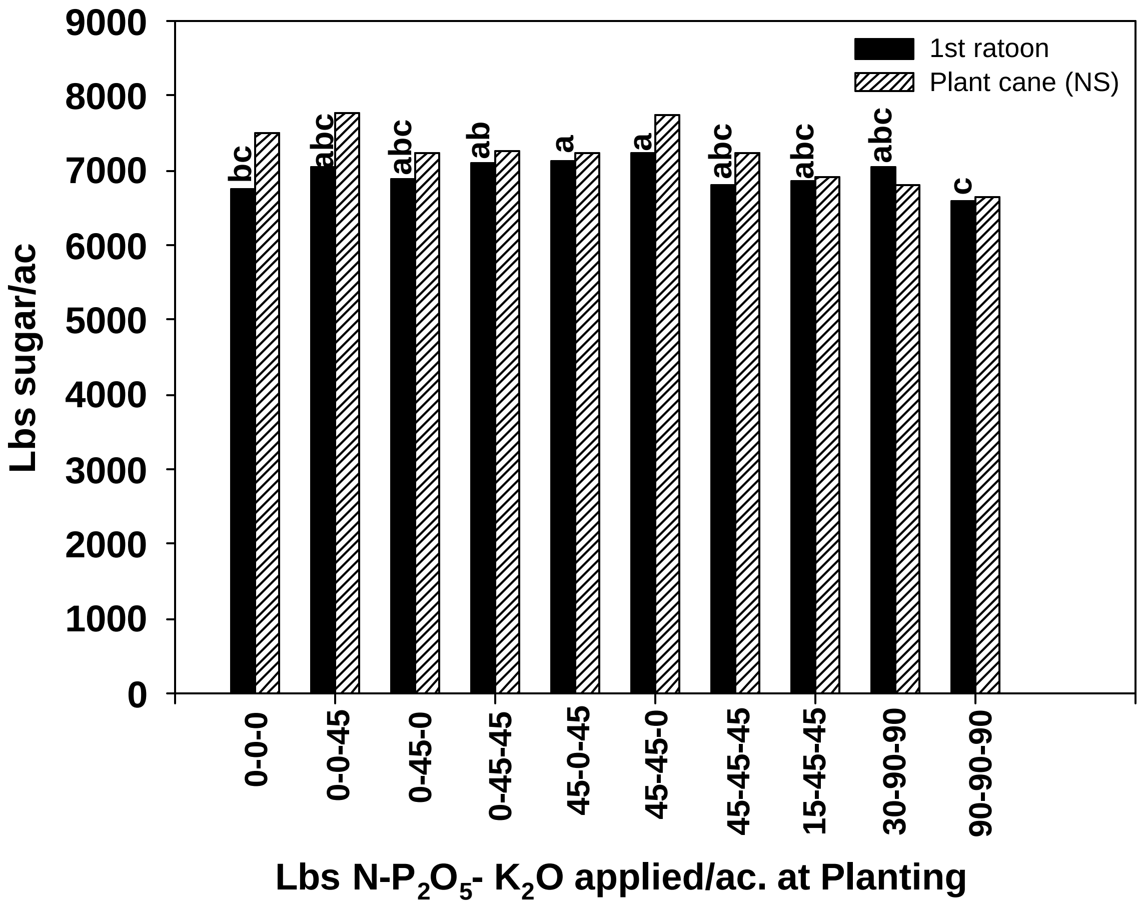


Fig.1. The effect of at-planting starter fertizer on subsequent yields of LCP85-384.

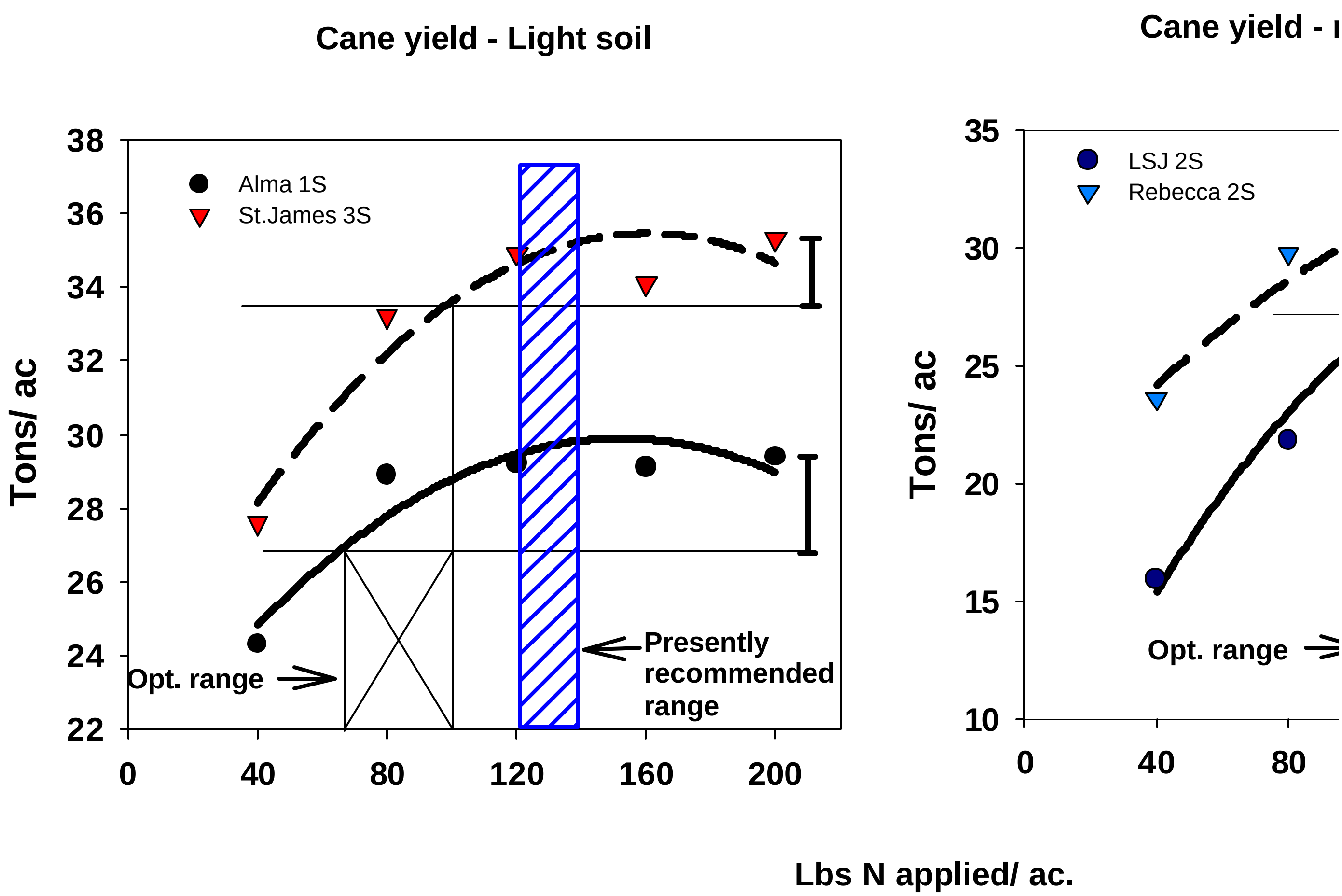


Fig. 2. Response of LCP85-384 ratoon crops to N application rates.

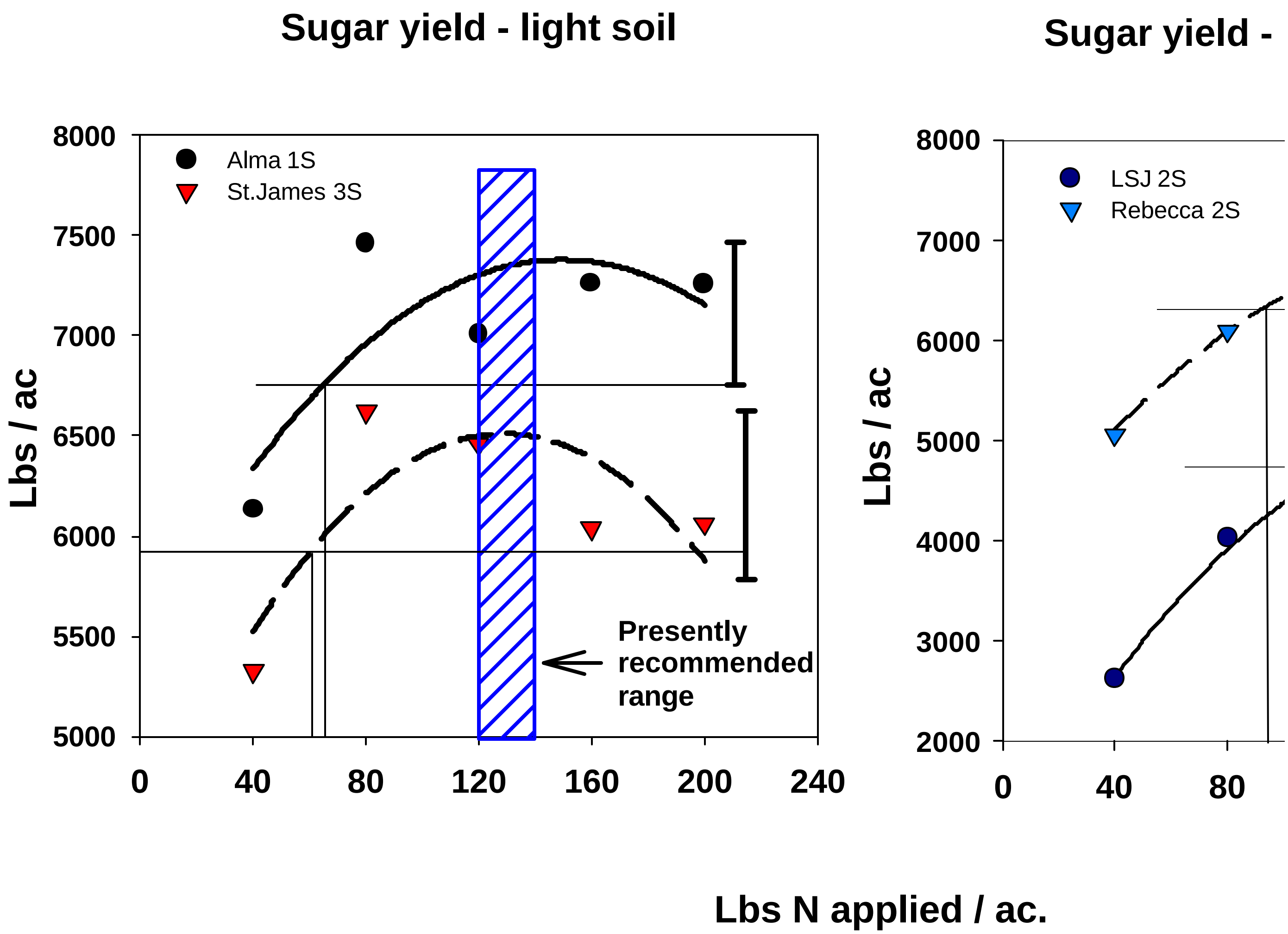


Fig. 3. The sugar yield response of LCP85-384 rato
crops to N application rates.

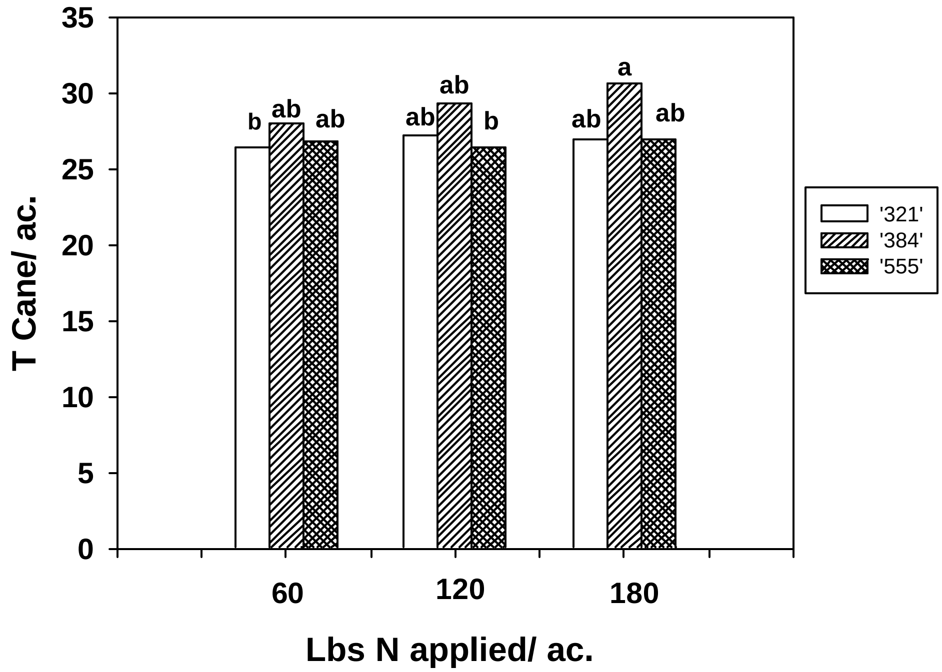


Fig. 4. Cane yield response of three varieties to N application rates. Bars topped by the same letter are NS (*P≤0.05*).

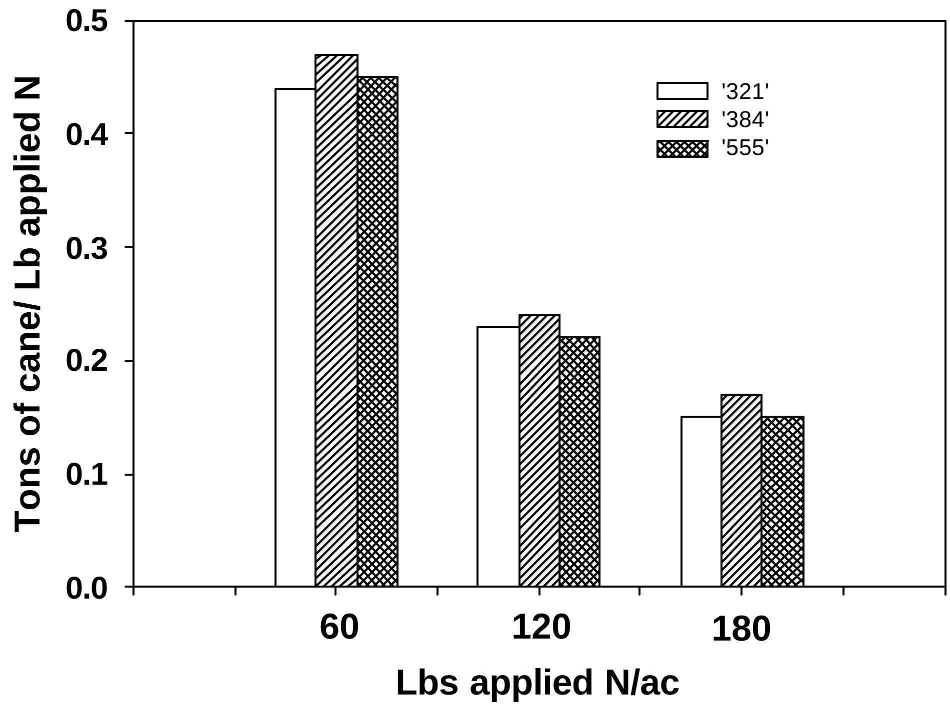


Fig. 5. N-use efficiency of three varieties at different applied N rates. There were no sig. variety differences.

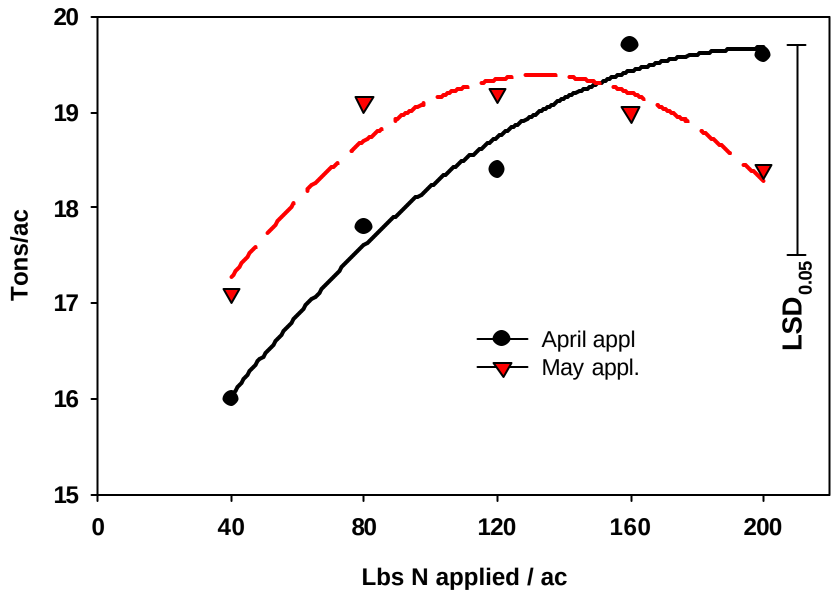


Fig. 6. The cane yield response of 3rd stubble LCP85-384 to rates and timing of applied N fertilizer.

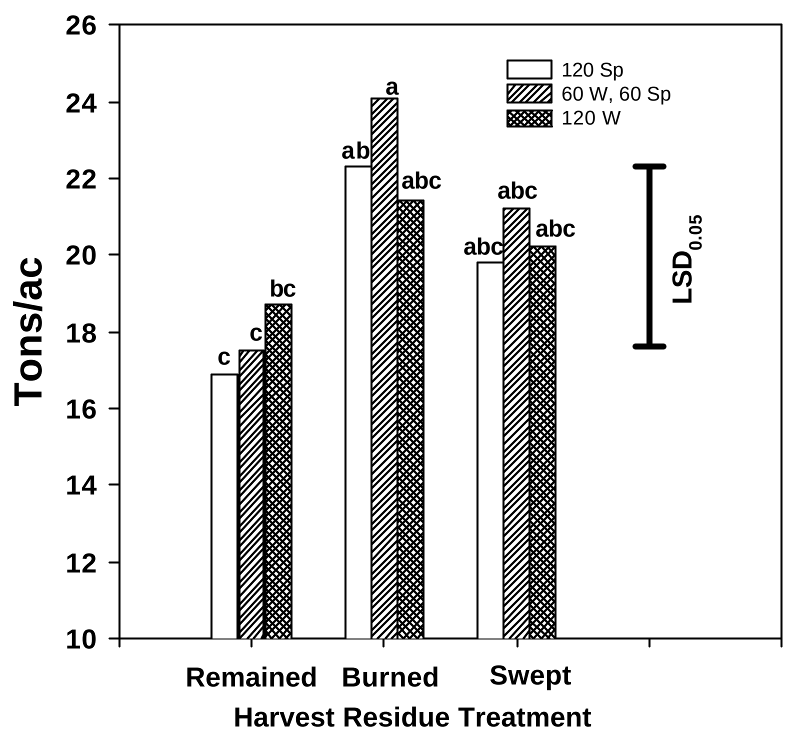


Fig.7. Cane yield response to residue management and N fertilizer type and method for 3rd stubble LCP85-384. All received 120lb N/ac. 'W' = winter applied 'SuperU'. 'Sp' = spring applied regular urea.

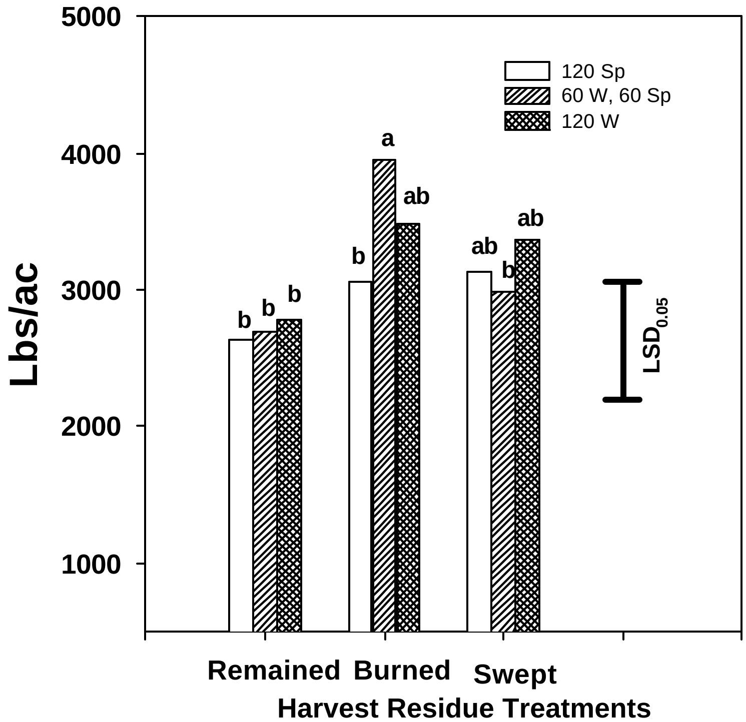
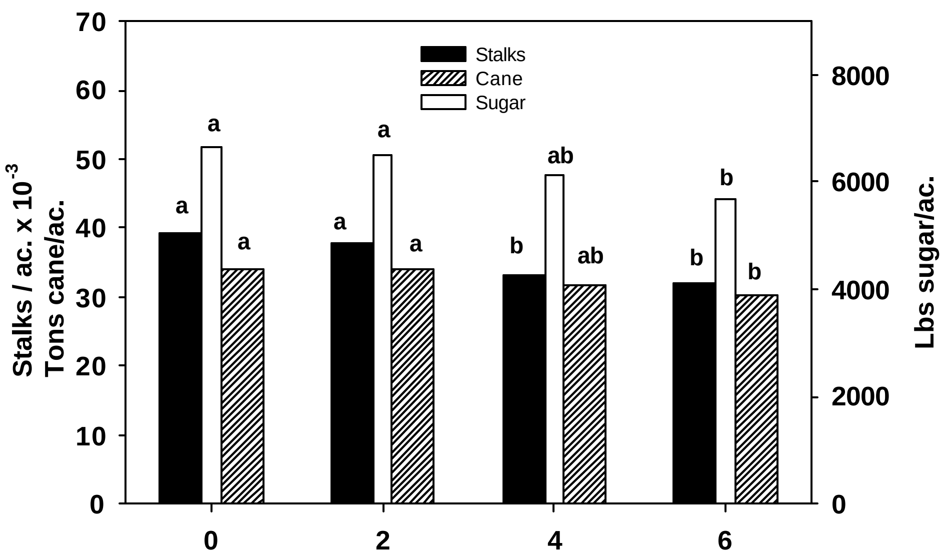


Fig.8. Cane yield response to residue management and N fertilizer type and method for 3rd stubble LCP85-384. All received 120lb N/ac. 'W' = winter applied 'SuperU'. 'Sp' = spring applied regular urea.



Tons silica slag applied/ac to seed source at the time of its planting.

Fig.9. Response of LCP85-384 plant cane to silica applications applied to the billeted seed source.

EFFECT OF CALCITIC LIME AND CALCIUM SILICATE SLAG RATES AND PLACEMENT ON LCP 85-384 PLANT CANE, FIRST-STUBBLE AND SECOND-STUBBLE YIELD PARAMETERS ON A LIGHT-TEXTURED SOIL

H. P. Viator, W. B. Hallmark (deceased), G.J. Williams, and G.L. Hawkins
Iberia Research Station and Sugar Research Station

Ronald Gonsoulin
Iberia Parish Sugarcane Producer

SUMMARY

As an average of all three crops in the production cycle, all rates (1 or 2 tons per acre) and placements (mixed in row or placed underneath the seed pieces at planting) of calcium silicate slag produced significantly higher (P=.03) tons of cane per acre than the check plot. The failure of the 2 tons/acre calcitic lime treatment to produce statistically comparable yields to the 2 tons/acre slag treatment suggests that the yield response to slag was caused by silica and not calcium. Other equivalent-rate slag and lime comparisons were not as convincing, though all slag treatments were numerically higher than the lime treatments. The test site was chosen for its low soil silica content of 13.5 ppm. Several other plant cane experiments this year did not produce positive results, but soil silica levels were all above 35 ppm, evidently too high to elicit a yield response in plant cane on the soils chosen for the evaluations.

INTRODUCTION

Silica (Si) is one of the most plentiful elements in the Earth's crust. In the soil, Si is generally abundant as mineral quartz and clays, but its concentration in a soluble form is highly variable. Monosilicic acid is soluble in the soil, and it influences the chemical, physical, and biological properties of soils and plants. Soluble Si (monosilicic acid) apparently increases plant resistance against attack by insects and diseases and enhances plant tolerance to cold and water stress. Increasing soil silica can result in increased phosphorus uptake by plants, while decreasing the soil concentration of some toxic elements. Depending on the crop, production responses to silicate fertilizers can improve from 10% to 100%. Substantial sugarcane yield responses to silica have been obtained in Florida and Hawaii. Agricultural activity removes large quantities of Si (over 100 lb/acre each year) from soil. Monosilicic acid is used by the plant rapidly, and unless replenished in the soil solution, plant available Si can be depleted. Crops under stress do not use Si efficiently, and Si-deficient crops do not use other nutrients efficiently. Also, successive ratoon yields decrease more dramatically when plant available Si is low. Silica can also be used as a liming agent. Recent analysis of Si in 22 Louisiana soils shows that all were deficient or very deficient in monosilic acid.

Research supported by grants from the American Sugar Cane League and Pro-Chem.

OBJECTIVE

To compare the effect of calcitic lime and calcium silicate slag rates and placement on soil and plant silica and sugarcane yields.

MATERIALS AND METHODS

A sugarcane study was planted in September 2000 with first progeny Kleentek variety LCP 85-384 billets. The six calcitic lime (Domino by-product) and calcium silicate slag (a by-product of the steel industry) treatments are given in Table 1. These treatments were replicated six times in a Latin square experimental design. Treatments 2, 3, 4, and 5 were incorporated into the rows before planting, and treatment 6 was placed under the cane at planting. Experimental plots consisted of three 5 foot 10 inches by 40 foot rows with a 10 foot alley at the ends of each plot. All experimental plots were separated by three border rows on each side of the plots.

The Domino lime and calcium silicate slag materials showed a calcium carbonate equivalent of 84.28% for the lime and 78.51% for the slag. The silicon content of the materials was 39,400 ppm for the lime and 133,000 ppm for the slag. The respective analysis of the lime vs. slag was: 0.39 vs. 0.50 ppm for arsenic; 0 vs. 0 ppm for cadmium; 53,970 vs. 8,430 ppm for calcium; 0.16 vs. 0.33 ppm for nickel; 1.12 vs. 8.05 ppm for copper; 0.57 vs. 0.73 ppm for lead; 5.95 vs. 14.38 ppm for iron; 0.03 vs. 0.04 ppm for zinc; 1.21 vs. 4.53% for organic matter; 788 vs. 378 ppm for magnesium; 0.20 vs. 0.94 ppm for manganese; 12.05 vs. 8.38 for pH; 1.99 vs. 5.74 ppm for phosphate; 112 vs. 56 ppm for potassium; and 61 vs. 23 ppm for sodium. Soil samples were taken from each plot and analyzed for monosilic acid. Plant leaf tissue was taken in August 2001 and analyzed for silica concentration.

The experiment was grown to maturity using standard cultural practices. The plots were harvested using a combine harvester and a weigh rig. Ten stalks were taken from the middle row of each plot immediately before harvest for determination of stalk weights and CRS.

RESULTS AND DISCUSSION

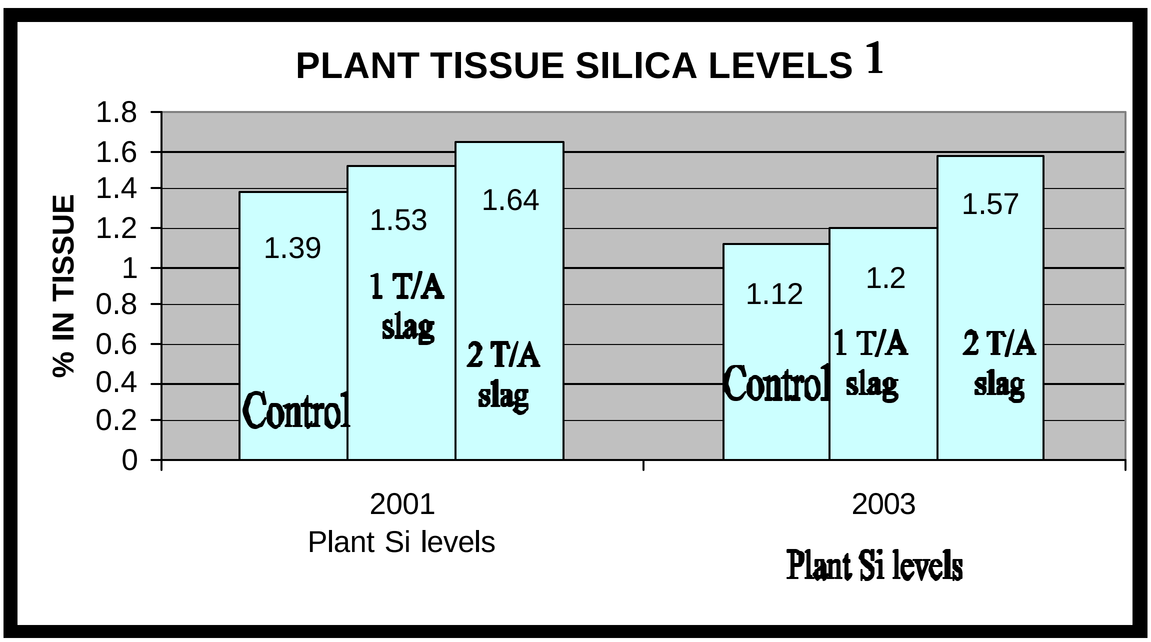
Sugarcane benefiting from the incorporation of calcium silicate slag, either one or two tons/acre, into the soil before planting or underneath the planted seed produced significantly ($P<.03$) more tons of cane per acre, as an average of the plant cane and both stubble crops, than the check. The significantly higher tonnage resulting from the application of 2 tons/acre of calcium silicate slag compared to the 2 tons/acre calcitic lime treatment is an indication that the yield response was silica induced and not calcium induced.

Ongoing research elsewhere in the AgCenter is attempting to correlate soil silica levels with plant response. Analyses needed to identify silica deficient soils are being evaluated for our environment.

Table 1. The effects of treatments on the yields of LCP 85-384 average over three crops in the cycle.

Treatment no.	Lime	Silica slag[1]	Placement	Sugar	Tonnage
	T/A	T/A		Lb/A	T/A
1	0	0	-	9,303	35.9
2	1	0	Mixed into rows	9,104	35.3
3	2	0	Mixed into rows	9,039	36.4
4	0	1	Mixed into rows	9,599	37.6
5	0	2	Mixed into rows	10,260	39.7
6	0	1	Placed under cane	9,671	39.2
LSD (.05) =				NS	3.01

[1] = Soil test indicated silica was critically (13.5 ppm) deficient.



1 - Data provided by Pro-Chem

EFFECT OF ZINC FERTILIZATION ON SUGARCANE (LCP 85-384) YIELDS

Jim J. Wang[1], Chuck Kennedy[1], Sonny Viator[2], Allen Arceneaux[1], and Alfred Guidry[3]
[1]Department of Agronomy and Environmental Management, [2]Iberia Research Station, and [3]Louisiana Cooperative Extension Service

SUMMARY

Two field experiments were conducted in 2003 to test the effects of zinc fertilizer application on sugarcane yield. One acid and one calcareous soil that tested low in available zinc by DTPA method were chosen for the study. Ground application of zinc (Zn) as zinc sulfate ($ZnSO_4$) at 4-8 lb/A significantly ($P<0.05$) increased cane and sugar yields of LCP 85-384 by 27-32% in acid Dundee soil and by 23-26% in calcareous Jeanerette soil. Zinc spray treatment increased yields at both sites but only statistically significant at acid soil site (by 23 and 29% for cane and sugar). These test results suggest that Zn application as $ZnSO_4$ in Louisiana soils low in DTPA test-Zn benefit sugarcane production significantly.

INTRODUCTION

Zinc is one of most important micronutrients that crops need for healthy growth. Different crops or even different varieties within a crop can have quite different Zn use efficiency and sensitivity to Zn levels in soils. Soil test with adequate calibration is a key to predict Zn deficiency or toxicity that a specific soil Zn level may impose on a crop. The benefit of Zn fertilization has been reported for sugarcane in different parts of world. However, currently there is no zinc fertilizer recommendation for sugarcane production in Louisiana. A recent survey by the LSU AgCenter Soil Testing and Plant Analysis Laboratory showed that many regions of Louisiana including sugarcane-producing areas are low to medium in soil Zn content. Therefore, an evaluation of Zn fertilization for sugarcane production is important and necessary.

OBJECTIVE

This research was designed to provide a comprehensive evaluation of Zn fertilization on sugarcane production in both acid and alkaline soils.

MATERIALS AND METHOD

One acid soil at Levert-St. John Farms, St. Martinville, and one alkaline soil at Herbert Farms, Jeanerette, were selected in this study. The acid soil was a Dundee silt loam (16% clay, 63% silt, and 21% sand). Soil tests for the Dundee silt loam showed a pH of 5.40, organic matter of 1.0%, sulfur of 5.28-6.24 ppm (low) and Zn of 0.26-0.59 ppm (low), respectively. The sugarcane at the acid soil site was first stubble of LCP 85-384. The alkaline soil was Jeanerette silt (2% clay, 88% silt, and 10% sand). Soil tests for the Jeanerette silt showed a pH of 8.1, organic matter of 1.1-1.6%, sulfur of 7.26-11.52 ppm (low-medium) and Zn of 0.21-0.35 ppm (low), respectively. The sugarcane at the alkaline site was second stubble of LCP 85-384. All plots consisted of three 6 foot by 50 foot rows. The experiment consisted of 5 rates (0, 4, 8, 16, and 32 lb Zn /A) of solid zinc sulfate ($ZnSO_4$) ground application, and one rate of spray application (1.2 lb Zn/A as 0.5% liquid $ZnSO_4$). One rate of sulfur (18 lb S/A) as gypsum was also used to check the effect of sulfur caused by $ZnSO_4$. All ground treatments were applied to the inner off-bar of each plot row. All plots also received equal amounts of N and P based on soil tests. All treatments were replicated four times. Ground applications were carried out before May 8, 2003, and spray applications before July 3, 2003. The plots were harvested on November 14 and 19, 2003, respectively. The numbers of millable stalks in each sugarcane plot were counted. Twenty stalks were randomly selected from each plot to measure average stalk weight and commercially recoverable sugar (CRS).

RESULTS AND DISCUSSION

The results are shown in Tables 1 and 2. Ground application of zinc as $ZnSO_4$ at 4-8 lb/acre significantly (P<0.05) increased cane and sugar yields by 27-32% in acid Dundee soil (Table 1) and by 23-26% in alkaline Jeanerette soil (Table 2). Because of micronutrient dichotomy, application of Zn > 8 lb/acre showed apparent yield reduction, even though no visible symptom was observed. Optimum rate may be further fine-tuned by applying smaller increments of Zn rates between 2-10 lb/acre. Spray treatment increased sugarcane yields at both sites but only statistically significant (P<0.05) at the acid soil site (by 23% and 29% for cane and sugar, respectively). Application of sulfur also significantly (P<0.05) increased both cane and sugar yields by 27-31% in the acid soil and 19-21% in the alkaline soil. Previous study found that sulfur application was most effective in heavy-textured soils. This study showed that application of sulfur in light- to medium-textured soils can also increase sugarcane yields. The sulfur treatment (18 lb/A) applied as gypsum corresponded to the amount of sulfur brought in by the highest Zn treatment. Since 4-8 lb/A of zinc application as $ZnSO_4$ brought in only 2.25-4.5 lb/A of sulfur (a much smaller amount than normal sulfur application), it would be reasonable to attribute all the yield effect to Zn. Nonetheless, the study could not rule out a possible effect of zinc-sulfur interaction on sugarcane yields. Further study is needed to demonstrate if this interaction exists. Overall one-year result of this study suggests that zinc application as $ZnSO_4$ in Louisiana soils low in DTPA test-Zn benefit sugarcane production significantly. DTPA test, a common test used for alkaline soils, worked well also for predicting Zn deficiency in acid soils for sugarcane.

ACKNOWLEGMENTS

This research was supported in part by a grant from the American Sugar Cane League.

Table 1. Effect of Zinc and Sulfur fertilizer on first stubble cane grown in acid Dundee soil.

Treatment	Pop	Stalk wt.	CRS	Cane yield (weighed)	Sugar yield
Lb Zn /A (as $ZnSO_4$)	1000/A	lb/stalk	lb/T	T/A	lb/A
0	19.3	2.11	231.3	18.9	4344
4	19.7	1.83	240.5	23.4	5637
8	19.1	2.15	240.5	24.0	5763
16	19.9	1.71	234.0	19.8	4615
32	18.3	1.97	234.0	19.8	4645
Spray (0.5% $ZnSO_4$)	20.5	1.75	240.2	23.4	5608
18 lb Sulfur /A	18.9	1.91	237.3	24.1	5709
LSD 0.05	NS	0.3	NS	5.0	1233

Table 2. Effect of Zinc and Sulfur fertilizer on second stubble cane grown in alkaline Jeanerette soil.

Treatment	Pop	Stalk wt.	CRS	Cane yield (estimated)	Sugar yield
Lb Zn /A (as $ZnSO_4$)	1000/A	lb/stalk	lb/T	T/A	lb/A
0	37.9	1.30	211.0	24.4	5161
4	42.9	1.45	211.4	31.1	6541
8	41.4	1.44	215.3	29.8	6384
16	41.1	1.39	213.7	28.4	6070
32	38.5	1.35	217.0	26.0	5639
Spray (0.5% $ZnSO_4$)	38.7	1.40	211.7	27.3	5742
18 lb Sulfur /A	39.2	1.46	215.1	29.0	6243
LSD 0.05	4.4	NS	NS	5.1	1069

IMPACT OF PAPER MILL SLUDGE ON SUGARCANE PRODUCTION AND YIELDS

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ABSTRACT

Soil amendments can improve soil fertility and provide a reasonable means of disposing of some industrial by-products. The objective of this study was to determine the effect of paper mill primary clarifier sludge on sugar and cane yields when applied to fallow fields and subsequently planted to sugarcane. The experimental design was a randomized complete block design with a split plot arrangement of treatments. The paper mill sludge was applied at rates of 0, 22.5, and 44.7 Mg tons per hectare and served as whole plots. Spring (0-0-0, 90-0-0, and 180-0-0) and starter (0-0-0 and 17-50-50) fertilizer treatments (kg/ha) were the subplots. Spring fertilizer treatments produced significant responses for sugar yield, cane yield, and sucrose content in the stubble crops only. Sludge and starter fertilizer treatments did not affect sugarcane yields significantly. The significant crop by sludge by spring fertilizer application interaction showed that in the first-stubble crop, the highest sludge and the highest spring fertilizer rates produced significantly less sucrose content. Excess nitrogen can delay maturity in sugarcane. Therefore, if sludge is applied to sugarcane in Louisiana, less fertilizer nitrogen can be applied to the first-stubble crop. In the second-stubble crop, sludge and spring fertilizer rates did significantly affect sucrose content. Paper mill sludge appears to be a suitable soil amendment for sugarcane grown in Louisiana.

INTRODUCTION

The organic matter content of most Louisiana soils is considered low by most standards. Generally speaking, increased organic matter in the soil will increase water- and nutrient-holding capacity, improve water percolation through the soil, improve tilth, and reduce erosion. These factors can cause improved plant survival and growth. The result can be increased yields with lowered fertilizer requirements and less soil, pesticide, and nutrient loss in runoff.

Research has been conducted in the past to determine the effect of several soil amendments on sugarcane production. Viator et al. (2002) showed a neutral effect of municipal compost on cane and sugar yield when subsoiled into the row rather than placed onto the row. The authors also determined that by-product gypsum did not significantly raise or lower cane and sugar yield when applied at rates of 2.24, 4.48, and 8.96 Mg/ha. Other research has shown cane and sugar yield increases following the addition of organic amendments to soils (Bevacqua and Mellano, 1994 and Hallmark et al. 1995).

Golden (1983) summarized results from 1975 through 1979 for by-product gypsum experiments conducted in Louisiana. He found average cane yield increases ranging from 1.67 tons/acre for the plant-cane crop, 3.31 tons/acre for the first-stubble crop, 3.73 tons/acre for the second-stubble crop, and 4.84 tons/acre for the third stubble crop. Golden concluded that by-product gypsum was a suitable fertilizer source for S fertilizer. Sometimes the gypsum response can be erratic. Viator et al. (2002) determined that by-product gypsum did not significantly raise or lower cane and sugar yield when applied at rates of 2.24, 4.48, and 8.96 Mg/ha.

Golden (1975) reported on the application of filter press mud to sugarcane fields. Filter press mud is a by-product of sugar processing after juice clarification. It is primarily composed of field soil. Golden reported that filter press mud is high in total nitrogen, extractable phosphorus and potassium, calcium and magnesium. Application of filter press mud increased both cane and sugar yields in Louisiana. It was noted that weeds increased where filter press mud was applied.

Paper mills collect large volumes of short fiber (sludge) in the paper-making process in their wastewater treatment plants. This material is primarily composed of partially digested cellulose and hemi-cellulose fibers and algae bodies with some residual lime. It is a convenient material to use and apply. The paper industry is seeking ways to use this material rather than landfill the large volumes it produces. Paper mill fiber residue has been used as mulch, a lime source, and an amendment to increase soil organic matter content. Therefore the objective of this research was to determine the effects of primary clarifier sludge on sugarcane yield and soil.

MATERIALS AND METHODS

The paper mill primary clarifier sludge was obtained from Georgia-Pacific Corporation, Port Hudson Operations, 1000 West Mount Pleasant Road, Zachary, Louisiana. The paper mill primary clarifier sludge is material derived from the kraft pulping and elemental free chlorine free bleaching process with non-ink paper, bath tissue, and towel machine operations. The material is clarified in two primary clarifiers and dewatered to about 60% moisture content using screw press equipment.

The experimental design was a randomized complete block (four replications) with a split plot arrangement of treatments. Sludge treatments (0, 22.5, and 44.7 Mg tons per hectare) were the whole plots. Starter fertilizer treatments (0 and 17-50-50) and spring nitrogen treatments 0-0-0, 90-0-0, and 180-0-0 (kg/ha) were the subplots. The soil type at the experimental site was a Commerce silt-loam (fine-silty, mixed, nonacid, thermic Aeric Fluvaquent). Each of the 18 plots per replication was two rows wide (3.7 m) by 7.3 m long with a 1.2 m buffer between plots. Sludge and starter fertilizer treatments were applied in the furrow at planting on October 16, 2000, and spring nitrogen treatments were applied in early April of each crop year (2001 – 2003). Standard cultural practices were applied to the experimental area with respect to cultivation and the control of weeds and insect pests (Legendre, 2001).

Ten-stalk samples, taken at random along the row, were removed from each plot on December 3, 2001, in the plant-cane crop, December 18, 2002, in the first-stubble crop, and November 6, 2003, in the second-stubble crop. All stalks were stripped of all leaves and topped approximately 10 to 12 cm below the apical meristem bud. Data collected and/or calculated included mean stalk weight, Brix by refractometer, sucrose by polarimetry, purity as the ratio of sucrose to Brix, and the yield of theoretical recoverable sugar per mass of cane (g/kg) (Gravois and Milligan, 1992). Plots then were harvested on the same dates by a cane combine (Cameco Model 2500) operating at approximately 5.6 k per hour and an extractor fan speed of 950 rpm. All cane from each plot was weighed in a wagon fitted with load cells and the weights recorded. From these data, the cane yield (Mg/ha) and sugar yield (Mg/ha) were calculated for each plot. The data were analyzed with a mixed model analysis (SAS 8.2 PROC MIXED). Least square means were calculated and separated using least square mean probability differences ($P = 0.05$).

A sample of the primary clarifier paper mill sludge was analyzed for chemical content and properties at the LSU AgCenter Soil Testing Laboratory (Sample No. AH01166). The soil at the experimental site was sampled prior to the application of the treatments (September 2000), seven months later (April 2001), and at the conclusion of the experiment (January 2004). Soil samples were also analyzed at the LSU AgCenter Soil Testing Laboratory in the Agronomy and Environmental Management Department, Baton Rouge, Louisiana. Data collected for various soil parameters included pH, macro and micro nutrient content as well as organic matter content.

RESULTS AND DISCUSSION

The chemical analysis of the primary clarifier paper mill sludge is shown in Table 1. The paper mill sludge is high in organic matter along with a relatively high pH. With the exception of calcium, the macronutrient content of the paper mill sludge was low.

Soil test results just before and after the application of the paper mill sludge are shown in Table 2. It appeared that the pH of the soil showed only a slight increase at the 44.7 Mg sludge rate approximately seven months following the application. Further, there was an increase of over 35% (1365 to 1855 ppm) in the available calcium from the 0 to the 44.7 Mg rate when sampled in April following the sludge application the previous October. There was also a 48% increase (25 to 37 ppm) in available sodium comparing the 44.7 Mg rate to the control. The increase in available calcium and sodium for the 22.5 Mg rate was intermediate between the 0 and 44.7 Mg/ha rate. There appeared to be no effect of paper mill sludge on the availability of K, Mg, and P at either the 22.5 or 44.7 Mg rate. Further, there was a numeric increase for organic matter in the April 2001 sampling date as sludge rate increased (0.97% to 1.22% for the 44.7 Mg rate). Paper mill sludge increased soil pH only slightly.

January 2004 soil test results showed a numeric increase in soil pH as sludge rates increased (7.0 to 7.8), which corresponded to the increase in concentration of calcium. The paper mill sludge increased soil pH. Application of paper mill sludge would not be necessary because of the already higher soil pH at the beginning of the experiment. Increasing soils with inherent high pH might cause other problems such as rendering phosphorus unavailable to the sugarcane plant. By the conclusion of the experiment, soil tests indicated that the other macronutrients and organic matter content did not seem to be affected by the paper mill sludge treatments.

Mixed model analysis of fixed effect terms for the experiments conducted at the St. Gabriel Research Station for the three crops of the sugarcane variety LCP 85-384 is shown in Table 3. The main effect crop in the analysis was significant (P=0.05) for sucrose yield, cane yield, and sucrose content. In this experiment, crop and year are confounded. Nutrient response can be both soil and crop specific (Golden and Abdol, 1977). They summarized that the greatest yield response is observed with nitrogen, followed by potassium responses on light to medium textured soils, and then phosphorus responses on medium-heavy to heavy textured soils. Plant cane crops tend to respond less to nitrogen and potassium applications. The duration of this experiment included one of the wettest weather patterns recorded during the 2002 harvest. Sucrose levels in 2002 were low because of lodging. However, the test in 2002 was harvested under good harvest conditions.

Spring fertilizer treatments produce significant responses for sugar yield, cane yield and sucrose content. In contrast, starter fertilizer treatments did not significantly affect any yield component. Response to starter fertilizer in sugarcane grown in Louisiana has been inconsistent. The crop-by-spring interaction was significant for sugar yield, cane yield, and sucrose content. In addition, the three-way interaction (crop-by-sludge treatment-by-spring fertilizer) was significant for sucrose content. Thus, means were reported by each main effect combination as the interaction dictated.

For the plant-cane crop, there were no significant sugar yield or cane yield differences caused by spring nitrogen applications (Table 4). Both stubble crops exhibited significant sugar yield and cane yield decreases when no nitrogen was applied. Cane yield and sugar yield were not significantly different at the 180 kg/ha nitrogen rate when compared to the 90 kg/ha nitrogen rate. This result is consistent with work done by Kennedy et al. 2003, who showed that LCP 85-384 had a greater nitrogen use efficiency at lower nitrogen rates than other Louisiana sugarcane varieties such as CP 70-321 and HoCP 91-555. Because of a nonsignificant spring fertilizer-by-sludge interaction, it appears that the paper mill sludge was not a useful fertilizer supplement that affected either sugar yield or cane yield.

Means by crop, sludge treatment, and spring fertilizer application for sucrose content are reported in Table 5. In the plant-cane crop for the 0 and 22.1 Mg/ha sludge rates, the 90-0-0 spring fertilizer treatment had significantly less sucrose content than the 180-0-0 treatment. In the first-stubble crop for the 44.7 Mg sludge rate, the 180-0-0 spring fertilizer rate had significantly less sucrose content than the 0-0-0 and 90-0-0 spring fertilizer treatments. This indicated that the first-stubble crop may have obtained additional nitrogen from the high sludge treatment. Excessive nitrogen can delay maturity in sugarcane, resulting in lower sucrose content. These data indicated that nitrogen rates could be reduced when high rates of paper mill sludge are applied to sugarcane to avoid delayed sugarcane maturity. In the second-stubble crop, sludge and spring fertilizer rates did affect sucrose content significantly.

It is interesting to note that there was no significant deleterious effect of the paper mill sludge on any of the yield components. This, in itself, is considered positive because many un-stabilized organic amendments can actually show a negative impact on crop yield the year of application. The paper mill sludge could be applied to increase soil pH with no apparent effect on the sugarcane crop. In fact, the data indicate that nitrogen fertilizer rates in the first-stubble crop could be reduced with sugar yields being maintained.

ACKNOWLEDGMENTS

We acknowledge Gert Hawkins for her assistance in making this study possible. This research was funded, in part, by a grant from Integrated Technical Services of Baton Rouge, Louisiana.

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Table 1. Chemical analysis of the primary clarifier paper mill sludge as analyzed by the LSU AgCenter Soil Testing Laboratory.

Analytical Parameter	Unit
Moisture content	56%
Organic matter (primarily pulp fiber)	43%
pH	9.2
Nitrogen	0.045%
Phosphorus	0.029%
Potassium	0.051%
Calcium	3.050%
Magnesium	0.108%
Sulphur	0.148%

Table 2. Soil test results conducted at the LSU AgCenter Soil Testing Laboratory for the experimental area (Commerce silt-loam) where the paper mill sludge was applied at the St. Gabriel Research Station.

	Sludge		Ca	K	Mg	Na	P	Bases	OM
Sample date	(Mg/ha)	pH	ppm					(meq/100g)	(%)
Sept. 2000†	0	7.1	1455	94	317	26	349	10.2	1.21
April 2001	0	7.3	1365	95	315	25	324	9.8	0.97
April 2001	22.5	7.4	1510	91	307	33	326	10.4	1.13
April 2001	44.7	7.4	1855	108	347	37	333	12.6	1.22
February 2004	0	7.0	1552	97	328	35	253	10.9	1.10
February 2004	22.5	7.4	1673	99	320	30	269	11.4	0.99
February 2004	44.7	7.8	2062	102	317	35	289	13.3	1.20

† The soil was sampled prior to the application of the paper mill sludge.

Table 3. Mixed model analysis of fixed effect terms for the experiments conducted at the St. Gabriel Research Station for the three crops of the sugarcane variety, LCP 85-384.

Source	Num df	Den df	Sugar yield (Mg/ha)	Cane Yield (Mg/ha)	Sucrose content (g/kg)
				Pr > F	
Crop	2	25	<0.001	<0.001	<0.001
Sludge	2	25	0.59	0.45	0.25
Starter	1	125	0.58	0.36	0.91
Spring	2	125	<0.001	<0.001	0.01
Crop*Sludge	4	25	0.73	0.91	0.47
Crop*Starter	2	125	0.31	0.46	0.23
Crop*Spring	4	125	<0.001	<0.001	0.04
Sludge*Starter	2	125	0.95	0.60	0.41
Sludge*Spring	4	125	0.44	0.44	0.42
Starter*Spring	2	125	0.50	0.54	0.59
Crop*Sludge*Starter	4	125	0.61	0.41	0.15
Crop*Sludge*Spring	8	125	0.66	0.60	0.04
Crop*Starter*Spring	4	125	0.44	0.33	0.07
Crop* Sludge*Starter*Spring	12	125	0.72	0.53	0.82

Table 4. Spring fertilizer treatment means across starter fertilizer and sludge treatments for sugar yield and cane yield for the three crops grown at the St. Gabriel Research Station.

Fertilizer Rate (kg/ha)	Sugar yield		Cane Yield	
	(Mg/ha)			
Plant cane				
0-0-0	9.57	A	98.8	A
90-0-0	9.36	A	98.7	A
180-0-0	9.46	A	96.7	A
First-stubble				
0-0-0	8.94	B	66.5	B
90-0-0	9.61	A	73.5	A
180-0-0	9.80	A	76.5	A
Second-stubble				
0-0-0	5.44	B	45.5	B
90-0-0	9.22	A	78.6	A
180-0-0	9.60	A	81.4	A

Table 5. Spring fertilizer by sludge treatment means across starter fertilizer treatments for sugar yield and cane yield for the three crops grown at the St. Gabriel Research Station.

	Sludge Rate (Mg)					
Crop (Spring Fertilizer Rate)	0		22.1		44.7	
	Sucrose Content (g/kg)					
Plant cane (0-0-0)	99.4	AB	95.4	AB	96.1	A
Plant cane (90-0-0)	96.4	B	92.2	B	96.4	A
Plant cane (180-0-0)	100.4	A	97.9	A	95.3	A
First-stubble (0-0-0)	133.7	A	134.8	A	135.4	A
First-stubble (90-0-0)	127.8	A	133.9	A	130.2	AB
First-stubble (180-0-0)	133.2	A	129.4	A	121.6	B
Second-stubble (0-0-0)	121.7	A	119.4	A	118.7	A
Second-stubble (90-0-0)	119.0	A	117.0	A	116.3	A
Second-stubble (180-0-0)	116.9	A	116.6	A	119.7	A

EFFECTS OF RESIDUE MANAGEMENT ON SUGARCANE YIELD

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We investigated the effect of sugarcane residue (mulch cover) resulting from the combine harvester on sugarcane yield and also quantified the decay of residue post harvest. The study consists of three treatments concerning the mulch left on the field after harvest. The treatments include (1) burning the mulch after harvest, off-barring and cultivating in the spring; (2) sweeping the mulch off the top of the row after harvest, off-barring and cultivating in the spring; and (3) leaving the mulch on the field after harvest, off-barring and cultivating in the spring. Treatment 3, where the mulch is not removed, may be best regarded as a no-till treatment that is a commonly used soil conservation measure. Sugarcane population, yields, and quality of runoff water are being measured for each treatment.

Sugarcane Yield

During the 2003 growing season, we implemented three cultural practices: namely burning of the mulch residue, sweeping, and no-till where the residue was not removed. To compare the yields of sugarcane biomass and sugar from sugarcane fields with three residue management practices grown on a Commerce silt loam soil at the St. Gabriel Research Station, variety HoCP91-555 was planted on 1 September 2001. The site consisted of six 0.22-ha plots (two replications $\times$ three treatments). Each plot consisted of nine rows 450 feet in length with levees on each treatment. Plantcane was harvested, using combine harvester, on 6 December 2002. Following harvest, the residue on two plots was burned on 13 December 2002. In another two plots, the residue was removed from the top of the rows using a three-row sweeper on 15 January 2003. Using brushes with nylon bristles, a thin layer of surface soil was also removed along with the mulch and deposited in the adjacent furrows. In the remaining two plots, the residue was not removed. Based on six replications, the average yield for plantcane was 32.42 tons/acre. The first stubble was harvested on 28 October 2003. This harvest was followed by sweeping two plots on 10 December 2003 and burning of another two plots on 11 December 2003 according to our treatments. The yields from the first stubble were 31.8, 30.2, and 28.9 tons/acre, for burn, no-till, and sweep, respectively. Although no statistical differences were obtained, our 2003 results from plantcane indicated highest yield was that for the burn treatment where 5 and 9% reduction in yield was obtained for the sweep and no-till treatments, respectively (see Table 1).

Mulch Decay

To assess the effect of the presence of a surface mulch residue on the retention of herbicides, the rate of decay of the sugarcane residue was quantified. The sugarcane residue was collected randomly within each plot, by measuring multiple 1 m^2 areas and collecting all surface mulch within each area. Sampling of residue was carried out several times following harvest of the plantcane as well as the first stubble. Sampling of residue was terminated several months following harvest and when it was decided that, because of low residue amounts and surface non-uniformity, accurate residue measure was not feasible. The collected residue was dried at 55°C for 24-h and weighed. A portion of dry residue was cut into 1cm sections for herbicide retention studies in the laboratory. Another portion of the residue was ground to a powder and mixed for homogeneity as required for fiber analysis.

Results of the amount of mulch remaining on the soil surface versus age of mulch following harvest are given in Figure 1. For the plantcane, the residue decreased from 2.80+0.777 tons/acre at harvest to 2.30+0.534, 66 days after harvest. For the first stubble, the amount of residue was consistently lower than that for the plantcane. Specifically, in 2003, the amount of mulch decreased from 1.58+0.642 to 0.870+0.247 tons/acre over a five month period. Such differences may be attributed to differences in the variety, yields, soil type, as well as combine setting during harvest.

A rate of residue decay was derived based on simple linear regression where the (negative) slope represents the mass of mulch degradation per acre over time. Rate of decay for this sugarcane variety (555) was 14.99 ± 5.73 and 10.14 ± 3.75 lbs/acre/day for plantcane and first stubble, respectively. Regression analysis suggests a linear model provided a good description of the decay of the mulch for all growing seasons. Moreover, the respective slopes of the regression lines were not significantly different. We should emphasize that earlier decay results from the LCP85-384 grown on Sharkey clay suggest similar overall rates of decay. Specifically, the rates of degradations for LCP85-384 were of 18.2±3.8, 14.9± 3.8, 11.7± 7.8 lb/acre/day for the three growing seasons (plant cane, first and second stubble), respectively. These earlier measurements on LCP85-384 were carried out during the 2000 through the 2003 growing seasons.

Table 1. Sugarcane yields (HoCP91-555) for the different treatments for the first stubble which was harvest on October 28, 2003**.

TREATMENT	Replicate Number	Number of Stalk per acre	Cane Yield tons/acre	Sugar Yield lbs/ acre
Burn	1	47,200	32.1	6622
	2	46,200	31.5	6552
	Average	46,700	31.8	6587
No - Till	1	44,000	29.5	5334
	2	48.800	30.8	6197
	Average	46,300	30.2	5765
Sweep	1	42,100	27.5	5767
	2	42,800	30.3	5993
	Average	42,500	28.9	5880
LSD 0.05		NS	NS	NS

** The cane was planted September 1, 2001, and plantcane was harvested December 6, 2002. Average yield for plant cane was 32.42 tons/acre.

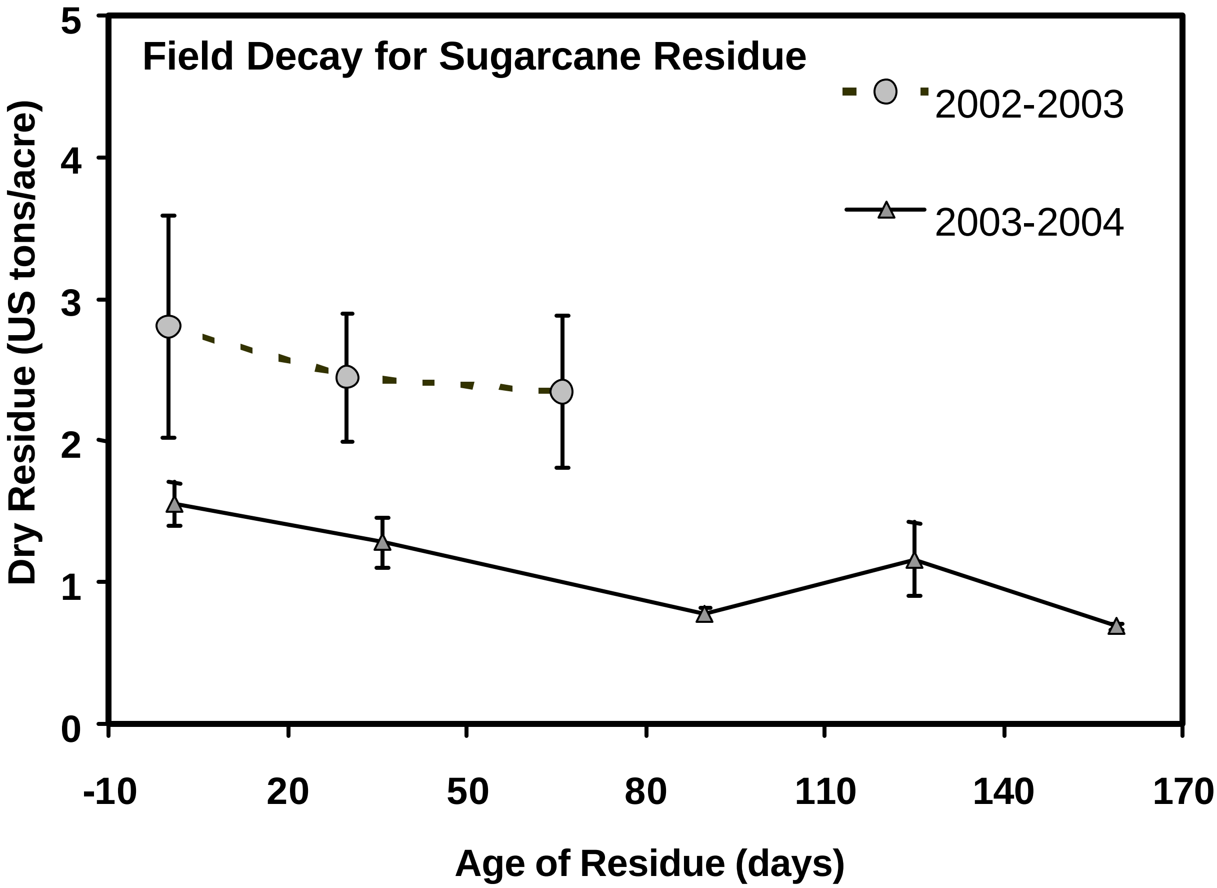

Figure 1. Field decay of sugarcane residue following harvest of HoCP91-555 for plantcane and first stubble.

ATRAZINE AND METRIBUZIN RETENTION BY SUGARCANE RESIDUE: EFFECT OF AGE OF RESIDUE

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The objective of this study was to quantify the retention of atrazine and metribuzin by the sugarcane mulch and to characterize their kinetic behavior in soil. To achieve this objective, laboratory studies of the retention kinetics of metribuzin and atrazine by the mulch residue as well as the soil were carried out. Changes in herbicide retention characteristics as a function of the age of the mulch; i.e., as the residue decays in the field, were also investigated.

To achieve our objectives, we quantified the retention of the mulch residue following cane harvest using the combine harvester over a three successive growing seasons: for plantcane, and first and second stubbles, respectively. This was carried out during 2000 through 2003 at the St. Gabriel Research Station. The sugarcane variety was LCP85-384 and the soil was Sharkey clay soil (very-fine, montmorillonitic nonacid, thermic, vertic Haplaquept), which is widely grown to sugarcane in south Louisiana.

Laboratory Measurements

To assess herbicide retention of the sugarcane mulch residue remaining on the soil surface over time, following harvest, adsorption by the mulch residue was carried out using the batch equilibration technique. The mulch samples used were collected at different times following sugarcane harvests of the 2000-2001, 2001-2002, and 2002-2003 growing seasons, representing plantcane, first stubble and second stubble, respectively. The collected residue was dried at 55°C for 24-h and weighed. A portion of dry residue was cut into 1 cm sections for our herbicide retention studies in the laboratory.

Adsorption was initiated by mixing 1g of dried and cut sugarcane mulch residue with 30 mL of the various herbicide concentration solutions in a 40-mL Teflon centrifuge tube. A wide range of atrazine and metribuzin concentrations was used. All samples were spiked with radio-labeled C-14 atrazine or metribuzin and were prepared in 0.005 M $CaCl_2$ were used. The mixtures were continuously shaken and centrifuged at $500 \times g$ for 10 minutes after each specific reaction time before sampling. A 0.5-mL aliquot was sampled from the supernatant at several reaction times up to 504 hours (21 d). The mixtures were subsequently returned to the shaker after each 0.5-mL aliquot sampling and vortexing. The collected samples were analyzed using liquid scintillation counting (LSC). The amount of pesticide retained by the residue at each reaction time was calculated from the difference in concentrations of the supernatant and that of the initial (input) solution.

Residue Retention of Herbicides

Adsorption isotherms represent the amount sorbed versus concentration of herbicide in the solution phase. Families of adsorption isotherms for atrazine and metribuzin by the mulch residue, from the second stubble are shown in Figures 1 and 2, respectively. Such relationships clearly illustrate herbicide affinities by the mulch residue as well as the extent of retention with time of reactions. Adsorption isotherms are often described by either a linear type f model ($S = K_d C$) or nonlinear (Freundlich) type of equilibrium model ($S = K_f C^N$), where S is the amount of herbicide sorbed (mg kg^{-1} soil), C is concentration in the soil solution (mg L^{-1}). The linear parameter K_d (mL g^{-1}) is the distribution coefficient which is widely reported in the literature, K_f is a Freundlich partitioning coefficient (mL g^{-1}), and N is a dimensionless parameter commonly less than unity.

The K_d values for atrazine adsorption by the sugarcane mulch residue increased with reaction times from 18.77 to 25.46 cm^3/g after 1 and 21 days, respectively (see Table 1). The metribuzin K_d values increased with reaction times from 10.58 to 14.2 cm^3/g after 1 and 21 days, respectively. These increases are representative of the strong kinetic behavior of atrazine and, to a lesser extent, metribuzin adsorption by the sugarcane mulch residue. The adsorption of both atrazine and metribuzin by sugarcane residue was initially rapid, and exhibited slower retention after 24-h of reaction time (see Figure 1 and 2). Therefore it is not recommended to rely on 24-K_d values as an estimate for potential sorption of atrazine and metribuzin by the mulch residue.

The retention capability of the mulch residue versus time of decay in the field following harvest is further depicted in Figure 3. Here we quantified the atrazine and metribuzin retention to find out the changes of adsorption characteristics caused by weather-induced changes in the field following harvest. Specifically, the K_d values were measured using 24-h batch adsorption and for individual mulch samples for the three successive growing seasons (2000-2001, 2001-2002 and 2002-2003). These results are given in Tables 2, 3 and 4 for the mulch residue collected from the residue from the plantcane, first stubble and second stubble, respectively. Strikingly, overall herbicide retention was similar over the two growing seasons and did not change significantly with age of residue or the time of decay in the field over the three growing seasons (see Tables 2 to 4). Such a finding is of significance and implies that only one K_d value is needed to quantify herbicide retention behavior and that such value is nearly time invariant for the mulch regardless of its age. Such a conclusion is valid for both herbicides.

Table 1. Linear and Freundlich model parameters for atrazine and metribuzin adsorption versus retention time by the sugarcane (LCP85-384) mulch residue. The residue was sampled on Jan 24, 2003.

Atrazine

Retention	Freundlich Model			Linear Model	
Time (d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
1	20.67 ± 2.26	0.92 ± 0.04	0.996	18.77 ± 0.58	0.935
2	23.76 ± 4.20	0.89 ± 0.06	0.988	18.04 ± 0.49	0.957
7	27.01 ± 7.60	0.95 ± 0.11	0.989	24.02 ± 0.96	0.916
14	25.12 ± 4.54	0.98 ± 0.07	0.989	24.24 ± 0.60	0.967
21	26.32 ± 4.78	0.98 ± 0.07	0.989	25.46 ± 0.64	0.966

Metribuzin

Retention	Freundlich Model			Linear Model	
Time (d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
1	13.82 ± 0.65	0.91 ± 0.01	0.994	10.58 ± 0.26	0.971
2	18.02 ± 2.49	0.88 ± 0.03	0.993	11.37 ± 0.22	0.985
7	19.28 ± 1.40	0.92 ± 0.01	0.994	13.87 ± 0.15	0.995
14	19.31 ± 1.30	0.92 ± 0.01	0.994	14.03 ± 0.15	0.995
21	19.55 ± 1.29	0.92 ± 0.02	0.994	14.20 ± 0.15	0.995

Table 2. Estimated linear and Freundlich model parameters (with 95% confidence interval) for atrazine and metribuzin adsorption by the sugarcane mulch residue (var. LCP85-384). The residue was sampled at several dates following harvest of plantcane December 8, 2000.

Sampling	Age of	Linear Model	Freundlich Model	
Date	Residue (days)	K_d (mL g^{-1})	K_f (mL g^{-1})	N
		Atrazine		
03-Jan-01	26	14.99 ± 0.15	18.27 ± 1.11	0.92 ± 0.02
07-Feb-01	61	16.52 ± 0.13	19.48 ± 0.87	0.93 ± 0.01
23-Mar-01	105	15.90 ± 0.22	19.36 ± 1.82	0.92 ± 0.03
27-Apr-01	140	18.09 ± 0.13	20.70 ± 0.97	0.94 ± 0.01
		Metribuzin		
03-Jan-01	26	10.00 ± 0.15	13.05 ± 0.80	0.96 ± 0.01
07-Feb-01	61	11.29 ± 0.49	10.11 ± 4.93	1.02 ± 0.12
23-Mar-01	105	11.20 ± 0.20	13.72 ± 2.46	0.94 ± 0.04
27-Apr-01	140	10.36 ± 0.10	13.31 ± 1.18	0.93 ± 0.02

Table 3. Estimated linear and Freundlich model parameters (with 95% confidence interval) for atrazine and metribuzin adsorption by the sugarcane mulch residue (var. LCP85-384). The residue was sampled at several dates following harvest of first stubble October 22, 2001.

Sampling Date	Age of Residue (days)	Linear Model K_d (mL g^{-1})	Freundlich Model K_f (mL g^{-1})	N
		Atrazine		
30-Oct-01	12	16.21 ± 0.36	22.62 ± 3.10	0.87 ± 0.05
26-Nov-01	39	14.92± 0.39	18.28 ± 3.51	0.92 ± 0.07
20-Dec-01	63	16.72 ± 0.27	20.67 ± 2.26	0.92 ± 0.04
22-Feb-02	127	15.65 ± 0.16	18.46 ± 1.32	0.93 ± 0.02
20-Mar-02	153	17.18 ± 0.31	22.69 ± 2.63	0.89 ± 0.04
23-May-02	217	15.93 ± 0.18	18.24 ± 1.54	0.94 ± 0.03
		Metribuzin		
30-Oct-01	12	9.23 ± 0.32	10.90 ± 4.02	0.95 ±0.09
26-Nov-01	39	9.47 ± 0.20	8.49 ± 2.12	1.02 ± 0.06
20-Dec-01	63	10.47 ± 0.22	8.76 ± 2.09	1.04 ± 0.05
22-Feb-02	127	11.11 ± 0.04	10.57 ± 0.42	1.01 ± 0.00
20-Mar-02	153	10.07 ± 0.06	11.56 ± 0.67	0.96 ± 0.01
23-May-02	217	10.97 ± 0.06	12.10 ± 0.73	0.97 ± 0.01

Table 4. Estimated linear and Freundlich model parameters (with 95% confidence interval) for atrazine and metribuzin adsorption by the sugarcane mulch residue (var. LCP85-384). The residue was sampled at several dates following harvest of second stubble November 24, 2002.

Sampling Date	Age of Residue (days)	Linear Model K_d (mL g^{-1})	Freundlich Model K_f (mL g^{-1})	N
		Atrazine		
24-Nov-02	1	20.82 ± 1.38	22.62 ± 3.10	0.87 ± 0.05
20-Dec-02	25	15.81 ± 1.49	18.28 ± 3.51	0.92 ± 0.07
24-Jan-03	63	18.77 ± 0.58	20.67 ± 2.26	0.92 ± 0.04
		Metribuzin		
25-Nov-02	1	8.52 ± 0.29	9.26 ± 2.39	0.98 ±0.09
20-Dec-02	25	10.63 ± 0.19	11.04 ± 2.21	0.99 ± 0.06
24-Jan-03	63	10.58 ± 0.26	13.82 ± 0.65	0.91 ± 0.05

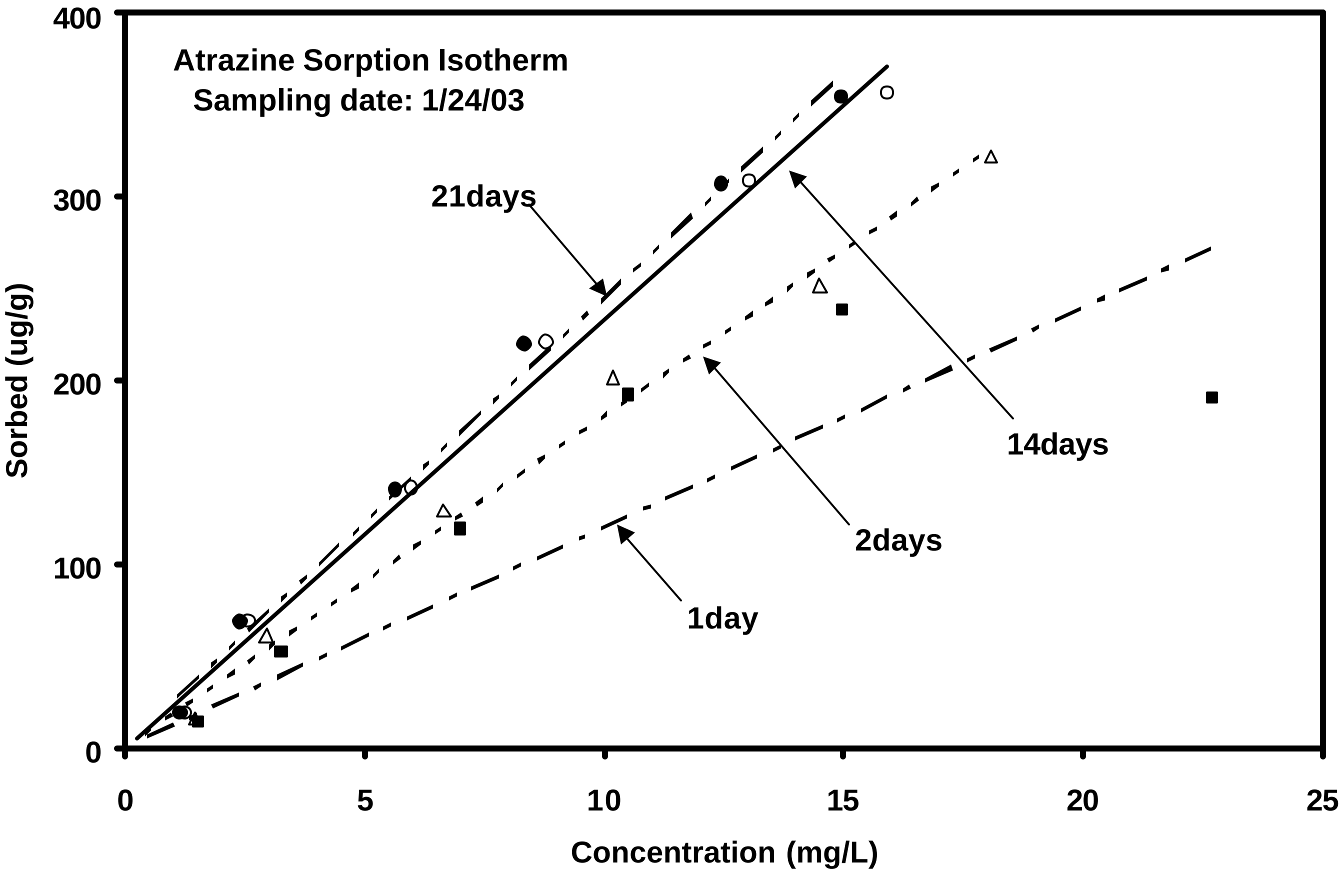

Figure 1. Adsorption isotherms for atrazine for sugarcane mulch residue at different reaction times. The residue was sampled on November 24, 2002.

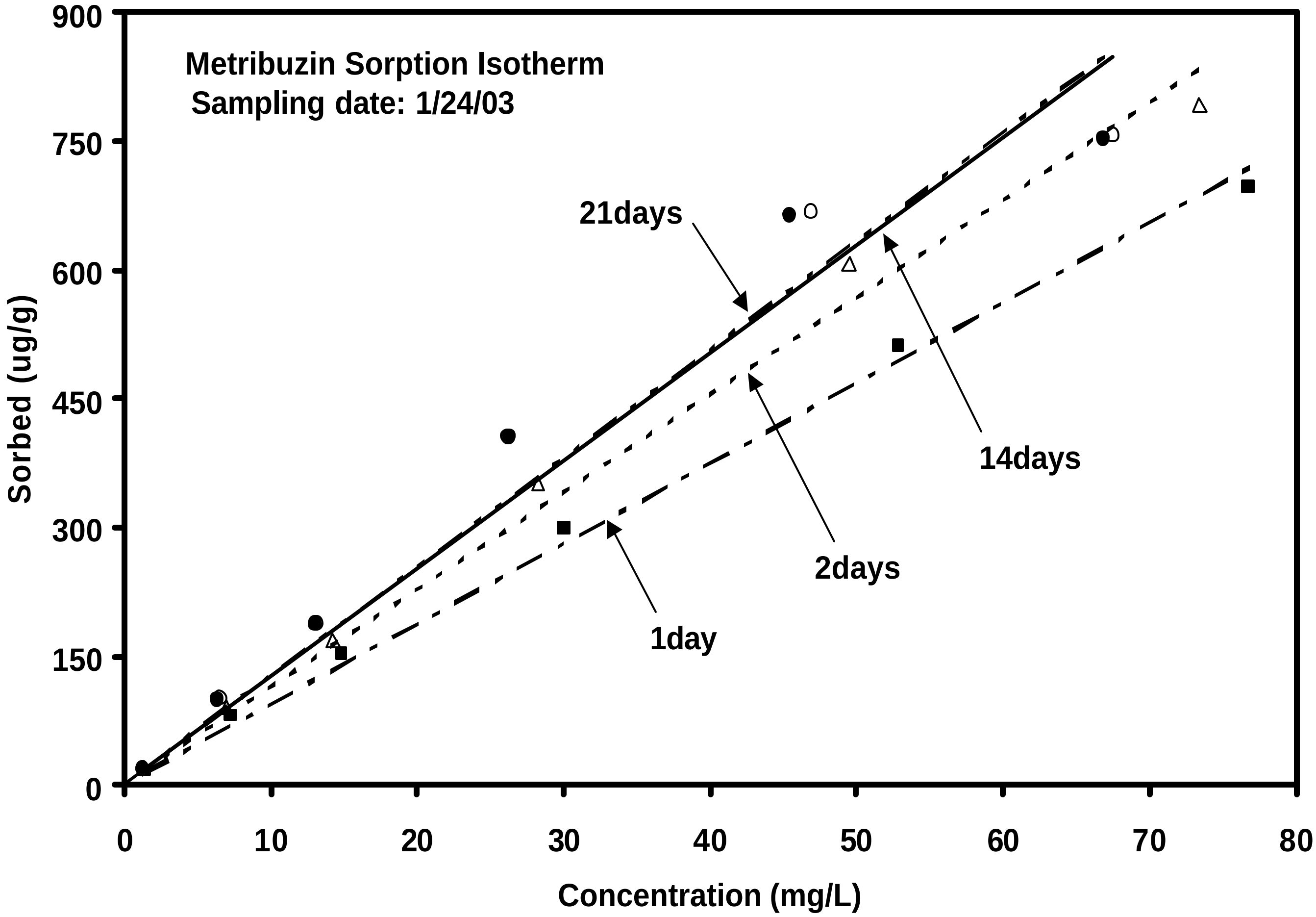

Figure 2. Adsorption isotherms for metribuzin for sugarcane mulch residue at different reaction times. The residue was sampled on November 24, 2002.

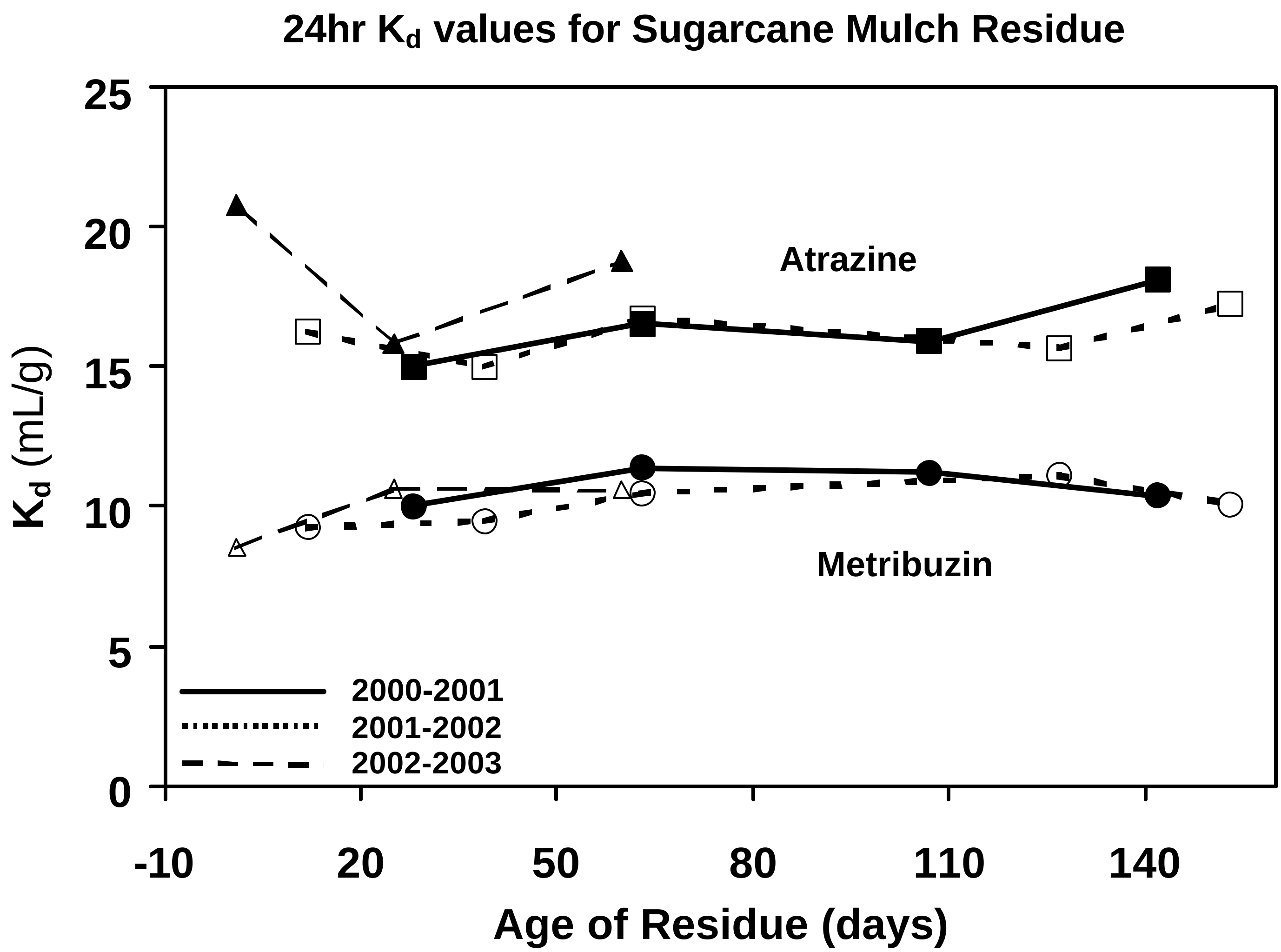

Figure 3. Distribution coefficient (K_d) for atrazine and metribuzin by the sugarcane residue versus age of the mulch during for three growing seasons.

ECONOMIC RESEARCH IN SUGARCANE IN 2003

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Projected costs and returns for the various stages of sugarcane production in Louisiana were estimated for the 2003 crop year. Production and tillage practices, as well as application rates for fertilizer, herbicides and insecticides, were updated. Input suppliers and equipment dealers were surveyed in 2002 for current input prices. Specific operations for which production costs were estimated included field operations on fallow land, seedbed preparation, cutting and planting heat-treated seedcane, planting cultured seedcane, field operations on plantcane, first stubble, second stubble, and third stubble, succession planting, as well as the costs of harvesting with whole-stalk and combine harvesters. Costs and returns were estimated for tenant-operators, reflecting the predominant land tenure situation and reflect a mill payment of 39% of production and a land rent payment of 20% of the "after milling crop" proceeds (12.2% of production). Total costs of production plus overhead for crop cycles through harvest of second, third and fourth stubble were estimated, and breakeven prices to cover direct and total specified production costs were estimated for one-fifth and one-sixth share rental arrangements. Summary breakeven prices to cover production costs through harvest of third stubble for alternative yield levels are shown in Table 1.

Allocation of sugarcane planting costs entering the 2003 crop year were estimated for planting cultured seedcane, propagated seedcane and plantcane. Table 2 presents the estimated total investment in planting costs associated with standing fields of cultured seedcane in 2003. Total investment in planting costs was estimated to be $972.64 per acre planted. This cane was assumed to be hand planted in 2002, and the estimated costs include expenses for fallow operations, seedbed preparation, purchase of cultured seed cane, and hand planting. Table 3 presents estimated total investment in planting costs associated with standing fields of propagated seedcane (1st expansion) in 2003. In this case, it is assumed cultured seedcane was planted in 2001, then harvested and replanted in 2002. Total investment in planting costs was estimated to be $577.43 per acre planted. This cost includes the allocated portion of hand planted cultured seed cane harvested and replanted mechanically. Table 4 presents estimated total investment in planting costs associated with standing fields of plantcane in 2003. Total costs were estimated to be $504.16 per planted acre and represent costs associated with two expansions of cultured seedcane. This cost value represents the total cost of planting one acre of sugarcane which will be harvested for sugar (plantcane). Allocated values of this planting cost to stubble crops were estimated at $378 per acre for first stubble, $252 per acre for second stubble, and $126 per acre for third stubble.

Table 1. Projected Breakeven Selling Prices for Raw Sugar for Selected Yield Levels, Harvest Through Third Stubble, Tenant-Operators, Louisiana, 2003

	Selected Yield Levels				
	-20%	-10%	Base	+10%	+20%
Cane yield per harvested acre[1] (tons)	25.8	28.7	32.2	35.4	38.6
Sugar yield per harvested acre[2] (lbs)	5,152	5,732	6,440	7,084	7,728
Sugar yield per rotational (farm)	3,924	4,365	4,905	5,395	5,885
One-Fifth Land Share Rent:					
	----------pounds of sugar per rotational acre------				
Share of production per rotational					
Mill share (39.0%)	1,530	1,702	1,913	2,104	2,295
Landlord share (12.2%)	479	533	598	658	718
Grower share (48.8%)	1,915	2,130	2,393	2,633	2,872
	---------------dollars per pound of sugar-----------				
Breakeven price to recover[4]:					
Direct costs	0.159	0.144	0.132	0.122	0.114
Total specified costs	0.205	0.185	0.168	0.155	0.144
Total costs plus overhead	0.242	0.218	0.198	0.183	0.169
One-Sixth Land Share Rent:					
	----------pounds of sugar per rotational acre------				
Share of production per rotational					
Mill share (39.0%)	1,530	1,702	1,913	2,104	2,295
Landlord share (10.2%)	400	445	500	550	600
Grower share (50.8%)	1,993	2,217	2,492	2,741	2,990
	---------------dollars per pound of sugar-----------				
Breakeven price to recover[4]:					
Direct costs	0.152	0.138	0.126	0.117	0.109
Total specified costs	0.196	0.177	0.162	0.149	0.139
Total costs plus overhead	0.232	0.209	0.190	0.175	0.163

[1] Average farm yield across harvested acreage of plantcane, 1st stubble, 2nd stubble, and 3rd stubble (base yield of 33 tons plantcane, 34 tons 1st stubble, 32 tons 2nd stubble, 30 tons 3rd stubble).

[2] Average yield in tons per acre multiplied by a 200 CRS.

[3] Assumes standard land rotation of 20% each of fallow, plantcane, 1st stubble, 2nd stubble and 3rd stubble.

[4] Breakeven prices are calculated by dividing grower's share of production into direct costs, total specified costs, and total specified costs plus overhead. No adjustment is made for molasses payments, hauling rebate, or other adjustments.

Table 2. Allocated Cultured Seed Cane Planting Costs in 2003.

Year	Operation	Cost Per Acre	Allocation Percentage	Allocated Planting Cost
2002	Fallow and Seedbed Preparation	$175.32	100%	$175.32
	Cultured Seed Cane	$524.51	100%	$524.51
	Hand Plant	$272.81	100%	$272.81
				$972.64

Total costs associated with planting cultured seed cane in 2002.

Table 3. Allocated Propagated Seed Cane Planting Costs in 2003.

Year	Operation	Cost Per Acre	Allocation Percentage	Allocated Planting Cost
2001	Fallow and Seedbed Preparation	$231.62	20%	$46.32
	Cultured Seed Cane	$499.75	20%	$99.95
	Hand Plant	$250.79	20%	$50.16
2002	Fallow and Seedbed Preparation	$175.32	100%	$175.32
	Harvest 1st Propagated Seed Cane	$59.94	20%	$7.79
	Mechanical Plant	$197.89	100%	$197.89
				$577.43

Total costs associated with planting propagated seed cane (1st expansion) in 2002.

Table 4. Allocated Plant Cane Planting Costs in 2003.

Year	Operation	Cost Per Acre	Allocation Percentage	Allocated Planting Cost
2000	Fallow and Seedbed Preparation	$215.86	4%	$8.63
	Cultured Seed Cane	$494.96	4%	$19.80
	Hand Plant	$221.36	4%	$8.85
2001	Fallow and Seedbed Preparation	$231.62	20%	$46.32
	Harvest 1st Propagated Seed Cane	$73.91	4%	$2.96
	Mechanical Plant	$162.02	20%	$32.40
2002	Fallow and Seedbed Preparation	$175.32	100%	$175.32
	Harvest 2nd Propagated Seed Cane	$59.94	20%	$11.99
	Mechanical Plant	$197.89	100%	$197.89
				$504.16

Total costs associated with planting plant cane in 2002.

EFFICACY OF DIFFERENT GLYPHOSATE FORMULATIONS AND ALTERNATIVE RIPENERS IN ENHANCING SUGAR YIELD IN LOUISIANA SUGARCANE DURING THE 2003 CROP

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SUMMARY

In the first of two field experiments, there was no apparent residual effect of Polado® (Monsanto) at 0.1875 lb ae/A (6 oz/A), Arsenal® (BASF) at 0.143 and 0.214 lb ai/A and Fusilade® (Syngenta) at 0.0625 and 0.875 lb ai/A on millable stalks per acre or TRS/TC. These results suggest that all treatments, with the possible exception of Arsenal at 0.214 lb-rate, can be applied repeatedly over years to the stubble crops of LCP 85-384 without a detrimental residual effect on the subsequent stubble crop.

In the second experiment, 18 ripener treatments were applied on August 26, 2003, in water at a broadcast rate of 8 gallong per acre with a CO_2 sprayer and hand-held boom: a nonionic surfactant, Induce® (Helena) (0.25% v/v), was added to all spray solutions for those treatments not loaded with their own surfactant to the fourth-stubble crop of the variety LCP 85-384. The 18 treatments included: Arsenal at 0.143 lb ai/A (8 oz/A), MON 78270 (Monsanto) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.56, 5.34, 7.12 and 8.90 oz/A, respectively), MON 78754 (Monsanto) at 0.125, 0.1875 and 0.25 lb ae/A (equivalent to 4.325, 6.487 and 8.650 oz/A, respectively), Polado at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 4, 6, 8 and 10 oz/A, respectively), Polado at 0.1875 lb ae/A (6 oz/A) mixed with Takeup® at 1 pt/A, Touchdown HiTECH® (Syngenta) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.2, 4.8, 6.4 and 8.0 oz/A, respectively) and an untreated check serving as control.

This study showed that glyphosate and Arsenal are effective in increasing the yield of theoretical recoverable sugar per ton of cane (TRS/TC) and sugar per acre (TRS/A) at the rates tested for the variety LCP 85-384 at 35 and 49 days after treatment (DAT), although it appears that little or no benefit is obtained by exceeding the glyphosate rate of 0.1875 lb ae/A (equivalent to 6 oz/A-rate of Polado). Because of the apparent impact of glyphosate and Arsenal on mean stalk weight (MSW) and yield of cane per acre (TC/A), it appears that a greater response in TRS/A occurs at 35 DAT although the efficacy of Arsenal in improving TRS/TC is greater at 49 DAT when compared to 35 DAT. However, the rates for both glyphosate and Arsenal will, undoubtedly, change depending upon variety (Millhollen & Legendre 1996). The data showed that the 0.125 lb ae/A rate of glyphosate (equivalent to 4 oz/A-rate of Polado) will significantly improve TRS/TC for LCP 85-384; however, the 0.1875 lb ae/A-rate is significantly more efficient in increasing TRS/TC when compared to control. These data support the previous recommendations that glyphosate, regardless of formulation tested, be applied at 0.1875 lb ae/A for optimal results in improving both TRS/TC and TRS/A. Arsenal, although not as effective as glyphosate in increasing TRS/TC and TRS/A, is still an effective ripener and currently the only

compound that offers new chemistry to compete with glyphosate as a proven chemical ripener under the prevailing conditions found in Louisiana. Although the use of a surfactant is optional with some products, it appears that response can be improved with the addition of a surfactant. No improvement in efficacy of glyphosate was noted for a second year with the addition of Takeup. To improve the probability of success in increasing TRS/A, sugarcane treated with a chemical ripener should be harvested within 35 to 49 DAT.

The only labeled and recommended glyphosate product included in the 2003 studies was Polado. Although Touchdown iQ® (Syngenta) is also currently labeled and recommended for commercial use in Louisiana, it was not included in these studies. Instead, the Touchdown HiTECH formulation of glyphosate was included to compare its efficacy to that of Polado. Both Polado and Touchdown HiTECH contain no surfactants or additives; therefore, these products allow the user the flexibility to customize the amount of high-quality non-ionic (NIS) surfactant added.

INTRODUCTION

In Louisiana, a sugarcane crop cycle usually consists of a fall-planted crop (plant-cane), which grows very little during winter and is harvested about one year after planting, and two or more stubble (ratoon) crops. The region has a 7- to 9-month growing season that extends from early spring to late November or until harvest during the period from late September to mid January. Consequently, sugarcane is relatively immature at the beginning of harvest, and sucrose levels are usually low, generally increasing as the harvest season advances, depending upon the variety. Sucrose levels in juice and yield of sugar per ton and per acre are affected greatly by variety and weather conditions during the growing season and harvest. A combination of high incident light, cool nights and drying soil prior to and during the harvest period retards vegetative growth and promotes sucrose accumulation (natural ripening) (Legendre 1975).

Artificial ripening of sugarcane has been made possible by the development of plant growth regulators such as chemical ripeners that hasten sugarcane maturation and increase sugar yield (Nickell 1984). Glyphosate [N-(phosphonomethyl)glycine], one of the most effective chemical ripeners used on a worldwide basis, apparently influences the way dry matter is partitioned, increasing the ratio of sucrose to fiber (Osgood et al. 1981). However, glyphosate treatment usually decreases cane yield in the crop by slowing cane growth after treatment, thus reducing stalk weight. In Louisiana, the effectiveness of glyphosate (Polado or Touchdown iQ) for ripening sugarcane is strongly dependent upon variety, treatment-harvest interval and growing season. The Polado label for sucrose enhancement in Louisiana, Florida and Texas stipulates use only in stubble crops, a rate range of 4 to 14 ounces per acre of the formulated product (contains 4 lb of glyphosate acid in each gallon in the isopropyl amine salt form) and a treatment-harvest interval of 35 to 49 days. The Touchdown label also stipulates use only in stubble crops at a rate of 8 to 10 ounces per acre of the formulated product (contains 3 lb of glyphosate acid in each gallon in the diammonium salt form) and a treatment harvest interval of 21 to 35 days. Neither product is labeled for plant-cane crops in these states because of possible phytotoxicity to crown buds which could affect regrowth (stubbling) adversely, thus having the potential to reduce plant stands and yields in the subsequent stubble crop. Slow stand development in spring is commonly observed in glyphosate-treated sugarcane in Louisiana.

Millhollon and Legendre (1996) found that annual glyphosate (Polado) ripener treatments will usually increase mean annual sugar yield, but the magnitude of the increase will depend on variety tolerance to the treatments. They found that CP 70-321 appeared to have adequate tolerance to annual treatments, whereas LCP 85-384 can show extreme sensitivity. This prompted a reduction in the rate of Polado from 8 oz/A to 6 oz/A for LCP 85-384.

Currently, glyphosate is used on approximately 305,000 acres in Louisiana, netting the state's sugarcane growers, processors and landlords an estimated $22.1 million in increased gross revenues each year. However, Polado and Touchdown are not labeled for plant-cane use and typically cause a loss of cane yield in the crop being treated. Further, there is potential for these products to cause yield reduction in the subsequent stubble crop. Therefore, additional research is needed to find alternative ripeners that can be used on the plant-cane crop and be harvested at a reduced treatment-harvest interval. Additionally, alternative ripeners should be developed that have little or no impact on cane yield and will not affect the subsequent stubble crop.

Polado is currently formulated without added surfactant. Although it is suggested that a quality non-ionic surfactant be added with Polado if conditions warrant, i.e., if rain is eminent, research has demonstrated that the use of a surfactant can improve the efficacy of the product. On the other hand, Touchdown iQ is formulated with a surfactant; however, the formulation of Touchdown (HiTECH) used in this experiment is formulated without a surfactant. This experiment was designed to test the efficacy of various loaded and unloaded formulations containing different salts of glyphosate from Monsanto and Syngenta along with potential ripeners with different chemistry in the same test.

A second objective of this experiment was to look at other potential ripeners. Because of the possibility of glyphosate-tolerant sugarcane varieties being developed in the future, the use of glyphosate as a ripener would be effectively eliminated. From 1983 to 1986, Legendre (unpublished data), while employed by the USDA-ARS, SRRC, Sugarcane Research Unit at Houma, showed that two products, Fusilade (fluazifop-P-butyl) and Arsenal (imazapyr), had the potential to ripen sugarcane under Louisiana conditions; however, the testing of both products was discontinued because the companies expressed no commercial interest. However, in recent years BASF has had renewed interest in the use of Arsenal as a ripener; consequently, it was included in this study.

PROCEDURES

In an attempt to measure the residual effect of repeated applications of chemical ripeners on the variety LCP 85-384, on plant populations and yield of cane the subsequent stubble crops, plots treated with Polado, Arsenal and Fusilade for two consecutive years, 2001 and 2002, were harvested in the third-stubble crop in 2003. Sugarcane was cultivated and fertilized according to recommended practices; insecticides were applied as required. The previous chemical treatments were applied on August 23, 2001, and again on August 21, 2002, in water at a broadcast rate of 8 gal/A with a CO_2 sprayer and hand-held boom. A nonionic surfactant, Induce® (0.25% v/v)(Helena), was added to all spray solutions. The experiment consisted of six treatments: Polado at 0.1875 ae/A (6 oz/A); Arsenal at 0.143 and 0.214 lb ai/A; Fusilade at 0.0625 and 0.0875 lb ai/A; and an untreated check serving as control. A 36-inch band was sprayed over sugarcane foliage so that most of the leaves were wet by the spray. Plots were one-row by 100 feet long with a 5-foot alley and with buffer rows on each side of treated row, arranged in a randomized complete block design with five replications. All plots were ultimately harvested green by combine at 49 days after treatment in both 2001 and 2002. The mulch residue remained on the fields after each harvest.

In 2003, fifteen-stalk samples, taken at random along the row, were removed from each plot on November 7. Stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). Following hand sampling, each plot was harvested by a cane combine (Cameco Model 2500) operating at approximately 3.5 mph and an extractor fan speed of 950 rpm. All cane from each plot was weighed in the wagon equipped with load cells and the weights recorded. Data collected and/or calculated from hand samples included millable stalks per acre, mean stalk weight (MSW), Brix by refractometer, sucrose by polarimetry, purity as the ratio of sucrose to Brix and the yield of theoretical recoverable sugar per ton of cane (TRS/TC). From weighed plots, the yield of tons cane per acre (TC/A) was calculated and, with the data for TRS/TC, the yield of theoretical recoverable sugar per acre (TRS/A) was calculated for each plot.

In the second experiment, 18 ripener treatments were applied on August 26, 2003, in water at a broadcast rate of 8 gal/A with a CO_2 sprayer and hand-held boom. Induce (0.25% v/v) was added again to all spray solutions for those treatments not having with their own surfactant (unloaded) to the fourth-stubble crop of the variety LCP 85-384. The 18 treatments included: Arsenal (BASF) at 0.143 lb ai/A (8 oz/A), MON 78270 (a loaded formulation of glyphosate from Monsanto in the isopropyl amine salt form) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.56, 5.34, 7.12 and 8.90 oz/A, respectively), MON 78754 (a loaded formulation of glyphosate from Monsanto in the potassium salt form) at 0.125, 0.1875 and 0.25 lb ae/A (equivalent to 4.325, 6.487 and 8.650 oz/A, respectively), Polado (Monsanto) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 4, 6, 8 and 10 oz/A, respectively), Polado at 0.1875 lb ae/A (6 oz/A) mixed with Takeup at 1 pt/A, Touchdown HiTech (an unloaded formulation of glyphosate from Syngenta containing 5 lb of glyphosate acid in each gallon in the potassium salt form) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.2, 4.8, 6.4 and 8.0 oz/A, respectively) and an untreated check serving as control. A 36-inch band was sprayed over sugarcane foliage so that most of the leaves were wet by the spray. Plots were one-row by 40 ft long with a 5-foot alley and with buffer rows on each side of treated row, arranged in a randomized complete block design with four replications.

Fifteen-stalk samples, taken at random along the row, were removed from each plot on September 30 and October 14 (35 and 49 DAT, respectively). Stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). On October 14 (49 DAT), each plot was harvested by a cane combine (Cameco Model 2500) operating at approximately 3.5 mph and an extractor fan speed of 950 rpm. All cane from each plot was weighed in the wagon equipped with load cells and the weights recorded. Data collected and/or calculated included mean stalk weight (MSW) and height, Brix by refractometer, sucrose by polarimetry, purity as the ratio of sucrose to Brix and the yield of theoretical recoverable sugar per ton of cane (TRS/TC). From weighed plots, the yield of tons cane per acre (TC/A) was calculated and with the data for TRS/TC, the yield of theoretical recoverable sugar per acre

(TRS/A) was calculated for each plot. However, because of the damage done to plots at harvest in 2002 following Tropical Storm Isidore, Hurricane Lili and the record rainfall amounts that occurred during the harvest season, there was considerable variation in plot weights that could not be attributed to ripener treatments. Therefore, the yield of tons of cane per acre (TC/A) was calculated by multiplying the MSW on each of the two dates of harvest by a constant (40,000) which represented the average number of stalks per plot. The yield of theoretical recoverable sugar per acre (TRS/A) was simply the product of TC/A by TRS/TC.

Data were analyzed using the Proc Mixed Procedure of the SAS (v 8.2) software package. When data were balanced, LSD values were calculated for mean separation. When data were unbalanced, least square means were calculated. Mean separation was done by the PDIFF option (P = 0.05).

RESULTS AND DISCUSSION

Where ripener treatments were applied to the same plots for two consecutive years in the first- and second-stubble crops, only Arsenal at the high rate (0.214 lb ai/A) resulted in a significant reduction in MSW in the subsequent third-stubble crop (Table 1). However, this reduction in MSW did not result in significant reductions of either TC/A or TRS/A, although the yields of both components were numerically lower. There was no apparent residual effect of any of the ripener treatments on millable stalks per acre or TRS/TC. These results suggest that all treatments, with the possible exception of Arsenal at 0.214 lb ai/A-rate, can be applied repeatedly over years to the stubble crops of LCP 85-384 without a detrimental residual effect on the subsequent stubble crop.

In the second experiment, there was a significant difference in MSW among the 18 treatments in the test at 35 DAT (Table 2) although the data were highly variable. The variability was, undoubtedly, caused by the residual effect of the poor harvesting conditions during the 2002 crop. There was no treatment with an MSW that was significantly heavier than control and only two treatments, MON 78270 at 5.34 oz/A (0.1875 lb ae/A) and MON 78754 at 4.325 oz/A (0.1875 lb ae/A), had an MSW that was lighter than the control. However, one would expect that MSW would be affected negatively at the higher glyphosate rates, not at the lower rates as seen in this study. This is somewhat of an anomaly, undoubtedly caused by the variability of results. The same trend was noted for TC/A since TC/A was the product of MSW times a constant of 40,000 (estimated number of stalks per acre); there were also no treatments with TC/A greater than control and the same two treatments mentioned above had TC/A significantly less than control. Again, one would expect that TC/A would be affected most by the higher rates of glyphosate, which was not the case in this study.

There were highly significant differences among treatments for TRS/TC at 35 DAT (Table 2). The TRS/TC for all ripener treatments was significantly higher than control. Further, it appeared that the higher the rate, the greater the efficacy of the product in increasing TRS/TC although it appeared that little or no improvement was noted when rates of glyphosate, regardless of formulation tested, exceeded the 0.25 lb ae/A-rate (equivalent to Polado at 8 oz/A). Although there was a significant increase in TRS/TC at the 0.125 lb ae/A-rate (Polado at 4 oz/A) for all glyphosate formulations tested when compared to control, there was also a significant improvement in TRS/TC at the 0.1875 lb ae/A rate (equivalent to Polado at 6 oz/A) for both

Polado and Touchdown. For LCP 85-385, it is recommended that glyphosate be applied at a rate equivalent to 6 oz of Polado (Legendre 2001), although the lower rate is sometimes used. Although Arsenal at the 0.143 lb ai/A rate significantly increased TRS/TC when compared to control, it does so at a lower level when compared to the higher rates of glyphosate. It has been claimed that tank mixing Takeup with Polado will improve TRS/TC when compared to Polado alone, especially early in the post-treatment period. However, in the current test there was no advantage to tank mixing Takeup with Polado (Table 2). These results are similar to those reported in 2002 (Legendre, et al. 2003).

There was a significant increase in TRS/A for all glyphosate treatments with the exception of the two lowest rates of MON 78270 (3.56 and 5.34 oz/A, which is equivalent to 0.125 and 0.1875 lb ae/A rates, respectively), the lowest rate of MON 78754 (4.325 oz, which is equivalent to 0.125 lb ae/A) and the 4 oz-rate of Polado (0.125 lb ae/A-rate) (Table 2). There was a numerical increase in TRS/A for all remaining ripener treatments although the differences when compared to control were not significant at the 5% level of probability.

At 49 DAT, there were no significant differences in MSW between control and any of the 17 ripener treatments although the MSW for all ripener treatments were numerically lower than control (Table 3). In general, the longer the treatment-to-harvest interval, the greater will be the measured reduction in MSW and possibly TC/A (Legendre and Finger 1987). Again, since TC/A was derived from MSW and a constant for stalk population, the same trends seen for MSW were likewise observed for TC/A.

There was a significant increase in TRS/TC for all ripener treatments when compared to control at 49 DAT (Table 3). As a rule, the higher the rate, the greater the efficacy of glyphosate in increasing TRS/TC although it appeared that little or no improvement was noted when rates of glyphosate, regardless of formulation tested, exceeded the 0.25 lb ae/A-rate (equivalent to Polado at 8 oz/A rate). For LCP 85-385, it is recommended that glyphosate be applied at a rate equivalent to 6 oz/A of Polado (Legendre 2001) although the lower rate is sometimes used. There was a significant increase in TRS/TC for Arsenal at the 0.143 lb ai/A-rate; however, its efficacy is slightly lower when compared to the higher rates of glyphosate. Again, there was no improvement in the efficacy of glyphosate at 6 oz/A when tank mixed with 1 pt/A of Takeup. Because of the apparent negative effect of most ripener treatments on MSW and TC/A at 49 DAT, there were only two treatments (Polado at 8 oz/A and Touchdown at 3.2 oz/A) where the TRS/A was improved significantly when compared to control (Table 3). For all other treatments, with the exception of Polado at 4 oz/A, there was a numerical increase in TRS/A; however, the differences were not significant at the 5% level of probability.

These data show that glyphosate and Arsenal are effective in increasing TRS/TC and TRS/A at the rates tested for the variety LCP 85-384 at 35 and 49 DAT, although it appears that little or no benefit is obtained by exceeding the glyphosate rate of 0.1875 lb ae/A (equivalent to 6 oz/A-rate of Polado). Because of the apparent impact of glyphosate and Arsenal on MSW and TC/A, it appears that a greater response in TRS/A occurs at 35 DAT although the efficacy of Arsenal in improving TRS/TC is greater at 49 DAT when compared to 35 DAT. However, the rates for both glyphosate and Arsenal will undoubtedly change, depending upon variety (Millhollen & Legendre 1996). It appears that the 0.125 lb ae/A rate of glyphosate (equivalent to

4 oz/A-rate of Polado) will significantly improve TRS/TC for LCP 85-384; however, the 0.1875 lb ae/A-rate is significantly more efficient in increasing TRS/TC when compared to control. These data support the previous recommendations that glyphosate, regardless of formulation tested, be applied at 0.1875 lb ae/A for optimal results in improving both TRS/TC and TRS/A. Arsenal, although not as effective as glyphosate in increasing TRS/TC and TRS/A, is still an effective ripener and currently the only compound that offers new chemistry to compete with glyphosate as a proven chemical ripener under Louisiana conditions. Although the use of a surfactant is optional with some products, it appears that response can be improved with the addition of a surfactant. No improvement in efficacy of glyphosate was noted for a second year with the addition of Takeup. To improve the probability of success in increasing TRS/A, sugarcane treated with a chemical ripener should be harvested within 35 to 49 DAT.

The only labeled and recommended glyphosate product included in the 2003 studies was Polado. Although Touchdown iQ (3-lb gallon) is also currently labeled and recommended for commercial use in Louisiana, it was not included in these studies. Instead, the Touchdown HiTECH (5-lb gallon) formulation of glyphosate was included in these studies to compare its efficacy to that of Polado and the other products. Both Polado and Touchdown HiTECH contain no surfactants or additives; therefore, these products allow the user the flexibility to customize the amount of high-quality non-ionic surfactant to be added.

ACKNOWLEDGMENTS

We acknowledge the assistance of Luke Etheredge, Curtis Jones and Gert Hawkins for their assistance in making this study possible. This research was supported in part by a grant from the American Sugar Cane League of the U.S.A.

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Table 1. Regrowth potential of LCP 85-384 in the third-stubble crop following the application of various chemical ripener treatments for two consecutive years in the first- and second-stubble crops and harvested by combine at the St. Gabriel Research Station, St. Gabriel, La., during the 2003 crop[12].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)	Millable stalks (no./A)
Arsenal(0.143 lb ai/A)	6797 AB	28.4 A	239 A	1.57 AB	36406 A
Arsenal(0.214 lb ai/A)	6136 B	26.0 A	239 A	1.50 B	35409 A
Control	7006 AB	29.7 A	237 A	1.73 A	34764 A
Fusilade(0.0625 lb ai/A)	6886 AB	29.5 A	233 A	1.69 AB	35094 A
Fusilade(0.0875 lb ai/A)	7344 A	30.0 A	244 A	1.66 AB	36121 A
Polado(0.1875 lb ae/A)	6519 AB	28.1 A	232 A	1.64 AB	34548 A

[1]Harvested on November 7, 2003. Treatments were applied to the same plots for two consecutive years, on August 23, 2001, and on August 21, 2002. Plots were harvested at 49 days after treatment (DAT) in both 2001 and 2002.
[2]Means followed by the same letter are non-significant at the 0.05 P.

Table 2. Response of LCP 85-384 to various chemical ripener treatments harvested at 35 days after treatment (DAT) at the St. Gabriel Research Station, St. Gabriel, La., during 2003 crop year[1].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)
Arsenal (8 oz/A)	5691	24.4	234 +	1.22
Control	4578	26.7	171	1.33
MON 78270 (3.56 oz/A)	6601 +	26.7	248 +	1.33
MON 78270 (5.34 oz/A)	5264	22.2 -	235 +	1.11 -
MON 78270 (7.12 oz/A)	6363 +	25.4	250 +	1.27
MON 78270 (8.90 oz/A)	6073 +	23.7	256 +	1.19
MON 78754 (4.325 oz/A)	5300	22.2 -	240 +	1.11 -
MON 78754 (6.487 oz/A)	6123 +	24.6	249 +	1.23
MON 78754 (8.650 oz/A)	6326 +	24.8	255 +	1.24
Polado (4 oz/A)	5382	24.7	218 +	1.23
Polado (6 oz/A)	5981 +	25.0	238 +	1.25
Polado (8 oz/A)	6894 +	27.4	252 +	1.37
Polado (10 oz/A)	5988 +	24.4	245 +	1.22
Polado (6 oz/A)+Takeup (1 pt/A)	6446 +	27.2	236 +	1.36
Touchdown (3.2 oz/A)	6238 +	26.6	234 +	1.33
Touchdown (4.8 oz/A)	6422 +	24.9	259 +	1.24
Touchdown (6.4 oz/A)	7374 +	28.3	260 +	1.42
Touchdown (8.0 oz/A)	6437 +	25.3	254 +	1.27
LSD (P=0.05)	1162	3.9	16	0.20

[1]Treatments applied on August 26, 2003; plots harvested on September 30 (35 DAT). Cane/A is based on estimated yield (mean stalk weight by a constant stalk population of 40,000/A). (+) or (-) denotes yield or stalk weight which is statistically higher or lower than control, respectively.

Table 3. Response of LCP 85-384 to various chemical ripener treatments harvested at 49 days after treatment (DAT) at the St. Gabriel Research Station, St. Gabriel, La, during 2003 crop year[1].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)
Arsenal (8 oz/A)	6559	25.4	258 +	1.27
Control	6318	29.8	212	1.49
MON 78270 (3.56 oz/A)	6693	25.4	263 +	1.27
MON 78270 (5.34 oz/A)	6710	24.5	274 +	1.23
MON 78270 (7.12 oz/A)	7353	27.0	272 +	1.35
MON 78270 (8.90 oz/A)	6633	24.5	271 +	1.23
MON 78754 (4.325 oz/A)	7463	27.5	272 +	1.37
MON 78754 (6.487 oz/A)	7833	28.6	273 +	1.43
MON 78754 (8.650 oz/A)	6950	25.8	269 +	1.29
Polado (4 oz/A)	5865	24.4	241 +	1.22
Polado (6 oz/A)	6957	27.3	255 +	1.36
Polado (8 oz/A)	7905 +	29.7	267 +	1.48
Polado (10 oz/A)	7333	26.8	274 +	1.34
Polado (6 oz/A)+Takeup (1 pt/A)	7173	28.6	251 +	1.43
Touchdown (3.2 oz/A)	8015 +	31.1	257 +	1.56
Touchdown (4.8 oz/A)	7266	26.8	270 +	1.34
Touchdown (6.4 oz/A)	7295	26.6	274 +	1.33
Touchdown (8.0 oz/A)	6806	24.9	273 +	1.25
LSD (P=0.05)	1581	5.5	13	0.28

[1]Treatments applied on August 26, 2003; plots harvested on October 14 (49 DAT). Cane/A is based on estimated yield (mean stalk weight by a constant stalk population of 40,000/A). (+) or (-) denotes yield or stalk weight which is statistically higher or lower than control, respectively.

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