SUGARCANE RESEARCH

ANNUAL PROGRESS REPORT

2002

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The LSU Agricultural Center provides equal opportunities in programs and employment.

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 2002.

Important parts of the 2002 research effort were conducted on cooperating farms and in cooperating factories throughout the industry. These activities are very 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.

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AN OVERVIEW OF 2002 ACTIVITIES IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

Kenneth A. Gravois
Sugar 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 in accordance with the provisions of the "Three-way Agreement of 1978." After yield data for one crop cycle (plantcane, first stubble, and second stubble) are collected in the outfield, those varieties that show promise are released for commercial production.

Table 1. Members of the LSU AgCenter Sugarcane Variety Development Team in 2002.

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

A total of 86,375 seedlings from 248 crosses from the 2001 crossing series were planted in the field in the spring of 2002. A total of 79,719 seedlings survived transplanting. In addition, 6,644 seedlings were planted in a cross appraisal trial. The 92.3% survival was after transplanting in mid-April and reflected the extremely dry conditions after transplanting (Table 3). The majority of the seedlings were from crosses of commercial varieties and elite experimental varieties. Selection will be carried out in 2003 when these seedlings are in the first stubble crop.

Photoperiod treatments to induce flowering began on May 31 and continued until September 10. Flowering in 2002 was excellent, with 513 crosses being made. Germination tests were conducted in December and January and indicated excellent germination for the 2002 crossing campaign. Seed production for 2002 was 312,768.

In the fall of 2002, individual selection was practiced on 68,214 first stubble seedlings that represented the 2000 crossing series. Family selection (top 90% in 2002) was utilized based on information from the cross appraisal study. Of the 68,214 clones, 4,126 were selected and planted to establish the first-line trials.

Excessive rainfall during the fall of 2002 prevented the planting of the 1999 series from first-line trials to second-line trials. However, the first-line trials were rated in August for advancement and evaluated again in mid-September for lodging, borer damage, diseases, and presence of pith/tube. The remaining 1343 clones from the plant cane first-line trials were sampled for a sucrose analysis in December 2002.

Established procedures were used to advance superior clones of the 1998 crossing series from second-line trials to increase trials (331 clones). These clones were advanced based on adequate stalk population and further evaluated for lodging, borer damage, presence of disease, and the presence of pith/tube.

The best 40 experimental varieties from the 1997 crossing series were assigned permanent variety designations in the fall of 2002. Newly assigned varieties were planted in a replicated nursery trial and a corresponding increase plot at the St. Gabriel Research Station only. "L" and "HoCP or Ho" varieties of the 2002 series were not exchanged between LSU and USDA in the fall of 2002 to plant cooperative infield and nursery tests the following year. Seed exchange will occur in 2003.

Experimental varieties were replanted in infield and off-station nursery tests (12 varieties of the 2001 assignment series), introduced to the outfield tests (five varieties of the 2000 assignment series), and planted in outfield tests (one variety of the 1997 assignment series; one variety of the 1998 assignment series; two varieties of the 1999 assignment series). Breeding personnel assisted Dr. Jeff Hoy and Dr. Gene Reagan to enter experimental varieties in the sugarcane smut and sugarcane borer resistance trials, respectively.

The distribution of "L" and "LCP" experimental clones through stages of testing in 2002 is presented in Table 2. The practice of planting nursery 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 2002.

Series	Stage of Testing	Number of experimental varieties
L 1997	Outfield - Replanted and harvested as first stubble	1
L 1998	Outfield – Replanted and harvested as plantcane On-station nurseries – 3rd stubble harvested Off-station nurseries – 2nd stubble harvested	1
L 1999	Outfield – Planted On-station nurseries - 2nd stubble harvested Off-station nurseries – 1st stubble harvested.	2
L 2000	Outfield – Introduced On-station nurseries 1st stubble harvested Off-station nurseries plantcane harvested	5
L 2001	On-station nurseries plantcane harvested Off-station nurseries planted.	12
L 2002	Assignment – On-station nurseries planted	40

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 2002 at the St. Gabriel Research Station is reported in Table 3. Total rainfall for the year was 65.78 inches, which was 116% of normal annual rainfall. After a dry February and wet March, little rain fell in late April through early June. A wet summer hindered early planting, but more normal rainfall in August allowed planting to be done. The big weather story of the year was Tropical Storm Isidore and Hurricane Lily. The sugarcane crop was severely lodged because of these storms. September and October rainfall occurred in extreme excess, preventing planting activities in those months. What planting did occur was done in less than ideal conditions. Harvest was conducted in extremely wet conditions that continued through November and December.

Freezing temperatures during the winter of 2001-2002 contributed to lower than normal levels of sugarcane rust. 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. 2002 rainfall reported by date at the St. Gabriel Research Station, St. Gabriel, Louisiana.

January	**Rain(in.)**	**%Normal**
1	0.31	
2	0.16	
5	1.60	
12	0.85	
19	0.43	
21	0.02	
22	0.03	
24	0.55	
29	0.10	
30	0.01	
31	1.03	
	5.09	**106%**
February	**Rain(in.)**	
1	0.12	
5	0.62	
6	0.11	
10	0.02	
13	0.07	
20	0.54	
	1.48	**30%**
March	**Rain(in.)**	
1	2.65	
9	0.34	
11	0.08	
12	0.14	
20	0.43	
26	1.70	
31	1.20	
	6.54	**142%**
April	**Rain(in.)**	
8	3.73	
11	0.29	
24	0.20	
	4.22	**102%**
May	**Rain(in.)**	
13	0.08	
17	0.73	
30	0.14	

31	0.26	**%Normal**
	1.21	**28%**
June	**Rain(in.)**	
3	0.23	
5	0.15	
8	0.02	
16	0.10	
19	2.50	
20	0.90	
23	0.45	
24	0.25	
26	0.80	
27	0.20	
28	0.25	
	5.85	**112%**
July	**Rain(in.)**	
5	0.02	
7	0.31	
8	0.17	
9	0.25	
10	0.74	
11	0.21	
12	0.40	
14	0.60	
22	0.53	
23	0.61	
24	0.09	
25	0.07	
26	1.09	
29	1.11	
30	0.28	
	6.48	**109%**
August	**Rain(in.)**	
8	0.85	
15	0.42	
16	0.13	
17	0.02	
19	0.26	

31	0.28	
	1.96	**35%**
September	**Rain(in.)**	**%Normal**
3	0.15	
4	0.12	
6	0.10	
8	1.20	
16	2.33	
21	0.48	
22	1.90	
24	0.30	
25	2.90	TS Isidore
26	3.10	
	12.58	**283%**
October	**Rain(in.)**	
3	2.85	Hurr. Lily
8	0.09	
9	2.20	
10	0.20	
20	0.20	
22	0.10	
25	1.16	
26	0.31	
27	1.35	
28	0.05	
29	1.68	
	10.19	**327%**

November	**Rain(in.)**	
3	0.81	
4	0.27	**%Normal**
5	0.80	
9	0.10	
10	0.40	
11	0.39	
15	0.53	
19	0.09	
20	0.56	
30	0.28	
	4.23	**105%**
December	**Rain(in.)**	
3	0.32	
4	1.05	
9	0.04	
10	0.87	
12	0.38	
19	0.03	
22	0.05	
23	2.30	
24	0.95	
31	1.00	
	6.99	**126%**
Total 2002	**66.82**	**117%**

Data provided by Dr. Richard Bengtson, Department of Biological and Agricultural Engineering.

2002 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

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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 2002 crossing season were planted in the fall of 2001. 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 2002, 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 six light-tight chambers (photoperiod bays) were used to impose photoperiod treatments. To prevent overwhelming the crossing facilities, two flowering peaks were planned for September 23 and October 8 although these two flowering peaks can be advanced or delayed because of certain climatic factors. Records of varietal flowering, past photoperiod response, and pollen production were used to determine the most appropriate photoperiod treatment for each variety. The first photoperiod treatments began on May 30. All photoperiod treatments (time from artificial sunrise to natural sunset) were initiated with a minimum of 34 consecutive days of 12½ hours of constant day length. After the initial constant photoperiod days, day length was shortened by one minute per day. Treatments differed by the number of days with constant day length and the date on which the decline of photoperiod was initiated. All photoperiod treatments were discontinued on September 10, 2002, when natural day length was 12½ hours and decreasing.

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

Flowering percentage of total stalks was excellent on the photoperiod carts in 2002 (Tables 1-2). Total flowering percentage for the six bays was 73% which was comprised from 1546 stalks. The excellent flowering could possibly be attributed to the cooler summer weather that was experienced in 2002. With an adequate germination rate, this number of tassels is sufficient to meet seed production needs. In 2002, seedlings were produced from varieties that have been and will be important to the Louisiana sugarcane industry. Some of these varieties include LCP85-384, HOCP91-555, and HOCP96-540. Because of its low pollen quantity, HOCP91-555 was used mainly as a female. LCP 85-384 and HOCP 96-540 were used mainly as males because of their abundance of pollen. The number of polycrosses for the 2002 crossing season was above average as seen in Table 3. This was because of a research project that was in progress during the 2002 crossing season. In a normal year the number will range from 10 to 15 polycrosses.

The flowering season in 2002 began extremely early. Crossing began on September 4 and ended on October 28, 2002. A total of 1,123 tassels of 100 varieties were used to produce 509 total crosses yielding 311,042 viable seed with 237,200 seed produced from biparental crosses (Table 3). The germination of seed from biparental crosses was average (75 viable seed per gram fuzz). The germination rate is one of two components that measure the success of this stage in the crossing program. The other component is photoperiod induction. Close attention was made again in maintaining high relative humidity within the crossing greenhouse. The early flowering had the majority of crosses being made in September when temperatures were relatively high. This accounted for the average germination percentage for the 2002 crossing campaign. Seed production in 2002 was an average year for the LSU AgCenter's Sugarcane Variety Development Program but far exceeded seed requirements.

The parents grown in the crossing greenhouse (carts 7 and 8) were used to make the first approximation of the flowering characteristics of new varieties by comparing the date of tasseling of new varieties to those of known varieties (Tables 4 and 6). Varietal flowering dates were recorded from December 3 through December 17, 2002. The data that was collected will be used to gage photoperiod response for upcoming crossing years.

Table 1. Summary of the 2002 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	26-Jun	34	30-Jul	62	77	Oct 18±10	91	70
1	B	26-Jun	34	30-Jul	62	77	Oct 20±8	98	74
1	C	26-Jun	34	30-Jul	62	77	Oct 19±9	85	65
2	A	16-Jun	34	20-Jul	72	87	Oct 3±9	92	77
2	B	16-Jun	34	20-Jul	72	87	Sept 30±7	83	86
2	C	16-Jun	34	20-Jul	72	87	Oct 3±12	84	70
3	A	30-May	37	6-Jul	87	102	Sept 23±9	85	75
3	B	30-May	37	6-Jul	87	102	Sept 19±10	88	77
3	C	30-May	37	6-Jul	87	102	Sept 21±11	84	73
4	A	30-May	37	6-Jul	87	102	Sept 20±6	77	83
4	B	30-May	37	6-Jul	87	102	Sept 21±9	83	77
4	C	30-May	37	6-Jul	87	102	Sept 24±11	83	64
5	A	4-Jun	36	10-Jul	82	97	Oct 10±12	92	66
5	B	4-Jun	36	10-Jul	82	97	Oct 8±12	83	55
5	C	4-Jun	36	10-Jul	82	97	Oct 10±8	76	53
6	A	30-May	41	10-Jul	82	97	Sept 27±10	91	77
6	B	30-May	41	10-Jul	82	97	Sept 22±11	89	81
6	C	30-May	41	10-Jul	82	97	Sept 23±10	82	82

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

Varieties used in crossing	Cans with stalks	Cans with tassels	Total stalks	Total tassels	Mean stalks per can	Mean tassels per can†	Mean pollen rating‡	Mean days to flower§
----------	----------	----------	----------	Number	----------	----------		days
100	324	291	1546	1123	4.77 ±1.19	3.86 ±1.44	4.79 ±1.76	79 ±10.79

† 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 2002 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	436	237,200	544 ± 798	519 ± 768	75 ± 95
Polycross	57	67,607	1186 ± 1777	815 ± 766	127 ± 110
Self	16	6,235	390 ± 506	390 ± 506	54 ± 59
Total	509	311,042	611 ± 971	548 ± 766	81 ± 97

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

Total Cans	Cans used	Total Varieties		Varieties Flowering		Mean stalks per can	Mean tassels per can†
		Known flowering response	Unknown flowering response	Known flowering response	Unknown flowering response		
----------	----------	----------	----------	number	----------	----------	----------
108	86	2	78	1	19	4.6±1.0	3.0±1.5

† Based upon cans with tassels.

Table 5. Varietal flowering summary in 2002 in the photoperiod bays.

Variety	Days of Constant Photoperiod	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
CP65-357	35	78±1	4	13	12	92
CP70-321	41	73±1	5	15	4	27
CP73-351	40±1	92±3	3	11	6	55
CP77-405	36±1	71±3	6	11	8	73
CP78-317	34	68±2	7	11	10	91
CP79-318	35	83±2	5	11	10	91
CP79-348	38±1	79±8	7	12	6	50
CP83-644	39	90±1	7	26	19	73
CP89-2143	39±1	.	.	12	.	.
CP89-831	37	98±4	4±1	8	7	88
HO01-566	34	83±2	4±1	10	8	80
HO89-889	39±1	91±5	5±1	4	4	100
HO91-572	34	68±1	7	17	16	94
HO95-988	36	82±2	6	26	23	88
HOCP00-905	37	73±1	3±1	11	8	73
HOCP00-920	37	85±4	6±1	7	5	71
HOCP00-928	36±1	.	.	10	.	.
HOCP00-939	37	118	.	3	1	33
HOCP00-950	34	87±1	7	11	11	100
HOCP01-517	34	89±2	3	11	4	36
HOCP85-845	36	85±3	3	45	25	56
HOCP88-739	39±1	87±4	7	20	16	80
HOCP89-846	34	78±3	3	12	11	92
HOCP91-552	34	68±2	3	8	8	100
HOCP91-555	40±1	90±4	7	20	7	35
HOCP92-618	37	80±1	2	14	12	86
HOCP92-624	34	77±2	7	29	26	90
HOCP92-648	35	82±3	7	15	9	60
HOCP93-746	34	80±4	6	9	6	67
HOCP93-749	39±1	78±5	7	9	8	89
HOCP93-754	39±1	98±5	5	9	8	89
HOCP93-767	37	81±5	5±1	10	4	40
HOCP94-806	36	83±4	5	5	5	100
HOCP95-951	37	71±1	4	9	7	78
HOCP96-509	37	96±4	5±1	21	9	43
HOCP96-540	36	76±2	3	20	18	90
HOCP96-561	36	85±2	4	18	16	89
HOCP97-606	36±1	93±3	6	19	6	32
HOCP97-609	36	72±1	4	18	18	100
HOCP97-645	37	82±4	6	10	9	90
HOCP98-741	36±1	75±2	5	12	12	100
HOCP98-771	37	99±9	7	5	3	60
HOCP98-778	34	94	.	8	1	13
HOCP98-781	34	84±2	4	11	6	55
HOCP99-804	39±1	73±4	7	8	7	88
HOCP99-808	35	100±2	7	10	8	80
HOCP99-815	36±2	107±3	.	7	4	57
HOCP99-825	39±1	66±1	4	8	7	88
HOCP99-866	38±1	78±4	5	15	8	53
L00-247	36	79±2	5	17	17	100
L00-249	41	87±1	3±1	17	8	47
L00-257	34	81±4	5	15	7	47
L00-264	36±1	75±4	7	16	9	56
L00-266	37	88±4	5±1	17	7	41

Table 5. Continued

Variety	Days of Constant Photoperiod	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
L01-283	41	82	7	9	2	22
L01-291	39±1	79±3	4±1	7	7	100
L01-292	41	83±1	7	7	2	29
L01-296	41	86±1	6	8	4	50
L01-299	38±1	70±1	3	11	11	100
L01-306	41	77	5	11	1	9
L01-312	41	67±3	7	10	5	50
L01-315	38±1	65±1	7	12	12	100
L89-113	39±1	86±3	4	15	7	47
L91-255	35	69±1	4	16	13	81
L91-281	34	76±1	5	17	16	94
L92-312	39±1	84±6	4	12	10	83
L92-321	36	89±5	5	8	5	63
L93-363	35±1	71±1	7	10	9	90
L93-365	35±1	84±1	7	10	9	90
L93-399	41	85±14	6	3	3	100
L94-424	41	83±1	4±1	7	3	43
L94-426	36	74±1	6	28	24	86
L94-428	38	74±2	5	27	18	67
L94-432	38±1	82±3	4	16	14	88
L94-433	37±1	87±2	5	12	9	75
L96-040	36	75±1	4	12	12	100
L96-092	39±1	86±4	7	8	8	100
L97-128	35	72±1	6	37	36	97
L97-137	37±1	108±4	6±1	24	4	17
L98-197	35±1	76±1	6	15	8	53
L98-207	35	73±1	3	35	33	94
L98-209	38	78±1	4	21	21	100
L99-226	38	81±2	4	27	25	93
L99-233	35	70±2	3	20	19	95
LCP81-010	35	74±1	5	30	27	90
LCP82-089	39±1	78±2	3	18	15	83
LCP83-137	40±1	88±4	7	14	13	93
LCP85-313	39±1	77±2	7	12	11	92
LCP85-384	37	77±1	3	158	132	84
LCP86-454	36	80±2	4	27	18	67
LHO83-153	41	75±3	5	12	6	50
N-27	40±1	73±3	7	10	7	70
TucCP77-042	36	88±1	5	24	18	75
US01-039	34	67±2	7	10	3	30
US01-040	36±1	63±1	3	5	5	100
US79-010	36	76±2	5	20	19	95
US80-004	37	74±1	3	12	5	42
US96-002	37	70±2	7	5	3	60
US99-002	34	68±1	7	5	4	80
US99-004	34	69	4	3	2	67

Table 6. Summary of varietal response to natural photoperiod in 2002.

Variety	First Flower Date	Mean Flower Date	Flowers
CP77-310	337	337	4
HOCP00-917	351	351	1
HOCP00-921	344	344	1
HOCP00-930	344	344	2
HOCP00-933	351	351	2
HOCP00-938	351	351	1
HOCP00-960	337	337	3
HOCP01-517	351	351	3
L01-288	337	342±4	3
L01-289	352	352	4
L01-294	344	344	4
L01-295	337	337	4
L01-298	351	351	1
L01-299	351	351	4
L01-305	337	337	5
L01-307	337	337	5
L01-313	353	353	6
L01-314	344	349±4	4
L01-315	337	337	2
LCP85-384	351	351	3
N-27	337	344±10	2

Table 7. Crosses and seed made in 2002 sorted by cross number.

Cross	Female	Male	Seed	Cross	Female	Male	Seed
XL02-001	US01-040	US01-040	361	XL02-029	US96-002	HOCP99-825	12
XL02-002	CP79-348	US01-040	2503	XL02-030	CP77-405	L91-255	849
XL02-003	L99-233	L99-233	1394	XL02-031	LCP81-010	L91-255	118
XL02-004	L99-233	02P1	1727	XL02-032	HOCP98-741	L91-255	110
XL02-004	L99-233	02P1	1727	XL02-033	LCP81-010	L99-233	1665
XL02-005	L91-255	02P1	1277	XL02-034	L01-312	L99-233	62
XL02-006	L01-315	LCP85-384	868	XL02-035	L97-128	L99-233	621
XL02-007	CP77-405	LCP85-384	1293	XL02-037	CP79-348	L98-207	2051
XL02-008	L99-233	HOCP98-741	1055	XL02-038	LCP81-010	L98-207	348
XL02-009	HOCP92-624	HOCP98-741	1037	XL02-039	LCP86-454	L98-207	1704
XL02-010	L01-315	HOCP98-741	1053	XL02-040	L97-128	L98-207	435
XL02-011	HOCP98-741	HOCP98-741	219	XL02-041	N-27	LCP85-384	1885
XL02-012	HOCP92-624	US01-040	828	XL02-042	HOCP92-624	LCP85-384	0
XL02-013	L97-128	US01-040	132	XL02-043	HOCP99-804	LCP85-384	12
XL02-014	L01-315	US01-040	467	XL02-044	L94-426	LCP85-384	168
XL02-015	US01-040	US01-040	13	XL02-046	L97-128	LCP85-384	591
XL02-016	HOCP92-624	L91-255	1472	XL02-047	HOCP99-804	HOCP99-825	0
XL02-017	L97-128	L91-255	243	XL02-048	L97-128	HOCP99-825	164
XL02-018	CP77-405	HOCP96-540	1213	XL02-049	HOCP99-866	HOCP99-866	31
XL02-019	LCP81-010	HOCP96-540	3195	XL02-050	L01-299	L01-299	25
XL02-020	L01-312	HOCP96-540	42	XL02-051	N-27	L94-428	466
XL02-021	L01-315	HOCP96-540	965	XL02-052	HOCP00-905	L94-428	118
XL02-022	L97-128	HOCP96-540	811	XL02-053	HOCP99-804	L94-428	11
XL02-023	US79-010	HOCP96-540	731	XL02-054	L00-264	L94-428	332
XL02-024	LCP81-010	HOCP99-825	1394	XL02-055	L01-315	L94-428	286
XL02-025	HOCP95-951	HOCP99-825	1901	XL02-056	L97-128	L94-428	473
XL02-026	L01-312	HOCP99-825	33	XL02-057	HOCP85-845	HOCP85-845	213
XL02-027	L01-315	HOCP99-825	265	XL02-058	L97-128	HOCP91-951	722
XL02-028	US79-010	HOCP99-825	215	XL02-059	N-27	HOCP96-540	1603

Cross	Female	Male	Seed
XL02-060	HOCP94-806	HOCP96-540	634
XL02-061	LCP85-384	HOCP96-540	1961
XL02-062	HOCP99-804	HOCP97-609	41
XL02-063	HOCP92-648	LCP85-384	241
XL02-064	L93-363	LCP85-384	907
XL02-065	HOCP99-825	LCP85-384	23
XL02-066	LCP85-384	LCP85-384	1532
XL02-067	L96-040	LCP85-384	106
XL02-068	L98-209	LCP85-384	321
XL02-069	LHO83-153	LCP85-384	0
XL02-070	L94-426	LCP85-384	309
XL02-071	HOCP92-648	LCP85-384	175
XL02-072	HOCP93-749	LCP85-384	559
XL02-073	L93-363	LCP85-384	836
XL02-074	HOCP98-741	LCP85-384	1057
XL02-075	L96-040	LCP85-384	1143
XL02-076	L94-426	L01-299	24
XL02-077	LCP85-384	L01-299	163
XL02-078	L98-209	L01-299	549
XL02-079	US79-010	L01-299	255
XL02-080	US96-002	L01-299	1496
XL02-081	HO95-988	LCP85-384	668
XL02-082	L94-426	LCP85-384	16
XL02-083	HOCP99-866	LCP85-384	271
XL02-084	LCP86-454	LCP85-384	3396
XL02-085	L94-428	LCP85-384	272
XL02-086	HOCP00-905	LCP85-384	152
XL02-087	US79-010	LCP85-384	489
XL02-088	HO95-988	HOCP96-540	654
XL02-089	L94-426	HOCP96-540	419
XL02-090	L94-428	HOCP96-540	465
XL02-091	HOCP93-749	HOCP96-540	22
XL02-092	LCP85-384	HOCP96-540	975
XL02-093	LHO83-153	HOCP96-540	147
XL02-094	L94-426	L99-226	0
XL02-095	L93-363	L99-226	252
XL02-096	HOCP00-905	L99-226	8
XL02-097	LCP85-384	L99-226	1537
XL02-098	L96-040	L99-226	1336
XL02-099	US96-002	L99-226	26
XL02-100	L94-426	HOCP97-609	781
XL02-101	L94-428	HOCP97-609	274
XL02-102	HOCP93-749	HOCP97-609	0
XL02-103	LCP85-384	HOCP97-609	2707
XL02-104	L96-040	HOCP97-609	523
XL02-105	L98-209	HOCP97-609	1053
XL02-106	HOCP93-749	L00-247	328
XL02-107	LCP85-384	L00-247	1633
XL02-108	HO95-988	L98-207	1250
XL02-109	L94-426	L98-207	294
XL02-110	L94-428	L98-207	1664
XL02-111	HOCP85-845	L98-207	1946
XL02-112	HOCP98-741	L98-207	1108
XL02-113	US79-010	L98-207	596
XL02-114	HOCP95-951	US80-004	1864
XL02-115	L92-312	US80-004	368
XL02-116	HOCP95-951	02P2	1436

Cross	Female	Male	Seed
XL02-117	LCP85-384	02P2	1553
XL02-118	L92-312	02P2	1530
XL02-119	LCP85-384	02P3	889
XL02-120	HOCP85-845	02P3	1489
XL02-121	US80-004	02P3	51
XL02-122	HOCP00-905	02P3	634
XL02-123	LCP82-089	02P3	550
XL02-124	L94-426	LCP85-384	309
XL02-125	L94-428	LCP85-384	975
XL02-126	LCP85-384	LCP85-384	769
XL02-127	LCP86-454	LCP85-384	2869
XL02-128	LCP85-384	LCP85-384	1711
XL02-129	CP78-317	LCP85-384	49
XL02-130	HOCP88-739	LCP85-384	353
XL02-131	HOCP93-749	LCP85-384	801
XL02-132	L94-426	LCP85-384	83
XL02-133	HOCP93-767	L99-226	1218
XL02-134	L00-247	L99-226	551
XL02-135	L99-226	L99-226	545
XL02-136	HOCP93-767	HOCP97-609	1063
XL02-137	HOCP91-552	HOCP97-609	3586
XL02-138	L00-247	HOCP97-609	605
XL02-139	HO95-988	L94-432	332
XL02-140	L00-264	L94-432	1128
XL02-141	HOCP88-739	L98-209	263
XL02-142	L93-399	L98-209	1164
XL02-143	L94-426	L98-209	41
XL02-144	L94-428	L98-209	45
XL02-145	HOCP91-552	L98-209	2678
XL02-146	L00-247	L98-209	498
XL02-148	HOCP00-905	02P4	652
XL02-149	LCP85-384	02P4	1106
XL02-150	LCP85-384	02P4	893
XL02-151	HOCP85-845	02P4	93
XL02-152	L00-247	02P4	681
XL02-153	LCP82-089	02P4	1517
XL02-154	CP65-357	LCP85-384	0
XL02-155	CP70-321	LCP85-384	394
XL02-156	HO95-988	LCP85-384	1036
XL02-157	CP70-321	LCP85-384	294
XL02-158	CP78-317	LCP85-384	0
XL02-159	CP79-318	LCP85-384	565
XL02-160	HO95-988	LCP85-384	364
XL02-161	L92-321	LCP85-384	129
XL02-162	L94-426	LCP85-384	149
XL02-163	HOCP97-645	LCP85-384	102
XL02-164	CP70-321	L92-312	142
XL02-165	CP78-317	L92-312	470
XL02-166	CP79-318	L92-312	1090
XL02-167	LCP81-010	L92-312	1158
XL02-168	L01-312	L92-312	164
XL02-169	HO95-988	LCP85-384	518
XL02-170	HOCP88-739	LCP85-384	47
XL02-171	HOCP92-624	LCP85-384	1686
XL02-172	HOCP97-645	LCP85-384	193
XL02-173	HO95-988	L94-432	0
XL02-174	LCP85-313	L94-432	921

Cross	Female	Male	Seed
XL02-175	HO95-988	L98-209	332
XL02-176	L93-399	L98-209	1842
XL02-177	HOCP97-645	L98-209	226
XL02-178	HOCP92-624	L98-209	2989
XL02-179	LCP85-313	L98-209	1239
XL02-180	N-27	L98-209	3557
XL02-181	US79-010	L98-209	69
XL02-182	HO95-988	LCP82-089	701
XL02-183	LCP85-313	LCP82-089	735
XL02-184	HOCP00-920	HOCP92-618	599
XL02-186	LCP85-313	HOCP92-618	436
XL02-187	L00-247	HOCP92-618	394
XL02-188	L00-264	HOCP92-618	120
XL02-189	LH083-153	HOCP92-618	650
XL02-190	HOCP96-561	HOCP00-905	339
XL02-191	L91-255	HOCP00-905	731
XL02-192	L94-428	HOCP00-905	104
XL02-193	LCP85-313	HOCP97-609	366
XL02-194	HOCP97-645	HOCP97-609	0
XL02-195	L00-247	HOCP97-609	406
XL02-196	LCP85-313	LCP86-454	297
XL02-197	L00-266	LCP86-454	802
XL02-198	L98-197	HOCP99-866	1353
XL02-199	L99-226	HOCP99-866	163
XL02-200	LCP83-137	LCP86-454	357
XL02-201	L01-315	LCP86-454	822
XL02-202	HOCP91-552	02P5	134
XL02-203	HOCP97-645	02P5	154
XL02-204	HOCP95-951	02P5	976
XL02-205	L96-040	02P5	711
XL02-206	LCP83-137	02P5	0
XL02-207	LHO83-153	02P5	116
XL02-208	CP65-357	L99-233	268
XL02-209	LCP81-010	L99-233	489
XL02-210	L00-264	L99-233	60
XL02-211	L01-312	L99-233	32
XL02-212	L97-128	L99-233	402
XL02-213	CP65-357	L98-209	215
XL02-214	HOCP98-741	L98-209	1030
XL02-215	HOCP99-866	L98-209	995
XL02-216	LCP81-010	L98-209	1284
XL02-217	L89-113	L98-209	95
XL02-218	L97-128	L98-209	130
XL02-219	L99-226	L98-209	154
XL02-220	CP79-348	HOCP96-561	968
XL02-221	CP70-321	HOCP96-561	144
XL02-222	L93-363	HOCP96-561	269
XL02-223	LCP81-010	HOCP96-561	1887
XL02-224	L00-264	HOCP96-561	457
XL02-225	L01-315	HOCP96-561	298
XL02-226	LCP85-384	L92-321	2083
XL02-227	L98-207	L92-321	810
XL02-228	L97-128	HOCP93-767	274
XL02-229	CP79-348	HOCP92-618	1308
XL02-230	LCP81-010	HOCP92-618	1213
XL02-231	L00-264	HOCP92-618	380
XL02-232	LCP85-384	HOCP92-618	951
XL02-233	L94-433	HOCP92-618	514
XL02-234	LCP81-010	LCP85-384	883
XL02-235	LCP83-137	LCP85-384	478
XL02-236	LCP83-137	L94-428	84
XL02-237	L00-264	L94-428	174
XL02-238	L01-315	L94-428	93
XL02-239	L94-433	L94-428	523
XL02-240	L98-207	L94-428	341
XL02-241	N-27	L94-428	72
XL02-242	HOCP92-624	L98-209	306
XL02-243	L94-426	L98-209	77
XL02-244	L97-128	L98-209	195
XL02-245	HO95-988	HOCP96-561	45
XL02-246	HOCP00-920	HOCP96-561	91
XL02-247	HOCP92-624	HOCP96-561	95
XL02-248	HOCP97-645	HOCP96-561	38
XL02-249	L94-426	HOCP96-561	28
XL02-250	L96-092	HOCP96-561	132
XL02-251	CP77-405	L98-207	1083
XL02-252	L96-092	L98-207	194
XL02-253	L97-128	L98-207	34
XL02-254	LCP81-010	L00-266	0
XL02-255	L96-092	L00-266	48
XL02-256	CP77-405	L99-233	551
XL02-257	HOCP88-739	L99-233	43
XL02-258	LCP81-010	L99-233	30
XL02-259	N-27	L99-233	79
XL02-260	HO95-988	HOCP89-846	41
XL02-261	HOCP88-739	HOCP89-846	22
XL02-262	HOCP92-624	HOCP89-846	102
XL02-264	L01-315	HOCP97-609	31
XL02-265	L97-128	HOCP97-609	34
XL02-266	L98-197	HOCP97-609	8
XL02-267	L01-315	HOCP92-618	93
XL02-268	L98-209	HOCP92-618	65
XL02-269	L96-092	HOCP92-618	72
XL02-270	L91-281	HOCP92-618	189
XL02-271	L93-363	HOCP92-618	0
XL02-272	L96-040	HOCP92-618	0
XL02-273	L97-128	HOCP92-618	18
XL02-274	TUCCP77-042	HOCP92-618	0
XL02-275	CP77-405	HOCP89-846	54
XL02-276	L93-363	HOCP89-846	75
XL02-277	L93-365	HOCP89-846	47
XL02-278	L94-426	HOCP89-846	66
XL02-279	L97-128	HOCP89-846	0
XL02-280	TUCCP77-042	HOCP89-846	8
XL02-281	HOCP91-555	L91-255	95
XL02-282	HOCP97-645	L91-255	297
XL02-283	LCP85-384	L91-255	172
XL02-284	L93-363	L91-255	359
XL02-285	L94-426	L91-255	2727
XL02-286	L93-363	L98-209	306
XL02-287	L94-426	L98-209	152
XL02-288	L94-433	L98-209	118
XL02-289	TUCCP77-042	LCP85-384	86
XL02-290	HO91-572	LCP85-384	601

Cross	Female	Male	Seed
XL02-291	L01-306	LCP85-384	286
XL02-292	L94-426	HOCP00-920	155
XL02-293	L97-128	HOCP00-920	9
XL02-294	L98-197	HOCP00-920	449
XL02-295	CP83-644	L91-255	187
XL02-296	HO95-988	L91-255	148
XL02-297	HOCP92-648	L91-255	157
XL02-298	LCP83-137	L91-255	771
XL02-299	HOCP97-606	L91-255	61
XL02-300	L91-281	HOCP92-618	151
XL02-301	LCP85-313	HOCP92-618	35
XL02-302	L97-128	HOCP92-618	7
XL02-303	HOCP88-739	HOCP89-846	0
XL02-304	L93-365	HOCP89-846	0
XL02-305	LCP85-313	HOCP89-846	0
XL02-306	CP83-644	LCP85-384	0
XL02-307	L93-365	LCP85-384	0
XL02-308	HOCP96-509	LCP85-384	302
XL02-309	L01-283	LCP85-384	86
XL02-310	L94-424	LCP85-384	21
XL02-311	L94-426	LCP85-384	78
XL02-312	US79-010	LCP85-384	290
XL02-313	L89-113	HOCP96-561	89
XL02-314	L91-281	HOCP96-561	307
XL02-315	LCP85-313	HOCP96-561	75
XL02-316	L00-257	HOCP96-561	5
XL02-317	L97-128	HOCP96-561	0
XL02-318	LCP83-137	L94-428	408
XL02-319	HOCP97-606	L94-428	0
XL02-320	L00-249	L94-428	36
XL02-321	L00-257	L94-428	42
XL02-322	L94-433	L94-428	37
XL02-323	LCP85-313	HO89-889	0
XL02-324	HOCP98-771	HO89-889	0
XL02-325	HOCP99-804	HO89-889	0
XL02-326	L97-128	HO89-889	5
XL02-327	L01-283	L99-233	418
XL02-328	L94-426	L99-233	159
XL02-329	CP77-405	CP89-831	53
XL02-330	HOCP88-739	CP89-831	44
XL02-331	L91-281	CP89-831	154
XL02-332	CP83-644	TUCCP77-042	14
XL02-333	LCP86-454	TUCCP77-042	89
XL02-334	LCP85-384	TUCCP77-042	54
XL02-335	L98-197	TUCCP77-042	112
XL02-336	CP83-644	L98-209	17
XL02-337	HOCP92-648	L98-209	27
XL02-338	L93-365	L98-209	34
XL02-339	HOCP91-555	L99-226	433
XL02-340	L98-197	L99-226	74
XL02-341	LHO83-153	L99-226	298
XL02-342	HOCP91-555	HOCP96-540	154
XL02-343	LCP85-313	HOCP96-540	118
XL02-344	HOCP99-804	HOCP96-540	22
XL02-345	L01-315	HOCP97-609	7
XL02-346	L97-128	HOCP97-609	37
XL02-347	US79-010	HOCP97-609	21

Cross	Female	Male	Seed
XL02-348	L01-292	HOCP97-609	73
XL02-349	HOCP85-845	02P6	63
XL02-350	L01-299	02P6	230
XL02-351	LCP86-454	02P6	330
XL02-352	US79-010	02P6	12
XL02-353	HOCP85-845	HOCP85-845	298
XL02-354	L01-299	L01-299	46
XL02-355	LCP85-384	LCP85-384	51
XL02-356	HOCP00-920	L99-226	202
XL02-357	L98-197	L99-226	70
XL02-358	N-27	L99-226	79
XL02-359	US01-039	L99-226	331
XL02-360	TUCCP77-042	L99-226	82
XL02-361	LCP86-454	02P7	209
XL02-362	LCP82-089	02P7	443
XL02-363	L98-197	02P7	17
XL02-364	L94-424	02P7	109
XL02-365	L00-249	02P7	131
XL02-366	HOCP96-509	02P7	373
XL02-367	HOCP85-845	02P7	675
XL02-368	CP73-351	02P7	312
XL02-369	L98-207	02P7	241
XL02-370	CP83-644	L96-040	0
XL02-371	HO95-988	L96-040	35
XL02-372	TUCCP77-042	L96-040	21
XL02-373	L00-266	CP65-357	124
XL02-374	L01-292	CP65-357	0
XL02-375	L01-296	CP65-357	183
XL02-376	CP83-644	LCP85-384	121
XL02-377	L97-128	LCP85-384	41
XL02-378	TUCCP77-042	LCP85-384	0
XL02-379	CP83-644	HOCP96-540	51
XL02-380	L00-257	HOCP96-540	165
XL02-381	TUCCP77-042	HOCP96-540	0
XL02-382	CP83-644	LCP85-384	87
XL02-383	L97-128	LCP85-384	8
XL02-384	HOCP93-754	HOCP89-846	0
XL02-385	HO95-988	HOCP89-846	0
XL02-386	CP83-644	L96-040	10
XL02-387	HOCP93-754	L96-040	0
XL02-388	HOCP96-561	L96-040	32
XL02-389	HOCP99-804	L96-040	29
XL02-390	CP83-644	L99-226	94
XL02-391	HOCP93-754	L99-226	0
XL02-392	L00-264	L99-226	192
XL02-393	L98-197	L99-226	25
XL02-394	CP78-317	HOCP85-845	181
XL02-395	HO91-572	HOCP85-845	340
XL02-396	HOCP98-741	HOCP85-845	764
XL02-397	HOCP98-781	HOCP85-845	602
XL02-398	US79-010	HOCP85-845	134
XL02-399	US99-002	HOCP85-845	286
XL02-400	CP79-318	L91-255	4289
XL02-403	L91-281	L91-255	427
XL02-404	HOCP93-746	L91-255	2504
XL02-405	HOCP93-754	L91-255	0
XL02-406	HOCP98-741	L91-255	742

Cross	Female	Male	Seed
XL02-407	HOCP98-771	L91-255	12
XL02-408	CP83-644	CP89-831	17
XL02-409	HOCP91-555	CP89-831	0
XL02-410	LCP83-137	CP89-831	0
XL02-411	HOCP88-739	HOCP91-552	173
XL02-412	HO95-988	HOCP91-552	142
XL02-413	HOCP94-806	HOCP91-552	770
XL02-414	HOCP91-555	HOCP96-509	112
XL02-415	HOCP96-561	HOCP96-509	233
XL02-416	L94-433	HOCP96-509	382
XL02-417	HOCP98-741	L94-432	1425
XL02-418	L94-426	L94-432	573
XL02-419	HOCP98-741	L00-249	610
XL02-420	HOCP98-781	L00-249	306
XL02-421	LCP81-010	L99-226	4284
XL02-422	LCP83-137	L99-226	423
XL02-423	HOCP98-741	L99-226	654
XL02-424	L98-207	L99-226	2078
XL02-425	L99-233	L99-226	1508
XL02-426	HOCP92-624	L98-209	1512
XL02-427	HOCP92-648	L98-209	585
XL02-428	HOCP93-754	L98-209	88
XL02-429	L93-365	LCP85-384	179
XL02-430	LCP86-454	LCP85-384	5590
XL02-431	L96-092	LCP85-384	999
XL02-432	US79-010	LCP85-384	270
XL02-433	HOCP98-781	02P8	1502
XL02-434	L94-433	02P8	942
XL02-435	LCP82-089	02P8	1181
XL02-436	HOCP92-624	02P8	1893
XL02-437	HOCP93-746	02P8	2331
XL02-438	CP89-831	02P8	391
XL02-439	HOCP96-561	02P8	284
XL02-440	L94-428	02P8	774
XL02-441	L93-365	LCP85-384	557
XL02-442	L96-092	LCP85-384	43
XL02-443	TUCCP77-042	LCP85-384	1066
XL02-444	HOCP98-781	LCP85-384	1256
XL02-445	HOCP00-920	L99-226	770
XL02-446	HOCP96-561	L99-226	748
XL02-447	L94-433	L99-226	1397
XL02-448	TUCCP77-042	L99-226	75
XL02-449	HOCP96-509	L98-207	4369
XL02-450	CP83-644	L99-233	710
XL02-451	HOCP93-746	L99-233	657
XL02-452	L93-365	L99-233	424
XL02-453	HOCP93-749	L91-255	285
XL02-454	L89-113	L91-255	160
XL02-455	L93-365	L91-255	274
XL02-456	L93-365	HOCP93-767	117
XL02-457	HO95-988	HOCP93-767	292
XL02-458	HOCP94-806	HOCP93-767	956
XL02-459	HOCP88-739	LCP85-384	181
XL02-460	HOCP92-624	LCP85-384	2377
XL02-461	HOCP93-749	LCP85-384	1313

Cross	Female	Male	Seed
XL02-462	L89-113	LCP85-384	394
XL02-463	LCP81-010	LCP85-384	3123
XL02-464	HOCP91-555	HOCP96-540	277
XL02-465	HO91-572	HOCP96-540	89
XL02-466	L98-207	02P9	1529
XL02-467	LCP82-089	02P9	1235
XL02-468	L91-281	02P9	1340
XL02-469	HO01-566	02P9	586
XL02-470	CP83-644	02P9	3954
XL02-471	HO95-988	L00-266	310
XL02-472	HOCP92-624	L00-266	2664
XL02-473	HOCP93-749	L00-266	1487
XL02-474	HOCP92-624	L99-226	2868
XL02-475	L91-281	L99-226	1610
XL02-476	LCP81-010	L99-226	3761
XL02-477	L97-137	L97-128	62
XL02-478	HOCP00-950	L97-128	196
XL02-479	HOCP99-808	L97-128	55
XL02-480	L00-264	L97-128	175
XL02-481	CP65-357	CP65-357	13
XL02-482	LCP81-010	LCP81-010	425
XL02-483	CP65-357	02P10	614
XL02-484	HOCP01-517	02P10	2636
XL02-485	HOCP92-624	02P10	2150
XL02-486	HOCP99-808	02P10	125
XL02-487	L92-312	02P10	359
XL02-488	L98-207	02P10	1258
XL02-489	L92-321	LCP85-384	116
XL02-490	HOCP99-808	LCP85-384	0
XL02-491	CP89-831	HOCP89-846	621
XL02-492	HO89-889	HOCP89-846	1418
XL02-493	HOCP85-845	HOCP89-846	747
XL02-494	HOCP00-950	HOCP89-846	98
XL02-495	L96-092	HOCP89-846	25
XL02-496	HOCP88-739	L91-281	79
XL02-497	HOCP00-950	L91-281	190
XL02-498	HOCP88-739	L97-137	81
XL02-499	HO95-988	L97-137	16
XL02-500	HOCP00-950	L97-137	167
XL02-501	LCP85-384	HOCP01-517	3211
XL02-502	HOCP88-739	HOCP01-517	29
XL02-503	HOCP99-808	HOCP01-517	54
XL02-504	HOCP97-645	HOCP01-517	0
XL02-505	HO95-988	HOCP85-845	0
XL02-506	HOCP00-950	HOCP85-845	10
XL02-507	HOCP92-648	HOCP85-845	173
XL02-508	LCP85-384	HOCP85-845	60
XL02-509	HOCP99-866	HOCP85-845	226
XL02-510	LCP86-454	L01-291	231
XL02-511	TUCCP77-042	L01-291	10
XL02-512	HOCP99-866	L01-291	483
XL02-513	HOCP99-866	HOCP99-866	121
XL02-514	LCP85-384	02P11	10984
XL02-515	HOCP85-845	02P11	2737
XL02-516	LCP86-454	02P11	7488

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2002

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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 93,019 seedlings from 247 crosses were planted in the field in the spring of 2002. The majority of these seedlings are progeny of crosses among commercial and elite experimental varieties. In the fall of 2002, family selection was practiced on the 75,973 stubble seedlings surviving the winter. This selection resulted in the planting of 4,197 eight-foot first-line trial plots. At the same time, superior clones were also selected and advanced through subsequent stages (0 to second line trials, 331 to the increase stage). Assignment of permanent "L02" numbers were given to the 40 best clones of the 1997 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 93,019 seedlings from 247 crosses of the 2001 crossing series were planted to the field in the spring of 2002 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2002, individual selection was practiced on the 75,973 stubble single stools of the 2000 crossing series that survived the winter. The 4,197 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 3,000 first-line trial plots of the 1999 crossing series were rated for cane yield and pest resistance in August of 2002 (Table 3). After screening for cane yield rating, acceptable clones were further evaluated for pest resistance (diseases and borer injury) and stalk quality (Table 3). The remaining clones were harvested and analyzed for sucrose content. Because of extremely wet conditions, second-line trial plots were not planted. These clones will be assessed again in first stubble first-line plots and sent directly to the increase stage in 2003.

Stalk counts were made on the 759 plant cane second-line trial plots of the 1998 crossing series in August 2002. Based on these counts and the previously described criteria, 331 clones were planted in 20-foot plots representing the increase stage of the program (Table 4). These clones will be candidates for assignment in 2003. Of the 392 candidates from the first stubble crop of the second-line trials, the best 40 clones from the 1997 crossing series were assigned permanent “L02" numbers (Table 5). These newly assigned “L02" varieties were then planted in a replicated nursery trial at the St. Gabriel Research Station.

The advancement summary of clones from crosses made in 1997 through 2000 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.

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	1 st line	2 nd line	Increase	On-station Nurseries (L02 Assignments)
			---- number of clones ----					
X97	75	174	71416	48322	3901	735	392	40
X98	125	193	64467	54794	3012	759	331	
X99		312	74263	46783	3371	0*		
X00	76	211	98371	75973	4197			
X01		247	93019					

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

Table 2. Dates of seedling and line trials planted or harvested in 2002.

Crossing Series	Test	Crop	Date Planted	Date Harvested
X01	Seedlings	Planted	4/16 - 24/02	
X01	Progeny Test	Planted	4/24/02	
X00	Seedlings	First Stubble	4/16 - 20/01	
X00	First-line Trials	Planted	9/5 - 9/12/02	
X99	First-line Trial	Plant Cane	9/14 - 17/01	12/3 & 12/11/02
X98	First-line Trial	First Stubble	9/7- 14/00	11/24/02
X98	Second-line Trial	Plant Cane	9/26/01	10/15/02
X97	Second-line Trial	First Stubble	9/20/00	10/1/02
X96	Second-line Trial	Second Stubble	9/23/99	10/22/02
X98	Light Soil Increase	Planted	10/17/02	
X97	Light Soil Increase	Plant Cane	10/2/01	12/4/02
X96	Light Soil Increase	First Stubble	9/26/00	11/19/02
X95	Light Soil Increase	Second Stubble	10/5/99	10/6/02
X97	Heavy Soil Increase	Plant Cane	10/2/01	10/31/02
X96	Heavy Soil Increase	First Stubble	9/26/00	11/19/02
X95	Heavy Soil Increase	Second Stubble	10/5/99	10/7/02

Table 3. Numbers of experimental clones dropped for identified faults in the 1999 crossing series first-line trials.

Trait	Fault Frequency	Fault Percent
------------------------------ 3371 clones enter first round of evaluation ----------------------------------		
Initial Selection (Rating)	1565	46.4
--------------------------- 1806 clones enter second round of evaluation ---------------------------------		
Brittle	96	2.8
Rust	2	0.1
Borers	2	0.1
Lodged	123	3.6
Pith / Tube	188	5.6
Short	53	1.6
Diameter	43	1.3
Smut	18	0.5
Other	36	1.1
-- 2126 clones dropped --		
--------------------------------1245 clones enter third round of evaluation ------------------------------		
Sugar/Ton (< 240 lbs)	651	19.3
Clones advanced	594	17.6

Table 4. Number of experimental clones dropped for identified faults in the 1998 crossing series second-line trial prior to advancement to the increase stage.

Trait	Fault Frequency	Fault Percent
-------------------------------- 759 clones enter first round of evaluation ---------------------------------		
Stalk count <80 per plot	247	32.5
Lodged	117	15.4
Pith / Tube	9	1.2
Short	13	1.7
Diameter	3	0.4
Smut	4	0.5
Brittle	21	2.8
Leaf Scald	1	0.2
Other	13	1.7
-- 428 clones dropped --		
Clones advanced to Increase stage	331	43.6

Table 5. Mean yield data of 2002 "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
CP1970-321	CP61-039	CP57-614	7317	40.4	182	1.93	41518
LCP1985-384	CP77-310	CP77-407	6959	49.5	141	1.72	57853
HOCP1985-845	CP72-370	CP77-403	6339	38.4	163	1.85	41972
L2002-316	L94-424	LCP85-384	8743	42.1	208	1.67	50366
L2002-317	LCP81-010	LCP85-384	7206	44.5	162	1.52	58534
L2002-319	L94-424	LCP85-384	9628	47.7	202	1.91	49913
L2002-320	L94-424	LCP85-384	8401	53.5	157	1.72	62164
L2002-322	LCP85-336	LCP85-384	8494	44.8	189	1.9	47190
L2002-323	L94-424	LCP85-384	10654	52.2	204	1.84	56719
L2002-324	L94-424	LCP85-384	12148	60.6	201	1.78	68063
L2002-325	L94-424	LCP85-384	11835	70.2	169	2.01	69878
L2002-326	L94-424	LCP85-384	8702	50.8	171	1.93	52635
L2002-327	L94-424	LCP85-384	7164	50.2	143	1.77	56719
L2002-328	L94-424	LCP85-384	9565	51.7	185	2.11	49005
L2002-329	HOCP93-746	L94-426	7211	48.8	148	1.75	55811
L2002-332	L91-281	LCP81-010	9935	56.0	177	1.93	58080
L2002-333	HOCP92-624	L94-428	9159	53.6	171	1.79	59895
LCP2002-334	HOCP90-941	HOCP90-941	7786	33.7	231	1.4	48098
L2002-335	L94-426	CP84-772	7521	39.2	192	1.73	45375
L2002-336	HOCP88-739	LCP85-384	11683	60.0	195	2.28	52635
LCP2002-337	HOCP91-542	CP91-559	8247	52.3	158	1.8	58080
L2002-338	L94-432	L91-255	7302	40.5	180	2.1	38569
L2002-339	LCP85-313	HOCP85-845	8512	43.5	196	1.51	57626
L2002-340	LCP81-010	L95-477	7757	44.7	174	1.79	49913
L2002-341	L96-071	LCP82-089	11301	58.6	193	2.35	49913
L2002-342	CP83-644	LCP85-384	8565	61.4	140	2.13	57626
LCP2002-343	LCP85-384	HOCP85-845	7712	38.6	200	1.59	48551
LCP2002-344	CP89-845	CP91-534	8722	51.2	170	2.09	49005
LCP2002-345	LCP85-384	HOCP85-845	10666	47.0	227	1.48	63525
L2002-346	L88-063	L91-255	9544	47.9	199	1.69	56719
L2002-347	L88-063	L91-255	7370	47.6	155	1.75	54450
L2002-348	HOCP93-746	HOCP85-845	7945	34.5	230	1.77	39023
L2002-349	HOCP93-746	HOCP85-845	7291	40.1	182	1.75	45829
L2002-350	HOCP92-624	LCP85-384	8673	51.5	168	1.83	56265
L2002-351	L88-063	L91-255	9543	48.8	196	2.15	45375
LCP2002-352	LCP85-384	HOCP85-845	8683	54.3	160	1.93	56265
L2002-353	L94-432	L91-255	7384	44.3	167	1.76	50366
L2002-354	L88-063	L91-255	8498	60.2	141	2.39	50366
LCP2002-355	HOCP90-941	HOCP93-750	7142	40.5	176	1.45	55811
LCP2002-358	HOCP91-542	CP91-559	7677	38.7	198	1.69	45829
L2002-359	L93-363	HOCP85-845	11744	57.9	203	2.26	51274
L2002-360	HOCP92-624	LCP85-384	9434	55.8	169	1.64	68063
L2002-361	HOCP92-624	LCP85-384	8091	39.8	203	1.95	40838

Table 6. Advancement summary of crosses in the 1997 through 2000 crossing series.

			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
1997 Crossing Series										
CP77-310	HOCP85-845	237	0	14	0	20	0	25	0	43
CP77-310	HOCP92-618	333	26	62	4	64	1	55	0	43
CP77-310	HOCP92-618	246	20	65	3	65	0	25	0	43
CP77-310	US78-020	81	0	14	0	20	0	25	0	43
CP77-407	CP88-769	220	0	14	0	20	0	25	0	43
CP77-407	LCP82-089	105	23	96	6	97	5	98	0	43
CP79-318	CP87-609	243	0	14	0	20	0	25	0	43
CP79-318	CP94-856	241	19	64	0	20	0	25	0	43
CP79-318	HO94-850	335	15	41	3	59	1	55	0	43
CP79-318	HO95-988	341	0	14	0	20	0	25	0	43
CP79-318	HOCP85-845	247	15	48	0	20	0	25	0	43
CP79-318	HOCP92-618	247	19	62	2	49	1	58	0	43
CP79-318	L88-072	238	22	73	2	53	0	25	0	43
CP79-318	US78-020	109	7	52	1	59	0	25	0	43
CP79-348	L91-255	484	21	40	8	70	2	60	0	43
CP80-356	LCP82-089	246	17	55	0	20	0	25	0	43
CP82-550	L91-255	243	19	62	0	20	0	25	0	43
CP83-644	LCP85-384	722	57	64	21	86	10	81	1	90
CP84-1198	TCP87-3388	344	6	32	0	20	0	25	0	43
CP84-722	LCP82-089	240	9	38	0	20	0	25	0	43
CP85-830	US78-020	229	17	58	5	79	0	25	0	43
CP87-626	HOCP95-950	112	0	14	0	20	0	25	0	43
CP88-769	HOCP85-845	111	14	87	0	20	0	25	0	43
CP89-805	LCP85-336	108	0	14	0	20	0	25	0	43
CP89-831	HOCP94-806	243	30	86	4	70	4	85	0	43
CP89-843	LCP86-454	480	11	33	2	45	1	53	0	43
CP89-845	CP91-534	234	20	69	7	86	5	92	1	95
CP94-1996	LHO83-153	244	11	41	2	51	0	25	0	43
HO93-771	HOCP92-678	236	15	52	5	78	4	86	0	43
HO93-771	HOCP93-775	235	23	76	10	94	9	97	0	43
HO93-771	LHO83-153	345	38	82	4	64	2	64	0	43
HO94-850	L95-482	939	39	40	8	55	3	56	0	43
HO95-985	CP88-769	244	20	66	2	51	0	25	0	43
HO95-985	L88-063	111	0	14	0	20	0	25	0	43
HO95-985	L95-461	343	33	75	8	81	4	77	0	43
HO95-985	L96-044	425	0	14	0	20	0	25	0	43
HO95-988	LCP82-089	244	0	14	0	20	0	25	0	43
HOCP85-845	SELF	221	0	14	0	20	0	25	0	43
HOCP85-845	US78-020	250	10	39	0	20	0	25	0	43
HOCP88-739	HO94-850	97	24	98	4	94	1	76	0	43
HOCP88-739	L94-428	108	0	14	0	20	0	25	0	43
HOCP88-739	LCP81-010	194	20	78	3	67	2	76	0	43

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
HOCP88-739	LCP85-384	105	18	94	5	96	4	97	1	98
HOCP89-846	L96-044	106	0	14	0	20	0	25	0	43
HOCP90-923	LHO83-153	465	15	36	5	63	3	67	0	43
HOCP90-941	HOCP92-618	239	0	14	0	20	0	25	0	43
HOCP90-941	HOCP93-750	938	80	69	29	87	11	77	1	88
HOCP90-941	SELF	421	51	84	4	61	2	64	1	91
HOCP91-542	CP91-559	483	40	67	15	88	4	69	2	94
HOCP92-618	HOCP93-775	485	36	58	4	51	2	59	0	43
HOCP92-618	US95-1001	240	0	14	0	20	0	25	0	43
HOCP92-624	CP79-318	110	17	91	0	20	0	25	0	43
HOCP92-624	CP84-772	1348	11	29	3	42	1	50	0	43
HOCP92-624	HOCP85-845	361	39	80	7	76	3	70	0	43
HOCP92-624	HOCP92-618	250	27	80	4	68	3	78	0	43
HOCP92-624	L94-428	808	115	90	7	58	5	66	1	89
HOCP92-624	LCP81-010	493	34	55	6	65	6	78	0	43
HOCP92-624	LCP85-384	245	25	77	2	51	0	25	0	43
HOCP92-624	LCP85-384	1944	238	85	54	85	30	83	2	87
HOCP92-624	LCP85-384	256	33	87	5	77	5	90	1	93
HOCP92-624	US95-1001	341	0	14	0	20	0	25	0	43
HOCP92-631	LHO83-153	503	0	14	0	20	0	25	0	43
HOCP92-648	L90-191	106	14	88	2	74	1	74	0	43
HOCP92-648	L91-255	706	53	60	1	40	1	52	0	43
HOCP92-648	L94-428	230	14	48	2	58	0	25	0	43
HOCP92-648	LCP81-010	232	47	95	9	93	4	87	0	43
HOCP92-648	LCP87-472	493	28	46	4	49	3	65	0	43
HOCP92-648	US90-018	106	0	14	0	20	0	25	0	43
HOCP92-654	HOCP93-752	453	0	14	0	20	0	25	0	43
HOCP93-744	CP77-407	221	0	14	0	20	0	25	0	43
HOCP93-744	HOCP85-845	869	0	14	0	20	0	25	0	43
HOCP93-746	HOCP85-845	1206	111	73	27	80	9	67	2	91
HOCP93-746	L94-426	240	13	44	2	52	1	61	1	95
HOCP93-746	LCP82-089	228	15	53	6	83	6	93	0	43
HOCP93-746	LHO83-153	243	0	14	0	20	0	25	0	43
HOCP93-746	US95-1014	234	23	76	4	71	3	79	0	43
HOCP93-750	HOCP90-941	249	0	14	0	20	0	25	0	43
HOCP93-775	SELF	250	24	75	10	93	4	84	0	43
HOCP93-775	US93-016	245	0	14	0	20	0	25	0	43
HOCP94-806	L91-255	684	0	14	0	20	0	25	0	43
HOCP94-806	L94-428	393	0	14	0	20	0	25	0	43
HOCP95-950	LCP82-089	461	0	14	0	20	0	25	0	43
HOCP96-569	HOCP93-775	487	30	50	6	66	2	58	0	43
L88-063	HOCP92-618	223	0	14	0	20	0	25	0	43
L88-063	L91-255	472	45	74	17	90	12	93	4	97

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
L88-072	HOCP85-845	1655	75	41	13	48	6	57	0	43
L88-072	L96-044	240	0	14	0	20	0	25	0	43
L89-113	LHO83-153	236	17	56	2	55	0	25	0	43
L89-136	HOCP85-845	237	29	85	2	53	1	62	0	43
L90-191	LCP82-089	476	27	46	5	62	4	70	0	43
L91-255	HOCP85-845	103	17	93	2	76	0	25	0	43
L91-281	CP87-626	251	22	71	5	77	5	91	0	43
L91-281	LCP81-010	96	26	98	9	99	6	99	1	99
L91-281	LCP84-222	107	15	90	4	91	4	95	0	43
L91-288	HOCP92-618	247	0	14	0	20	0	25	0	43
L92-321	HOCP85-845	234	0	14	0	20	0	25	0	43
L93-363	HOCP85-845	243	20	66	5	78	2	68	1	94
L94-424	LCP85-384	1473	96	52	28	75	21	82	9	96
L94-426	CP84-772	400	97	97	14	90	6	83	1	92
L94-426	L95-477	106	9	69	5	95	4	96	0	43
L94-428	L93-365	109	8	57	3	84	1	72	0	43
L94-428	LCP87-472	108	2	33	1	60	1	73	0	43
L94-432	L91-255	211	19	72	7	89	6	94	2	98
L94-432	LCP81-010	481	19	39	3	47	1	53	0	43
L94-432	LCP86-454	105	23	96	7	98	2	90	0	43
L95-495	CP79-318	232	0	14	0	20	0	25	0	43
L95-495	CP85-830	90	0	14	0	20	0	25	0	43
L95-495	HO95-988	232	20	70	2	56	1	63	0	43
L95-495	HOCP85-845	216	0	14	0	20	0	25	0	43
L96-013	HOCP85-845	243	26	79	4	70	1	59	0	43
L96-024	LCP82-089	465	24	43	10	79	4	71	0	43
L96-044	LCP81-010	104	10	75	0	20	0	25	0	43
L96-048	LCP87-472	242	15	50	1	44	1	60	0	43
L96-051	CP85-830	212	35	93	12	97	4	89	0	43
L96-060	L95-477	611	0	14	0	20	0	25	0	43
L96-060	L96-044	703	0	14	0	20	0	25	0	43
L96-060	LCP82-089	712	0	14	0	20	0	25	0	43
L96-071	LCP82-089	685	51	58	13	75	7	75	1	90
LCP81-010	HOCP85-845	1691	47	35	0	20	0	25	0	43
LCP81-010	HOCP85-845	1405	0	14	0	20	0	25	0	43
LCP81-010	L88-072	456	27	47	2	47	1	54	0	43
LCP81-010	L89-136	110	12	81	2	72	2	88	0	43
LCP81-010	L91-281	1403	51	37	12	56	4	54	0	43
LCP81-010	L94-432	1431	51	37	2	40	1	50	0	43
LCP81-010	L95-477	1064	132	86	25	82	14	81	1	86
LCP81-010	L96-044	105	104	99	8	98	5	98	0	43
LCP81-010	LCP82-089	734	42	46	3	44	0	25	0	43
LCP81-010	LCP85-384	106	9	69	0	20	0	25	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
LCP81-010	LCP85-384	1057	57	44	24	81	15	82	1	87
LCP81-010	LCP87-472	893	11	31	0	20	0	25	0	43
LCP81-010	US78-020	914	9	30	2	42	1	51	0	43
LCP82-089	HOCP94-806	679	0	14	0	20	0	25	0	43
LCP82-089	LCP87-472	321	6	33	1	43	1	56	0	43
LCP85-313	HOCP85-845	237	9	38	0	20	0	25	0	43
LCP85-313	HOCP85-845	387	35	72	11	85	5	80	1	93
LCP85-313	HOCP85-845	234	45	95	9	92	3	79	0	43
LCP85-313	L88-072	112	7	51	2	72	2	87	0	43
LCP85-313	LCP82-089	728	39	44	5	48	1	51	0	43
LCP85-313	LCP85-336	105	20	94	1	61	1	74	0	43
LCP85-336	L96-024	109	0	14	0	20	0	25	0	43
LCP85-336	LCP85-384	842	97	82	27	89	14	85	1	89
LCP85-384	HOCP85-845	349	42	83	15	95	12	94	3	97
LCP85-384	US95-1075	461	28	48	4	58	4	71	0	43
LCP86-429	HOCP92-618	109	9	67	2	73	2	89	0	43
LCP86-429	L88-072	436	0	14	0	20	0	25	0	43
LCP86-429	L91-255	940	71	61	13	67	6	66	0	43
LCP86-429	L94-428	484	0	14	0	20	0	25	0	43
LCP86-429	L95-477	227	37	92	7	87	2	72	0	43
LCP86-429	LCP85-336	1167	56	43	2	41	0	25	0	43
LCP86-429	LCP85-384	446	59	88	12	83	9	91	0	43
LCP86-429	LCP87-472	236	16	54	2	55	0	25	0	43
RSB90-22	US95-1014	453	11	34	0	20	0	25	0	43
US78-020	HOCP85-845	240	18	60	1	45	1	61	0	43
US79-010	HOCP94-806	234	32	89	4	71	1	63	0	43
US80-004	LCP84-222	94	7	58	0	20	0	25	0	43
US80-004	LCP87-472	95	15	91	1	62	0	25	0	43
US80-004	US78-020	196	0	14	0	20	0	25	0	43
US90-021	HO94-850	239	19	64	1	45	0	25	0	43
US90-025	US90-020	103	7	54	1	62	0	25	0	43
US90-027	97P2	187	19	77	7	91	7	95	0	43
US90-027	L95-477	230	0	14	0	20	0	25	0	43
US90-20	HOCP92-678	236	0	14	0	20	0	25	0	43
US90-25	US92-11	241	2	29	0	20	0	25	0	43
US92-11	CP88-757	232	0	14	0	20	0	25	0	43
US93-16	HOCP93-750	464	49	79	11	82	8	87	0	43
US95-1036	RSB90-24	248	0	14	0	20	0	25	0	43
US96-1	HO93-769	245	29	83	4	68	2	68	0	43
US96-1	SELF	242	0	14	0	20	0	25	0	43
US96-2	HOCP93-775	484	14	35	0	20	0	25	0	43
US96-2	LCP86-454	360	25	55	1	43	0	25	0	43
US96-2	LHO83-153	250	4	31	0	20	0	25	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
US96-6	HO94-851	219	0	14	0	20	0	25	0	43
US96-6	SELF	246	0	14	0	20	0	25	0	43
1998 Crossing Series										
CP65-357	98P1	234	20	76	0	14	0	22	.	.
CP78-357	HOCP92-624	448	43	84	11	80	5	85	.	.
CP78-357	HOCP96-561	351	24	64	7	71	3	77	.	.
CP79-318	98P3	85	9	86	3	92	0	22	.	.
CP79-318	HOCP85-845	461	7	25	1	30	1	47	.	.
CP79-318	HOCP89-846	207	14	64	1	41	0	22	.	.
CP79-318	HOCP94-836	351	5	24	0	14	0	22	.	.
CP79-318	HOCP95-947	79	0	11	0	14	0	22	.	.
CP79-318	L95-495	593	44	68	2	34	2	50	.	.
CP79-318	LCP82-089	187	16	77	1	43	1	63	.	.
CP79-318	LCP82-089	242	36	96	9	93	2	73	.	.
CP79-318	LCP85-384	251	34	95	16	98	9	98	.	.
CP79-348	US96-006	657	25	41	2	33	0	22	.	.
CP82-550	L96-045	62	0	11	0	14	0	22	.	.
CP83-644	CP79-318	211	9	44	1	40	0	22	.	.
CP83-644	HO94-856	231	0	11	0	14	0	22	.	.
CP83-644	HOCP85-845	964	27	32	3	34	3	49	.	.
CP83-644	HOCP92-624	245	29	90	9	93	4	92	.	.
CP83-644	HOCP95-947	237	0	11	0	14	0	22	.	.
CP83-644	HOCP96-538	246	29	90	5	72	2	69	.	.
CP83-644	L89-113	93	0	11	0	14	0	22	.	.
CP83-644	L95-477	1616	107	62	49	90	26	92	.	.
CP83-644	L95-495	540	0	11	0	14	0	22	.	.
CP83-644	L96-044	225	0	11	0	14	0	22	.	.
CP83-644	LCP81-010	1306	51	42	18	63	6	60	.	.
CP83-644	LCP81-010	232	7	34	2	48	1	58	.	.
CP83-644	LCP82-089	1328	80	56	34	82	20	90	.	.
CP83-644	US80-004	101	8	72	0	14	0	22	.	.
CP85-803	L89-113	221	21	83	9	96	2	80	.	.
HO95-985	HOCP85-845	250	28	88	5	71	1	52	.	.
HO95-985	HOCP85-845	397	7	26	2	42	2	63	.	.
HO95-985	L96-040	227	37	98	6	85	0	22	.	.
HO95-985	LCP81-010	452	9	28	3	44	2	60	.	.
HO95-985	LCP81-010	340	21	57	3	49	1	49	.	.
HO95-985	LCP82-089	238	12	48	3	58	0	22	.	.
HO95-985	LCP85-384	106	12	88	7	98	2	95	.	.
HO95-988	HOCP85-845	250	6	30	1	36	0	22	.	.
HO95-988	L89-113	230	17	68	6	83	4	93	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HO95-988	L94-426	105	14	94	4	95	2	95	.	.
HO95-988	L95-495	109	7	59	1	52	0	22	.	.
HO96-566	HOCP92-624	240	22	82	4	65	2	74	.	.
HO96-566	HOCP96-538	394	48	92	5	58	4	84	.	.
HOCP92-618	LCP81-010	689	0	11	0	14	0	22	.	.
HOCP92-624	HO96-565	91	3	36	0	14	0	22	.	.
HOCP92-624	HOCP85-845	249	20	73	10	95	3	87	.	.
HOCP92-624	HOCP85-845	944	71	69	22	78	8	76	.	.
HOCP92-624	HOCP96-509	103	10	85	3	86	0	22	.	.
HOCP92-624	L89-113	427	32	69	10	79	3	68	.	.
HOCP92-624	L96-040	241	35	96	9	94	7	98	.	.
HOCP92-624	L96-045	643	22	38	7	55	6	82	.	.
HOCP92-624	L96-045	240	19	72	1	38	1	55	.	.
HOCP92-624	L97-121	220	17	71	3	62	0	22	.	.
HOCP92-624	LCP85-384	344	24	65	10	86	8	96	.	.
HOCP92-624	LCP85-384	1146	69	56	30	84	7	66	.	.
HOCP92-648	L96-040	234	15	59	5	76	1	58	.	.
HOCP92-648	L97-121	1179	16	24	2	29	1	46	.	.
HOCP92-648	L97-133	242	16	62	1	38	1	55	.	.
HOCP92-648	LCP81-010	564	29	49	3	43	2	51	.	.
HOCP92-648	LCP82-089	92	7	70	2	76	1	85	.	.
HOCP92-654	98P3	621	0	11	0	14	0	22	.	.
HOCP92-654	HOCP85-845	473	0	11	0	14	0	22	.	.
HOCP92-654	L94-426	1215	0	11	0	14	0	22	.	.
HOCP92-654	L96-083	480	0	11	0	14	0	22	.	.
HOCP94-836	HOCP95-998	1135	0	11	0	14	0	22	.	.
HOCP96-500	L89-113	543	20	39	11	72	2	52	.	.
HOCP96-500	LCP81-010	497	17	38	2	36	0	22	.	.
HOCP96-500	LCP81-010	470	30	59	8	66	3	67	.	.
HOCP96-500	LCP85-384	901	47	50	12	61	6	68	.	.
HOCP96-515	HO96-565	227	14	57	4	68	1	59	.	.
HOCP96-519	HOCP95-998	591	42	66	15	82	7	87	.	.
HOCP96-519	HOCP96-538	333	9	31	1	33	0	22	.	.
HOCP96-522	HOCP95-947	236	9	41	1	38	1	56	.	.
HOCP96-522	LCP82-089	508	24	46	8	65	3	65	.	.
HOCP96-538	CP78-317	226	0	11	0	14	0	22	.	.
HOCP96-538	HOCP85-845	455	0	11	0	14	0	22	.	.
HOCP96-538	HOCP92-624	233	0	11	0	14	0	22	.	.
HOCP96-538	LCP82-089	1074	45	44	20	69	9	74	.	.
HOCP96-546	HOCP85-845	395	19	47	1	31	0	22	.	.
HOCP96-546	L96-044	665	0	11	0	14	0	22	.	.
HOCP96-561	L96-045	85	0	11	0	14	0	22	.	.
L89-113	LCP82-089	713	27	41	10	63	6	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
L89-163	HOCP94-836	111	6	51	0	14	0	22	.	.
L89-163	HOCP95-947	430	60	95	13	89	4	81	.	.
L89-163	LCP81-010	1296	14	23	2	28	1	45	.	.
L91-255	HOCP96-561	650	0	11	0	14	0	22	.	.
L91-255	L89-113	384	0	11	0	14	0	22	.	.
L91-255	LCP85-384	533	35	62	9	66	6	86	.	.
L94-428	LCP86-454	234	0	11	0	14	0	22	.	.
L95-461	HO94-856	500	52	85	15	88	3	65	.	.
L95-461	HOCP92-624	244	8	36	3	57	0	22	.	.
L95-461	HOCP94-836	247	7	32	1	36	1	53	.	.
L95-495	CP78-2114	93	5	51	0	14	0	22	.	.
L95-495	HO96-565	220	13	55	2	51	0	22	.	.
L95-495	HOCP85-845	374	0	11	0	14	0	22	.	.
L95-495	HOCP96-500	224	0	11	0	14	0	22	.	.
L95-495	L89-113	414	45	87	13	90	4	82	.	.
L95-495	L96-045	196	0	11	0	14	0	22	.	.
L95-495	L96-083	77	10	93	1	61	0	22	.	.
L96-040	L96-044	694	58	75	12	67	7	84	.	.
L96-040	L97-149	229	0	11	0	14	0	22	.	.
L96-040	LCP82-089	567	67	90	17	88	9	91	.	.
L96-040	US96-006	245	22	81	5	73	2	70	.	.
L96-045	HOCP85-845	108	8	68	2	69	1	80	.	.
L96-060	HOCP95-998	227	0	11	0	14	0	22	.	.
L96-060	L95-495	349	6	26	1	32	0	22	.	.
L96-060	LCP82-089	344	14	43	3	49	3	78	.	.
L96-072	HOCP85-845	234	12	49	2	47	0	22	.	.
L96-072	HOCP89-846	100	0	11	0	14	0	22	.	.
L96-072	LCP82-089	392	32	74	13	91	5	88	.	.
L96-078	HOCP95-947	107	9	75	1	53	0	22	.	.
L97-104	L97-146	444	29	60	4	50	1	48	.	.
L97-104	LCP82-089	241	21	79	6	81	3	88	.	.
L97-113	L96-044	97	3	34	2	74	0	22	.	.
L97-113	LCP81-010	244	1	23	0	14	0	22	.	.
L97-121	HOCP92-624	101	17	98	7	99	4	99	.	.
L97-121	HOCP96-561	882	40	45	8	51	5	64	.	.
L97-121	LCP81-010	237	26	87	5	75	2	76	.	.
L97-128	HOCP95-998	235	8	38	0	14	0	22	.	.
L97-128	LCP81-010	899	17	27	6	45	2	47	.	.
L97-146	LCP85-384	219	18	74	9	96	3	90	.	.
L97-149	LCP81-010	225	0	11	0	14	0	22	.	.
LCP81-010	HOCP96-550	235	8	38	3	59	1	57	.	.
LCP81-010	L95-495	225	5	29	0	14	0	22	.	.
LCP81-010	L97-149	343	24	65	6	68	3	79	.	.

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
LCP81-010	LCP82-089	1194	4	22	2	29	1	46	.	.
LCP82-089	HOCP96-527	427	0	11	0	14	0	22	.	.
LCP82-089	L89-113	746	0	11	0	14	0	22	.	.
LCP82-089	LCP86-454	166	0	11	0	14	0	22	.	.
LCP85-384	CP78-2114	314	23	66	6	70	2	66	.	.
LCP85-384	L96-045	221	28	92	6	85	4	94	.	.
LCP85-384	LCP82-089	1223	192	97	28	77	10	71	.	.
LCP85-384	LCP82-089	237	40	99	7	87	5	96	.	.
LCP85-384	LCP86-454	211	7	36	2	53	1	61	.	.
LCP86-429	L94-428	753	16	28	2	31	0	22	.	.
LCP87-492	CP78-2114	203	26	93	7	92	2	83	.	.
MISC	98P2	231	13	52	3	61	2	77	.	.
MISC	CP78-317	245	21	77	2	46	1	53	.	.
MISC	HOCP85-845	600	35	54	14	78	8	89	.	.
MISC	HOCP92-624	404	35	79	10	80	7	93	.	.
MISC	HOCP96-500	219	19	79	2	51	0	22	.	.
MISC	L89-113	486	25	49	5	54	4	72	.	.
MISC	L89-163	251	23	82	1	36	0	22	.	.
MISC	L94-426	243	23	83	11	97	6	97	.	.
MISC	L95-495	198	8	42	3	64	0	22	.	.
MISC	L96-044	229	13	53	5	77	2	79	.	.
MISC	L96-045	243	29	91	5	74	1	54	.	.
MISC	L97-146	241	14	54	2	46	2	73	.	.
MISC	LCP81-010	101	9	80	0	14	0	22	.	.
MISC	LCP85-384	243	16	62	3	57	2	72	.	.
MISC	LCP86-454	214	5	30	1	40	1	61	.	.
US77-017	HOCP85-845	235	7	34	3	59	1	57	.	.
US77-017	HOCP92-624	247	20	73	3	56	0	22	.	.
US93-015	CP78-2114	228	0	11	0	14	0	22	.	.
US93-015	L96-044	252	0	11	0	14	0	22	.	.
US93-016	CP78-2114	203	12	55	1	42	1	62	.	.
US93-016	L95-495	583	28	47	5	48	2	50	.	.
US93-016	L96-045	247	11	45	3	56	2	69	.	.
US93-016	LCP86-454	38	1	31	1	84	0	22	.	.
US96-006	CP78-2114	234	0	11	0	14	0	22	.	.
US96-006	L97-121	241	0	11	0	14	0	22	.	.
US96-006	L97-155	102	0	11	0	14	0	22	.	.
US96-006	US96-006	206	18	79	1	42	0	22	.	.
1999 Crossing Series										
CP65-357	L95-482	407	16	50	.	.	.	.	.	.
CP65-357	LCP85-384	94	20	99	.	.	.	.	.	.

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
CP65-357	LCP85-384	190	24	95	.	.	.	.	.	.
CP70-321	LCP82-089	176	3	31	.	.	.	.	.	.
CP72-370	HO95-988	469	24	62	.	.	.	.	.	.
CP77-405	HOCP92-618	185	0	12	.	.	.	.	.	.
CP77-405	HOCP95-931	178	0	12	.	.	.	.	.	.
CP77-405	HOCP97-621	393	17	56	.	.	.	.	.	.
CP77-405	L90-191	197	0	12	.	.	.	.	.	.
CP77-405	L94-426	207	1	25	.	.	.	.	.	.
CP77-405	L94-428	377	0	12	.	.	.	.	.	.
CP77-405	L94-428	354	0	12	.	.	.	.	.	.
CP77-405	L96-040	377	0	12	.	.	.	.	.	.
CP77-405	LCP85-384	176	0	12	.	.	.	.	.	.
CP77-405	US90-018	182	0	12	.	.	.	.	.	.
CP78-357	HOCP92-618	207	23	92	.	.	.	.	.	.
CP78-357	L94-432	1106	75	73	.	.	.	.	.	.
CP78-357	L96-030	214	21	91	.	.	.	.	.	.
CP78-357	US90-018	188	6	42	.	.	.	.	.	.
CP79-318	HO95-988	375	0	12	.	.	.	.	.	.
CP79-318	HOCP94-806	232	2	26	.	.	.	.	.	.
CP79-318	HOCP95-931	162	0	12	.	.	.	.	.	.
CP79-318	L97-137	544	20	47	.	.	.	.	.	.
CP79-318	LCP81-010	214	0	12	.	.	.	.	.	.
CP79-318	LCP85-384	698	32	58	.	.	.	.	.	.
CP79-318	LCP85-384	407	17	55	.	.	.	.	.	.
CP79-318	LCP85-384	161	28	98	.	.	.	.	.	.
CP79-348	HOCP92-618	211	0	12	.	.	.	.	.	.
CP79-348	L94-426	1079	18	31	.	.	.	.	.	.
CP82-550	LCP81-010	84	3	45	.	.	.	.	.	.
CP83-644	HOCP97-621	93	2	35	.	.	.	.	.	.
CP83-644	L91-255	194	14	75	.	.	.	.	.	.
CP83-644	L91-255	399	27	73	.	.	.	.	.	.
CP83-644	L96-030	64	12	99	.	.	.	.	.	.
CP83-644	L96-040	140	11	81	.	.	.	.	.	.
CP83-644	L96-063	435	33	77	.	.	.	.	.	.
CP83-644	L98-207	141	7	61	.	.	.	.	.	.
CP83-644	LCP81-010	384	16	55	.	.	.	.	.	.
CP83-644	LCP82-089	347	23	71	.	.	.	.	.	.
CP83-644	LCP85-384	398	0	12	.	.	.	.	.	.
CP88-702	HOCP92-618	179	6	43	.	.	.	.	.	.
CP88-702	L94-428	243	7	39	.	.	.	.	.	.
CP88-702	LCP86-454	86	2	37	.	.	.	.	.	.
CP89-879	HOCP92-618	213	9	55	.	.	.	.	.	.
CP89-879	L91-255	347	24	74	.	.	.	.	.	.

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
CP89-879	L94-426	212	6	38	.	.	.	.	.	.
CP89-879	L94-428	413	51	95	.	.	.	.	.	.
CP89-879	L94-428	148	0	12	.	.	.	.	.	.
CP89-879	L96-030	221	18	81	.	.	.	.	.	.
CP89-879	LCP81-010	237	12	62	.	.	.	.	.	.
CP89-879	LCP81-010	210	4	32	.	.	.	.	.	.
HO89-889	LCP85-384	730	42	67	.	.	.	.	.	.
HO95-985	CP77-405	232	18	79	.	.	.	.	.	.
HO95-985	HOCP85-845	163	9	65	.	.	.	.	.	.
HO95-985	HOCP95-931	190	3	31	.	.	.	.	.	.
HO95-985	L91-255	376	29	78	.	.	.	.	.	.
HO95-985	L94-426	200	15	76	.	.	.	.	.	.
HO95-985	L94-428	190	10	64	.	.	.	.	.	.
HO95-985	L98-209	236	12	62	.	.	.	.	.	.
HO95-985	LCP85-384	168	27	98	.	.	.	.	.	.
HO95-988	LCP82-089	181	0	12	.	.	.	.	.	.
HO96-565	HOCP92-618	206	14	73	.	.	.	.	.	.
HO96-565	LCP85-384	152	21	96	.	.	.	.	.	.
HOCP85-845	99P3	194	0	12	.	.	.	.	.	.
HOCP85-845	L97-137	209	18	83	.	.	.	.	.	.
HOCP89-846	L94-428	374	20	64	.	.	.	.	.	.
HOCP92-618	LCP85-384	218	9	53	.	.	.	.	.	.
HOCP92-624	99P4	170	7	53	.	.	.	.	.	.
HOCP92-624	HO89-889	431	53	95	.	.	.	.	.	.
HOCP92-624	HOCP85-845	238	15	69	.	.	.	.	.	.
HOCP92-624	HOCP92-618	83	3	45	.	.	.	.	.	.
HOCP92-624	HOCP95-931	206	0	12	.	.	.	.	.	.
HOCP92-624	L75-056	453	0	12	.	.	.	.	.	.
HOCP92-624	L91-255	366	35	90	.	.	.	.	.	.
HOCP92-624	L94-426	185	12	70	.	.	.	.	.	.
HOCP92-624	L94-428	168	9	64	.	.	.	.	.	.
HOCP92-624	L95-482	433	16	47	.	.	.	.	.	.
HOCP92-624	L97-137	407	23	66	.	.	.	.	.	.
HOCP92-624	LCP81-010	789	17	35	.	.	.	.	.	.
HOCP92-624	LCP85-384	86	7	81	.	.	.	.	.	.
HOCP92-624	LCP86-454	634	48	77	.	.	.	.	.	.
HOCP92-648	HOCP95-931	233	37	97	.	.	.	.	.	.
HOCP92-648	HOCP96-509	362	0	12	.	.	.	.	.	.
HOCP92-648	L91-255	204	7	43	.	.	.	.	.	.
HOCP92-648	L96-063	359	27	76	.	.	.	.	.	.
HOCP92-648	LCP85-384	625	64	91	.	.	.	.	.	.
HOCP92-648	LCP85-384	627	29	58	.	.	.	.	.	.
HOCP92-648	US90-018	219	9	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
HOCP94-806	HOCP85-845	453	34	76	.	.	.	.	.	.
HOCP94-806	HOCP92-618	389	34	84	.	.	.	.	.	.
HOCP94-806	HOCP97-621	91	1	27	.	.	.	.	.	.
HOCP94-806	HOCP97-621	420	36	83	.	.	.	.	.	.
HOCP95-931	L75-056	638	35	65	.	.	.	.	.	.
HOCP96-509	HO89-889	170	7	53	.	.	.	.	.	.
HOCP96-509	HOCP92-618	227	5	35	.	.	.	.	.	.
HOCP96-509	L75-056	460	56	94	.	.	.	.	.	.
HOCP96-509	L94-428	204	8	50	.	.	.	.	.	.
HOCP96-509	L94-432	352	10	38	.	.	.	.	.	.
HOCP96-509	L95-482	151	14	87	.	.	.	.	.	.
HOCP96-509	L97-117	523	44	82	.	.	.	.	.	.
HOCP96-509	LCP85-384	351	7	34	.	.	.	.	.	.
HOCP96-518	LCP85-384	306	0	12	.	.	.	.	.	.
HOCP96-519	L94-428	213	1	25	.	.	.	.	.	.
HOCP96-519	LCP86-454	239	0	12	.	.	.	.	.	.
HOCP96-522	HO95-988	392	19	59	.	.	.	.	.	.
HOCP96-522	HOCP92-618	83	0	12	.	.	.	.	.	.
HOCP96-522	L91-255	76	7	86	.	.	.	.	.	.
HOCP96-522	L95-482	332	5	30	.	.	.	.	.	.
HOCP96-522	L96-026	215	0	12	.	.	.	.	.	.
HOCP96-522	L98-209	155	9	67	.	.	.	.	.	.
HOCP96-522	LCP82-089	325	14	56	.	.	.	.	.	.
HOCP96-522	LCP85-384	219	21	90	.	.	.	.	.	.
HOCP96-522	LCP85-384	1031	71	74	.	.	.	.	.	.
HOCP96-522	US96-001	203	32	97	.	.	.	.	.	.
HOCP96-525	L94-428	394	0	12	.	.	.	.	.	.
HOCP96-525	L94-432	344	0	12	.	.	.	.	.	.
HOCP96-525	LCP85-384	460	0	12	.	.	.	.	.	.
HOCP97-609	HOCP85-845	224	19	83	.	.	.	.	.	.
HOCP97-609	HOCP97-621	431	40	87	.	.	.	.	.	.
HOCP97-609	L94-426	140	0	12	.	.	.	.	.	.
HOCP97-609	LCP86-454	211	15	75	.	.	.	.	.	.
HOCP97-620	LCP81-030	355	28	81	.	.	.	.	.	.
HOCP97-621	HOCP85-845	389	0	12	.	.	.	.	.	.
HOCP97-621	LCP85-384	1086	40	47	.	.	.	.	.	.
HOCP97-641	HOCP94-806	234	11	59	.	.	.	.	.	.
HOCP97-646	L75-056	361	7	32	.	.	.	.	.	.
HOCP97-646	L95-482	170	2	28	.	.	.	.	.	.
HOCP97-670	L94-432	229	13	66	.	.	.	.	.	.
HOCP97-670	L94-432	173	19	92	.	.	.	.	.	.
HOCP97-697	L94-426	194	7	45	.	.	.	.	.	.
L75-056	L98-207	243	19	79	.	.	.	.	.	.

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
L89-113	HO95-988	388	26	72	.	.	.	.	.	.
L89-113	HOCP85-845	178	6	43	.	.	.	.	.	.
L89-113	HOCP92-618	435	17	50	.	.	.	.	.	.
L89-113	L91-255	399	0	12	.	.	.	.	.	.
L89-113	L94-428	462	0	12	.	.	.	.	.	.
L89-113	L94-428	423	17	51	.	.	.	.	.	.
L89-113	L94-432	366	0	12	.	.	.	.	.	.
L89-113	LCP82-089	197	4	34	.	.	.	.	.	.
L90-191	HOCP94-806	85	3	44	.	.	.	.	.	.
L90-191	LCP82-089	222	0	12	.	.	.	.	.	.
L91-255	HO89-889	375	6	31	.	.	.	.	.	.
L91-255	HOCP95-931	167	5	40	.	.	.	.	.	.
L91-255	L94-428	195	3	30	.	.	.	.	.	.
L91-255	LCP82-089	413	0	12	.	.	.	.	.	.
L91-255	LCP82-089	359	28	79	.	.	.	.	.	.
L91-255	LCP85-384	646	79	94	.	.	.	.	.	.
L91-255	US90-018	207	5	37	.	.	.	.	.	.
L94-426	HOCP85-845	175	5	39	.	.	.	.	.	.
L94-426	LCP82-089	224	3	29	.	.	.	.	.	.
L94-426	LCP85-384	225	17	77	.	.	.	.	.	.
L94-428	LCP86-454	150	0	12	.	.	.	.	.	.
L94-432	CP78-357	326	28	83	.	.	.	.	.	.
L94-432	HO95-988	176	0	12	.	.	.	.	.	.
L94-432	HOCP85-845	183	7	49	.	.	.	.	.	.
L94-432	HOCP92-618	407	0	12	.	.	.	.	.	.
L94-432	HOCP97-621	323	14	56	.	.	.	.	.	.
L94-432	HOCP97-670	221	0	12	.	.	.	.	.	.
L94-432	L91-255	203	8	50	.	.	.	.	.	.
L94-432	L98-209	342	23	72	.	.	.	.	.	.
L94-432	LCP85-384	690	64	87	.	.	.	.	.	.
L94-432	US93-015	189	7	47	.	.	.	.	.	.
L95-482	LCP82-089	542	13	37	.	.	.	.	.	.
L96-026	CP83-644	158	0	12	.	.	.	.	.	.
L96-026	HO95-988	504	33	70	.	.	.	.	.	.
L96-026	HOCP85-845	198	0	12	.	.	.	.	.	.
L96-026	HOCP85-845	302	12	51	.	.	.	.	.	.
L96-026	HOCP97-670	421	28	72	.	.	.	.	.	.
L96-026	L91-255	340	11	42	.	.	.	.	.	.
L96-026	LCP81-010	237	0	12	.	.	.	.	.	.
L96-026	LCP82-089	190	0	12	.	.	.	.	.	.
L96-030	HO95-988	193	18	87	.	.	.	.	.	.
L96-030	HOCP96-525	208	9	56	.	.	.	.	.	.
L96-040	HOCP95-931	404	0	12	.	.	.	.	.	.

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
L96-040	L94-426	206	7	43	.	.	.	.	.	.
L96-092	HOCP96-525	160	0	12	.	.	.	.	.	.
L97-113	HOCP85-845	167	24	97	.	.	.	.	.	.
L97-113	L91-255	188	0	12	.	.	.	.	.	.
L97-113	LCP81-010	205	16	79	.	.	.	.	.	.
L97-113	US96-005	425	5	28	.	.	.	.	.	.
L97-117	L94-432	197	0	12	.	.	.	.	.	.
L97-121	L94-428	231	3	29	.	.	.	.	.	.
L97-121	L94-432	158	18	93	.	.	.	.	.	.
L97-121	US90-018	227	9	51	.	.	.	.	.	.
L97-128	HO95-988	420	37	85	.	.	.	.	.	.
L97-128	L91-255	473	0	12	.	.	.	.	.	.
L97-128	LCP85-384	859	0	12	.	.	.	.	.	.
L97-137	US96-001	194	6	41	.	.	.	.	.	.
L97-142	HO95-988	390	0	12	.	.	.	.	.	.
L97-142	HO95-988	215	0	12	.	.	.	.	.	.
L97-142	LCP82-089	195	0	12	.	.	.	.	.	.
L97-143	L94-428	166	6	45	.	.	.	.	.	.
L97-147	L94-432	165	15	86	.	.	.	.	.	.
L98-191	HOCP97-621	87	10	93	.	.	.	.	.	.
L98-207	HOCP85-845	200	6	40	.	.	.	.	.	.
L98-207	HOCP92-618	329	17	63	.	.	.	.	.	.
L98-207	L94-428	372	0	12	.	.	.	.	.	.
L98-207	L94-432	816	41	61	.	.	.	.	.	.
L98-207	LCP81-010	379	24	69	.	.	.	.	.	.
LCP81-010	HOCP95-931	208	0	12	.	.	.	.	.	.
LCP81-010	HOCP97-621	402	8	34	.	.	.	.	.	.
LCP81-010	L91-255	417	24	67	.	.	.	.	.	.
LCP81-010	L94-432	1029	0	12	.	.	.	.	.	.
LCP81-010	LCP81-030	208	0	12	.	.	.	.	.	.
LCP81-010	LCP85-384	1113	110	91	.	.	.	.	.	.
LCP81-010	LCP85-384	1564	64	53	.	.	.	.	.	.
LCP81-030	L94-432	112	0	12	.	.	.	.	.	.
LCP82-089	HOCP97-621	182	11	68	.	.	.	.	.	.
LCP85-384	99P3	387	37	90	.	.	.	.	.	.
LCP86-454	99P4	238	7	39	.	.	.	.	.	.
LCP86-454	HO95-988	599	13	35	.	.	.	.	.	.
LCP86-454	L96-040	146	0	12	.	.	.	.	.	.
LCP86-454	LCP85-384	207	19	86	.	.	.	.	.	.
LCP86-454	LCP85-384	1098	103	88	.	.	.	.	.	.
LHO83-153	LCP82-089	192	10	63	.	.	.	.	.	.
LHO83-153	LCP85-384	189	18	89	.	.	.	.	.	.
US79-010	HOCP85-845	348	20	66	.	.	.	.	.	.

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
US79-010	HOCP92-618	219	14	70	.	.	.	.	.	.
US79-010	L94-426	206	0	12	.	.	.	.	.	.
US79-010	LCP85-384	186	9	59	.	.	.	.	.	.
US79-010	LCP86-454	439	56	96	.	.	.	.	.	.
US80-004	HOCP92-618	71	1	29	.	.	.	.	.	.
US80-004	L94-428	188	7	47	.	.	.	.	.	.
US90-018	HOCP85-845	409	2	25	.	.	.	.	.	.
US90-018	L94-428	364	13	45	.	.	.	.	.	.
US90-018	L94-428	515	12	37	.	.	.	.	.	.
US90-021	LCP81-010	179	11	69	.	.	.	.	.	.
US90-021	LCP81-030	206	0	12	.	.	.	.	.	.
US93-016	L94-426	192	9	59	.	.	.	.	.	.
US93-016	L94-428	267	0	12	.	.	.	.	.	.
US93-016	L94-428	205	10	60	.	.	.	.	.	.
US93-016	LCP85-384	101	2	34	.	.	.	.	.	.
US93-016	LCP85-384	181	2	27	.	.	.	.	.	.
US96-001	US90-018	340	30	85	.	.	.	.	.	.
US96-005	L94-428	379	15	51	.	.	.	.	.	.
2000 Crossing Series										
CP65-357	L91-255	429	30	79	.	.	.	.	.	.
CP65-357	LCP85-384	984	40	53	.	.	.	.	.	.
CP77-405	L96-040	249	8	42	.	.	.	.	.	.
CP77-405	L98-197	242	16	77	.	.	.	.	.	.
CP77-405	L98-209	483	7	18	.	.	.	.	.	.
CP77-405	LCP85-384	940	20	29	.	.	.	.	.	.
CP78-317	L98-209	496	14	37	.	.	.	.	.	.
CP78-317	L99-229	245	22	91	.	.	.	.	.	.
CP78-317	LCP85-384	493	21	55	.	.	.	.	.	.
CP79-318	HOCP92-618	251	8	42	.	.	.	.	.	.
CP79-318	L96-040	243	16	77	.	.	.	.	.	.
CP79-318	L98-207	254	10	50	.	.	.	.	.	.
CP79-318	L98-209	249	5	27	.	.	.	.	.	.
CP79-318	L99-233	962	18	25	.	.	.	.	.	.
CP79-318	LCP85-384	727	9	18	.	.	.	.	.	.
CP83-644	HOCP97-609	251	10	51	.	.	.	.	.	.
CP89-846	LCP85-384	249	12	61	.	.	.	.	.	.
HO91-572	L94-428	250	2	16	.	.	.	.	.	.
HO91-572	LCP85-384	688	41	72	.	.	.	.	.	.
HO91-572	LCP87-492	244	0	6	.	.	.	.	.	.
HO95-988	HOCP85-845	241	11	59	.	.	.	.	.	.
HO95-988	HOCP96-561	249	5	27	.	.	.	.	.	.
HO95-988	L90-191	227	14	74	.	.	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Pcnt'l	2nd Line No.	2nd Line Rank Pcnt'l	Increase No.	Increase Rank Pcnt'l	Assignment No.	Assignment Rank Pcnt'l
HO95-988	L94-433	426	27	75	.	.	.	.	.	.
HO95-988	L96-040	480	0	6	.	.	.	.	.	.
HO95-988	L98-207	733	31	54	.	.	.	.	.	.
HO95-988	L98-209	247	6	31	.	.	.	.	.	.
HO95-988	LCP85-384	1047	77	82	.	.	.	.	.	.
HOCP85-845	HOCP92-624	241	15	74	.	.	.	.	.	.
HOCP85-845	HOCP96-540	507	21	53	.	.	.	.	.	.
HOCP85-845	L89-113	254	1	14	.	.	.	.	.	.
HOCP85-845	L91-255	220	5	30	.	.	.	.	.	.
HOCP85-845	L98-209	470	0	6	.	.	.	.	.	.
HOCP85-845	LCP85-384	2348	129	68	.	.	.	.	.	.
HOCP91-522	US80-004	194	14	81	.	.	.	.	.	.
HOCP91-552	L90-191	182	3	21	.	.	.	.	.	.
HOCP91-552	L91-255	476	34	80	.	.	.	.	.	.
HOCP91-552	L94-432	211	9	55	.	.	.	.	.	.
HOCP91-552	L99-233	912	26	39	.	.	.	.	.	.
HOCP92-618	HOCP96-540	697	63	91	.	.	.	.	.	.
HOCP92-618	L99-233	245	3	18	.	.	.	.	.	.
HOCP92-624	HOCP85-845	477	16	45	.	.	.	.	.	.
HOCP92-624	HOCP92-618	251	17	79	.	.	.	.	.	.
HOCP92-624	HOCP96-522	241	9	47	.	.	.	.	.	.
HOCP92-624	HOCP96-540	977	82	88	.	.	.	.	.	.
HOCP92-624	HOCP96-561	473	2	14	.	.	.	.	.	.
HOCP92-624	HOCP97-601	249	11	56	.	.	.	.	.	.
HOCP92-624	HOCP97-609	498	46	92	.	.	.	.	.	.
HOCP92-624	HOCP97-621	486	14	39	.	.	.	.	.	.
HOCP92-624	L89-113	735	44	72	.	.	.	.	.	.
HOCP92-624	L91-255	1185	106	90	.	.	.	.	.	.
HOCP92-624	L91-281	239	29	98	.	.	.	.	.	.
HOCP92-624	L98-197	483	40	87	.	.	.	.	.	.
HOCP92-624	L98-209	236	8	45	.	.	.	.	.	.
HOCP92-624	L99-226	239	8	43	.	.	.	.	.	.
HOCP92-624	LCP85-384	2371	110	59	.	.	.	.	.	.
HOCP92-624	LCP85-384	715	32	57	.	.	.	.	.	.
HOCP92-624	LCP86-454	665	26	50	.	.	.	.	.	.
HOCP92-624	US80-004	252	7	37	.	.	.	.	.	.
HOCP92-648	HOCP85-845	243	6	33	.	.	.	.	.	.
HOCP92-648	HOCP92-624	228	8	46	.	.	.	.	.	.
HOCP92-648	L91-281	246	23	92	.	.	.	.	.	.
HOCP92-648	L93-363	238	7	39	.	.	.	.	.	.
HOCP92-648	L96-040	230	15	76	.	.	.	.	.	.
HOCP92-648	L98-209	238	2	16	.	.	.	.	.	.
HOCP92-648	LCP85-384	700	34	62	.	.	.	.	.	.

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
HOCP94-867	L99-226	227	36	99	.	.	.	.	.	.
HOCP95-950	LCP85-384	482	10	29	.	.	.	.	.	.
HOCP95-951	HOCP96-540	247	0	6	.	.	.	.	.	.
HOCP95-951	LCP85-384	732	24	43	.	.	.	.	.	.
HOCP96-522	CP78-317	501	20	51	.	.	.	.	.	.
HOCP96-522	HOCP96-561	453	38	88	.	.	.	.	.	.
HOCP96-522	L91-255	498	28	70	.	.	.	.	.	.
HOCP96-522	L94-432	223	9	51	.	.	.	.	.	.
HOCP96-522	LCP85-384	973	78	86	.	.	.	.	.	.
HOCP96-522	LCP85-384	615	0	6	.	.	.	.	.	.
HOCP96-540	HOCP85-845	222	10	57	.	.	.	.	.	.
HOCP96-540	HOCP91-552	232	26	95	.	.	.	.	.	.
HOCP96-540	HOCP92-624	245	0	6	.	.	.	.	.	.
HOCP96-540	L91-281	398	0	6	.	.	.	.	.	.
HOCP96-540	L92-312	248	0	6	.	.	.	.	.	.
HOCP96-540	L94-433	243	0	6	.	.	.	.	.	.
HOCP96-540	L99-229	219	0	6	.	.	.	.	.	.
HOCP96-540	US96-001	216	0	6	.	.	.	.	.	.
HOCP96-561	HOCP92-624	244	21	89	.	.	.	.	.	.
HOCP96-561	L99-229	251	19	84	.	.	.	.	.	.
HOCP96-561	L99-233	776	26	45	.	.	.	.	.	.
HOCP97-601	HOCP92-618	245	11	57	.	.	.	.	.	.
HOCP97-606	LCP85-384	486	9	25	.	.	.	.	.	.
HOCP97-609	HOCP85-845	229	6	34	.	.	.	.	.	.
HOCP97-609	HOCP92-624	469	0	6	.	.	.	.	.	.
HOCP97-609	HOCP97-621	215	13	72	.	.	.	.	.	.
HOCP97-609	L91-255	483	19	50	.	.	.	.	.	.
HOCP97-609	LCP81-010	235	1	14	.	.	.	.	.	.
HOCP97-609	LCP85-384	227	9	51	.	.	.	.	.	.
HOCP97-621	HOCP96-540	249	0	6	.	.	.	.	.	.
HOCP97-621	LCP85-384	946	26	36	.	.	.	.	.	.
HOCP97-645	L98-197	234	12	65	.	.	.	.	.	.
HOCP97-645	L99-226	469	37	85	.	.	.	.	.	.
HOCP98-743	L98-209	675	0	6	.	.	.	.	.	.
HOCP98-743	L99-226	236	0	6	.	.	.	.	.	.
HOCP98-776	HOCP97-621	240	16	78	.	.	.	.	.	.
HOCP98-776	L91-281	250	4	21	.	.	.	.	.	.
HOCP98-776	LCP81-010	711	15	29	.	.	.	.	.	.
L89-113	L96-040	230	32	99	.	.	.	.	.	.
L89-113	LCP85-384	482	32	77	.	.	.	.	.	.
L90-191	LCP85-384	239	18	83	.	.	.	.	.	.
L90-191	US96-001	236	0	6	.	.	.	.	.	.
L91-255	HOCP85-845	481	12	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
L91-255	L96-040	447	0	6	.	.	.	.	.	.
L91-255	LCP85-384	710	36	65	.	.	.	.	.	.
L91-281	L91-255	242	18	82	.	.	.	.	.	.
L91-281	L96-040	247	4	21	.	.	.	.	.	.
L91-281	L98-197	476	17	47	.	.	.	.	.	.
L91-281	L98-209	461	35	84	.	.	.	.	.	.
L91-281	L99-237	238	23	93	.	.	.	.	.	.
L91-281	LCP85-384	1205	60	63	.	.	.	.	.	.
L93-363	HOCP92-618	239	0	6	.	.	.	.	.	.
L93-363	L96-040	477	24	63	.	.	.	.	.	.
L93-363	LCP85-384	243	7	39	.	.	.	.	.	.
L93-399	HOCP85-845	489	24	62	.	.	.	.	.	.
L93-399	HOCP91-552	237	12	65	.	.	.	.	.	.
L93-399	L99-226	233	6	34	.	.	.	.	.	.
L94-426	L96-040	248	7	37	.	.	.	.	.	.
L94-426	L98-209	249	11	56	.	.	.	.	.	.
L94-426	L99-224	234	13	70	.	.	.	.	.	.
L94-426	L99-233	234	9	48	.	.	.	.	.	.
L94-426	LCP85-384	947	25	34	.	.	.	.	.	.
L94-426	LCP86-454	237	19	86	.	.	.	.	.	.
L94-428	HOCP97-601	472	16	45	.	.	.	.	.	.
L94-428	L91-281	241	32	98	.	.	.	.	.	.
L94-428	L94-433	234	18	85	.	.	.	.	.	.
L94-428	L99-226	226	12	67	.	.	.	.	.	.
L94-428	LCP81-010	675	16	31	.	.	.	.	.	.
L94-428	LCP85-384	712	39	68	.	.	.	.	.	.
L94-432	HOCP85-845	244	5	27	.	.	.	.	.	.
L96-040	HOCP98-776	471	0	6	.	.	.	.	.	.
L96-040	LCP81-010	242	15	74	.	.	.	.	.	.
L96-040	LCP85-384	1193	36	41	.	.	.	.	.	.
L97-128	HOCP85-845	237	2	16	.	.	.	.	.	.
L97-128	HOCP92-618	237	15	75	.	.	.	.	.	.
L97-128	L91-281	993	119	97	.	.	.	.	.	.
L97-128	L93-363	479	52	94	.	.	.	.	.	.
L97-128	L99-229	471	53	96	.	.	.	.	.	.
L97-128	L99-233	199	22	95	.	.	.	.	.	.
L97-128	LCP81-010	699	33	60	.	.	.	.	.	.
L97-128	LCP87-492	468	40	89	.	.	.	.	.	.
L97-128	US80-004	236	12	65	.	.	.	.	.	.
L97-128	US96-001	476	32	78	.	.	.	.	.	.
L98-158	L99-233	225	11	62	.	.	.	.	.	.
L98-197	HOCP96-522	204	0	6	.	.	.	.	.	.
L98-197	US99-002	225	0	6	.	.	.	.	.	.

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
L98-198	HOCP97-621	445	26	71	.	.	.	.	.	.
L98-198	US79-010	474	35	82	.	.	.	.	.	.
L98-207	CP79-318	702	11	21	.	.	.	.	.	.
L98-207	L92-312	250	25	93	.	.	.	.	.	.
L98-209	L94-428	238	0	6	.	.	.	.	.	.
L98-209	L99-233	476	9	25	.	.	.	.	.	.
L98-209	LCP85-384	461	0	6	.	.	.	.	.	.
L99-224	L99-226	240	14	71	.	.	.	.	.	.
L99-224	L99-233	234	8	45	.	.	.	.	.	.
L99-226	HOCP96-522	231	23	93	.	.	.	.	.	.
L99-226	L99-233	711	14	27	.	.	.	.	.	.
L99-226	LCP85-384	688	0	6	.	.	.	.	.	.
L99-229	LCP81-010	240	11	59	.	.	.	.	.	.
L99-229	LCP85-384	474	19	51	.	.	.	.	.	.
L99-233	LCP85-384	838	52	74	.	.	.	.	.	.
LCP81-010	CP78-317	458	1	13	.	.	.	.	.	.
LCP81-010	HOCP85-845	439	8	24	.	.	.	.	.	.
LCP81-010	HOCP96-561	186	7	48	.	.	.	.	.	.
LCP81-010	HOCP97-609	475	11	30	.	.	.	.	.	.
LCP81-010	HOCP97-621	229	4	23	.	.	.	.	.	.
LCP81-010	L92-312	243	13	67	.	.	.	.	.	.
LCP81-010	L94-428	239	13	67	.	.	.	.	.	.
LCP81-010	L96-040	239	6	33	.	.	.	.	.	.
LCP81-010	L98-207	705	12	23	.	.	.	.	.	.
LCP81-010	L99-233	817	13	21	.	.	.	.	.	.
LCP81-010	LCP85-384	1687	122	81	.	.	.	.	.	.
LCP81-010	US96-001	236	7	41	.	.	.	.	.	.
LCP81-010	US99-002	221	11	63	.	.	.	.	.	.
LCP81-030	HOCP85-845	249	7	37	.	.	.	.	.	.
LCP85-384	CP79-318	243	0	6	.	.	.	.	.	.
LCP85-384	HOCP92-624	236	0	6	.	.	.	.	.	.
LCP85-384	HOCP96-540	720	53	82	.	.	.	.	.	.
LCP85-384	L93-363	224	18	86	.	.	.	.	.	.
LCP85-384	L94-433	712	21	39	.	.	.	.	.	.
LCP85-384	L99-226	757	0	6	.	.	.	.	.	.
LCP85-384	LCP86-454	943	18	25	.	.	.	.	.	.
LCP86-454	L99-226	710	26	47	.	.	.	.	.	.
LCP86-454	L99-234	252	6	31	.	.	.	.	.	.
LCP86-454	LCP85-384	1861	157	88	.	.	.	.	.	.
LCP87-492	HOCP97-609	241	29	97	.	.	.	.	.	.
LCP87-492	L89-113	219	6	36	.	.	.	.	.	.
LCP87-492	L91-281	487	25	65	.	.	.	.	.	.
LCP87-492	L94-432	224	0	6	.	.	.	.	.	.

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
LCP87-492	L98-209	481	8	23	.	.	.	.	.	.
LCP87-492	L99-233	446	41	92	.	.	.	.	.	.
TucCP77-042	LCP85-384	716	82	96	.	.	.	.	.	.
US79-010	HOCP96-540	237	13	68	.	.	.	.	.	.
US79-010	L98-209	236	13	68	.	.	.	.	.	.
US79-010	LCP85-384	700	19	36	.	.	.	.	.	.
US79-010	LCP87-492	246	4	21	.	.	.	.	.	.
US80-004	LCP85-384	664	7	17	.	.	.	.	.	.
US92-010	L91-281	201	9	57	.	.	.	.	.	.
US96-001	LCP85-384	948	15	21	.	.	.	.	.	.
US96-002	L94-432	221	3	18	.	.	.	.	.	.
US96-002	LCP85-384	468	19	53	.	.	.	.	.	.

Table. 7. Plant weight and rank summary statistics from the 2001 crossing series plant cane cross appraisal test at the St. Gabriel Research Station in 2002.

Female	Male	Plant Weight	
		Kg/Plant	Pcnt'l
L99-224	L99-233	9.36	98
L98-198	US79-010	8.35	97
LCP87-492	L91-255	8.25	96
L99-224	US79-010	8.18	94
US79-010	L94-428	8.17	93
LCP86-454	L99-234	8.05	92
L99-224	LCP81-010	7.99	90
L93-399	L99-224	7.82	89
L99-224	L91-255	7.81	88
L98-207	L99-233	7.75	86
US92-010	L91-281	7.51	85
L99-229	L90-191	7.51	84
LCP87-492	L99-233	7.43	82
HOCP98-776	HOCP85-845	7.40	81
L97-128	L99-229	7.31	80
US79-010	L99-234	7.29	78
L94-432	L99-224	7.28	77
L98-209	L99-233	7.12	76
HOCP98-717	LCP85-384	7.12	75
CP79-318	HOCP85-845	7.11	73
HOCP97-645	L99-226	6.89	72
TUCCP77-042	HOCP92-618	6.85	71
HOCP96-522	L99-226	6.81	69
HOCP98-717	L91-255	6.79	68
HOCP96-561	HOCP85-845	6.78	67
HOCP98-776	LCP81-010	6.66	65
HOCP92-624	US80-004	6.63	64
L99-229	LCP81-010	6.48	63
L93-399	L99-226	6.46	61
HOCP92-648	HOCP97-609	6.31	60
L94-428	L99-226	6.26	59
HOCP97-645	L98-197	6.26	57
US96-002	L99-226	6.25	56
HOCP92-624	L99-229	6.19	55
L99-245	HOCP85-845	6.18	53
HOCP92-624	L99-226	6.18	52
CP79-318	L99-233	6.13	51
L99-224	L99-226	6.12	50
L99-226	LCP85-384	6.10	48
HOCP96-561	L99-233	6.07	47
HOCP98-741	HOCP85-845	6.07	46
L93-399	L99-233	6.04	44
HOCP97-606	L89-113	6.00	43

Female	Male	Plant Weight	
		Kg/Plant	Pcnt'l
HOCP91-552	L99-233	5.94	42
HOCP95-950	L99-237	5.93	40
L94-426	L99-233	5.81	39
L90-191	US96-001	5.81	38
CP78-317	L99-229	5.77	36
HOCP98-776	L89-113	5.67	35
L98-207	00P5	5.66	34
HOCP96-561	HOCP98-648	5.66	32
LCP81-010	L99-234	5.62	31
HOCP98-741	HOCP97-609	5.58	30
US96-001	L99-226	5.51	28
L99-237	HOCP98-648	5.49	27
L98-158	US79-010	5.42	26
L99-229	LCP85-384	5.32	25
L99-237	HOCP85-845	5.32	23
L99-226	L99-233	5.11	22
HOCP96-561	L99-229	5.06	21
L99-226	HOCP96-540	4.98	19
HOCP98-776	L96-040	4.97	18
L97-128	LCP85-384	4.74	17
US79-010	L96-040	4.68	15
HOCP92-618	L99-233	4.68	14
L91-281	L99-237	4.66	13
L96-040	HOCP98-776	4.53	11
HOCP98-776	HOCP97-621	4.47	10
HOCP98-776	L91-281	4.47	9
LCP85-384	L99-226	4.42	7
HOCP94-867	L99-226	4.36	6
HOCP98-743	L98-209	3.52	5
L98-197	HOCP96-522	2.91	3
HOCP98-743	US96-001	2.74	2
HOCP98-743	L99-226	2.67	1

2002 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS

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

One objective of the nursery and infield stages is to identify and select varieties that will perform well across the range of environments a commercial variety will encounter in Louisiana. Nursery tests are initially planted at three on-station locations (USDA-ARS - Ardoyne Farm, Iberia Research Station, and St. Gabriel Research Station) during the year of assignment, and four to five additional and different off-station locations are planted the year after assignment. In 2002, only one on-station (and corresponding seed increase) was planted at the St. Gabriel Research Station because of the extended rainy period experienced in the fall of 2002. The three off-station nurseries -- Blake Newton Farm, Danny Stoute, and Westfield (Joel Landry Farms) -- along with the two infield trial locations of Blackberry and Sugarland farms 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, LCP 85-384, HOCP91-555, and, HOCP 85-845 were planted in tests for comparison.

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. In contrast for 2002, the prolonged wet soil conditions reduced accuracy because of the accumulation of mud in the plot weights from the combine-harvested tests. 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 was estimated as the product of stalk weight and stalk number. Cane yield for the infield tests was determined from the plot weights and reduce 14 percent to account for extraneous trash. Sugar per acre was calculated as the product of sugar per ton and cane yield.

The 2002 sugarcane crop experienced extreme conditions throughout the growing season. Spring and early summer were rather dry. The fall brought Tropical Storm Isidore and Hurricane Lili, which dropped over 7 inches of rain accompanied by winds in excess of 50 mph over eight days in late September and early October. This resulted in extremely lodged cane and muddy conditions for the remainder of the growing season. All locations were harvested before the first freeze, which occurred in mid-January. Recommended cultural practices were followed at all test locations.

LCP85-384 has been the leading variety in Louisiana since 1998. Approximately, 80% of Louisiana's harvested sugarcane acreage was in LCP85-384 for 2002. For comparison, LC85-384 is highlighted in the tables. To adjust for missing data, the statistical analysis calculated least square means (SAS 8.01 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. 2002 Location, soil texture, and planting and harvest dates for the nursery and infield tests.

Series	Location†	Stage	Soil Texture‡	Planting Date	Harvest Dates 2000	2001	2002	Varieties No. Planted	No. Harvested
1998	Ardoyne*	Nursery	Csl	10/15/98	11/01	10/18	10/23	53	1
1998	Iberia**	Nursery	Bsc	10/14/98	11/01	10/18	10/25	53	1
1998	Blackberry	Infield	Csl	08/24/99	11/30	12/04	11/15	65	5
1998	Gonsoulin	Nursery	Psl	08/13/99	11/30	11/07	10/02	44	2
1998	Stoute	Nursery	Bsc	08/20/99	11/15	10/06	10/02	13	1
1998	Westfield	Nursery	Csl	08/17/99	12/16	11/13	10/23	44	2
1999	Ardoyne	Nursery	Csl	10/20/99	11/20	11/19	10/23	34	2
1999	Iberia	Nursery	Bsc	10/19/99	11/30	10/25	10/25	34	2
1999	St. Gabriel	Nursery	Sc	10/18/99	11/15	10/18	10/08	34	2
1999	Blackberry	Infield	Csl	08/17/00		12/04	11/15	39	4
1999	Newton	Nursery	Mosl	08/24/00		11/12	11/14	39	4
1999	Stoute	Nursery	Bsc	08/18/00		11/15	10/25	16	2
1999	Sugarland	Infield	Cosl	08/23/00		12/06	12/11	39	4
1999	Westfield	Nursery	Csl	08/21/00		10/18	11/07	39	4
2000	Ardoyne	Nursery	Csl	10/12/00		11/19	12/06	33	2
2000	Iberia	Nursery	Bsc	10/13/00		11/19	12/02	33	2
2000	St. Gabriel	Nursery	Sc	10/12/00		12/09	11/21	33	2
2000	Blackberry	Infield	Csl	08/21/01			11/15	48	13
2000	Newton	Nursery	Mosl	08/24/01			11/14	48	13
2000	Sugarland	Infield	Cosl	08/22/01			12/11	47	13
2000	Westfield	Nursery	Csl	09/18/01			11/07	48	13
2001	Ardoyne	Nursery	Csl	10/18/01			12/06	37	11
2001	Iberia	Nursery	Bsc	10/22/01			12/12	37	9
2001	St. Gabriel	Nursery	Sc	10/09/01			11/21	37	11
2001	Blackberry	Infield	Csl	08/27/02				38	
2001	Newton	Nursery	Mosl	08/21/02				38	
2001	Stoute	Nursery	Bsc	08/22/02				12	
2001	Sugarland	Infield	Cosl	08/09/02				38	
2001	Westfield	Nursery	Csl	08/29/02				38	
2002	St. Gabriel	Nursery	Sc	11/01/02				38	

* Harvest date in 1999 was 12/07.

** Harvest date in 1999 was 12/06.

† Ardoyne-U.S.D.A. Ardoyne Farm (Terrebonne), Blackberry Farm (Vacherie), Gonsoulin-R. Gonsoulin Farm (Iberia), Iberia-Iberia Research Station (Iberia), Newton-Blake Newton Farm (Avoyelles), St. Gabriel-Saint Gabriel Research Station (Iberville), Stoute-D. Stoute Farm (St. Martin), Sugarland Farm (Youngsville), Westfield-Westfield Plantation (Assumption).

‡ Bsc-Baldwin silty clay, Csl-Commerce silt loam, Cosl-Coteau silt loam, Sc-Sharkey clay, Mosl-Moreland silt loam, Psl-Patou silt loam.

Table 2. 2002 Nursery third-stubble means of the 1998 "L" assignment series in light soil at 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	5721	-	28.1	-	204		1.80		31309	-
LCP85-384	12224		53.8		227		1.40		77138	
HoCP85-845	7925	-	32.8	-	241		1.54		42653	-
L98-209	10486		44.8		235		1.73		51954	-

Table 3. 2002 Nursery third-stubble means of the 1998 "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	7801	-	43.2	-	181		2.31	+	37434	-
LCP85-384	12372		60.5		205		1.69		71466	
HoCP85-845	10755		49.7		216		1.99		49913	-
L98-209	11643		53.6		217		1.82		58988	-

Table 4. 2002 Infield second-stubble means of the 1998 "HOCP" and "L" assignment series in light soil at Blackberry Farm, Vacherie, 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	8134	-	29.5	-	262		2.17		26239	-
TucCP77-042	11169		46.7		239		2.87	+	32741	-
LCP85-384	13095		53.7		248		1.85		58042	
HoCP85-845	13048		49.5		264		2.36		42643	
HoCP96-540	10172	-	43.5		234		2.04		43112	
L97-128	13804	+	53.0		262		2.44	+	43913	
L98-207	10380	-	42.6	-	246		1.54		56958	
L98-209	8378	-	32.5	-	259		1.96		32770	-

† Harvested with combine harvester.

Table 5. 2002 Nursery second-stubble means of the 1998 "L" assignment series in light soil at Gonsoulin Farm, 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	10556		59.3		177		2.78	+	42653	-
TucCP77-042	8575		46.8		184		2.61	+	35937	-
LCP85-384	8458		51.4		165		1.79		57354	
HoCP85-845	7497		38.8		193	+	2.04		37752	-
L98-209	10687		54.0		198	+	2.19		49731	

Table 6. 2002 Nursery second-stubble means of the 1998 "L" assignment series in heavy soil at Danny Stoute's 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	8026	-	30.1	-	266	-	1.44		41927	-
LCP85-384	11389		39.3		290		1.38		57173	
HoCP85-845	7149	-	28.3	-	252	-	1.59		35937	-
L98-209	9049		35.6		254	-	1.34		52998	-

Table 7. 2002 Nursery second-stubble means of the 1998 "L" assignment series in heavy soil at Westfield, 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	11040		47.8		230		2.08		45920	-
TucCP77-042	16011		80.2		199		2.63		61166	
LCP85-384	14673		64.4		228		1.87		68970	
HoCP85-845	11689		51.4		228		2.04		51002	-
L98-209	12719		60.1		213		1.87		64070	

Table 8. 2002 Nursery second-stubble means of the 1999 "L" assignment series in light soil at 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	9122		41.6		219		2.25	+	36981	-
LCP85-384	9955		42.4		235		1.37		62391	
HoCP85-845	9074		36.0		252		1.65		43787	-
L99-226	15871	+	68.0	+	234		2.63	+	51728	
L99-233	11266		50.3	+	225		1.81	+	55811	

Table 9. 2002 Nursery second-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	9314		47.7		196		2.35	+	40611	-
LCP85-384	9248		45.8		202		1.50		61937	
HoCP85-845	9067		41.3		220		2.13	+	38796	-
L99-226	14930	+	66.6	+	224		2.66	+	50139	
L99-233	10678		54.1	+	199		1.83	+	58988	

Table 10. 2002 Nursery second-stubble means of the 1999 "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)
CP70-321	4230	24.1	174	1.68	28359 -
LCP85-384	5246	33.1	160	1.32	49913
HoCP85-845	3564	20.4	173	1.61	25410 -
L99-226	6615	35.4	189	1.81	39023
L99-233	5168	30.2	171	1.40	42879

Table 11. 2002 Infield first-stubble means of the 1999 "HOCP" and "L" assignment series in light soil at Blackberry Farm, Vacherie, 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	9174 -	37.7	243	1.98	38282 -
LCP85-384	12085	48.9	256	1.91	56396
HoCP85-845	10255	37.7	272	1.99	38023 -
L99-226	12792	43.2	296 +	2.99 +	29032 -
L99-233	11754	44.4	267	1.66	53735
HoCP99-825	8640 -	31.7 -	272	2.17	29458 -
HoCP99-866	12142	45.5	261	2.58 +	37304 -

† Harvested with combine harvester.

Table 12. 2002 Nursery first-stubble means of the 1999 "HOCP" and "L" assignment series in light soil at Newton Farm, 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	10096	47.0	215	2.66	35393 -
LCP85-384	14767	67.6	218	2.36	56628
HoCP85-845	8811 -	40.2 -	219	2.28	35574 -
L99-226	15787	62.4	253 +	2.93	42653 -
L99-233	13691	58.3	235	1.94	60258
HoCP99-825	12020	51.0	235	2.70	37752 -
HoCP99-866	11929	55.1	216	3.17 +	34848 -

Table 13. 2002 Nursery first-stubble means of the 1999 "L" assignment series in heavy soil at Danny Stoute's 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	10058	46.0	220	2.76 +	33396
LCP85-384	9302	41.5	221	1.94	42752
HoCP85-845	6914	30.9	224	2.01	30674
L99-226	16963 +	77.1 +	219	3.16 +	48824
L99-233	15388 +	69.2 +	223	2.27	60803 +

Table 14. 2002 Infield first-stubble means of the 1999 "HOCP" and "L" assignment series in light soil at Sugarland Farm, Youngsville, 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	10889	41.5	266	2.69 +	30277
LCP85-384	10324	39.5	261	1.79	44059
HoCP85-845	12151	47.6	256	2.14 +	44324
L99-226	11521	39.2	292 +	2.71 +	29529
L99-233	7803	29.3	271	1.89	31223
HoCP99-825	9918	37.5	264	2.78 +	26996 -
HoCP99-866	11221	41.3	272	2.63 +	31520

† Harvested with combine harvester.

Table 15. 2002 Nursery first-stubble means of the 1999 "HOCP" and "L" assignment series in heavy soil at Westfield, 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	11049	44.1	250	2.17 +	40656
LCP85-384	10506	43.7	240	1.75	50094
HoCP85-845	11363	44.5	255	2.10	42471
L99-226	15551	57.2	271 +	2.65 +	43016
L99-233	14109	55.6	255	1.68	66248 +
HoCP99-825	12088	48.6	249	2.29 +	42471
HoCP99-866	13502	61.4	221	2.71 +	45012

Table 16. 2002 Nursery first-stubble means of the 2000 "L" assignment series in light soil at 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	11188 -	43.7 -	256	2.25	39023 -
LCP85-384	18809	70.5	267	2.25	62844
HoCP85-845	12779 -	47.3 -	270	2.39	39476 -
L00-247	8814 -	40.6 -	218 -	1.63 -	51501
L00-266	14260 -	53.2 -	268	2.36	45148

Table 17. 2002 Nursery first-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	9136	37.9	242	2.07	36754 -
LCP85-384	15290	69.7	222	2.23	62391
HoCP85-845	14462	58.4	247	2.96	39023 -
L00-247	12957	56.5	228	1.83	61483
L00-266	13707	55.2	249	2.07	53316

Table 18. 2002 Nursery first-stubble means of the 2000 “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)	
CP70-321	10831		42.6		254		2.09		41064	-
LCP85-384	13856		58.7		236		2.04		57626	
HoCP85-845	12316		47.1		262		2.12		44694	-
L00-247	8141		45.4		179	-	1.54		58988	
L00-266	16444		62.9		263		2.01		62391	

Table 19. 2002 Infield plant cane means of the 2000 “HOCP” and “L” assignment series in light soil at Blackberry Farm, Vacherie, 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	9202		39.6		233		2.44		32579	
HoCP85-845	8594		37.3		230		2.43		30778	
HoCP91-555	10173		41.1		248		2.44		33652	
L00-247	11896	+	55.9	+	213		1.81	-	63327	+
L00-266	9168		41.0		223		2.23		36914	
HoCP00-905	9512		37.9		250		2.15		35690	
HoCP00-927	8076		35.0		231		2.40		29258	
HoCP00-930	9915		41.5		238		2.33		35559	
HoCP00-933	11582		50.5		229		2.48		40930	
HoCP00-934	9260		41.2		224		2.62		31602	
HoCP00-939	10495		46.6		226		2.47		38110	
HoCP00-942	11775	+	48.2		245		2.41		39974	
HoCP00-945	9850		43.3		229		2.26		38558	
HoCP00-950	13287	+	50.2		265	+	2.59		38798	
HoCP00-951	9623		42.7		225		2.11		40585	
Ho00-960	9206		47.1		195	-	3.11	+	30302	

† Harvested with combine harvester.

Table 20. 2002 Nursery plant cane means of the 2000 "HOCP" and "L" assignment series in light soil at Newton Farm, 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	10878	46.6	233	2.17	42834
HoCP85-845	9640	40.3	239	2.42	33215 -
HoCP91-555	9324	40.7	229	2.00	40656
L00-247	9470	39.9	238	1.85	42471
L00-266	10777	51.3	211	2.10	48642 +
HoCP00-905	11387	50.3	225	2.29	44105
HoCP00-927	9952	44.9	221	2.19	40838
HoCP00-930	10790	45.6	236	2.45	37208 -
HoCP00-933	10547	53.7	196 -	2.24	48098 +
HoCP00-934	12123	55.7	218	2.91 +	38297
HoCP00-939	10728	47.5	226	2.54	37571 -
HoCP00-942	10959	44.3	248	2.46	36300 -
HoCP00-945	7525	36.3	208 -	2.30	31581 -
HoCP00-950	14095	55.1	255	2.45	44831
HoCP00-951	9073	43.8	207 -	2.12	41382
Ho00-960	11056	60.5	181 -	2.72	44467

Table 21. 2002 Infield plant cane means of the 2000 "HOCP" and "L" assignment series in light soil at Sugarland Farm, Youngsville, 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	9040	35.7	252	2.43	29634
HoCP85-845	7866	32.7	239	2.38	27516
HoCP91-555	7915	32.7	237	2.24	29080
L00-247	7785	37.3	209 -	1.68 -	44315 +
L00-266	10479	42.0	249	2.37	35410
HoCP00-905	9543	41.1	232	2.62	31959
HoCP00-927	11093	44.2	251	2.47	35811
HoCP00-930	9737	36.9	263	2.52	29539
HoCP00-933	7937	33.4	237	2.42	27822
HoCP00-934	8115	33.3	244	2.47	27221
HoCP00-939	11852	49.9	238	2.17	46404 +
HoCP00-942	11854	45.5	260	2.65	34459
HoCP00-945	8467	31.8	266	2.22	28607
HoCP00-950	9724	33.9	286	2.24	30108
HoCP00-951	7316	27.7	264	1.90	30674
Ho00-960	7063	35.9	197 -	2.14	33709

† Harvested with combine harvester.

Table 22. 2002 Nursery plant cane means of the 2000 "HOCP" and "L" assignment series in heavy soil at Westfield, 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	9518		48.4		199		1.63		59351	
HoCP85-845	7589		34.7	-	220		2.24	+	31218	-
HoCP91-555	14177	+	60.7		232	+	2.23	+	54087	
L00-247	10538		50.4		209		1.75		58806	
L00-266	10960		48.4		226		1.91		50639	
HoCP00-905	11527		49.6		232	+	1.98		50276	
HoCP00-927	12462		55.3		225		2.27	+	48824	
HoCP00-930	14290	+	58.4		245	+	2.54	+	46101	-
HoCP00-933	9956		49.1		202		2.31	+	42471	-
HoCP00-934	10429		48.2		217		2.75	+	35030	-
HoCP00-939	12298		51.9		237	+	2.31	+	45012	-
HoCP00-942	9893		40.6		244	+	2.28	+	35574	-
HoCP00-945	10158		44.9		226		2.28	+	39386	-
HoCP00-950	15482	+	63.2	+	244	+	2.42	+	52091	
HoCP00-951	10198		49.5		206		1.86		53361	
Ho00-960	9325		48.8		190		2.31	+	42108	-

Table 23. 2002 Nursery plant cane means of the 2001 "L" assignment series in light soil at 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	14099	56.2	250		2.30		49005
HOCP85-845	15408	63.2	244		3.05	+	41745
HOCP91-555	13006	50.1	259		2.13		47190
L01-280	12824	50.0	255		2.30		43787
L01-281	15246	58.9	257		2.96	+	40611
L01-283	15255	58.1	263		2.47		47190
L01-290	9688	42.8	226	-	2.17		39703
L01-292	16085	61.8	260		3.08	+	40157
L01-296	13600	47.3	287	+	2.83		34031
L01-299	11601	43.3	268	+	2.49		35393
L01-300	13379	56.7	235		2.82		40157
L01-306	10237	45.2	226	-	2.31		39476
L01-312	11991	52.8	227	-	1.73		61256
L01-315	11638	48.6	240		2.11		46282

Table 24. 2002 Nursery plant cane 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	8536		34.2		250		2.18		31309	
HOCP85-845	8205		35.6		231		2.69		26318	
HOCP91-555	10637		42.0		253		2.34		36073	
L01-280	7664		33.5		229	-	2.06		32443	
L01-281	9580		42.5		225	-	2.47		34712	
L01-283	7248		30.8		233		2.51		24503	
L01-290	5061		23.7		210	-	2.09		22688	
L01-292	8125		33.7		241		2.66		25410	
L01-299	6311		25.0		253		2.17		22914	
L01-300	8063		38.3		210	-	2.89	+	26544	
L01-306	7353		33.4		220	-	2.53		26771	
L01-312	7228		32.7		222	-	1.80		36073	
L01-315	7891		39.2		201	-	2.23		35619	

† L01-296 was not harvested because of excessive broken stalks.

Table 25. 2002 Nursery plant cane 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	13062		57.2		228		2.13		53543	
HOCP85-845	11317		54.0		210		2.67	+	40611	-
HOCP91-555	15042		60.4		249		2.46		49005	
L01-280	12078		50.9		237		2.30		44468	-
L01-281	13863		62.0		223		2.88	+	43106	-
L01-283	9868		46.3		201		2.31		39249	-
L01-290	11914		61.1		196		2.33		52408	
L01-292	13639		57.6		237		2.90	+	39930	-
L01-296	10936		41.9	-	261		2.53		32897	-
L01-299	11386		49.2		232		2.78	+	35393	-
L01-300	12640		60.1		210		3.07	+	39249	-
L01-306	9041		39.5	-	230		2.43		32670	-
L01-312	11075		49.1		226		2.41		40838	-
L01-315	8793		43.7	-	201		1.76		49912	

Table 26. 2002 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	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	6761	-	35.7	-	193	-	2.05	+	34372	-
LCP85-384	12298		57.2		216		1.55		74302	
HOCP85-845	9340	-	41.3	-	229		1.76		46282	-
L98-209	11065		49.2		226		1.77		55471	-

Table 27. 2002 Infield and Nursery second-stubble means of the 1998 "HOCP" and "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	9504		42.2		234		2.12	+	39730	-
TucCP77-042	11548		54.6		218		2.55	+	43008	-
LCP85-384	11904		52.2		233		1.72		60385	
HOCP85-845	9846		42.0		234		2.01		41833	-
HOCP96-540	10000		47.3		211		1.86		50229	
L97-128	13633		56.8		238		2.26	+	51029	
L98-207	10208		46.5		222		1.36		64074	
L98-209	10208		45.6		231		1.84		49892	-

Table 28. 2002 Nursery second-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	7556		37.8		196		2.09	+	35317	-
LCP85-384	8149		40.4		199		1.40		58080	
HOCP85-845	7235		32.6		215		1.80	+	35998	-
L99-226	12472	+	56.7	+	216		2.37	+	46963	-
L99-233	9037		44.8		198		1.68		52559	

Table 29. 2002 Infield and Nursery first-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	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	10238		43.1		238		2.43	+	35780	-
LCP85-384	11313		48.0		239		1.95		49549	
HOCP85-845	9899		40.2		245		2.10		38213	-
L99-226	14691	+	56.4		266	+	2.90	+	38632	-
L99-233	12984		52.4		250		1.88		55346	
HOCP99-825	10659		43.0		249		2.52	+	34134	-
HOCP99-866	12163		51.9		236		2.80	+	36899	-

Table 30. 2002 Nursery first-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	10385	-	41.4	-	250		2.14		38947	-
LCP85-384	15985		66.3		241		2.17		60954	
HOCP85-845	13186		50.9	-	259		2.49		41064	-
L00-247	9971	-	47.5	-	209	-	1.66	-	57324	
L00-266	14804		57.1		260		2.15		53618	

Table 31. 2002 Infield and Nursery plant cane means of the 2000 “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)	
LCP85-384	9660		42.6		229		2.17		41099	
HoCP85-845	8422		36.3		232		2.37		30682	-
HoCP91-555	10397		43.8		236		2.23		39369	
L00-247	9922		45.9		217		1.77	-	52230	+
L00-266	10346		45.7		227		2.15		42901	
HoCP00-905	10492		44.7		235		2.26		40507	
HoCP00-927	10396		44.9		232		2.33		38683	
HoCP00-930	11183		45.6		246		2.46	+	37102	
HoCP00-933	10006		46.7		216		2.36		39830	
HoCP00-934	9982		44.6		226		2.68	+	33037	-
HoCP00-939	11146		48.1		232		2.37		40819	
HoCP00-942	11120		44.6		249	+	2.45	+	36577	
HoCP00-945	9000		39.1		232		2.26		34533	
HoCP00-950	13147	+	50.6		262	+	2.42		41457	
HoCP00-951	9052		40.9		226		2.00		41500	
Ho00-960	9162		48.1		191	-	2.57	+	37647	

Table 32. 2002 Nursery plant cane 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	11899		49.2		243		2.20		44619	
HoCP85-845	11643		50.9		228		2.80	+	36224	-
HoCP91-555	12895		50.8		254		2.31		44089	
L01-280	10856		44.8		240		2.22		40233	
L01-281	12897		54.5		235		2.77	+	39476	
L01-283	10911		45.6		232		2.40		37585	
L01-290	9065	-	43.9		211	-	2.21		39408	
L01-292	12616		51.0		246		2.88	+	35166	-
L01-296	10778		38.6	-	272	+	2.66	+	28968	-
L01-299	9766		39.1	-	251		2.48		31233	-
L01-300	11360		51.7		219	-	2.93	+	35317	-
L01-306	8877	-	39.4	-	225	-	2.42		32973	-
L01-312	10098		44.9		225	-	1.98		46056	
L01-315	9441	-	43.9		214	-	2.03		43938	

2002 LOUISIANA "HoCP" NURSERY VARIETY TRIALS [1/]

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The USDA sugarcane breeding program nursery testing stage begins in the fifth year after crossing. It is at this time that superior varieties in the first stubble of 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 three 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 (including CP 70-321, HoCP 85-845, LCP 85-384, and/or HoCP 91-555) 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 program and replanted in two nurseries and two infield tests on commercial farms. Plot length in these two-replication nursery tests have been increased to 20 feet, with a 4-foot alley between plots.

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, pol, and fiber content 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, are used to calculate yield of sugar per acre, yield of cane per acre, mean stalk weight, 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 1999 through the 2001 HoCP and Ho series were harvested from nursery trials in 2002. Because of excessive rainfall and poor field conditions, the 2002 HoCP and Ho assignment series were planted only at one location in 2002. Varieties from the 2001 HoCP and Ho series were combined with varieties from the 2001 LSU series and replanted on four commercial farms (two nursery trials and two infield trials). Test locations, planting dates, and harvest dates of HoCP and Ho series nursery tests can be found in Table 1.

1/ HoCP Varieties selected at Houma (Ho), LA, from seed produced at Canal Point (CP), FL, from Louisiana parents.

Statistical analysis 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 which 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 2002, along with combined analyses where applicable, can be found in Tables 2 to 13.

Table 1. 2002 Planting and harvest dates of "HoCP" nursery tests.

				Harvest Dates		
Series	Location[2/]	Soil Texture [3/]	Planting Date	2000	2001	2002
1999	AFL	Csl	10/20/99	11/27	10/31	10/11
1999	IRS	Bsc	10/19/99	11/29	10/23	11/01
1999	STG	Csl	10/21/99	11/28	11/08	12/13
2000	AFL	Csl	10/27/00		11/21	10/31
2000	IRS	Bsc	10/31/00		11/26	11/01
2000	STG	Csl	10/30/00		12/07	12/13
2001	AFL	Csl	10/18/01			12/06
2001	IRS	Bsc	10/23/01			12/11
2001	STG	Csl	10/19/01			12/13
2002	AFL	Csl	11/8/02			

[2/] 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

Table 2. Means of the 1999 HoCP series second-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	8475	42.3	199	2.34 +	36300
LCP 85-384	10631	53.1	200	1.62	65794
HoCP 85-845	10920	47.2	231 +	1.76	53769
HoCP 99-825	12494	54.9	227 +	2.33 +	47190
HoCP 99-866	8889	48.2	184	1.84	52181

Table 3. Means of the 1999 HoCP series second-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	11779	53.4	221	2.39+	44694
LCP 85-384	15361	64.6	238	1.86	69651
HoCP 85-845	9930	42.0 -	236	1.98	42653
HoCP 99-825	12548	53.3	236	2.34+	45602
HoCP 99-866	11763	53.7	220	2.51+	43106

Table 4. Means of the 1999 HoCP series second-stubble nursery variety trial on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, LA, in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	13327	46.8	285	2.54	36981
LCP 85-384	16025	53.7	298	1.67	64206
HoCP 85-845	10832	35.7	303	1.86	38342
HoCP 99-825	15464	49.7	312	2.06	48778
HoCP 99-866	13839	45.7	304	2.65	34485

Table 5. Combined means of the 1999 HoCP series second-stubble nursery variety trials in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	11194 -	47.5 -	235	2.42	39325 -
LCP 85-384	14005	57.1	245	1.71	66550
HoCP 85-845	10561 -	41.7 -	257	1.86	44921 -
HoCP 99-825	13502	52.6	259	2.24	47190 -
HoCP 99-866	11497	49.2-	236	2.33	43258 -

Table 6. Means of the 2000 HoCP and Ho series first-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA, in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	12100	53.2	226	2.72 +	39023
LCP 85-384	14643	62.8	233	1.94	64886
HoCP 85-845	12127	48.6	250	2.32	41745
HoCP 00-905	13943	59.8	233	2.05	58307
HoCP 00-927	11830	49.1	241	1.85	53316
HoCP 00-930	11266	46.7 -	241	2.01	46283
HoCP 00-933	12658	58.7	215	2.12	55358
HoCP 00-934	12175	56.3	216	2.38 +	47417
HoCP 00-939	13725	60.7	227	2.28	53316
HoCP 00-942	9614	40.8 -	235	1.73	47190
HoCP 00-945	10824	45.5 -	238	1.78	50820
HoCP 00-950	12769	46.9 -	271 +	1.83	51274
HoCP 00-951	11228	46.8 -	238	1.57	59441
Ho 00-960	12368	59.7	207 -	2.32	51954

Table 7. Means of the 2000 HoCP and Ho series first-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	10654	57.8 +	183	2.62	44241
LCP 85-384	14258	73.9	191	2.20	67155
HoCP 85-845	10886	55.0 -	197	2.59	42426
HoCP 00-905	10337	52.6 -	197	2.03	51954
HoCP 00-927	15756	74.0	213	2.49	59441
HoCP 00-930	11511	58.2 -	198	2.18	53543
HoCP 00-933	11176	62.8	177	2.51	50139
HoCP 00-934	8999	54.4 -	165	2.24	49005
HoCP 00-939	11758	59.5	197	2.37	50366
HoCP 00-942	13829	61.8	224	2.26	54677
HoCP 00-945	9974	55.7 -	178	2.57	43106
HoCP 00-950	10395	51.4 -	202	1.87	55131
HoCP 00-951	8959	51.3 -	175	1.69 -	61029
Ho 00-960	9741	62.9	155	2.62	48098

Table 8. Means of the 2000 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 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	10248	39.1 -	263	2.26	34939
LCP 85-384	16593	61.5	270	1.98	62391
HoCP 85-845	10780	39.9 -	271	2.06	39023
HoCP 00-905	11744	43.5 -	270	1.76	49686
HoCP 00-927	12393	47.6	259	1.80	52862
HoCP 00-930	14025	49.2	285	2.14	46056
HoCP 00-933	16459	65.0	255	2.25	58080
HoCP 00-934	12399	46.8	267	2.18	42879
HoCP 00-939	11493	44.7 -	258	1.96	45375
HoCP 00-942	13781	45.8	300	1.83	49686
HoCP 00-945	11487	41.5 -	277	1.80	46056
HoCP 00-950	16980	56.4	302	2.30	49232
HoCP 00-951	10868	43.7 -	249	1.43 -	61483
Ho 00-960	9122	41.7 -	217 -	2.11	39476

Table 9. Combined means of the 2000 HoCP and Ho series first-stubble nursery variety trials in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	11001 -	50.0 -	224	2.53	39401 -
LCP 85-384	15164	66.1	231	2.04	64811
HoCP 85-845	11264 -	47.8 -	239	2.32	41064 -
HoCP 00-905	12008 -	52.0 -	233	1.94	53316 -
HoCP 00-927	13326	56.9	238	2.04	55206 -
HoCP 00-930	12267	51.4 -	241	2.11	48627 -
HoCP 00-933	13431	62.2	216	2.29	54526 -
HoCP 00-934	11191 -	52.5 -	216	2.26	46434 -
HoCP 00-939	12325	54.9 -	227	2.20	49686 -
HoCP 00-942	12408	49.5 -	253 +	1.94	50518 -
HoCP 00-945	10762 -	47.6 -	231	2.05	46661 -
HoCP 00-950	13381	51.6 -	258 +	2.00	51879 -
HoCP 00-951	10352 -	47.3 -	221	1.56	60651
Ho 00-960	10410 -	54.8 -	193 -	2.35	46509 -

Table 10. Means of the the 2001 HoCP and Ho series plant-cane nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, LA, in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	12857	49.2	261	2.33	42199
HoCP 85-845	11567	43.2	268	2.61	33124
HoCP 91-555	12358	49.1	252	2.27	43333
HoCP 01-500	11964	44.8	267	2.34	38342
HoCP 01-506	12070	54.1	224	2.27	47644
HoCP 01-507	8166	39.3	207 -	2.38	33124
HoCP 01-510	11549	49.1	232	2.09	46963
HoCP 01-517	13875	50.7	274	3.13 +	33124
HoCP 01-520	10319	43.8	235	2.02	43333
HoCP 01-523	12964	49.5	262	2.39	41518
HoCP 01-525	9983	40.7	237	2.09	39023
HoCP 01-526	10848	46.8	231	2.34	40157
HoCP 01-528	11863	48.4	245	3.06 +	31763
HoCP 01-529	14700	59.0	250	2.73	43106
HoCP 01-531	13045	46.9	278	2.24	41972
HoCP 01-532	12289	43.5	282	2.20	39476
HoCP 01-533	11023	42.6	257	2.11	40611
HoCP 01-534	13347	46.2	289	2.43	37661
HoCP 01-535	12373	44.8	275	2.62	34258
HoCP 01-541	12141	43.0	282	1.88	45829
HoCP 01-543	10944	41.6	262	1.88	44241
HoCP 01-544	11466	42.9	267	2.68	32216
HoCP 01-545	8460	35.7	238	2.03	35166
HoCP 01-551	13305	48.5	275	2.67	36300
HoCP 01-553	12695	51.1	248	2.72	37888
HoCP 01-558	13650	52.4	260	2.23	46509
HoCP 01-561	14609	54.0	270	3.07 +	35393
Ho 01-564	11327	44.4	255	2.46	36300

Table 11. Means of the 2001 HoCP and Ho series plant-cane nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10729	44.7	240	2.14	41745
HoCP 85-845	6998	29.1	241	2.26	25637 -
HoCP 91-555	11773	49.3	241	2.39	41064
HoCP 01-500	6457 -	27.5	235	2.38	23141 -
HoCP 01-506	6668	32.1	208	2.18	29267 -
HoCP 01-507	4895 -	28.0	174 -	2.45	22914 -
HoCP 01-510	6078 -	28.7	213	1.99	28813 -
HoCP 01-517	8800	34.4	256	2.92 +	23822 -
HoCP 01-520	6673	34.1	197 -	1.92	35619
HoCP 01-523	8847	36.3	240	2.33	30855 -
HoCP 01-525	8861	34.9	253	2.41	29040 -
HoCP 01-526	5163 -	22.6 -	229	2.04	22234 -
HoCP 01-527	4206 -	25.8 -	162 -	1.87	27679 -
HoCP 01-528	5464 -	26.9 -	202	2.59	20646 -
HoCP 01-529	6788	31.4	214	2.39	26318 -
HoCP 01-531	8899	33.4	267	2.35	28359 -
HoCP 01-532	8113	30.3	268	2.06	29494 -
HoCP 01-533	5112 -	30.5	158 -	2.21	26544 -
HoCP 01-534	8138	31.8	253	2.13	29040 -
HoCP 01-535	7995	33.5	240	2.16	31082 -
HoCP 01-541	9967	39.9	249	2.17	37208
HoCP 01-543	7905	37.5	216	1.95	38342
HoCP 01-544	7296	34.1	214	2.59	26318 -
HoCP 01-545	6211 -	26.6 -	234	1.84	29040 -
HoCP 01-551	7918	34.4	231	2.57	26771 -
HoCP 01-553	9375	43.1	217	3.18 +	27225 -
HoCP 01-558	6071 -	26.8 -	226	2.25	24049 -
HoCP 01-561	6944	30.0	232	2.30	26091 -
Ho 01-564	6924	28.5	243	2.14	26544 -

Table 12. Means of the 2001 HoCP and Ho series plant-cane nursery variety trial on a Commerce silt loam soil at St. Gabriel Research Station in St. Gabriel, LA, in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	10024	41.5	242	2.23	37434
HoCP 85-845	11908	44.6	267	2.49	36073
HoCP 91-555	13178	48.1	274 +	2.30	41972
HoCP 01-500	11805	44.1	268	2.17	40838
HoCP 01-506	11101	49.2	226	2.43	40611
HoCP 01-507	8890	40.7	219	2.49	32670
HoCP 01-510	7751	37.1	211 -	1.82	40838
HoCP 01-517	10200	36.1	283 +	2.90 +	24956
HoCP 01-520	12080	50.9	237	2.28	44694
HoCP 01-523	14199 +	55.8 +	255	2.75	40611
HoCP 01-525	11858	41.6	285 +	2.29	36300
HoCP 01-526	14881 +	58.4 +	255	2.63	44694
HoCP 01-527	8164	41.1	198 -	1.73	47417
HoCP 01-528	11037	45.3	244	2.87 +	31763
HoCP 01-529	12529	48.0	259	2.79	34258
HoCP 01-531	8431	30.8	272 +	2.05	29948
HoCP 01-532	9463	37.3	253	2.32	32216
HoCP 01-533	10463	40.4	258	2.43	33351
HoCP 01-534	11741	39.4	298 +	2.26	34939
HoCP 01-535	10142	39.7	255	2.74	29040
HoCP 01-541	12410	47.6	260	2.09	45602
HoCP 01-543	10217	36.3	280 +	1.99	36300
HoCP 01-544	11183	42.6	262	2.40	35846
HoCP 01-545	11094	42.3	261	2.28	37208
HoCP 01-551	13288	52.1	255	2.90 +	35846
HoCP 01-553	11948	47.3	252	3.01 +	31536
HoCP 01-558	13630	53.2	256	2.50	42653
HoCP 01-561	12167	45.0	272 +	2.64	33804
Ho 01-564	9316	33.9	274 +	2.07	32897

Table 13. Combined means of the 2001 HoCP and Ho series third-stubble nursery variety trials in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
LCP 85-384	11298	45.2	249	2.25	40202
HoCP 85-845	10158	39.0	259	2.45	31611 -
HoCP 91-555	12436	48.8	256	2.32	42123
HoCP 01-500	10075	38.8	257	2.30	34107
HoCP 01-506	9946	45.1	219 -	2.29	39174
HoCP 01-507	7317 -	36.0	200 -	2.44	29569 -
HoCP 01-510	8459	38.3	218 -	1.97	38871
HoCP 01-517	10958	40.4	271 +	2.98	27301 -
HoCP 01-520	9691	43.0	223	2.07	41216
HoCP 01-523	12003	47.2	252	2.49	37661
HoCP 01-525	9909	38.6	253	2.25	34485
HoCP 01-526	10297	42.6	238	2.34	35695
HoCP 01-527	6185 -	33.5	180 -	1.80	37548
HoCP 01-528	9455	40.2	230	2.84	28057 -
HoCP 01-529	11339	46.2	241	2.64	34561
HoCP 01-531	10125	37.0	273 +	2.21	33426
HoCP 01-532	9955	37.0	268	2.19	33729
HoCP 01-533	8866	37.8	225	2.25	33502
HoCP 01-534	11075	39.1	280 +	2.27	33880
HoCP 01-535	10170	39.3	257	2.51	31460 -
HoCP 01-541	11506	43.5	264	2.04	42879
HoCP 01-543	9689	38.5	253	1.94	39628
HoCP 01-544	9981	39.9	248	2.55	31460 -
HoCP 01-545	8588	34.9	244	2.05	33804
HoCP 01-551	11504	45.0	253	2.71	32973 -
HoCP 01-553	11339	47.1	239	2.97	32216 -
HoCP 01-558	11117	44.2	247	2.33	37737
HoCP 01-561	11240	43.0	258	2.67	31763 -
Ho 01-564	9189	35.6	257	2.22	31914 -

2002 USDA INFIELD VARIETY TRIALS AT ARDOYNE FARM

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Infield variety tests are usually planted at Ardoyne Farm two years after assignment. Varieties in this test are introduced to outfield locations and primary stations this same year. Infield tests planted at Ardoyne Farm still use a traditional infield plot size of three rows wide by 16-feet long, compared to the two-row-wide by 24-feet long plots used in off-station infield tests. Although both plot sizes encompass the same area, the two-row plots are more efficient to harvest on commercial farms, where it is necessary to use a farmer's combine harvester and his operator to harvest tests. Because all infield tests are now harvested with a combine harvester, the two-row plot size may be used 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, and/or HoCP 91-555) for use as checks.

Recommended culture practices were used at the USDA Ardoyne Farm in 2002. In mid-March, Karmex (2 lb/A), Prowl (3 qt/A), and Weedmaster (1 qt/A) were applied to all infield tests at Ardoyne Farm. Tests were fertilized at a rate of 100-30-60 lbs per acre on either April 22 or April 23. Prowl (3 qt/A) and 2, 4-D (1 qt/A) were broadcast at layby in mid-May. Fields were monitored for sugarcane borer infestations through the growing season. Confirm (6 oz/A) was applied by airplane on August 2 and September 9 in 2002.

In the tests at Ardoyne Farm, a 15-stalk sample was cut from each active plot just prior to harvest and sent to the juice analysis lab. Each bundle was weighed in the lab, and a five-stalk sub-sample was separated from each bundle and run through the pre-breaker at Ardoyne Farm for fiber analysis. The remaining 10 stalks were run through the roller-mill, and a juice sample was obtained and sent to the lab for analysis. Brix and pol were obtained and used to estimate sucrose, purity, and TRS for each sample.

Planting and harvest dates can be found in Table 1. Results from individual tests can be found in Tables 2 through 4. An analysis of variance was performed for each test, using the SAS (Release 8.02) PROC MIXED procedure. Varieties with a "+" or "-" are significantly higher or lower (P=.05), respectively, than LCP 85-384.

Table 1. 2002 Planting and harvest dates of infield tests at Ardoyne Farm.

Series	Location†	Soil Texture‡	Planting Date	Harvest Dates 2000	Harvest Dates 2001	Harvest Dates 2002	Varieties No. Planted	Varieties No. Harvested*
1997	AFL	Csl	8/20/99	11/22	11/02	10/11	12	1
1998	AFH	Sc	10/2/00		11/15	11/26	10	3
1999	AFH	Sc	9/27/01			11/26	10	4

† AFL-Ardoyne Farm light soil, AFH-Ardoyne Farm heavy soil.
‡ Csl-Commerce silt loam, Sc-Sharkey clay
* No. Harvested does not include varieties used for "check" plots.

Table 2. Means of the 1997 HoCP series second-stubble infield variety test on light soil at Ardoyne Farm in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	4656	25.4	184 -	1.85	28123	11.3
LCP 85-384	4775	22.8	209	1.40	32649	11.3
HoCP 85-845	5784	26.2	220	1.73	30481	12.4
L 97-128	7115 +	30.6 +	232 +	1.76	34912	13.7 +

Table 3. Means of the 1998 HoCP and L series first-stubble infield variety test on heavy soil at Ardoyne Farm in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	7052 -	28.1	251	2.30	24508	9.5
LCP 85-384	9923	38.0	261	1.98	38721	10.7
HoCP 85-845	8216	30.6	269	2.05	29915	13.2
TUCCP 77-42	9002	37.6	241	2.03	36946	12.3
L 98-207	6932 -	27.5	250	1.22 -	47474	10.4
L 98-209	8743	35.2	252	1.93	37034	10.4

Table 4. Means of the 1999 Ho series plant-cane infield variety test on heavy soil at Ardoyne Farm in 2002.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
LCP 85-384	10643	40.7	262	2.4	33966	10.2
HoCP 85-845	9114	39.4	230	2.41	32676	11.7
HoCP 91-555	9021	36.0	250	2.22	32402	10.4
L 99-226	11638	46.8	249	3.12	30248	10.3
L 99-233	8686	37.9	228	2.24	34203	11.5
HoCP 99-825	8912	37.0	247	3.27 +	22568	9.4
HoCP 99-866	9381	40.5	232	3.16	26443	9.1

2002 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 trails are used in both variety advancement and crossing decisions. The outfield variety trials are cooperatively conducted at nine commercial locations throughout the Louisiana Sugarcane Belt by the Louisiana Agricultural Experiment Station, The United States Department of Agriculture – Agricultural Research Service, 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 2002 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. First, second, and third-stubble plots were three rows wide (6-foot rows) and 32 feet long with 5-foot alley between plots, with the exception of Glenwood. Plant cane and Glenwood test plots harvested were two rows wide and 50 feet long with 5-foot alley between plots. All tests planted in 2002 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 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. No adjustment is made to account for leaf trash.

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[1]The data for each plot were obtained through a cooperative effort of personnel from the Louisiana Agricultural Experiment Station-LSU AgCenter, USDA-Agricultural Research Service, 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 80% (approximately 420,000 acres) of the sugarcane acreage in 2002. 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 means 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.

Twelve experimental varieties were introduced to the outfield locations for seed increase in 2002 (Table 1). Seven experimental and three commercial varieties were planted at nine outfield locations. Twenty-five tests were harvested in 2002 including eight plant cane, eight first-stubble, seven second-stubble, and two third-stubble crops (Table 2).

Variety yields are reported by crop and trait with overall means and individual location data in the same table (Table 3-22) and in summary tables by crop (Tables 23-26). Tables 27-34 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 a product of the basic breeding program from the USDA-ARS in Houma. It 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 will be replanted at the primary stations in 2003. In 2002, the combined second-stubble data for Ho95-988 exhibited significantly higher sugar yield and sucrose content than did LCP85-384. Smut data indicate the variety is moderately susceptible. Ho95-988 has had higher yields than LCP85-384 in sugar per acre and theoretical recoverable sugar in plant cane through second-stubble crops. In the third-stubble crop for 2002, there were no statistical differences in sugar yield, cane yield, and sucrose content. The variety is more erect than LCP85-384. Ho95-988 will be a candidate for release in 2004.

L97-128 is an erect variety. The variety begins maturing very early in the harvest season. Sugar yield and tonnage were significantly higher in the combined plant cane analysis for 2002. 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 LCP81-010 X LCP85-384. The variety will be a candidate for release in 2004.

The most advanced experimental variety, HoCP96-540, had sugar per acre and cane yields that were significantly higher than LCP85-384 in plant cane and second-stubble in 2002. In first-stubble, sugar per acre and cane yield were not statistically different in 2002. The variety tends to have a larger stalk and lower population than LCP85-384. Based on current data and observations, HoCP96-540 is classified as resistant to smut and mosaic. It is moderately resistant to leaf scald and susceptible to the sugarcane borer. The parents of HoCP96-540 are LCP86-454 x LCP85-384. The Louisiana Sugarcane Variety Development release committee will meet in April 2003 to discuss the release of HoCP96-540.

Table 1. 2002 Commercial and experimental varieties planted in the outfield.

Commercial Varieties	Experimental Varieties		Experimental Varieties Introduced to the Outfield		
LCP85-384	HOCP96-540	L99-233	L00-247	HOCP00-930	HOCP00-945
HOCP85-845	L97-128	HOCP99-825	L00-266	HOCP00-933	HOCP00-950
HOCP91-555	L98-209	HOCP99-866	HOCP00-905	HOCP00-939	HOCP00-951
	L99-226		HOCP00-927	HOCP00-942	HOCP00-960

Table 2. Harvest and planting dates for all outfield locations harvested in 2002.

			Plant cane		First-stubble		Second-stubble		Third-stubble	
Location	Parish	2002 Date Planted	2002 Harvest Date	2001 Plant Date	2002 Harvest Date	2000 Plant Date	2002 Harvest Date	1999 Plant Date	2002 Harvest Date	1998 Plant Date
Allain	St. Mary	*	**	09/19	12/23	09/27	12/23	09/14	**	**
Alma	Pointe Coupee	09/04	12/13	09/14	**	08/30	**	**	**	**
Bon Secour	St. James	09/03	12/18	09/08	11/14	08/24	11/14	09/13	**	**
Georgia	Lafourche	09/21	12/06	09/15	12/06	09/19	12/06	08/24	**	**
Glenwood	Assumption	08/29	11/22	09/25	11/22	08/23	11/08	08/26	**	**
Lanaux	St. John	09/11	12/03	09/05	12/03	09/06	11/13	09/15	11/13	10/06
Levert-St.John	St. Martin	09/11	11/18	09/19	11/18	09/01	11/18	08/18	**	**
Magnolia	Terrebonne	08/16	11/21	10/04	11/21	10/04	11/21	08/23	**	**
R. Hebert	Iberia	09/18	12/11	09/27	12/11	09/05	11/07	08/25	11/07	09/24
A. Landry	Iberville	08/28	**	**	**	**	**	**	**	**

* Not planted because of saturated soil conditions.

** No test harvested at this location.

Table 3. Plant cane sugar per acre for three commercial and five experimental varieties at eight outfield locations in 2002.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs/A)					
TucCP77-42	6549	6266	8287	8396	8648	9263	8033	7005	7806
LCP85-384	6633	7036	7956	7320	7902	7773	7952	7802	7547
HOCP85-845	5850	5776	8107	6766	7861	8388	7540	6778	7193
HOCP91-555	8477 +	4881 -	7843	7128	9072	7881	7620	7621	7565
HOCP96-540	8253	6305	8340	8858 +	8317	11253 +	8622	8354	8538 +
L97-128	5527	7399	8669	8193	9313	10276	7963	7431	8096
L98-207	6089	7538	6476 -	7600	8053	8746	6637	7004	7410
L98-209	7687	7614	8323	7481	9397	7432	7517	8649	8013

Table 4. Plant cane yield for three commercial and five experimental varieties at eight outfield locations in 2002.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(tons/A)					
TucCP77-42	33.7	30.1	45.7 +	35.3 +	38.4 +	40.8 +	41.7 +	35.1	37.6 +
LCP85-384	29.4	27.9	30.9	26.6	30.9	30.4	30.7	34.1	30.1
HOCP85-845	27.4	23.8	32.7	25.4	30.4	32.0	31.1	30.1	29.1
HOCP91-555	32.8	21.1 -	31.2	24.8	33.0	33.2	30.7	31.7	29.8
HOCP96-540	31.7	24.6	34.2	31.2 +	30.4	41.0 +	34.5	35.0	32.8 +
L97-128	25.0	29.2	34.3	30.9 +	34.0	37.7 +	31.2	31.9	31.8
L98-207	24.0	27.9	28.1	27.1	30.9	31.7	28.9	28.5	28.6
L98-209	32.3	26.4	31.4	26.6	35.7	29.0	32.1	34.0	30.9

Table 5. Plant cane sugar per ton for three commercial and five experimental varieties at eight outfield locations in 2002.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs/ton)					
TucCP77-42	195	207 -	181 -	238 -	225 -	228	193 -	200 -	208 -
LCP85-384	228	253	257	276	257	254	260	229	252
HOCP85-845	239	244	248	267	259	263	242	225	249
HOCP91-555	258	234	251	287	274	237	248	240	254
HOCP96-540	261	256	245	284	273	275	250	240	260
L97-128	220	252	254	265	274	272	255	232	253
L98-207	268	271	229 -	280	261	275	237	246	259
L98-209	240	288	265	281	263	256	235 -	254 +	260

Table 6. Plant cane stalk weight for three commercial and five experimental varieties at eight outfield locations in 2002.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs)					
TucCP77-42	2.78 +	3.05 +	2.89 +	2.89 +	3.01 +	2.93 +	2.74 +	3.30 +	2.97 +
LCP85-384	2.26	2.29	2.00	2.00	2.23	1.95	2.18	2.27	2.18
HOCP85-845	2.30	2.40	2.68 +	2.68 +	2.21	2.18	2.74 +	2.17	2.40 +
HOCP91-555	2.47	2.72 +	2.31	2.31	1.91	2.18	2.05	2.15	2.27
HOCP96-540	2.53	2.62 +	2.73 +	2.73 +	2.19	2.82 +	3.08 +	2.85 +	2.71 +
L97-128	2.41	2.68 +	2.80 +	2.80 +	2.57	2.74 +	2.64 +	2.73 +	2.67 +
L98-207	1.94	1.98 -	1.68	1.68	1.86	1.91	1.71 -	1.55 -	1.78 -
L98-209	2.40	2.20	2.29	2.29	2.41	2.38	2.61 +	2.19	2.37 +

Table 7. Plant cane stalk number for three commercial and five experimental varieties at eight outfield locations in 2002.

	Heavy	Light							
Variety	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(stalks/A)					
TucCP77-42	24637	19892	31704	23129	25605	27877	30376	21309	25566
LCP85-384	26131	24612	31064	23983	27707	32052	28275	30333	28020
HOCP85-845	21557	19916	24763 -	20356	28297	29742	22945	28001	24560 -
HOCP91-555	26615	15709 -	27298	21319	34668	30679	29811	29533	26954
HOCP96-540	25052	18802	25123 -	22288	28611	29250	22448	24521	24512 -
L97-128	20650	21813	24613 -	22125	26533	27674	23636	23555	23825 -
L98-207	23354	28250	33421	31469 +	33093	33902	33999	38218	32742 +
L98-209	27578	24044	27695	21714	29626	24614	24934	31168	26422

Table 8. First-stubble sugar per acre for four commercial and two experimental varieties at eight outfield locations in 2002.

	Heavy		Light						
Variety	Allain	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(lbs/A)					
CP70-321	5675	4027	8105	7114	5144 -	7360	7603	6771	6407 -
LCP85-384	6393	4435	8631	8583	6745	8246	7788	7725	7324
HOCP85-845	6216	5009	7479	6311 -	6552	9340	6346 -	7339	6646
HOCP91-555	6257	4620	7388	8459	6659	7540	7479	8163	7071
HOCP96-540	6906	5385	9816	9579	6989	8540	9039 +	8504	8095
L97-128	6970	5061	8273	9382	5899	8924	6951	7707	7432

Table 9. First-stubble cane yield for four commercial and two experimental varieties at eight outfield locations in 2002.

	Heavy		Light						
Variety	Allain	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
				(tons/A)					
CP70-321	21.5	15.3	33.3	25.7	16.5 -	26.8	30.9	27.6	24.5
LCP85-384	24.4	16.3	34.8	29.6	22.0	30.9	30.3	30.4	27.4
HOCP85-845	24.2	18.0	32.1	23.7 -	21.0	34.6	27.6	28.9	25.7
HOCP91-555	25.6	18.4	27.7 -	29.0	21.6	26.6	30.0	30.2	26.1
HOCP96-540	27.4	19.4	38.0	34.9 +	22.0	32.8	36.9 +	33.4	30.6
L97-128	27.5	17.5	32.4	33.1	18.1	33.2	28.5	30.8	27.7

Table 10. First-stubble sugar per ton for four commercial and two experimental varieties at eight outfield locations in 2002.

	Heavy		Light						
Variety	Allain	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs/ton)				
CP70-321	265	262	244	277 -	311	273	246	246	265
LCP85-384	262	272	247	290	306	265	257	254	269
HOCP85-845	257	278	233	266 -	312	268	230 -	254	262
HOCP91-555	244	253	267	291	309	283	249	270	271
HOCP96-540	252	277	258	275 -	317	259	245	253	267
L97-128	254	290	256	283	325 +	269	244	250	271

Table 11. First-stubble stalk weight for four commercial and two experimental varieties at eight outfield locations in 2002.

	Heavy		Light						
Variety	Allain	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(lbs)				
CP70-321	1.88	2.11 +	2.29	1.98 +	1.46	2.22	2.88 +	2.35 +	2.15 +
LCP85-384	1.80	1.50	1.90	1.46	1.44	2.00	1.75	1.91	1.73
HOCP85-845	2.01	2.12 +	2.21	1.61	1.57	2.34	2.17	2.16	2.01 +
HOCP91-555	1.86	1.67	1.80	1.68	1.35	1.85	2.01	1.68	1.74
HOCP96-540	2.42 +	2.07 +	2.19	2.33 +	1.38	2.44	2.48 +	2.37 +	2.21 +
L97-128	2.13	2.05 +	2.27	2.19 +	1.61	2.70 +	2.24 +	2.38 +	2.20 +

Table 12. First-stubble stalk number for four commercial and two experimental varieties at eight outfield locations in 2002.

	Heavy		Light						
Variety	Allain	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R.Hebert	St. John	Mean
					(stalks/A)				
CP70-321	22952	14608 -	29255	26118 -	22903	23315	21572 -	23849 -	23044 -
LCP85-384	27596	21826	36842	41661	30686	30482	34802	33098	32049
HOCP85-845	24272	17175	29408	30348 -	27616	28404	25813 -	27028	26144 -
HOCP91-555	28029	22916	30850	34874	31871	28914	29919	36010	30423
HOCP96-540	23104	18941	36155	30177 -	32524	26918	30201	28448	28308 -
L97-128	26131	17326	28683	30496 -	22769	25143	25543 -	25818	25264 -

Table 13. Second-stubble sugar per acre for four commercial and two experimental varieties at seven outfield locations in 2002.

	Heavy		Light												
Variety	Allain		Bon Secour		Georgia		Glenwood		Lanaux		R.Hebert		St. John		Mean
							(lbs/A)								
CP70-321	3846	-	5376	-	6662	-	3817	-	4955	-	5050		5214		4988 -
LCP85-384	5862		8309		8726		8416		7528		5802		6879		7439
HOCP85-845	5750		7228		6895	-	8278		6183		6820		7508		6952
HOCP91-555	6204		7328		7363		8160		5982		8015		7655		7205
HO95-988	6428		7503		9120		9457		8334		6762		8895	+	8071
HOCP96-540	7504	+	8823		8970		9843		8762		7465		8330		8528 +

Table 14. Second-stubble cane yield for four commercial and two experimental varieties at seven outfield locations in 2002.

	Heavy		Light												
Variety	Allain		Bon Secour		Georgia		Glenwood		Lanaux		R.Hebert		St. John		Mean
							(tons/A)								
CP70-321	15.4	-	23.9	-	24.3	-	15.7	-	19.0		22.4		21.6	-	20.3 -
LCP85-384	21.6		35.3		31.0		31.9		27.4		28.9		29.0		29.3
HOCP85-845	21.7		29.5	-	25.6	-	31.5		22.5		28.0		29.8		27.0
HOCP91-555	24.5		28.0	-	24.8	-	28.9		21.2		31.5		29.8		27.0
HO95-988	24.8		29.5	-	31.1		34.9		31.0		26.0		32.9		30.0
HOCP96-540	27.3	+	35.6		31.7		39.5	+	36.7		31.7		32.8		33.6 +

Table 15. Second-stubble sugar per ton for four commercial and two experimental varieties at seven outfield locations in 2002.

	Heavy		Light												
Variety	Allain		Bon Secour		Georgia		Glenwood		Lanaux		R.Hebert		St. John		Mean
							(lbs/ton)								
CP70-321	249	-	226		274		247		262		225		240		246
LCP85-384	272		236		281		264		275		221		236		257
HOCP85-845	265		245		269		264		273		244	+	252		259
HOCP91-555	252	-	263	+	297		282		282		248	+	257		270 +
HO95-988	260		254		294		272		268		261	+	271	+	268
HOCP96-540	275		249		283		249		242		235	+	255		256

Table 16. Second-stubble stalk weight for four commercial and two experimental varieties at seven outfield locations in 2002.

	Heavy		Light											
Variety	Allain		Bon Secour	Georgia		Glenwood		Lanaux		R.Hebert		St. John		Mean	
						(lbs)									
CP70-321	1.62		2.08	2.11	+	1.60		2.27	+	2.40	+	1.95	+	2.01	+
LCP85-384	1.39		1.78	1.40		1.56		1.83		1.76		1.52		1.60	
HOCP85-845	1.81	+	2.09	1.53		1.74		1.72		1.95		1.75		1.80	+
HOCP91-555	1.64	+	1.50	1.45		1.60		1.69		1.52		1.69		1.59	
HO95-988	1.95	+	2.13	1.99	+	2.12	+	2.11		2.25	+	2.03	+	2.08	+
HOCP96-540	2.04	+	2.09	1.77	+	2.14	+	2.33	+	2.23	+	1.95	+	2.08	+

Table 17. Second-stubble stalk number for four commercial and two experimental varieties at seven outfield locations in 2002.

	Heavy		Light													
Variety	Allain		Bon Secour		Georgia		Glenwood		Lanaux		R.Hebert		St. John		Mean	
							(stalks/A)									
CP70-321	18963	-	23416	-	23141	-	19821	-	16761	-	18636	-	22173	-	20416	-
LCP85-384	30956		40517		44910		40979		29948		29900		38415		36849	
HOCP85-845	24119	-	28667	-	33670	-	36306		26060		28513		34184		30217	-
HOCP91-555	30207		37436		34782	-	36341		25007		43026	+	35593		34208	
HO95-988	25334		27727	-	31558	-	32912		29376		22910		32369		28884	-
HOCP96-540	26894		34416		35996	-	37186		31169		28560		34649		32696	-

Table 18. Third-stubble sugar per acre for four commercial and one experimental varieties at two outfield locations in 2002.

	Light			
Variety	Lanaux	R. Hebert	Mean	
		(lbs/A)		
CP70-321	6454	5824	6139	
LCP85-384	7766	7589	7678	
HOCP85-845	6658	5486	6072	-
HOCP91-555	6542	5625	6083	-
HO95-988	7506	8068	7787	

Table 19. Third-stubble cane yield for four commercial and one experimental varieties at two outfield locations in 2002.

	Light			
Variety	Lanaux	R. Hebert	Mean	
		(tons/A)		
CP70-321	23.8	26.1	24.9	
LCP85-384	29.5	30.0	29.8	
HOCP85-845	24.2	24.5	24.4	-
HOCP91-555	23.2	21.8	22.5	-
HO95-988	27.6	30.3	28.9	

Table 20. Third-stubble sugar per ton for four commercial and one experimental varieties at two outfield locations in 2002.

	Light			
Variety	Lanaux	R. Hebert		Mean
		(lbs/ton)		
CP70-321	272	223	-	247
LCP85-384	262	255		259
HOCP85-845	277	220	-	249
HOCP91-555	280	258		269
HO95-988	271	265		268

Table 21. Third-stubble stalk weight for four commercial and one experimental varieties at two outfield locations in 2002.

	Light				
Variety	Lanaux		R. Hebert	Mean	
			(lbs)		
CP70-321	2.45	+	1.88	2.17	+
LCP85-384	1.47		1.51	1.49	
HOCP85-845	2.18	+	1.73	1.95	+
HOCP91-555	1.69		1.55	1.62	
HO95-988	2.00	+	1.71	1.86	+

Table 22. Third-stubble stalk number for four commercial and one experimental varieties at two outfield locations in 2002.

Variety	Light			Mean	
	Lanaux		R. Hebert		
			(stalks/A)		
CP70-321	19485	-	28275	23880	-
LCP85-384	40264		41201	40732	
HOCP85-845	22199	-	28208	25203	-
HOCP91-555	27683	-	28293	27988	-
HO95-988	27752	-	35244	31498	-

Table 23. 2002 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)	
TucCP77-42	7806		37.6	+	208	-	2.97	+	25566	
LCP85-384	7547		30.1		252		2.18		28020	
HOCP85-845	7193		29.1		249		2.40	+	24560	-
HOCP91-555	7565		29.8		254		2.27		26954	
HOCP96-540	8538	+	32.8	+	260		2.71	+	24512	-
L97-128	8096		31.8		253		2.67	+	23825	-
L98-207	7410		28.6		259		1.78	-	32742	+
L98-209	8013		30.9		260		2.37	+	26422	

Table 24. 2002 first 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	6407	-	24.5		265		2.15	+	23044	-
LCP85-384	7324		27.4		269		1.73		32049	
HOCP85-845	6646		25.7		262		2.01	+	26144	-
HOCP91-555	7071		26.1		271		1.74		30423	
HOCP96-540	8095		30.6		267		2.21	+	28308	-
L97-128	7432		27.7		271		2.20	+	25264	-

Table 25. 2002 second-stubble means from seven outfield locations: Allain, Bon Secour, Georgia, Glenwood, Lanaux, 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	4988	-	20.3	-	246		2.01	+	20416	-
LCP85-384	7439		29.3		256		1.60		36849	
HOCP85-845	6952		27.0		259		1.80	+	30217	-
HOCP91-555	7205		27.0		269	+	1.59		34208	
HO95-988	8071		30.0		268	+	2.08	+	28884	-
L96-540	8528	+	33.6	+	256		2.08	+	32696	-

Table 26. 2002 third-stubble means from two outfield locations: Lanaux 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	6139		24.9		247		2.17	+	23880	-
LCP85-384	7678		29.8		259		1.49		40732	
HOCP85-845	6072	-	24.4	-	249		1.95	+	25203	-
HOCP91-555	6083	-	22.5	-	269		1.62		27988	-
HO95-988	7787		28.9		268		1.86	+	31498	-

Table 27. Combined plant cane means across outfield locations from 2000 to 2002.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
LCP85-384	7819		30.0		260		2.11		28711	
HOCP85-845	7177	-	29.4		245	-	2.48	+	23750	-
HOCP91-555	7871		30.6		257		2.19		28324	
HOCP96-540	9097	+	34.8	+	261		2.68	+	26137	-

Table 28. Combined plant cane means across outfield locations from 2001 to 2002.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
LCP85-384	7674		29.8		257		2.16		27938	
HOCP85-845	7135	-	28.9		249	-	2.45	+	23588	-
HOCP91-555	7628		29.6		258		2.19		27537	
HOCP96-540	8861	+	33.7	+	262		2.69	+	25294	-
L97-128	8793	+	33.0	+	265		2.77	+	23990	-

Table 29. Combined plant cane means across outfield locations from 1996 to 2002.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
LCP85-384	8612		32.4		266		2.29		28642	
HOCP85-845	7751	-	31.6		246	-	2.59	+	24527	-
HOCP91-555	8287	-	31.5		263		2.31		27635	-

Table 30. Combined first-stubble means across outfield locations from 2001 to 2002.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	6372	-	24.2	-	265		2.26	+	21582	-
LCP85-384	7566		28.3		268		1.77		32285	
HOCP85-845	6642	-	25.7	-	260	-	2.04	+	25393	-
HOCP91-555	7291		26.6	-	274		1.74		30841	
HOCP96-540	8285	+	31.7	+	263		2.20	+	29089	-

Table 31. Combined first-stubble means across outfield locations from 1997 to 2002.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	7465	-	27.8	-	269		2.44	+	22923	-
LCP85-384	8754		32.3		271		1.94		33662	
HOCP85-845	7762	-	30.0	-	259	-	2.23	+	27081	-
HOCP91-555	8246	-	30.0	-	275		1.91		31622	-

Table 32. Combined second-stubble means across outfield locations from 1998 to 2002.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	6438 -	25.4 -	253 -	2.23 +	22834 -
LCP85-384	8019	30.8	262	1.70	36602
HOCP85-845	7402 -	28.8 -	256 -	1.97 +	29272 -
HOCP91-555	7562 -	27.7 -	274 +	1.64	34037 -

Table 33. Combined second-stubble means across outfield locations from 2001 to 2002.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	5579 -	22.8 -	246 -	2.13 +	21443 -
LCP85-384	7400	29.3	257	1.68	34844
HOCP85-845	6740 -	26.1 -	259	1.86 +	28301 -
HOCP91-555	7306	26.8 -	275 +	1.62	33318
HO95-988	8009 +	30.0	267 +	2.07 +	29138 -

Table 34. Combined third-stubble means across outfield locations from 1999 to 2002.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
CP70-321	5977 -	23.2 -	257	2.28 +	20483 -
LCP85-384	7803	29.7	263	1.64	36861
HOCP85-845	7777	30.2	257	2.09 +	28951 -
HOCP91-555	7315	26.6 -	274 +	1.70	31519 -

SUCROSE LABORATORY AT ST. GABRIEL

G. L. Hawkins and K. A. Gravois
Sugar Research Station

More than 4,400 samples were processed at the St. Gabriel Sucrose Laboratory during the 2002 harvest season (Table 1). Standard laboratory procedures, which include use of the ABC Clarifier, were used to measure the Brix and Pol of the juice. Personnel in the lab continued to test clarifier, Octapol®, developed by Baddley Chemical to measure the juice pol. Compared to the ABC Clarifier the Octapol® was found to clarify stale sugarcane juice using the same amount of product. The ABC Clarifier does not clarify stale sugarcane juice as easily. The ABC Clarifier active ingredients tend to break down more quickly; therefore, it requires more product to clarify the same amount of raw juice. The juice was extracted via a three-roller mill for 4424 samples. Fiber analysis was done on 48 samples via chip/press extraction. 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 2002 to January 2003.

Table 1. Number of sugarcane samples processed at the St. Gabriel Sucrose Laboratory during the 2002 harvest season.

Project Area	Leader	Number of Samples
Agronomy	James Griffin	205
	Chuck Kennedy	572
	Magdi Selim	6
	Jim Wang	32
	John Richard	48
	John Richard (fiber)	48
Iberia Research Station	William Hallmark	474
	Howard Viator	26
Plant Pathology and Crop Physiology	Jeff Hoy	115
LCES	Ben Legendre	328
USDA	Jim Fouss	36
Sugar Research Station	Line Trials	2058
	Increase	132
	Nursery	248
	Planting Rate	144
TOTAL		4472

LAES SUGARCANE TISSUE CULTURE LABORATORY

Q.J.XIE, J.L Flynn, and K.A.Gravois
Certis USA, LLC and Sugar Research Station

During the 2002-2003 production season, more than 30,000 sugarcane plantlets were regenerated in the Louisiana Agricultural Experiment Station Sugarcane Tissue Culture Laboratory. A total of 31,469 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	10,472
Ho98-988	8,662
HoCP96-540	7,021
L97-128	3,669
HoCP91-555	1,117
HoCP85-845	369
CP70-321	101
L98-209	58
Total	31,469

THE 2002 LOUISIANA SUGARCANE VARIETY SURVEY

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And
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A sugarcane variety survey was conducted during the summer of 2002 by county agents in the 24 sugarcane-growing parishes of Louisiana to determine the variety makeup and distribution across the Sugarcane Belt 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 named 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. However, not all growers participated in the survey; therefore, total acreage figures as reported may differ from those acres certified by FSA.

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 in the state. Statewide, the area reported in this survey was 482,666 acres. This is 97.5% of the total acres planted to sugarcane as reported in Louisiana Agricultural Summary for 2002 (Anonymous 2002). Total acres for the 2002 survey for each of the three regions - Teche, River-Bayou Lafourche, and Northern – are shown in Table 1.

The estimated statewide sugarcane acreage in percent by variety and crop is shown in Table 2. The leading variety for 2002 was LCP 85-384, with 85% of the total acreage followed by HoCP 85-845, CP 70-321, and HoCP 91-555 with 6, 5, and 3% of the total acreage, respectively. These are the only four varieties currently recommended for commercial planting in Louisiana (Legendre 2001). LCP 85-384 has been steadily increasing in popularity among growers since its release in 1993. No other variety occupied more than 1% of the total acreage in the current survey.

There was a tendency for growers in the Northern region to plant less cane each year (22.9%) and keep more older stubble crops (29.3% second-stubble and 25.6% third and older stubble)(Table 3). Conversely, there was a tendency for growers in the River-Bayou Lafourche region to plant more cane each year (27.9%) and keep less older stubble (26.2% second stubble and 17.3% third and older stubble) than the Northern region. The distribution by crop for the Teche region was generally intermediate of the other two regions. 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).

Undoubtedly, LCP 85-384 was the preferred variety in all regions (Tables 4, 5, and 6). In the Teche region, LCP 85-384 was the leading variety, with 85% of the total area followed by CP 70-321 with 8% and HoCP 85-845 with 4% (Table 4). HoCP 91-555, released for commercial planting in 1999, has not been widely accepted by growers in the Teche region, with only a 2% share of the planted area. LCP 85-384 occupied 84% of the area in the River-Bayou Lafourche region (Table 5). However, HoCP 85-845 was the second most popular variety, with 9% of the planted area followed by only 2% for both CP 70-321 and HoCP 91-555. For the Northern region, LCP 85-384 occupied 86% of the planted area (Table 6). HoCP 85-845 was planted on 6% of the area followed by HoCP 91-555 with 4% and CP 70-321 with 3%.

Only two varieties, LCP 85-384 and HoCP 91-555, showed an increase in the acreage grown in 2002 when compared to the previous year (Table 7) (Legendre and Gravois 2002). 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 3% from crop year 2001. This is a drop of 46 percentage points from its high of 49% in 1995. LCP 85-384, now at 85%, is the first variety to reach more than 70% of the total acreage in recent history since CP 65-357, released in 1973, occupied 71% of the acreage in 1980. LCP 85-384 is a high-yielding, excellent-stubbling variety; however, it has a tendency to lodge and is very susceptible to the sugarcane borer. The variety produces a large number of small stalks and consistently out-yields the other three recommended commercial varieties in tons of cane and sugar per acre (Waguespack et al. 2002).

It is anticipated that LCP 85-384 will continue to gain in popularity for the near term, with the possible exception of the Northern region, 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. 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, especially in the Northern region where the plant-cane crop reached 11% in 2002. However; it is not anticipated that this variety will ever become a major variety statewide. Because of the possibility of an early frost in the Northern region, growers have possibly selected HoCP 91-555 because of its early maturity and its mostly erect growth habit. This allows for the harvest of this variety by both combine and whole-stalk harvesters. On the other hand, LCP 85-384 frequently lodges and is brittle and difficult to harvest when lodged. Since 1995, most of the growers in the state have converted to the combine harvest system to take advantage of the superior yielding ability of LCP 85-384.

Most sugarcane-growing areas of the world are currently in a situation where there is not 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. Guidelines were established in Cuba wherein individual growers were advised not to plant more than 30% of their area with their leading commercial variety. It is known that LCP 85-384 is now considered susceptible to rust as well; however, it appears that rust has not caused a significant reduction in its yield. A similar situation occurred recently in Australia with Q 124 and susceptibility to orange rust. However, once a clearly superior variety, as is the case with LCP 85-384, has been identified in a sugarcane-growing area, 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 a continuing effort to lessen the dependence 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.

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. Estimated total sugarcane acres by parish and region for 2002[1].

Teche region		River-Bayou Lafourche region		Northern region	
Parish	Acres	Parish	Acres	Parish	Acres
Acadia	3,854	Ascension	15,018	Avoyelles	22,034
Calcasieu	5,500	Assumption	41,748	East Baton Rouge	532
Cameron	500	Iberville	36,224	Evangeline	3,021
Iberia	63,536	Lafourche	31,330	Pointe Coupee	31,566
Jeff Davis	7,700	St. Charles	1,630	Rapides	10,562
Lafayette	16,694	St. James	24,837	St. Landry	22,163
St. Martin	36,300	St. John	4,128	West Baton Rouge	15,454
St. Mary	44,940	Terrebonne	11,617		
Vermilion	31,778				
Total	210,802	Total	166,532	Total	105,332
Total all regions: 482,666					

[1] Estimates are based on 2002 variety survey information from county agents.

Figure 1. Louisiana sugarcane growing parishes

Table 2. Estimated statewide sugarcane acreage percentage by variety and crop, 2002[1].

Variety	Plant-cane	First-stubble	Second-stubble	Third-stubble and older	Total
	--%--				
CP 65-357	<1	<1	<1	1	<1
CP 70-321	3	4	6	7	5
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	87	86	82	83	85
HoCP 85-845	4	5	8	7	6
HoCP 91-555	6	3	1	<1	3
Others	<1	<1	1	1	<1
Total acres Percent total crop (%)	124,212 25.7	124,181 25.7	128,215 26.6	106,058 22.0	482,666

[1]Based on 2002 variety survey information from county agents.

Table 3. Estimated sugarcane distribution by region and crop, 2002[1].

Crop	Teche	River-Bayou Lafourche	Northern	State total
Plant-cane acres %	53,582 25.4	46,508 27.9	24,122 22.9	124,212 25.7
First-stubble acres %	53,310 25.3	47,528 28.6	23,343 22.2	124,181 25.7
Second-stubble acres %	53,712 25.5	43,633 26.2	30,871 29.3	128,215 26.6
Third-stubble and older acres %	50,198 23.8	28,863 17.3	26,996 25.6	106,058 22.0
Total acres	210,802	166,532	105,332	482,666

[1]Based on 2002 variety survey information from county agents.

Table 4. Estimated Teche region acreage percentage by variety and crop, 2002[1].

Variety	Plant-cane	First- stubble	Second-stubble	Third-stubble and older	Total
CP 65-357	0	<1	<1	<1	<1
CP 70-321	6	7	9	10	8
CP 72-370	<1	1	1	1	1
LCP 82-89	<1	<1	1	1	1
LHo 83-153	0	0	<1	<1	<1
LCP 85-384	88	85	82	83	85
HoCP 85-845	2	3	5	4	4
HoCP 91-555	4	2	1	<1	2
Others	<1	<1	1	1	1

[1] Based on 2002 variety survey information from county agents.

Table 5. Estimated River-Bayou Lafourche region sugarcane acreage percentage by variety and crop, 2002[1].

Variety	Plant-cane	First-stubble	Second- stubble	Third-stubble and older	Total
CP 65-357	<1	<1	<1	<1	<1
CP 70-321	1	2	3	4	2
CP 72-370	<1	1	1	1	1
LCP 82-89	<1	0	1	1	<1
LHo 83-153	<1	1	2	1	1
LCP 85-384	90	86	78	79	84
HoCP 85-845	4	7	13	12	9
HoCP 91-555	4	3	1	<1	2
Others	<1	1	1	1	1

[1] Based on 2002 variety survey information from county agents.

Table 6. Estimated Northern Region sugarcane acreage percentage by variety and crop, 2002[1].

Variety	Plant-cane	First- stubble	Second-stubble	Third-stubble and older	Total
CP 65-357	0	0	0	2	<1
CP 70-321	1	2	4	4	3
CP 72-370	0	0	0	<1	<1
LCP 82-89	0	0	<1	<1	<1
LHo 83-153	0	<1	<1	<1	<1
LCP 85-384	80	87	89	88	86
HoCP 85-845	7	5	6	5	6
HoCP 91-555	11	5	1	<1	4
Others	<1	<1	<1	<1	<1

[1]Based on 2002 variety survey information from county agents.

Table 7. Louisiana sugarcane variety trends 1998-2002[1].

	% of Louisiana total acreage by year					
Variety	1998	1999	2000	2001	2002	1 yr. Change
CP 65-357	3	1	1	1	<1	-1
CP 70-321	29	20	13	8	5	-3
CP 72-370	5	3	2	1	1	0
LCP 82-89	7	5	2	1	<1	-1
LHo 83-153	3	3	2	1	<1	-1
LCP 85-384	43	58	71	78	85	+7
HoCP 85-845	6	8	8	7	6	-1
HoCP 91-555	-	<1	<1	1	3	+2
Others	1	<1	<1	1	<1	-1

[1]Based on annual variety survey reports from county agents in sugarcane-producing parishes, 1998-2002.

DEVELOPMENT OF TRANSGENIC LOUISIANA SUGARCANE FOR HERBICIDE RESISTANCE

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SUMMARY

The following results were obtained during 2002: (1) The ALS gene that confers resistance to immidazilinone herbicides was transferred to calli of LCP-384 by bombardment-mediated transformation. The bombarded calli were selected in the presence of the antibiotic G418. A total of about 260 plants were produced in four successful experiments. PCR assays and southern blot analysis indicated that ALS gene was stably integrated into the sugarcane genome. (2) Gene expression was detected in stems of transgenic LCP-384 with construct pCL3 by ELISA assays, and the amount of NPT II protein produced was 1~2 ng /ml extract. (3) Minimum lethal dosage of normal LCP-384 plants and callus cells cultured *in vitro* to the herbicide Arsenal was determined across three separate experiments (4) A total of eight regenerated plants from calli showed tolerance to the herbicide Glean. Additional tests will be required to fully characterize this material.

The Sugarcane Genetics Project, located at the LSU Agricultural Center Department of Agronomy, was carried out under LAES Project 3295 in close cooperation with scientists at the Sugar Research Station and the LSU Baton Rouge campus. The objectives of this project were as follows:

(1) Transfer ALS herbicide resistance gene to variety LCP-384 to obtain transgenic plants. Confirm gene integration by molecular analysis.

(2) Determine extent and level of NPTII reporter gene expression in stems of transgenic sugarcane.

(3) Determine minimum lethal dose response of normal LCP-384 plants to the herbicide Arsenal.

(4) Determine dose response of sugarcane calli to Arsenal herbicide.

(5) Select plants regenerated from calli grown in the presence of lethal doses of the herbicide Glean.

Objective 1: Production and identification of transgenic sugarcane containing ALS herbicide gene by particle bombardment

The plasmid constructs pCL4, pCL21and pCL22, containing the NPT II gene, and constructs pUAUA2 and pURAL34, containing the ALS herbicide resistance gene, were engineered and used in particle bombardment experiments in the following combinations: pCL4 + pUAUA2; pCL21 + pURAL34; pCL22 + pUAUA2; and pCL22 + pUAUA2. The plasmids were mixed and transferred to calli of LCP-384 via particle bombardment. A total of six experiments were conducted using the above plasmid combinations, followed by selection using the antibiotic G418. Regenerated plants were produced in four successful experiments designated I, II, III, and IV.

Experiment I: In this experiment the plasmid combination of pCL4 and pUAUA2 was used. Approximately 90 plants were regenerated and transferred to the greenhouse, among which 38 plants were transplanted to the St. Gabriel Sugar Research Station in 2002. Because of an unusually dry April and May of that year, only seven plants survived, with four plants currently being propagated for cuttings in the greenhouse. This material will be further evaluated for levels of herbicide resistance and additional biochemical/molecular tests in 2003.

Experiment II: The plasmid combination used was pCL21 and pURAL34. A total of 60 plants were produced and transferred into greenhouse. Thirty-six plants were transplanted in the 2002 field at the St. Gabriel. Because of the unusual dry spring in 2002, only eight plants survived in the field. Currently cuttings are being produced from seven plants for additional evaluation in 2003.

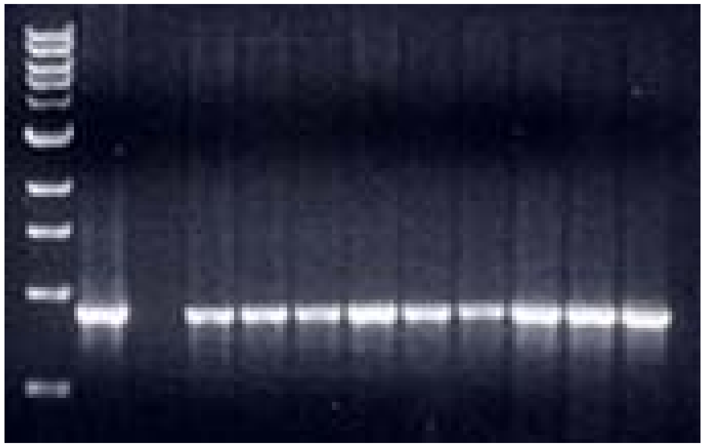
Experiment III: One plasmid pCL22 and a fragment containing the Ubi-1-ALS cassette were used in this experiment. About 50 plants were regenerated and transferred to the greenhouse. A total of 14 plants were cut for propagation in the green house, and seven of them produced plants for further testing in 2003.

Experiment IV: This experiment involved co-transformation of constructs pCL21 and pUAUA2. Approximately 60 plants were produced and transferred to the winter greenhouse for propagation of cuttings and subsequent testing in 2003.

IDENTIFICATION OF TRANSGENIC PLANTS BY MOLECULAR ANALYSIS

As stated previously, 260 plants were produced by particle bombardment via co-transformation of two separate constructs. NPT II gene expression was demonstrated by ELISA analysis. Selection of transformed plants was based on the NPT II antibiotic gene, while the ALS herbicide gene resided on the second, unlinked plasmid. Therefore, PCR assays were used to detect presence and incorporation of the ALS gene into the sugarcane genome. From a total of 28 plants that contained the NPT II gene, 23 plants showed positive results for the ALS gene. The figure below shows PCR products of nine positive plants, indicating that the ALS gene could be successfully introduced into Louisiana sugarcane germplasm by co-transformation of two separate plasmids during particle bombardment.

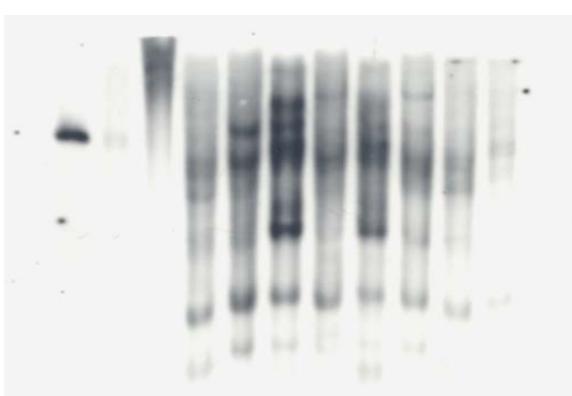
M CK+ CK- 1 2 3 4 5 6 7 8 9



M: Marker; Ck^{+}: 0.9 kb PCR product from plasmid pUAUA2; Ck^{-}: No PCR product from nontransgenic plant; lanes 1 to 9: Nine plants showing 0.9 kb PCR product

To confirm foreign stable gene integration into Louisiana sugarcane, southern blot analysis was carried out using the GUS or ALS gene as probes. The genomic DNA was extracted from leaves of transgenic plants, digested with the enzyme *Kpn I*, separated in agarose gels and hybridized with fluorescein-dUTP labeled probe. The results showed that the GUS gene was stably integrated into sugarcane genome. Gene copy number ranged from 2 to 6, and some plants showed multi-copy insertion. Similar results were obtained for the ALS gene. The figure below shows the hybridization profile after total genomic DNA of transgenic plants was digested with *Kpn I* (lane 1~8) or undigested (Lane U), fractionalized on an agarose gel and hybridized with fluorescein-dUTP labeled ALS gene probe.

CK+ CK- U 1 2 3 4 5 6 7 8



Ck^{+}: plasmid pCL4; Ck^{-}: Genomic DNA from nontransgenic plant; U: Undigested DNA from transgenic plant; Lanes 1 to 8: Genomic DNA from eight transgenic plants.

Objective 2: Gene expression analysis in the stem of transgenic LCP-384 sugarcane

The gene expression in leaves of sugarcane was demonstrated by histochemical assays for GUS gene, and by ELISA assays for NPT II gene. For the NPT II assay, protein solutions were extracted from the stem of transgenic plants about ~ 1 m in height. NPT II protein production was determined using a commercial NPT II ELISA kit. Seven out of eight plants that were tested did express NPT II protein in the stem at ~1 to 2 ng/ml, while no NPT II protein was detected in non-transgenic plants. This result indicated that NPT II gene could be efficiently expressed in an economically important part of the sugarcane plant under the control of Ubi-1 promoter.

Objective 3: Determine minimum lethal dose response of normal LCP-384 plants to the herbicide Arsenal

To determine if transgenic plants show tolerance or resistance to different herbicides, it is necessary to determine the minimum lethal dose response of normal, untransformed sugarcane plants. Because no documentation existed to indicate the lethal rate of Arsenal herbicide to LCP-384, two dose response trials were conducted in the greenhouse. Arsenal was sprayed at the rate of 1 lb, ½ lb, ¼ lb, 1/8 lb, 1/16lb a.i./A on normal LCP-384. All plants were killed within four weeks after herbicide application, indicating that the lowest rate of 1/16lb a.i./A was sufficient for lethal damage to the plants. To narrow the minimum rate of killing sugarcane plants, Arsenal was sprayed on sugarcane plants ~ 60 cm in height at the rate of 1/30 lb, 1/60 lb, 1/120 lb and 1/200 lb a.i./A. One month post application, plants treated with 1/30 lb and 1/60 lb a.i./A showed herbicide damage as yellow leaves, while plants treated with 1/120 lb or 1/200 lb a.i./A showed no visible systems. One month later, all plants died that were treated at the 1/30 lb and 1/60 lb a.i./A rates. It should be noted that all plants sprayed at any rate with Arsenal did lead to a substantial reduction of plant height (~ 50%) compared to unsprayed plants. These results show that the minimum rate for killing sugarcane ranged from 1/30 lb to 1/60 lb a.i./A. A total of 20 transgenic plants derived from co-transformation of pCL22 and Ubi-1-ALS were sprayed with Arsenal at the rate of 1/60 lb a.i./A. No clear herbicide damage was observed for transgenic plants one month after application. The control plants with the same herbicide application rate showed yellowish leaves, but did not die. Therefore, more experiments are needed in the future to determine potential levels of Arsenal resistance of this transgenic material.

Objective 4: Dose response of sugarcane calli to Arsenal herbicide

Due to public concerns of antibiotic genes in transgenic plants, a non-antibiotic transformation system is urgently needed, especially for vegetatively propagated crops such as sugarcane, where antibiotic genes would be difficult to remove by means of sexual propagation and subsequent selection. In an effort to use herbicide Arsenal as a selectable agent, herbicide ranging from 0.1 mg/L to 4.0 mg/L was added to callus culture medium to determine minimum lethal rates. The results showed that calli exhibited a sticky, brown appearance when placed on medium with 0.7 mg/L Arsenal for two, four-week rounds. A majority of the calli died after three, four-week rounds of culture on medium > 1.0 mg/L Arsenal. This indicated that Arsenal was a strong herbicide that could kill sugarcane calli at a minimum lethal concentration of 1 mg/L.

Objective 5: Selection for Glean herbicide-resistant sugarcane via somatic cell culture

There are numerous reports in the literature of ALS mutants that exhibit resistance to ALS herbicides by natural mutation or somatic cell selection. For the purpose of obtaining Louisiana sugarcane exhibiting resistance to the herbicide Glean, two experiments were conducted using technical grade Glean as a selectable agent. Six rounds of selection, two weeks each round, were carried out in Experiment I at herbicide concentrations of 4 mg/L for 2 rounds, 6 mg/L for 2 rounds and 8 mg/L for 2 rounds. In experiment II, five rounds of selection were carried out at 4 mg/L for one round, 6 mg/L for two rounds and 8 mg/L for two rounds. Five and six pieces of resistant calli were obtained in experiment I and II, respectively. Approximately 15 plants were regenerated from these calli, and eight plants are currently growing in the greenhouse. Biochemical and molecular tests will be conducted in 2003 to further evaluate the regenerated lines for level of resistance to Glean.

SMALL PLOT ASSESSMENT OF INSECTICIDES AGAINST THE SUGARCANE APHID

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Seven insecticide treatments were evaluated for control of the sugarcane aphid in a randomized complete block design with five replications in a field of second ratoon LCP 85-384 sugarcane located on a farm near New Iberia, LA. Pre-treatment aphid counts were made (31 July) prior to test initiation. Insecticide treatments were applied on 31 July to 3-row plots (6 feet x 20 feet) using a CO_2 sprayer mounted on an all-terrain vehicle with 8005 flat fan nozzles (one per row) delivering 10 gpa at 35 psi. For each sampling date, aphids were counted on the third leaf down from the whorl of 10 randomly selected plants from the center row of each plot. Data were analyzed with ANOVA and means separated with LSD.

There was no significant difference among pre-treatment counts on 31 July. On 3 August (3 DAT), all treatments had significantly fewer sugarcane aphids than the check. On 14 August (14 DAT), the imidacloprid, Capture, Furadan, and Fury treatments had significantly fewer sugarcane aphids than the check.

Table 1. Results of small plot insecticidal test for control of the sugarcane aphid, Melanaphis sacchari (Zehntner).

		Mean Number of Aphids per 10 Leaves[a]		
Treatment/Formulation	Rate (oz/A)	Pre-treatment[b]	3 DAT	14 DAT
Imidacloprid 4F	1.5	239.6a	12.2b	2.2b
Asana XL	6.0	324.0a	17.0b	33.0ab
Capture 2EC	6.4	520.8a	48.0b	5.4b
Karate Z	1.92	566.8a	58.0b	18.8ab
Furadan 4F	8.0	676.2a	75.2b	1.8b
Baythroid 2E	2.1	613.0a	87.60b	10.6ab
Fury 1.5EC	3.37	594.8a	113.8b	6.8b
Check	--	194.6a	275.4a	60.6a
LSD		592.1	159.3	99.5

[a]Means within a date followed by the same letter are not significantly different ($P<0.05$, LSD).
[b]Counts on 31 Jul are pre-treatment counts prior to application of insecticide.

SMALL PLOT ASSESSMENT OF INSECTICIDES AGAINST THE SUGARCANE BORER

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Eight insecticide treatments were evaluated for season-long control of sugarcane borer in a randomized complete block design with six replications in a field of first ratoon HoCP91-555 sugarcane at the LSU AgCenter Sugar Research Station, St. Gabriel, LA (Iberville Parish). Insecticide treatments were applied to 3-row plots (6 feet x 30 feet) 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 (15 lb/A) was applied on 10 June to suppress fire ant predation on the sugarcane borer (SCB) larvae. Initial treatment of novaluron was made on 9 July when 3% of the stalks were infested with SCB larvae in the leaf sheaths. All other insecticide treatments were made on 17 July when SCB infestations reached the Louisiana Cooperative Extension Service recommended threshold (5% of the stalks infested with SCB larvae in the leaf sheaths). Second applications of all treatments were made on 19 August when re-infestation reached 5% in the Confirm 2F treated plots. SCB damage was assessed by counting bored internodes and the total number of internodes per stalk from 120 randomly selected stalks (20 stalks/plot) in each treatment (1 November). Data were analyzed with ANOVA and means separated with LSD.

All insecticide-treated plots resulted in less than 10% bored internodes (economic injury level) and were significantly less than the untreated check of 30.6% bored internodes. With adequate rainfall conditions, borer infestations were normal during the summer of 2002. Experience with SCB tests shows that the most reliable results are obtained when the untreated check approaches at least 25% bored internodes, which was easily surpassed in this test.

Table 1. Results of small plot insecticidal test on (SCB) *Diatraea saccharalis* (F.), St. Gabriel Research Station, 2002.

Treatment/ Formulation[a]	Rate (oz/A)	% Bored Internodes[b]
Fury 1.5EC	3.37	2.9b
Baythroid 2E	2.10	2.9b
Intrepid 2F	4.00	2.8b
Confirm 2F	8.00	2.8b
F0570 0.8EC	3.20	2.4b
Karate Z	1.92	2.0b
novaluron (3% Threshold)	12.00	1.8b
novaluron (5% Threshold)	12.00	1.7b
Check	--	30.6a
LSD		2.87

[a]All treatments were applied with Latron CS-7 at 0.25% vol/vol.
[b]Means within a column followed by the same letter are not significantly different ($P<0.05$,LSD).

MONITORING 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 2002 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 potentially increasing threat to Louisiana.

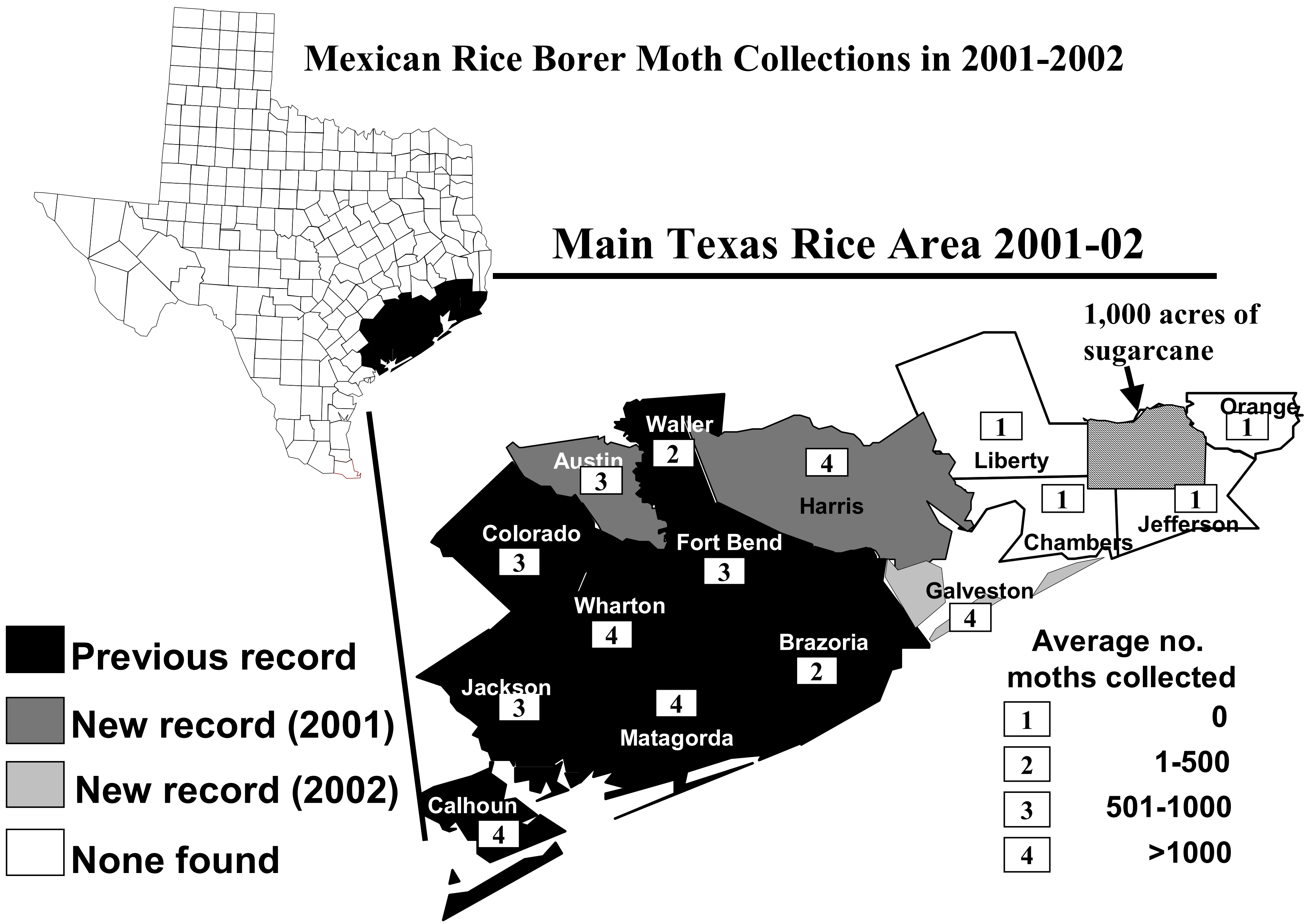
In May 2002, two bucket-type pheromone traps were set up in each county of the Texas Rice Belt (Chambers, Liberty, Jefferson, Orange, Waller, Harris, Austin, Colorado, Fort Bend, Wharton, Brazoria, Galveston, Jackson, Matagorda, and Calhoun). Extensive monitoring was also conducted in two western Louisiana parishes (Calcasieu and Jeff Davis) adjacent to sugarcane fields. Traps were additionally placed at three 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 eight 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 2002 in Texas and every six to eight weeks from June to December in Louisiana. Trap collections were placed in plastic bags and frozen for identification and enumeration.

MRB was found in the newly infested county of Galveston in Texas (See Figure). The insect is still not known to occur in Louisiana, but now appears in relatively high populations 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, 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 2002[1.]

Texas Counties	May	June	July	August	September	October	November	Total
New Discovery								
Galveston	74	258	255	560	253	777	131	**2308**
Previously Known Counties								
Austin	-	85	32	128	155	-	113	**523**
Brazoria	424	1108	281	248	434	1021	206	**3722**
Calhoun	211	374	510	440	604	1570	736	**4445**
Colorado	298	224	274	135	415	1554	383	**3283**
Fort Bend	-	375	49	77	-	-	-	**501**
Harris	416	923	362	541	797	2452	314	**5805**
Jackson	728	424	258	77	141	359	-	**1987**
Matagorda	26	42	47	75	85	207	49	**531**
Wharton	44	256	84	120	176	734	505	**1919**
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.



Mexican Rice Borer Moth Collections in 2001-2002
Main Texas Rice Area 2001-02
1,000 acres of sugarcane
Orange
1
Liberty
1
Waller
2
Austin
3
Harris
4
Chambers
1
Jefferson
1
Colorado
3
Fort Bend
3
Galveston
4
Wharton
4
Brazoria
2
Jackson
3
Matagorda
4
Calhoun
4
Previous record
New record (2001)
New record (2002)
None found
Average no. moths collected
1 0
2 1-500
3 501-1000
4 >1000

RESISTANCE TO THE MEXICAN RICE BORER AMONG LOUISIANA AND TEXAS SUGARCANE VARIETIES

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The Mexican rice borer (MRB), *Eoreuma loftini* (Dyar), is a potentially 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, now the major insect pest of sugarcane in the LRGV of Texas, represents more than 95% of the LRGV sugarcane stalk borer population in Texas. With MRB established only 50-60 miles from new sugarcane production near Beaumont, Tx, the invasion of Louisiana sugarcane fields in the near future is expected. Efforts are under way to develop more adequate management strategies in both Louisiana and Texas.

Relative resistance to MRB was determined among Louisiana and Texas sugarcane cultivars based on plant damage as well as their contribution to the production of borer populations on an area wide basis. The four commercially recommended Louisiana sugarcane cultivars CP 70-321, LCP 85-384, HoCP 85-845, and HoCP 91-555 were planted on 2 October 2000 in a randomized block design with five replications at the Weslaco Center annex. An additional cultivar, NCo 310, commercially produced in Texas (formerly a major cultivar in Louisiana), was planted as an MRB susceptible check. A second experiment was planted on 3 October 2001, also with five replications in a randomized block design at Ganado, Tx. Treatments in this test were the sugarcane cultivars NCo 310, CP 70-321, LCP 85-384, HoCP 85-845, and HoCP 91-555, plus the candidate Louisiana cultivar HoCP 96-540. Criteria for resistance assessment at the end of the season included percent bored internodes as well as adult emergence holes, which would be used to determine the relative impact of each cultivar on the potential area wide buildup or reduction of MRB populations. One of the newer cultivars, HoCP 85-845, appeared to lose a portion of its resistance under heavy MRB infestation pressure, indicating its value only in moderate to low infestation conditions. Cultivar CP 70-321 was the most resistant. Results from both locations indicated that cultivars HoCP 91-555 and LCP 85-384 were significantly the most susceptible cultivars when considering both criteria, even more so than NCo 310, traditionally the most susceptible cultivar commercially produced in Texas.

Table 1. Injury by E. loftini to five commercial sugarcane cultivars, resultant survival of older larvae inside the stalks, and moth production at Weslaco, TX, 2001-2002.

Cultivar	% Bored internodes		Relative survival[a]		Moth emergence/ha[b]	
	2001	2002	2001	2002	2001	2002
HoCP 91-555	13.84a	9.84a	0.089a	0.050a	15071a	7868a
LCP 85-384	12.06ab	6.48ab	0.111a	0.112a	17052a	13994a
NCo 310	9.03abc	6.40ab	0.047a	0.091a	4926b	5483a
CP 70-321	7.63bc	4.15b	0.040a	0.167a	3805b	6225a
HoCP 85-845	5.29c	4.94ab	0.034a	0.083a	3038b	4197a
F[c]	2.82	3.58	2.00	0.97	4.33	0.60
P > F	0.060	0.029	0.144	0.4510	0.0146	0.668

Means within the same column followed by the same letter are not significantly different (P>0.05; Tukey's [1955] test).

[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.
[c] Degrees of freedom for F values were 4, 16.

Table 2. Injury by E. loftini to five sugarcane cultivars, resultant survival of older larvae inside the stalks, and moth production at Ganado, TX, 2002.

Cultivar	% Bored internodes	Relative survival[a]	Moth Emergence/ha[b]
LCP 85-384	67.46a	0.225a	112255ab
HoCP 96-540	62.45ab	0.200a	105590ab
HoCP 91-555	57.53b	0.363a	165097a
HoCP 85-845	47.23c	0.150a	62669b
NCo 310	36.15d	0.166a	53057b
CP 70-321	28.32e	0.171a	39140b
F[c]	34.01	1.23	2.12
P > F	< 0.0001	0.3307	0.106

Means within the same column followed by the same letter are not significantly different (P>0.05; Tukey's [1955] test).

[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.
[c] Degrees of freedom for F values were 4, 20.

SUGARCANE YELLOW LEAF VIRUS DISTRIBUTION IN LOUISIANA

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Sugarcane yellow leaf virus (SCYLV) was first discovered in Louisiana by Grisham and others in 1996. It is spread by the sugarcane aphid, *Melanaphis sacchari*. The sugarcane aphid was first detected in Louisiana in 1999 during surveys conducted by both USDA and LSU AgCenter Department of Entomology personnel.

A survey was conducted to assess the incidence of SCYLV throughout the Louisiana sugarcane production area in July and August 2002. Forty-two fields in 17 parishes were sampled. The sugarcane production area was divided into seven areas. The areas were Central (Rapides and Avoyelles parishes); Upper River (Pointe Coupee, West Baton Rouge, and Iberville parishes); Lower River (Ascension, St. Charles, St. John, and St. James parishes); Lafourche (Assumption, Lafourche, and Terrebonne parishes); Upper Teche and Western (St. Martin, Vermilion, and Lafayette parishes); Lower Teche (Iberia and St. Mary parishes); and Southwest (Jefferson Davis and Calcasieu parishes). All surveyed fields were first ratoon LCP 85-384. A single leaf was collected from 50 plants in an 0.86-acre portion of each field. The leaves were processed in the laboratory, and SCYLV was detected using a tissue blot immunoassay.

The virus was found to occur in varying degrees throughout the entire production area. Table 1 shows the results grouped by sampling region. The Lower Teche area had the lowest incidence of virus (0.3%), and the Lafourche area had the highest incidence (11.3%).

This study indicates that SCYLV is widely distributed throughout the Louisiana sugarcane production area. However, over half the fields surveyed had no virus infection detected, and 79% had less than 10% infection. This suggests that the disease is, as yet, not increasing rapidly in LCP 85-384. Other research being conducted in conjunction with areawide surveys includes studies to relate sugarcane aphid abundance to SCYLV infection and evaluation of disease spread and increase within different fields.

Table 1. Results for sugarcane yellow leaf virus statewide survey by region, July-August, 2002.

Survey Region	No. positive/no. stalks tested	SCYLV Infection (%)
Central	13/251	5.2
Upper River	38/349	10.9
Lower River	7/301	2.3
Lafourche	34/302	11.3
Upper Teche and Western	29/300	9.7
Lower Teche	1/300	0.3
Southwest	25/303	8.3

This research is a portion of the Ph.D. dissertation research of Chris D. McAllister in the Department of Entomology.

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 2001 were 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. Stalk rot research is a component of research on billet planting that is reported separately.

RATOON STUNTING DISEASE

RSD testing was conducted as part of the Sugarcane Disease Detection Lab operations for the sixth year during 2002. RSD was monitored in fields on commercial farms, in the LSU AgCenter Variety Selection Program, 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. By 2002, these statistics had decreased to 10, 5, and 1%, respectively. These numbers have been declining progressively each season. 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. The highest infection levels detected during 2002 were 11% for fields with RSD and 3% for stalks infected in first stubble fields (Table 2). 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 very 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. Testing results with HoCP 91-555, a highly susceptible variety, found that 22% of the fields tested had RSD. This variety will become infected if RSD is persisting on a farm. The results suggest that this may be the case and emphasize the need for farmers to continue to use a healthy seedcane program.

SUGARCANE YELLOW LEAF

Sugarcane yellow leaf virus (SCYLV) causes our most recent disease in Louisiana. Research is under way to determine the potential impact to LCP 85-384 under Louisiana conditions. Results have been obtained from an experiment to determine the effect of SCYLV on yield of LCP 85-384 (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 first ratoon. This experiment has been re-planted. A tissue-blot immunoassay using imprints from leaf mid-ribs was used in the Sugarcane Disease Detection Lab for the detection of SCYLV (Table 3). Sources of Kleentek® seedcane were monitored for SCYLV for the third year. 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. 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 statewide survey was conducted, in which 42 fields of LCP 85-384 first ratoon were sampled. The virus was detected in fields in all areas of the industry. Field infection levels ranged from 0-63%. However, no virus was detected in over half of the sampled fields. Rates of increase and patterns of disease spread were determined in two plant cane and two ratoon fields of LCP 85-384. The sugarcane aphid that spreads the virus from plant to plant was detected in all fields, but only low levels of virus infection occurred in three fields, while a moderate level of infection was detected in one ratoon field.

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. 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.

Additional research conducted during 2002 in cooperation with Dr. Ed McGawley evaluated the effects of a potential new chemical for the control of nematodes and a general biocide that can kill all organisms in the soil. In a field experiment conducted at the Sugar Research Station, nematode numbers were decreased, but no increases in yield were obtained. The general biocide showed some potential for weed control, but cane germination was delayed. Another experiment is planned to evaluate different chemical application rates and time intervals between treatment and planting.

SELECTION OF DISEASE RESISTANT VARIETIES

Experimental varieties in the selection program are screened and rated for resistance to mosaic, leaf scald, and smut. Natural mosaic infection levels were determined in breeding program outfield yield trials. Little infection was detected in experimental varieties during 2002. Leaf scald 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, but few symptoms resulted from the inoculation. Smut resistance in experimental varieties also 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 2002 and compared to infection levels in varieties with known resistance reactions. Within the experimental varieties, 19 (68%), six (21%), and three (11%) of 28 were rated as resistant, moderately susceptible, and highly susceptible to smut, respectively (Table 4).

Table 1. RSD testing summary for 2002.

Source	Location	No. of fields	No. of varieties	No. of samples
Louisiana growers	State-wide	195	5	3900
LSUAgCenter	St. Gabriel & Iberia	-	5	110
Variety Release Program	1° & 2° stations	-	23	1297
Kleentek®	Foundation stock	-	-	28
Kleentek®	1° increase farms	15	5	336
Kleentek®	2° increase farms	16	3	326
Local Quarantine	LSUAC	-	14	95
Research	LSUAC	-	8	805
Totals		226		6897

Table 2. RSD field and stalk infection frequencies in different crop cycle years for all varieties combined during 2002.

Crop Year	Total number of fields	Average field infection (%)	Total number of stalks	Average stalk infection (%)
Plant cane	142	4.2	2820	0.6
First stubble	35	11.4	700	2.7
Second stubble	13	0.0	281	0.0
Older stubble	5	0.0	99	0.0
Totals	195	5.1	3900	0.9

Table 3. Sugarcane yellow leaf virus testing summary for 2002.

Source	Location	No. of fields	No. of varieties	No. of samples
Louisiana growers	State-wide	1	1	39
LSUAgCenter	St. Gabriel & Iberia	-	8	85
Kleentek®	Foundation stock	-	15	187
Kleentek®	1° increase farms	57	4	1260
Kleentek®	2° increase farms	33	3	880
Local Quarantine	LSUAC	-	14	95
Research	LSUAC	46	14	7978
Totals		137		10,412

Table 4. Smut infection level and resistance ratings for experimental varieties determined from an inoculated test.

Variety	Infection (%)	Rating[x]	Variety	Infection (%)	Rating[x]
CP 65-357	12	4	HoCP 99-825	1	2
CP 70-321	0	1	HoCP 99-866	4	2
CP 73-351	41	8	HoCP 99-870	0	2
CP 74-383	28	6	L 00-247	23	5
TucCP 77-042	4	2	L 00-249	3	2
L 97-128	0	1	L 00-250	0	1
L 97-137	0	1	L 00-255	0	1
L 98-207	1	2	L 00-257	38	7
L 98-209	4	2	L 00-259	4	2
HoCP 98-741	31	6	L 00-263	0	1
L 99-213	1	2	L 00-264	11	4
L 99-226	1	2	L 00-266	23	5
L 99-231	2	2	L 00-268	9	4
L 99-233	6	3	L 00-270	23	5
HoCP 99-804	1	2	L 00-271	0	1
HoCP 99-808	0	1	L 00-273	67	9
HoCP 99-815	51	9			

[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 IN SUGARCANE

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SUGARCANE RESPONSE TO PREEMERGENCE HERBICIDES APPLIED IN SPRING AND AT LAYBY

Significant injury was not observed when LCP 85-384, HoCP 85-845, and HoCP 91-555 were treated with a single application of Valor at 8 oz/A in March or April, or with a single or sequential application of DuPont K4 (a premix of Velpar and Karmex) at 4 lb/A in March or in March and again at layby. In another study when Valor at 8 oz/A was applied with Agridex crop oil concentrate in April or at layby, LCP 85-384 was injured and a reduction in sugarcane and sugar yield was observed. Sugar yield, however, was not negatively affected when Valor at 8 or 12.2 oz/A was applied in March or when DuPont K4 at 4 lb/A was applied in March or April. LCP 85-384 showed excellent tolerance to Envoke (CGA 362622) applied at 0.6 oz/A alone or in combination with Evik. In two layby experiments conducted in St. Martin Parish LCP 85-384 sugarcane was not injured from directed applications of DuPont K4.

REDUCED TILLAGE RESEARCH

Experiments were conducted using LCP 85-384 plant cane and stubble cane in Lafayette, St. James, St. Martin, and St. Mary parishes. Atrazine, DuPont K4, Command plus Direx, or Prowl plus Direx or Sencor was applied in March after cane was either off-barred or not off-barred. Sugarcane shoot populations assessed around four weeks after application were as much as 12% higher where rows were not off-barred. Weed control was excellent in all experiments, but cane injury from Command was observed at some of the locations. At the St. Martin site at layby, soil moisture was higher and sugarcane was taller in plots that had not been off-barred in the spring. In a study at St. Gabriel, soil temperature on the row top within the sugarcane drill in March and April and sugarcane shoot emergence and height were each equal whether or not sugarcane had been off-barred This same response was also reflected in sugar yields. These findings suggest that in fields where rutting is not a problem, tillage operations in the spring could be eliminated without affecting sugarcane emergence, early season tillering, or yield as long as weeds are not a limiting factor.

JOHNSONGRASS CONTROL AND FALLOW WEED RESEARCH

Asulox alone and in combination with Prowl, and Envoke were evaluated for control of 24-inch johnsongrass. By 38 days after treatment, johnsongrass was controlled 70% with Asulox at 4 qt/A, and the addition of Prowl (1 and 4 qt/A) did not enhance control. Johnsongrass control with Envoke (0.3 and 0.6 oz/A) was no more than 35%. Sugarcane was not injured with any of the herbicide treatments. In a fallow area 28 days after treatment, johnsongrass was controlled 71% with Asulox at 3 and 4 qt/A and addition of Prowl at 1, 2, 3, or 4 qt/A did not enhance control. In St. Martin Parish two experiments were conducted in fallowed fields, and excellent bermudagrass control was obtained with DuPont K4 at 4 lb/A and Sencor at 1.5 and 3 lb/A applied immediately after rows were formed.

RED MORNINGGLORY CONTROL AT LAYBY WITH SOIL-APPLIED HERBICIDES

Spartan was applied at 4, 5.3, 6.7, and 8 oz/A both to the soil surface after Treflan at 2 qt/A had been soil-incorporated and in combination with Treflan as a soil-incorporated treatment to evaluate red morningglory control at layby. At 53 days after treatment, Spartan applied at 8 oz/A and soil-incorporated controlled red morningglory 80%. However, when Treflan was soil-incorporated and Spartan was applied at 4 oz/A to the soil surface, control was 94%. When Spartan was applied to the soil surface and Treflan was not applied, red morningglory was controlled 79% with 6.7 oz/A and 91% with 8 oz/A. Findings clearly show that to maximize red morningglory control, Spartan should not be soil-incorporated and that a Treflan program followed by a surface application of Spartan is superior to that of Spartan applied alone.

SUGARCANE SEED RESPONSE TO 2,4-D AND ALTERNATIVES FOR RED MORNINGGLORY CONTROL

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Red morningglory (*Ipomoea coccinea* L.) emerging after the layby cultivation in May can reduce harvest efficiency and sugar yield. To manage this weed, producers often use a late-season aerial application of 2,4-D. This treatment poses no problem if sugarcane is harvested for sugar production, but if stalks are harvested for planting material, bud germination and shoot emergence may be affected.

Field studies conducted over two growing seasons evaluated the effect of 2,4-D applied at 1.5 qt/A (3.8 lb ai/gal) to LCP 85-384 sugarcane 7, 5, 3, and 1 wk before planting. Sugarcane was planted in mid-September using both whole stalk and billet (18 inch) seed pieces. When 2,4-D was applied five weeks or closer to planting, sugarcane shoot emergence and shoot population averaged across planting methods were reduced 5, 7, and 28 weeks after planting (WAP) when compared to the nontreated but stalk counts 52 WAP were not affected. Sugarcane height in one of two years was reduced when 2,4-D was applied five weeks or closer to harvest for seed, regardless of planting method. The first year, sugarcane and sugar yield were reduced 12 to 15% when 2,4-D was applied five weeks or closer to harvest for seed compared with the nontreated but yields were not affected the second year. Since the potential for yield reduction exists, a seven-week period should be allowed between 2,4-D application and harvest of LCP 85-384 for planting material as either whole stalks or billets.

Because of restrictions on use of 2,4-D in sugarcane production areas, alternative herbicides for red morningglory control were evaluated over two years. Complete control of 12- and 24-inch red morningglory was obtained 21 days after treatment (DAT) with 2,4-D at 1 pt/A, Weedmaster at 1 pt/A, Aatrex at 2 qt/A, Valor at 3 oz/A, and Spartan at 6.7 oz/A. Red morningglory 6 feet tall was controlled 100% with 2,4-D at 1 qt/A 28 DAT the first year, but control was only 78% the second year. In the second year when herbicides were applied three weeks earlier than the previous year and when weed growth was more vigorous, red morningglory was controlled 87% with 2,4-D at 1.5 qt/A. Postemergence - directed applications to the lower 18 inches of 6 feet red morningglory plants with Aatrex at 4 qt/A and Spartan at 6.7 oz/A provided at least 96% control the first year, but control was 23 to 30 percentage points less the second year. Several viable options are available to control 24-inch red morningglory in areas where 2,4-D is restricted. When red morningglories begin to climb and wrap sugarcane stalks, control with alternative herbicides is more variable and complete control is difficult to obtain. 2,4-D remains the treatment of choice for late-season control of red morningglory in areas where its use is not restricted.

RED MORNINGGLORY EMERGENCE AND RESPONSE TO SHADE AND TILLAGE

C. A. Jones, J. L. Griffin, and J. D. Siebert
Department of Agronomy

Field studies were conducted in West Baton Rouge Parish, LA, to evaluate red morningglory (*Ipomoea coccinea* L.) emergence and growth in response to shade and tillage. In both studies, plots were tilled with a rotary tiller to a 4-inch depth in May, June, July, and August of each year. Data were collected 20 to 41 days after each tillage operation. In the shade study, shade boxes were used and treatments included 0, 30, 50, 70, or 90% shade. Weed emergence, leaf area, and plant height data were collected just prior to each tillage operation. In the red morningglory tillage study, tilled and non-tilled treatments were included, and initial and final seed population in soil for each treatment were determined each year. Additionally weed emergence 20 to 41 days after each tillage operation was determined. In non-tilled plots Liberty herbicide was used to control weeds in lieu of tillage.

A response in red morningglory emergence to shade was observed in 2001 only for the June sampling date. As shade level increased red mornigglory emergence decreased linearly. Under no shade (full sunlight) red morningglory emergence was 13.5 plants/ft^2 and under 90% shade 9.8 plants/ft^2 emerged. At the July, August, and September sampling dates in 2001, shade did not influence weed emergence and emergence ranged from 1.6 to 3.8 plants/ft^2. In full sunlight 3.8, 3.3, 1.8 plants/ft^2 emerged at the July, August, and September sampling dates, respectively.

In 2002, shade influenced red morningglory emergence at the June and July sampling dates. In June, red morningglory emergence under full sunlight was 4.7 plants/ft^2 while increasing shade to 90% decreased emergence by 2 plants/ft^2. In July, red morningglory emergence was reduced from 1.9 for full sunlight to 0.4 plants/ft^2 for 90% shade. At the August and September sampling dates, red morningglory emergence was not influenced by shade and weed emergence ranged from 1.4 to 0.5 plants/ft^2. As noted for the previous year, red morningglory emergence decreased as the season progressed.

Even though red morningglory emergence decreased for some of the sampling dates in response to shading, plant growth (leaf area and height) for individual dates both years was equivalent regardless of shade. The differences in red morningglory growth among sampling dates for the individual shade levels is probably a reflection of soil moisture. Data also indicate that environmental conditions were more conducive to red morningglory growth and development in 2002.

Soil samples collected at a 4-inch depth prior to initiation of the study contained between 100 and 450 red morningglory seeds/ft^2. On the July sampling date red morningglory emergence was equal whether soil was tilled or not tilled around four weeks earlier and emergence averaged 9.7 plants/ft^2. In August, weed emergence was 45% greater when plots had been tilled around four weeks earlier as compared with plots that had not been tilled (9.3 vs 6.4 plants/ft^2). On the

September sampling date, only 2.1 plants/ft^2 emerged in the non-tilled plots compared with 8.0 plants/ft^2 where plots were tilled. The decrease in red morningglory emergence as the season progressed and the greater separation between tillage treatments for the August and September sampling dates are probably caused by soil seed bank depletion. Soil samples taken in October clearly showed a decrease in the seed bank from the initial sampling, but no differences in seed population were noted between tilled and non-tilled treatments. This indicates that tillage redistributed seed in the soil profile and that soil aeration enhanced germination.

BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet planting. During 2002, results were only obtained from billet planting experiments conducted at the Sugar Research Station at St. Gabriel, LA. The experiments included one LCP 85-384 experiment in second stubble comparing billets planted at two rates and whole stalks with and without starter fertilizer, LCP 85-384 plant cane and first-stubble experiments comparing billet date and rate of planting, and a plant cane experiment comparing billet and whole-stalk planting in HoCP 85-845 and HoCP 91-555. Yield differences seen among treatments in plant cane were no longer evident in the second-stubble experiment. The sugar per acre (lbs.) yields for whole stalks, 1x billets, and 2x billets were 5856, 5743, and 5400, respectively, without starter fertilizer (45-45-45) and 5524, 5719, and 5158, respectively, with starter fertilizer. No yield differences were detected in the plant cane date of planting test (Table 1); however, an early August planting date was not included. Yield differences were no longer evident in first stubble of the date of planting test (Table 2). Yields were lower at the lowest planting rates for both planting dates in plant cane (Table 3). No significant differences were detected among the different planting rates in first stubble (Table 4). HoCP 85-845 and HoCP 91-555 responded well to billet planting in plant cane (Table 5). Stalk population was higher in billet planted HoCP85-845. Yields were not obtained from farm experiments because of adverse harvesting conditions.

The results obtained during 2002 were similar to those from experiments in previous years. Yield differences were detected among treatments in the plant cane crop, but differences in yield detected in a prior plant cane crop were no longer significant in the stubble crops. As long as large gaps do not occur in the plant cane stand, the ratooning ability of LCP 85-384 allows it 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. Heavy rains during the planting season created problems in billet plantings across the industry during 2002. Numerous freezes then occurred during the winter, but most stand problems appeared to be associated with planting problems. Most stand problems occurred when heavy rains occurred shortly after planting in sandy soils. The research results from this and previous years suggest that practices to maximize the chance of success with billet planting include: 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), providing a well-prepared seed-bed, 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 2002 plant cane yield of billet planted LCP 85-384.

Date of planting	Stalks/acre (x1000)	Tons cane per acre	Sugar per acre (lbs.)
August 23	48.7	44.0	8943
August 28	53.4	42.1	8496
September 17	55.1	46.0	9199
September 28	53.1	45.4	8854

Average values for the different yield components were not significantly different among dates.

Table 2. Effect of date of planting on 2001 plant and 2002 first-stubble yields of billet planted LCP 85-384 at the Sugar Research Station.

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

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 3. Effect of rate of planting on 2002 plant cane yield of LCP 85-384 planted as billets on two dates at the Sugar Research Station.

	Stalks/acre (x1000)		Tons cane per acre		Sugar per acre (lbs)	
Rate	Aug 23	Sep 17	Aug 23	Sep 17	Aug 23	Sep 17
1 billet	40.8 c	38.7 d	34.8 b	34.3 c	6734 b	6442 c
3 billets	47.8 bc	48.1 c	40.0 ab	38.7 bc	8355 a	6913 bc
6 billets	50.5 ab	54.3 b	42.0 ab	43.5 ab	8773 a	8747 a
9 billets	55.7 ab	59.2 a	43.1 ab	47.1 a	8656 a	8068 abc
12 billets	57.3 a	60.3 a	46.2 a	45.8 ab	9525 a	8383 ab

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

	Plant cane (2000) Tons per acre		First-stubble (2001) Tons per acre	
Rate	Aug 22	Sep 18	Aug 22	Sep 18
1 billet	56.1 b	46.9 b	48.5	38.8
3 billets	66.9 a	57.9 a	50.4	41.0
6 billets	65.4 a	63.6 a	46.8	42.2
9 billets	65.2 a	58.3 a	45.9	44.5
12 billets	66.7 a	62.5 a	45.8	42.0

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 5. Comparison of yields obtained in plant cane for two varieties, HoCP 91-555 and HoCP 85-845, planted as billets and whole stalks at the Sugar Research Station.

Variety	Treatment	Stalks/acre	Tons cane/acre	Sugar/acre (lbs.)
HoCP 91-555	Billet	54,640	49.4	8786
	Whole stalk	45,725	43.5	7519
HoCP 85-845	Billet	38,910 a	39.1	7901
	Whole stalk	31,380 b	35.8	7037

Average values for stalk population per acre followed by different letters were significantly different (P = 0.05).

CULTURAL PRACTICES RESEARCH IN SUGARCANE IN 2002

Chuck Kennedy , Allen Arceneaux and Ray Ricaud
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 2002 to test the effects of management practices on yield and yield components of sugarcane.

An early (October) first ratoon harvest of HoCP85-845 and HoCP91-555 resulted in lower second ratoon yield, significantly lower than second ratoon production following a late (December) first ratoon harvest when all were preceded by an October plant cane harvest. Therefore, the effect of first ratoon harvest date on subsequent ratoon yields was greater when plant cane was harvested in October instead of December. In a similar study initiated this year, plant cane yields of LCP85-384 and HoCP91-555 were higher in a December harvest than an October harvest. Yields were generally higher for LCP85-384 than HoCP91-555 at the December harvest. October yields were equivalent for the two varieties.

Incorporating harvest residue of first ratoon HoCP85-845 resulted in cane and sugar yields of the second ratoon crop similar to that of burning the residue. Other treatments were generally lower to significantly lower than these treatments. Individual residue management treatments on first ratoon LCP85-384 did not produce significantly different yield or yield parameters. Orthogonal contrasts indicated treatments that removed or incorporated residue on the cane bed produced only 4% more millable stalks than when residue was treated with additives (66 kg/ha N as UAN or stabilized urea or 3.78 l/ha molasses) or left undisturbed. Sweeping residue to row middles produced significantly higher cane and sugar yields than other treatments that removed or incorporate residue on the cane bed.

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 AND DISCUSSION:

Harvest Date on Subsequent Yields

It is well established that later harvest of sugarcane often results in higher sugar yield. Date of harvest for earlier crops also can affect subsequent stubble yields. An early (October) first ratoon harvest of HoCP85-845 and HoCP91-555 resulted in lower second ratoon yield, significantly lower than second ratoon production following a late (December) first ratoon harvest when all were preceded by an October plant cane harvest. Therefore, the effect of first ratoon harvest date on subsequent ratoon yields was greater when plant cane was harvested in October instead of December (Table 1). In a similar study initiated this year, plant cane yields of LCP85-384 and HoCP91-555 were higher in a December harvest than an October harvest. Yields were generally higher for LCP85-384 than HoCP91-555 at the December harvest. October yields were equivalent for the two varieties (Table 2).

Residue Management/Stubble Protection

Soil temperature 4 inches deep in the cane bed of second stubble HoCP 85-845 was only moderately affected by residue management. When harvest residue was burned, average daily soil temperature was usually a few degrees higher than temperatures occurring under the residue mat. Incorporating the residue and sweeping it to the row middle resulted in temperatures that were intermediate and higher, respectively, compared to burning and leaving the residue (Fig. 1). When average daily air temperature (ADAT) was below 43 , incorporating or leaving the residue mat resulted in slightly warmer average daily soil temperature (ADST). When ADAT was between 43 and 50 F , ADST for all treatments were comparable. When ADAT was above 50 , ADST became increasingly higher for the burn and sweep treatments compared to incorporation and leaving the residue (Fig. 2). The differences in ADST between treatments during winter were relatively small, amounting to only 1-2 F on average. Using a cultivator to slightly incorporate harvest residue and provide some soil cover over the stubble of HoCP 85-845 resulted in a 5% (not statistically significant) increase in second stubble yield over the residue-burned check (Table 3) and a significant 22% average increase above other treatments. Sugar yield was 12% more in tillage vs. burn and 25% more in tillage vs others (Table 3).

In a more comprehensive study with first stubble LCP85-384 , about 3 T of residue per acre remained on the field over the winter and into spring. We did not find a significant loss of residue from Nov. 2001 to March 2002 for residue plots amended with UAN, stabilized urea, or molasses (Fig. 4). Shoot emergence rate was very similar for all treatments. In late March, the average shoot population was about 57,000 / acre, with the lowest population in the undisturbed residue check (about 51,000) and the highest population in the residue-incorporated treatment (about 63,000). Shoot population increased through spring to populations averaging about 90,000 /ac, but declined to about 60,000 millable stalks/acre by August. Plots where residue was removed or incorporated had only about 4% more stalks than plots where residue was treated or left undisturbed (Table 4). Crop growth was variable, but tended to be the highest for treatments where residue was removed or incorporated vs. residue treated or left undisturbed.

Yield ranged from 27.8 to 34 T/acre, whole-stalk sample CRS ranged from 171.7 to 191.9 lbs/T and Lbs sugar/acre ranged from 4,856 to 6,250. There were no significant differences in cane yield among treatments although the burn treatment had the lowest average and the swept treatment had the highest average yield (Fig. 5). The molasses treatment produced the lowest CRS and was significantly lower than the highest CRS obtained in residue-incorporated plots (Fig.6). The molasses-treated plots also produced the lowest sugar/acre and were significantly lower than the residue swept treatment, which produced the highest sugar/acre (Fig.7). Orthogonal contrasts indicated sweeping residue from the top of the bed produced better cane and sugar yield than other forms of removal or incorporating (Figs. 5, 7). Nutrient uptake rate and concentrations in the shoot from samples taken during the season will be determined as processing and analysis occur this winter.

Table 1. Effect of date of harvest in plant cane and first stubble on the second stubble yield of two varieties on the St. Gabriel Research Station, 2002.

Plant Cane 2000	1[ST] Stubble 2001	Cane Yield T/A	Stalk No. 1000/A	Stalk Wt. lbs.	Normal Sucrose %	Sugar Yield lbs/A
			HoCP 85-845			
Oct. 1	Oct. 9	25.0	34.8	1.65	14.1	5030
	Nov. 1	29.7	37.0	1.61	13.8	5796
	Dec. 3	34.7	37.0	1.71	13.4	6541
Dec. 1	Oct. 9	27.9	38.0	1.96	13.5	5322
	Nov. 1	30.9	38.7	1.54	13.8	6055
	Dec. 3	30.9	38.8	1.96	13.2	5717
			HoCP 91-555			
Oct. 1	Oct. 9	23.1	42.3	1.62	14.2	4668
	Nov. 1	28.4	43.2	2.01	13.0	5168
	Dec. 3	31.1	44.8	1.50	13.6	5997
Dec. 1	Oct. 9	27.8	46.1	1.75	13.9	5525
	Nov. 1	28.9	44.9	1.76	12.9	5203
	Dec. 3	31.0	44.2	1.66	13.6	5990
LSD .05 Treat.		4.7	1.6	0.35	1.3	1049
			Mean Effect			
Oct. 1		28.7	39.8	1.69	13.5	5483
Dec. 1		29.6	41.8	1.77	13.5	5635
	Oct. 9	26.0	40.2	1.76	13.7	5061
	Nov. 1	29.5	41.0	1.73	13.4	5555
	Dec. 3	31.9	41.2	1.71	13.4	6061
LSD .05 Plant cane		NS	0.6	NS	NS	NS
LSD .05 1[st] Stubble		2.4	0.8	NS	NS	524

Plant cane was harvested in October and December in 2000. First stubble cane was harvested in October, November, and December in 2001. Second stubble cane was harvested on one date in October 2002.

Table 2. Effect of date of harvest on plant cane yield of two cane varieties on the St. Gabriel Research Station, 2002.

Harvest Date		Plant Cane - 2002					
Plant cane	1st Stubble	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
2002	2003	T/A	1000/ A	lbs.	%	%	lbs/A
				LCP 85-384			
Oct. 8	Oct.	29.0	35.9	1.68	13.9	11.0	4319
	Nov.	31.6	37.8	1.59	13.4	10.4	4371
	Dec.	30.5	36.5	1.71	13.4	10.3	4160
Dec. 4	Oct.	39.3	38.5	1.90	16.9	14.6	8266
	Nov.	37.0	37.4	2.12	15.9	13.6	7140
	Dec.	36.7	38.3	1.93	15.9	13.5	7022
				HoCP 91-555			
Oct. 8	Oct.	27.7	36.1	1.76	14.8	11.9	4538
	Nov.	28.9	38.8	1.50	14.2	11.2	4362
	Dec.	28.6	37.5	1.62	14.0	10.7	4105
Dec. 4	Oct.	32.8	35.1	2.19	16.8	14.3	6725
	Nov.	33.4	36.3	2.23	16.3	13.8	6534
	Dec.	32.2	37.5	1.76	16.3	13.7	6271
LSD .05		3.5	3.0	0.30	1.1	1.3	1032
					Mean Effect		
Oct. 8		29.4	37.1	1.64	14.0	10.9	4309
Dec. 4		35.2	37.2	2.02	16.3	13.9	6993
LSD .05 Plant		1.4	NS	0.14	0.5	0.6	426

Plant cane was harvested in October and December in 2002. The cane was mechanically planted with combine-harvested billets.

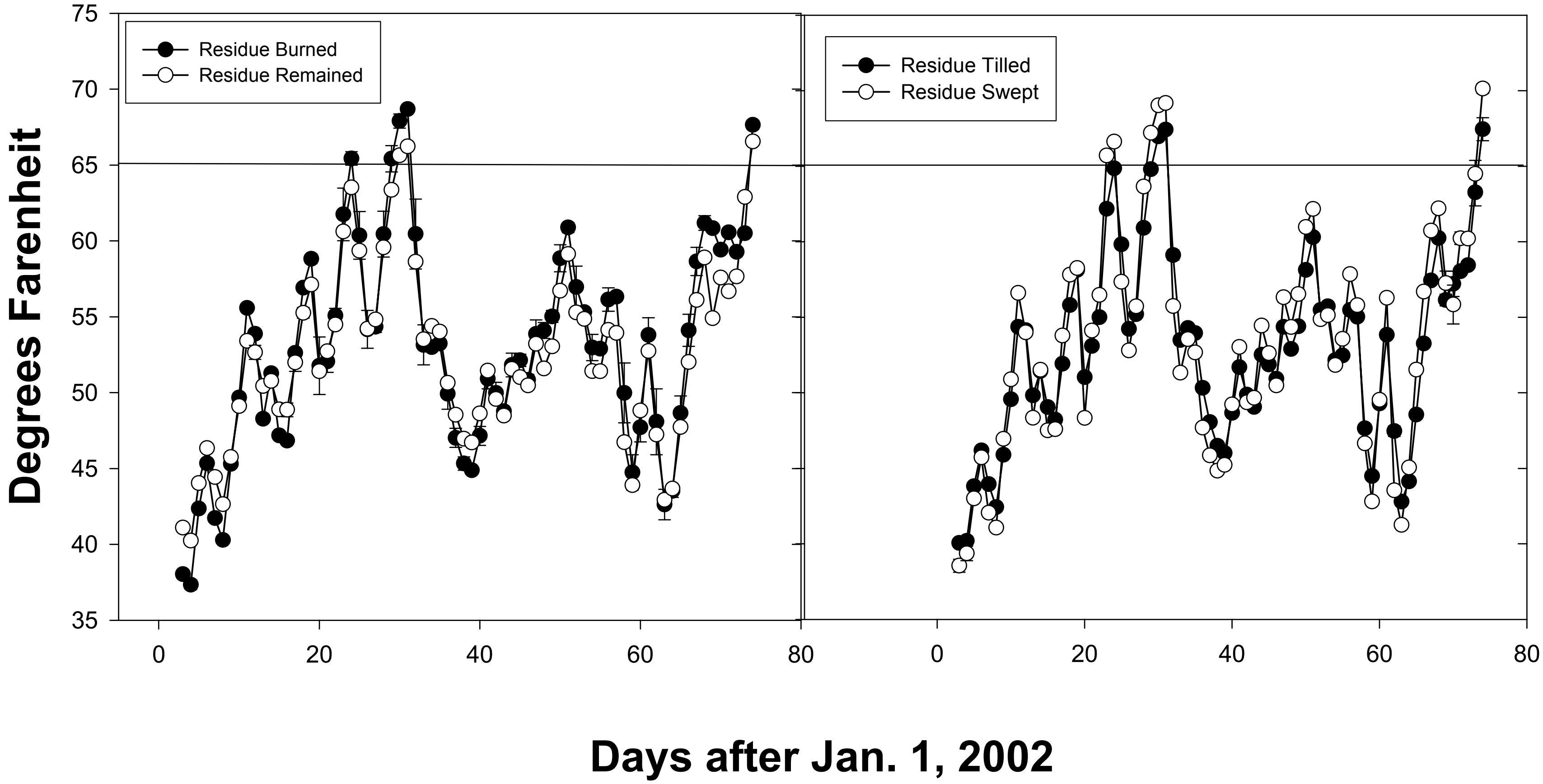

Fig. 1. Average daily soil temperature at 4" depth for different harvest residue management practices of HoCP85-845.

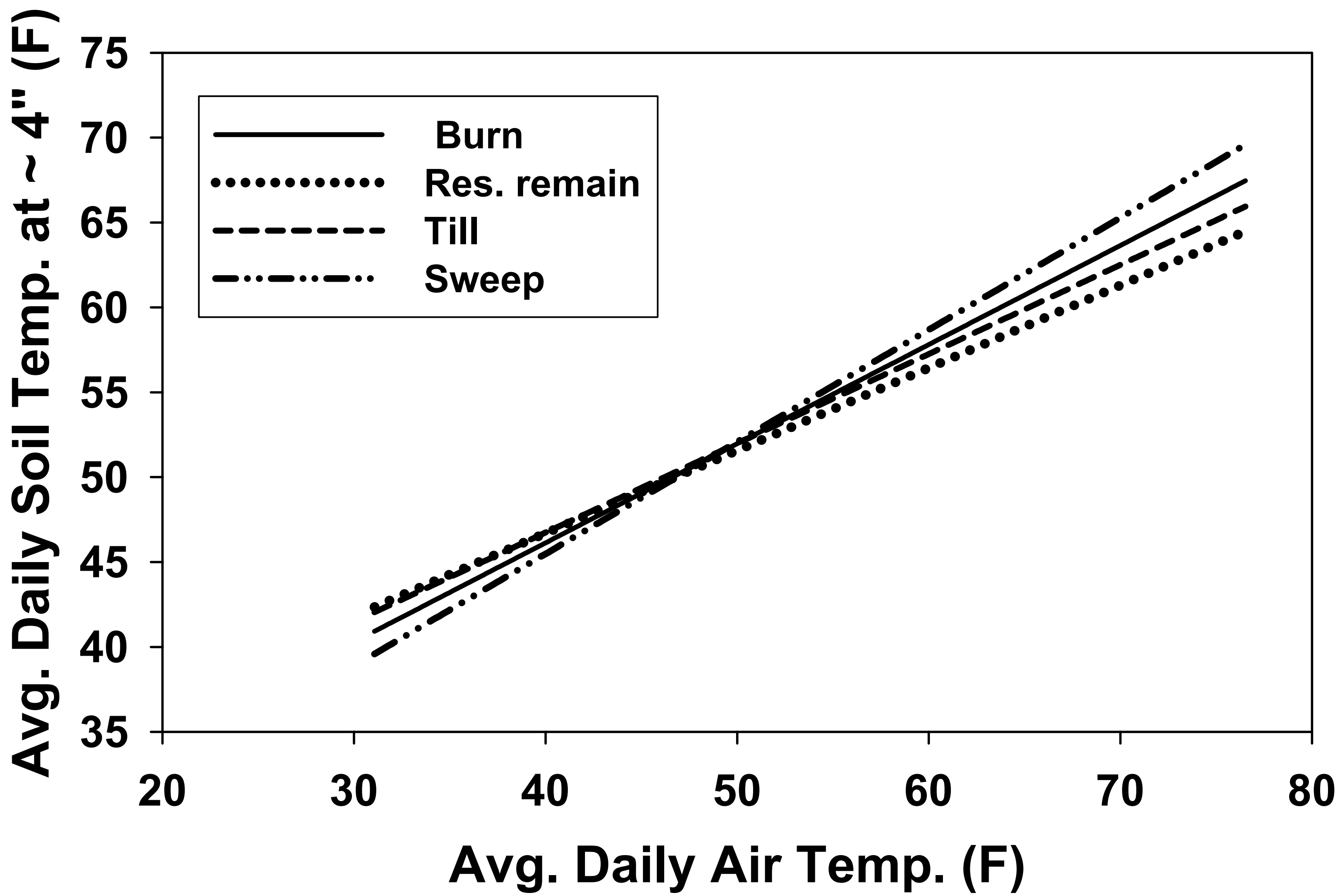

Fig. 2. Relationship between soil and air temperatures for different harvest residue management treatments of HoCP85-845.

Table 3. Effect of residue management on the second stubble yield of HoCP 85-845 variety on the St. Gabriel Research Station, 2002.

Residue Management Treatment	Cane Yield	Second Stubble Cane - 2002 Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
2001	T/A	1000/A	lbs.	%	%	lbs/A
Residue	27.7	23.2	2.44	16.1	13.6	5191
Burn	32.1	21.9	2.60	15.8	13.3	5992
Sweep	27.9	22.3	2.66	16.5	14.0	5564
Surfactant	27.5	20.5	2.44	16.1	13.6	5297
Till	33.8	21.7	2.38	16.4	14.0	6724
LSD .05	3.1	2.0	NS	NS	NS	795

The burn plots were harvested and the trash was removed by burning. The soil cover was applied over the cane stubbles immediately after harvesting plant cane in 2000 and first stubble in 2001.

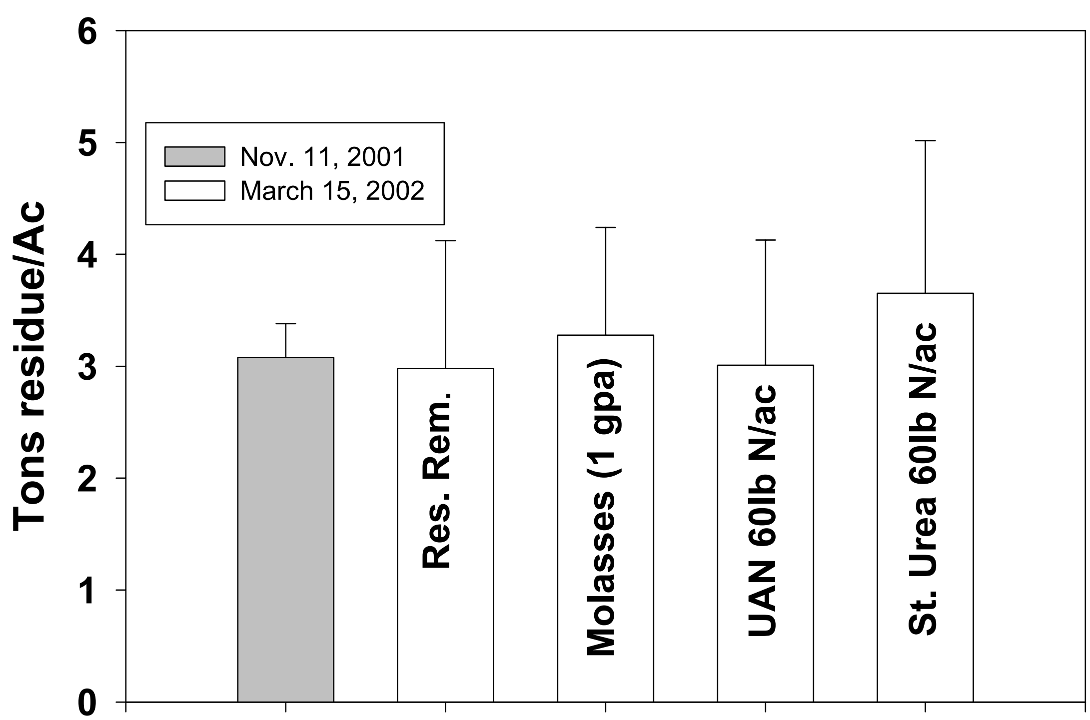

Fig. 3. Spray-on adjuvants did not reduce residue over winter on 1st Stubble LCP85-384.

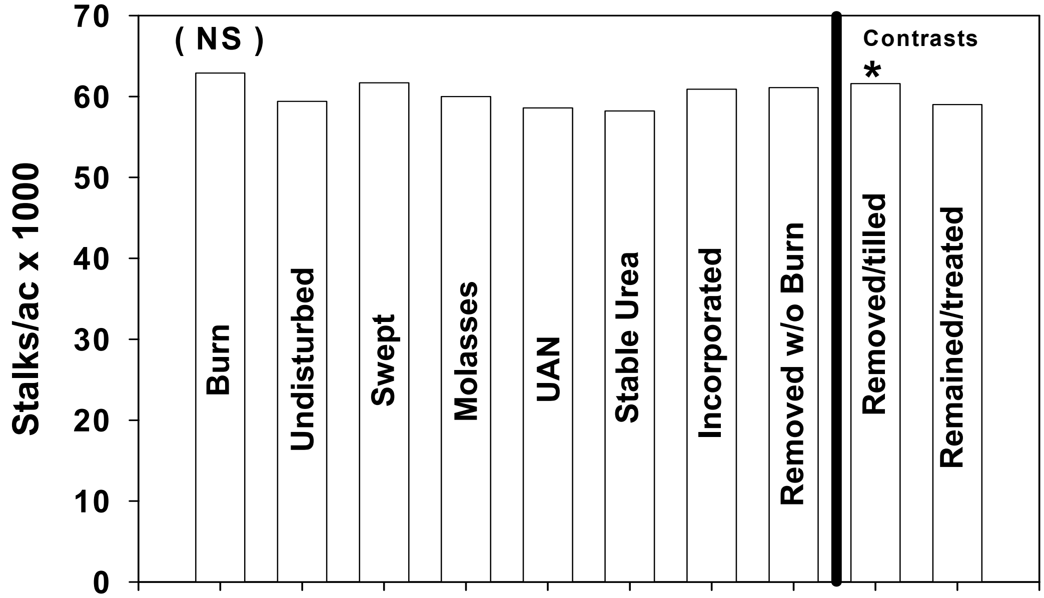

Fig. 4. The effect of harvest residue management treatments on millable stalk population of 1st stubble LCP85-384

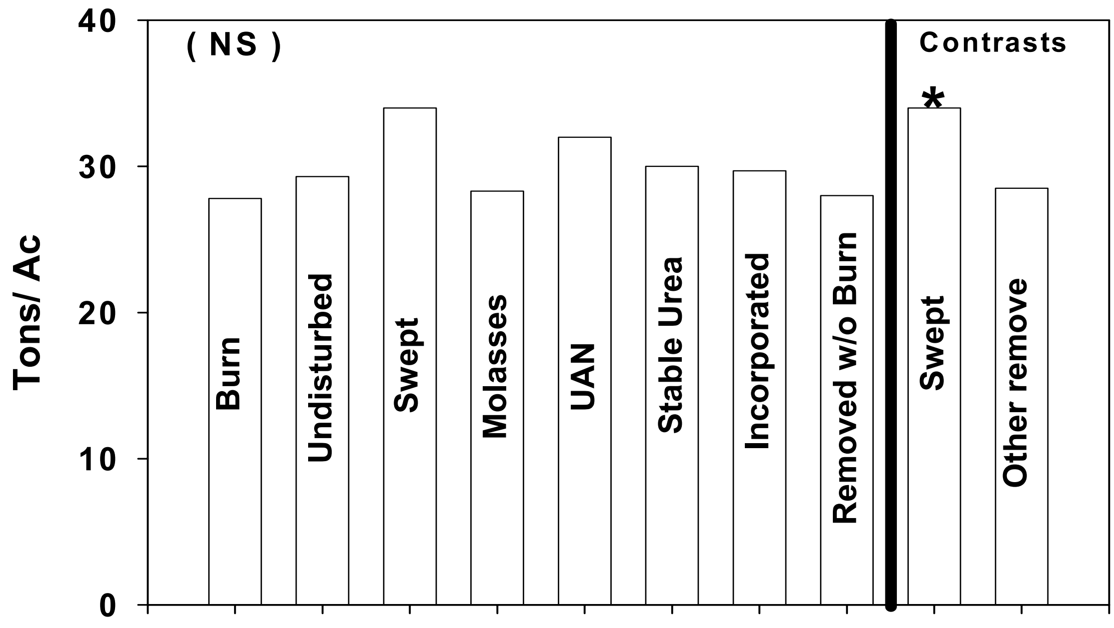

Fig. 5. The effect of different residue managements on cane yield of 1st stubble LCP85-384.

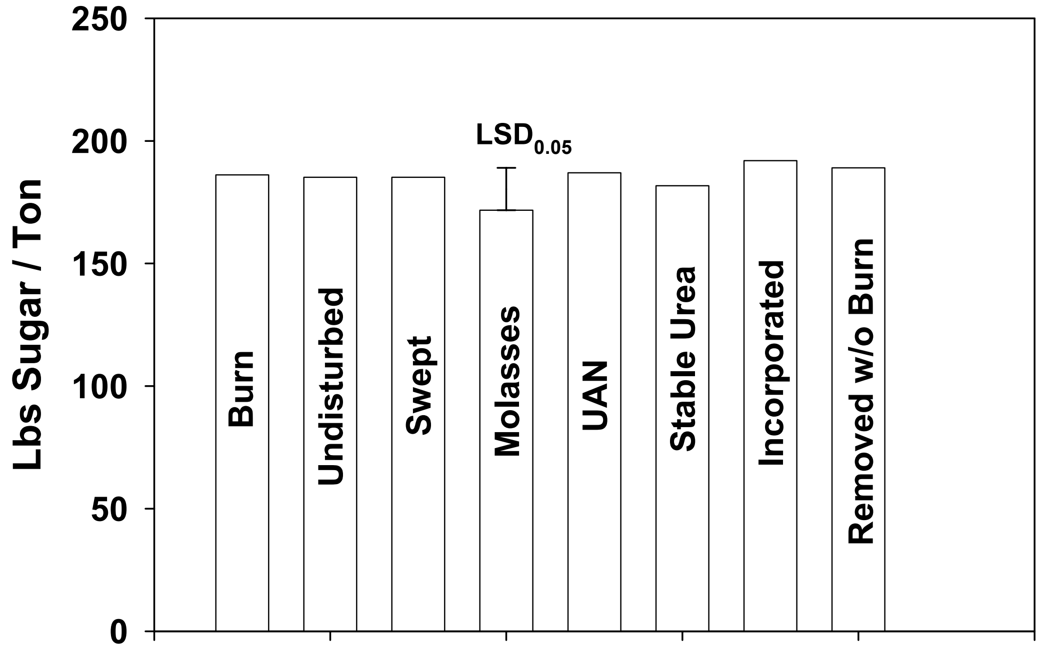

Fig. 6. The effect of different residue managements on CRS of 1st stubble LCP85-384.

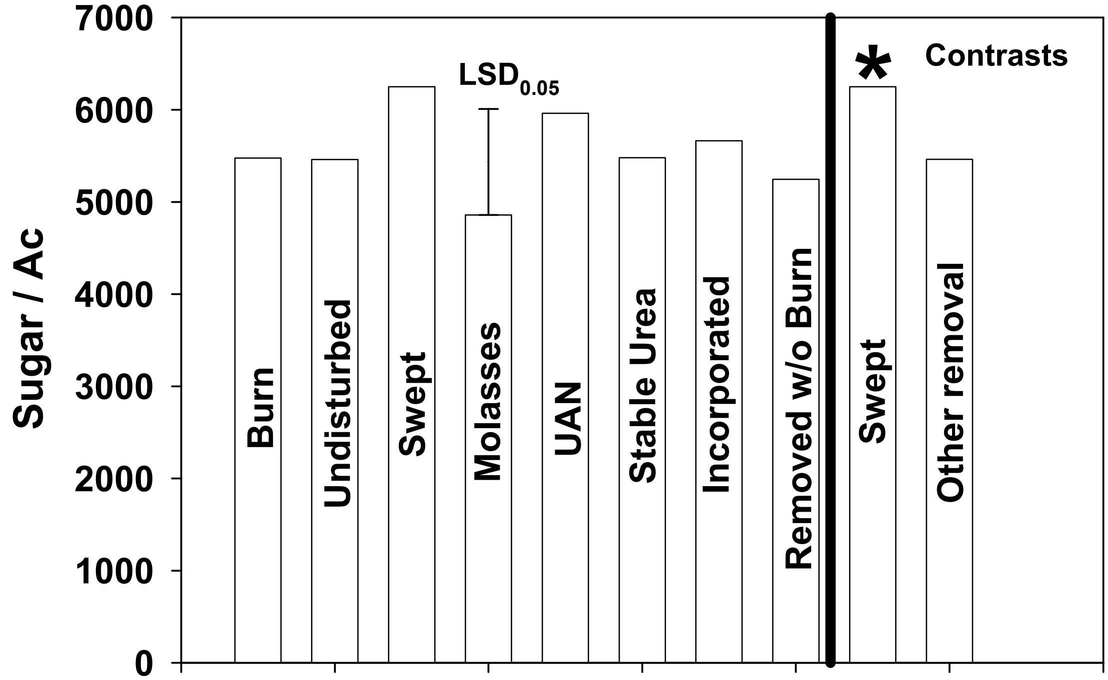

Fig. 7. The effect of different residue managements on Sugar/Ac of 1st stubble LCP85-384, St. Gabriel, 2002.

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

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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 will be 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). Plant cane of cycle no. two was harvested in the fall of 2002. Sugar/acre yields for GCTB, TBR, and BSTB were 5,033, 5,493, and 5,743 pounds/acre (plant cane yields were not significantly different), respectively. When comparing treatment means as an average of the four crops to date (three in cycle one and plant cane in cycle two), cane plots on which residue was retained averaged at least 750 pounds of sugar/acre (P=.02) less than the other residue management approaches. While it is premature to tell, it appears that the adverse influence of retained residue may carry over to the next production cycle, in spite of an intervening fallow period.

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 negatively influences ratoon yields 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 <u>long-term basis</u>.

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

PROCEDURES

In November 1997 a field of LCP 85-384 plant cane was divided and the cane on one-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 physically 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. Cane yield and juice quality will be determined at a commercial sugar mill.

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 of the soil will be monitored. An appropriate analysis of variance will be used to determine significant differences among the treatment means.

RESULTS

The debilitating effects of trash blanket retention on subsequent ratoon crops may carry over from one production cycle to the next, even though a fallow period intervenes. Plant cane plots in the second production cycle that were positioned as plots with full trash coverage in production cycle no. one produced only 88% of the yield of plots on which cane was burned standing and 91% of the yield of plots on which the residue was repositioned into the furrows. The table below shows treatments yields as an average of the four crops harvested thus far in the study.

Influence of Combine-residue Management on the Yield and Quality of LCP 85-384 as an Average of the Four Harvests (three ratoons in cycle one and plant cane in cycle two)			
Residue management	Pounds of sugar/acre	Tons of cane/acre	CRS
Cane burned standing prior to harvest	7,184	41.1	177
Cane grown on rows from which residue was removed	7,050	41.0	173
Cane grown on rows with residue retained	6,301	37.9	168
P =	.02	.13	.004

THE EVALUATION OF SOIL ELECTRICAL CONDUCTIVITY AS A SURROGATE FOR SOIL ANALYSIS IN SUGARCANE

(Observations are preliminary and investigations are ongoing)

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SUMMARY

An investigation of precision farming technologies was initiated in 2000. Three separate sugarcane fields are being used to evaluate the relationship between soil electron conductivity (EC), soil attributes, and sugarcane yield. The principal objective is to ascertain if soil EC can be used as a surrogate for conventional soil sampling and analysis. A secondary objective is to determine if zones of similar EC can be useful in managing fertilizer nitrogen. In 2002 nitrogen rates, 0, 80, 120 and 180 lb/acre, were applied at random across a plant cane field. Preliminary analysis suggests a relationship between EC and yield and EC and other soil characteristics. There was a trend (P=.20) for the highest N application rate to give the highest yield. The 2003 growing season will be used to determine the appropriateness of using zones of similar EC for fertilizer N management.

INTRODUCTION

Precision farming is defined as using information technologies to tailor soil and crop management to fit the specific conditions found within a field. Precision farming involves technologies that depend on global positioning systems (GPS) to collect information for site-specific management plans. Geo-referenced maps of the field can be produced to identify areas within individual fields to be uniquely managed. With sugarcane growers spending from 35 to 45% of direct expenses ($115 to $140/acre) for fertilizer and herbicides, it is easy to see the potential for significant savings with variable rate technology. Use of precision farming technologies may also have important environmental and health benefits. Prescription fertilizer and herbicide programs have the potential for minimizing ground and surface water contamination, which qualifies these practices as Best Management Practices useful for meeting water quality standards. The profitable use of these precision farming technologies in sugarcane production have not been investigated for the conditions that prevail in Louisiana.

PROCEDURES

Three fields were mapped using a Veris 3100 Soil Electrical Conductivity mapping ystem equipped with DGPS mapping capability. The Veris was operated on approximately 36 ft transects at 5-6 mph and measured EC at two depths in the soil (0-1 ft and 0-3 ft)

Research is partially supported by a financial grant from the American Sugar Cane League and nitrogen fertilizer was donated by Ouachita Fertilizer.

simultaneously. Over 4,500 data points were acquired for each field, yielding a density from 145 to 150 data points per acre. The Veris data were imported into SSToolbox, an ArcView-based agricultural Geographical Information System (GIS). The data for the shallow EC readings was classified into five classes using the quantile method, which grouped the data with equal numbers of data points. A referenced grid consisting of 1-acre cells was used as a pattern for sampling soil. The randomly selected sampling points within the cells were moved to the nearest corresponding Veris point to assure that five sample points fell within each of five zones of similar electrical conductivity. Samples were collected at each point and submitted to the LSU AgCenter Soil Testing Laboratory for analysis. The EC value for each sample location was added as an attribute of the soil test data.

A nitrogen fertilizer rate study was imposed on one of the fields mapped for EC in the spring of 2002. Four N rates, 0, 80, 120 and 180 lb N/acre, were randomly applied, with each rate replicated 21 times.

PRELIMINARY RESULTS

It appears that field patterns articulated by variation in EC reflect differences in soil texture, organic matter content, and inherent fertility - attributes which should be suitable candidates for variable input rates such as nitrogen fertilizer and/or herbicides. Plant cane did not differentially respond to applied fertilizer N (P=.20), but there was a trend for the 180 lb N/acre rate to produce the highest yield. Plant cane often is not the most sensitive crop in the production cycle to variable nitrogen application rates. As clearly indicted in the table below and by preliminary analysis of the data, a relationship between soil electrical conductivity and yield appears to exist. Ongoing spatial analysis has revealed spatial variability in EC but areas of homogeniety will be used this season for an additional evaluation of nitrogen rate comparisons. Ultimately, a nitrogen fertilizer prescription will be written based on EC and, perhaps, other variables.

Table 1. Apparent Influence of Soil Electrical Conductivity on the Yield of LCP 85-384

Range in Electrical Conductivity in mS/m	Yield in Tons of Cane/Acre
10 to 20	31.9
21 to 30	32.3
31 to 40	34.6
41 to 50	40.0

SOIL FERTILITY RESEARCH IN SUGARCANE IN 2002

Chuck Kennedy, Allen Arceneaux, Bill Hallmark, Ben Legendre, Ray Ricaud, Howard Cormier, Jimmy Flanagan, Jimmy Garrett, Alfred Guidry, Barton Joffrion, and Rick Louque
in cooperation with
St. Gabriel Research Station and Louisiana Cooperative Extension Service

SUMMARY:

Four field experiments were conducted in 2002 to test the effects of rates of fertilizers on the yield components of current sugarcane varieties. The effect of starter fertilizer on LCP85-384 was marginal, and there was no residual effect of starter fertilizer application at planting on subsequent second-stubble yield of HoCP85-845.

Results of a multi-location outfield test to determine the optimum rate of N fertilizer for LCP 85-384 continued to indicate the optimum rate was on the low end of present recommendations. This variety may have higher N use efficiency than other varieties at lower N application rates, but the effect is lost and possibly reversed at higher application rates.

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 in fallow planted cane:

Averaged across two planting dates, the use of some complete starter fertilizers on billet-planted LCP 85-384 improved cane yield by 10% above the check (Table 2). Use of orthogonal contrasts indicated complete (N-P-K) starter fertilizer applications had higher cane and sugar yield than partial fertilizers from the September planting but not the August planting. The positive effect of starter fertilizer in plant cane diminshed in subsequent ratoon crops, and no consistent residual effect was found in second stubble HoCP85-845 from starter fertilizers applied to plant cane at planting (Table 1) .

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. Stalk population response to N application rate generally plateaued by 80 lb N / a. However, population tended to increase slightly beyond that rate in heavy soil (Fig. 1). Nitrogen concentration of first leaf below top visible dewlap sampled in early August reflected relative yields among locations. Lowest N percent in these leaves ranged from 1.27% to 1.5%, with an application rate of 40 lb N/a . Highest N percent ranged from 1.66% to 1.86% and did not always result from the highest N application rate. Leaf N response to N application rate was generally not linear (Fig. 2). Cane yield response to N rate varied with location (Fig. 3). Stubble crops tended to have more response to N input than plant cane. Lower yield at Alma indicated other factors may have been limiting and therefore lowered the response to N but could also have been related to the generally unresponsive characteristic of plant cane to N applications. Where there was a response, the N rate for optimum yield ($\geq$ 90% of maximum yield and not statistically different) was at the lower end of the recommended range or slightly below it. Mill-core CRS was not affected by N rate, but whole-stalk CRS indicated a decline in stubble crops with increasing N rate(Fig. 4). The response of   CRS varied with location.   Sugar yield response reflected that of tonnage with stubble crops responding to N rate (Fig. 5).

The variety LCP85-384 produced numerically to significantly higher cane and sugar yield than CP70-321 and HoCP91-555 at 50 lb/a N but not at 100 and 150 lb/a N (table 3). This indicated a trend for greater N use efficiency at the lowest N rate relative to the other two varieties (Fig.6). More precise measurements of growth rate and N use efficiency throughout the growing season are being determined.

Table 1. Effect of fall and spring applied fertilizer on the yield of second-stubble cane HoCP 85-845 planted after a fallow year on Commerce soil on the St. Gabriel Research Station, 2002.

Fertilizer applied $N-P_2O_5-K_2O$ Fall	Spring	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
			Second Stubble Cane - Fallow Planted				
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
0-0-0	0-0-0	16.2	24.2	1.53	14.9	12.5	2815
	160-0-0	25.9	30.2	1.74	15.5	13.0	4716
	160-40-80	22.0	30.7	1.51	15.9	13.4	4167
15-45-45	0-0-0	13.8	25.3	1.24	15.5	13.1	2515
	160-0-0	24.4	31.3	1.54	15.5	13.2	4490
	160-40-80	22.6	32.6	1.49	15.2	12.8	4034
45-45-45	0-0-0	17.6	25.8	1.56	15.3	12.9	3158
	160-0-0	23.9	29.9	1.64	15.2	12.5	4140
	160-40-80	24.2	31.3	1.72	15.8	13.4	4550
30-30-90	0-0-0	17.0	24.7	1.40	14.8	12.3	2886
	160-0-0	22.0	30.7	1.58	15.4	12.8	3942
	160-40-80	22.7	31.2	1.82	15.2	12.9	4069
LSD .05 Treatments		6.4	4.1	0.31	NS	NS	1267
			Mean Effect				
0-0-0		21.4	28.3	1.59	15.4	13.0	3899
15-45-45		20.3	29.7	1.42	15.4	13.0	3680
45-45-45		21.9	29.0	1.64	15.4	12.9	3949
30-90-90		20.5	28.9	1.60	15.1	12.6	3632
	0-0-0	16.1	25.0	1.43	15.1	12.7	2843
	160-0-0	24.0	30.5	1.62	15.4	12.9	4322
	160-40-80	22.9	31.4	1.63	15.5	13.1	4205
LSD .05 Fall		NS	1.2	0.19	NS	NS	NS
LSD .05 Spring		1.6	1.1	0.16	0.4	NS	323

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1999 and spring fertilizer was applied in the off-bar furrow in the spring of each year.

Table 2. The effect of starter fertilizers on yield and quality of LCP85-384.

TREAT.	POP	STALK WT.	YIELD	BRIX	SUCROSE	CRS	SUGAR PER ACRE
AUG. Lb / a	1000/A	LBS.	TONS/A	%	%	LBS/T	LBS/A
0-0-0	40.7	1.77	31.9	16.5	14.0	199.9	6383
0-0-45	40.3	1.84	33.1	16.4	14.2	202.5	6679
0-45-45	39.6	1.82	32.0	16.3	14.1	201.6	6448
0-45-45	41.3	1.90	35.0	17.0	14.7	210.6	7382
45-0-45	41.3	1.74	32.4	16.5	14.2	202.5	6569
45-45-0	41.0	1.83	34.5	17.0	14.7	211.4	7294
45-45-45	40.5	1.77	34.2	17.0	14.7	211.0	7226
15-45-45	40.3	1.91	33.4	16.8	14.4	206.7	6905
30-90-90	38.1	2.05	32.4	16.4	14.1	200.8	6494
90-90-90	40.2	1.83	35.0	16.3	13.8	195.3	6852
LSD .05	2.9	0.30	4.9	1.0	1.0	17.2	1495
			NS	NS	NS	NS	NS
SEPT. Lbs./ a							
0-0-0	38.2	2.00	31.0	16.8	14.4	205.9	6378
0-0-45	39.3	1.77	33.8	16.4	14.1	200.4	6766
0-45-0	38.8	1.80	31.6	16.6	14.4	205.9	6497
0-45-45	37.3	1.95	31.4	16.5	14.2	202.9	6367
45-0-45	37.4	1.89	31.9	16.9	14.8	212.7	6773
45-45-0	37.0	1.91	31.4	16.4	13.9	197.8	6214
45-45-45	37.6	1.99	34.2	16.7	14.3	204.2	7010
15-45-45	37.8	1.97	32.3	16.6	14.2	202.1	6542
30-90-90	40.9	1.77	34.8	16.5	14.2	202.1	7025
90-90-90	41.1	1.71	34.0	17.0	14.6	209.3	7102
LSD .05	2.5	0.29	4.2	0.9	0.9	15.6	1009
		NS	NS	NS	NS	NS	NS
DATE				MEAN	EFFECT		
AUG.	40.3	1.84	33.4	16.6	14.3	204.2	6823
SEPT.	38.5	1.88	32.6	16.6	14.3	204.3	6667
LSD .05	0.8	NS	NS	NS	NS	NS	NS

FERT.							
0-0-0	39.5	1.88	31.4	16.6	14.2	202.9	6380
0-0-45	39.8	1.81	33.5	16.4	14.1	201.4	6723
0-45-0	39.2	1.81	31.8	16.5	14.3	203.8	6473
0-45-45	39.3	1.92	33.2	16.8	14.4	206.7	6874
45-0-45	39.4	1.81	32.1	16.7	14.5	207.6	6671
45-45-0	39.0	1.87	33.0	16.7	14.3	204.6	6754
45-45-45	39.0	1.88	34.2	16.8	14.5	207.6	7118
15-45-45	39.0	1.94	32.9	16.7	14.3	204.4	6723
30-90-90	39.5	1.91	33.6	16.4	14.1	201.4	6759
90-90-90	40.7	1.77	34.5	16.6	14.2	202.3	6977
LSD .05	NS	NS	3.1	NS	NS	NS	NS

Table 3. Effect of nitrogen fertilizer on the yield of plant cane of three varieties on Commerce soil on the St. Gabriel Research Station, 2002.

		Plant Cane				
Fertilizer applied $N-P_2O_5-K_2O$	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
		CP 70-321				
50-0-0	33.3	53.2	2.89	15.0	11.8	5333
100-0-0	40.8	55.7	2.92	14.7	11.7	6521
150-0-0	40.5	53.2	2.80	15.3	12.3	6922
		LCP 85-384				
50-0-0	36.2	69.0	1.88	15.4	12.6	6347
100-0-0	38.6	67.7	1.90	15.0	12.1	6447
150-0-0	36.1	71.5	1.86	15.6	12.9	6496
		HoCP 91-555				
50-0-0	34.5	66.1	2.08	15.4	12.2	5825
100-0-0	37.6	69.0	2.02	16.1	12.4	6418
150-0-0	43.8	77.5	1.89	15.3	12.2	7380
		Mean Effect				
50-0-0	34.6	62.7	2.28	15.2	12.2	5837
100-0-0	39.0	64.1	2.28	15.3	12.0	6462
150-0-0	40.1	67.4	2.18	15.4	12.4	6933
LSD .05	2.3	NS	NS	NS	NS	759

The nitrogen fertilizer was applied in the off-bar furrow in the spring of 2002.

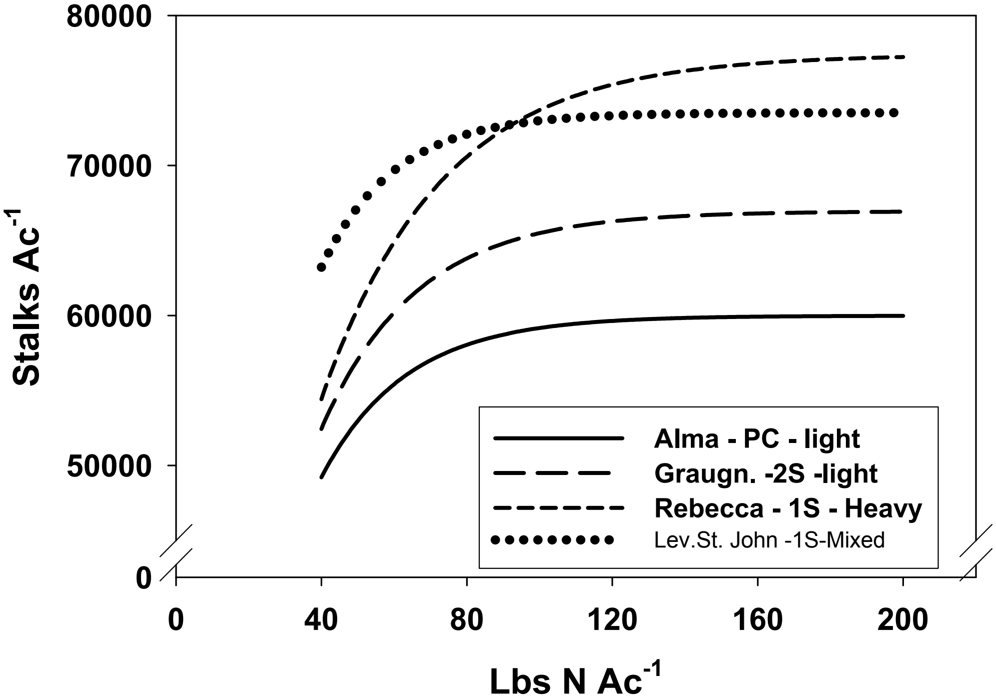

Fig. 1. Response of stalk population of cv 'LCP 85-384' to N fertilizer application. Exponential curve fit was used to smooth data.

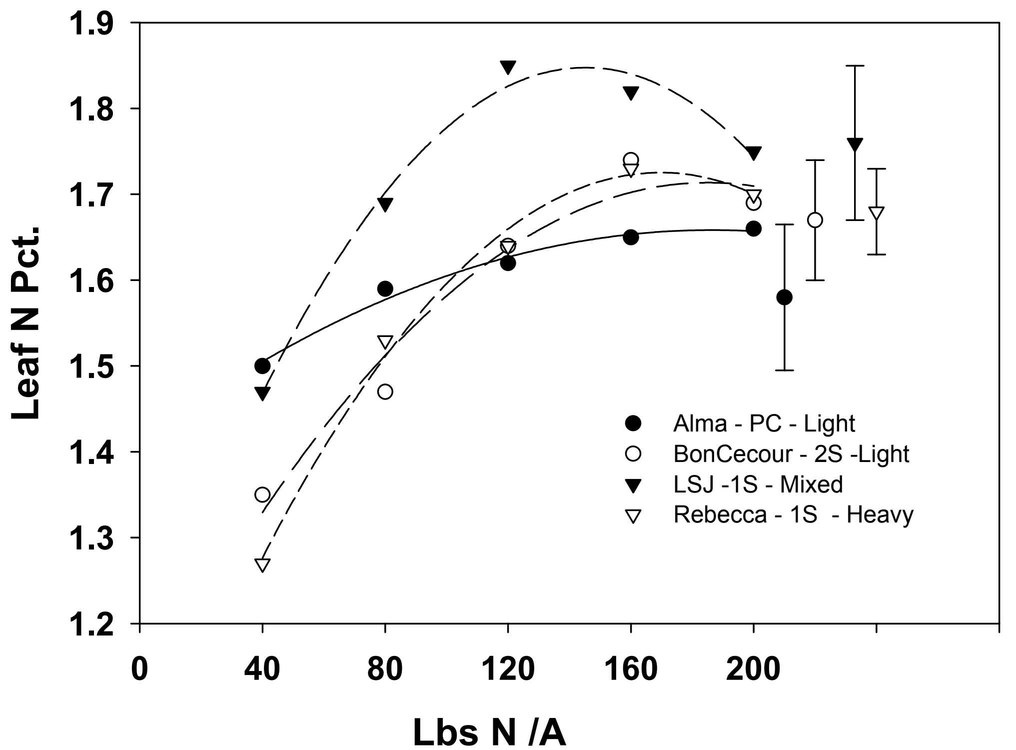

Fig. 2. N concentration of leaf below TVD for LCP85-384 as affected by N fertilizer rate and environment, Aug., 2002. Error bars represent $LSD_{0.05}$ for corresponding symbol.

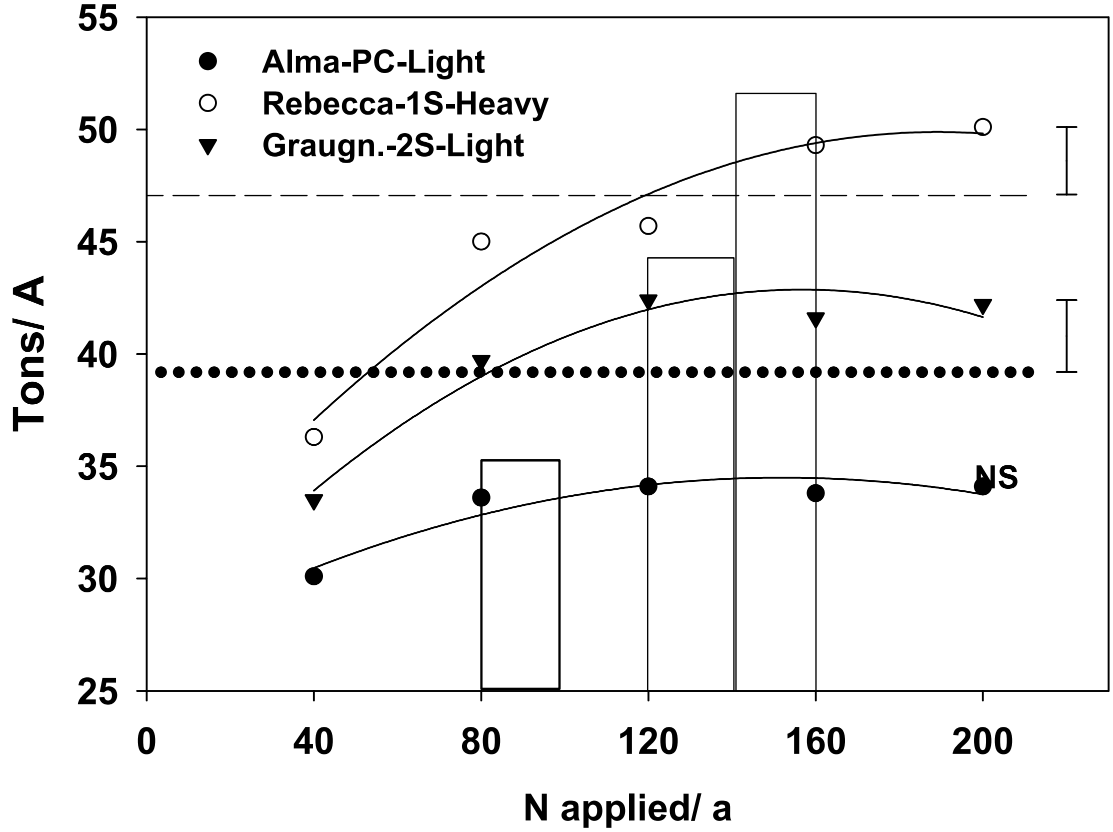

Fig. 3. The effect of N fertilizer rate, environment and crop stage on cane yield of LCP85-384. Error bars represent $LSD_{0.05}$ Rectangles represent present recommendations for N for corresponding crop stage and soil type.

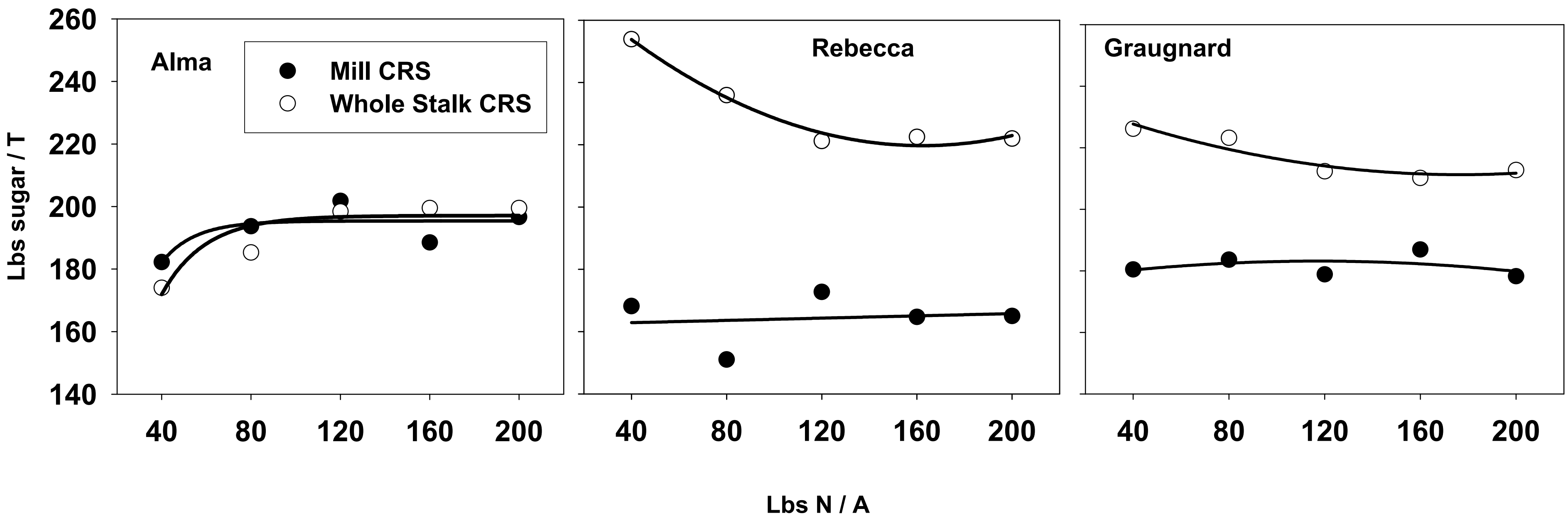

Fig. 4. The effect of N fertilizer rate, environment, and crop stage on CRS.

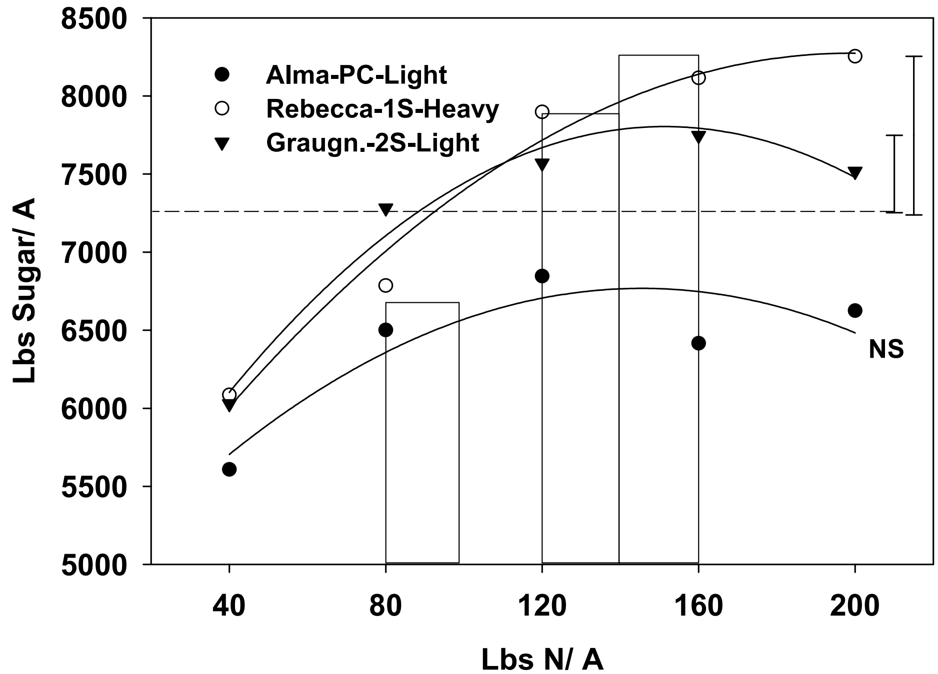

Fig. 5. The effect of N fertilizer rate, environment and crop stage on sugar yield of LCP85-384. Error bars represent $LSD_{0.05}$ Rectangles represent present recommendations for N for corresponding crop stage and soil type. Interception of dashed line and response curves represents area of curves that do not statistically from maximum response.

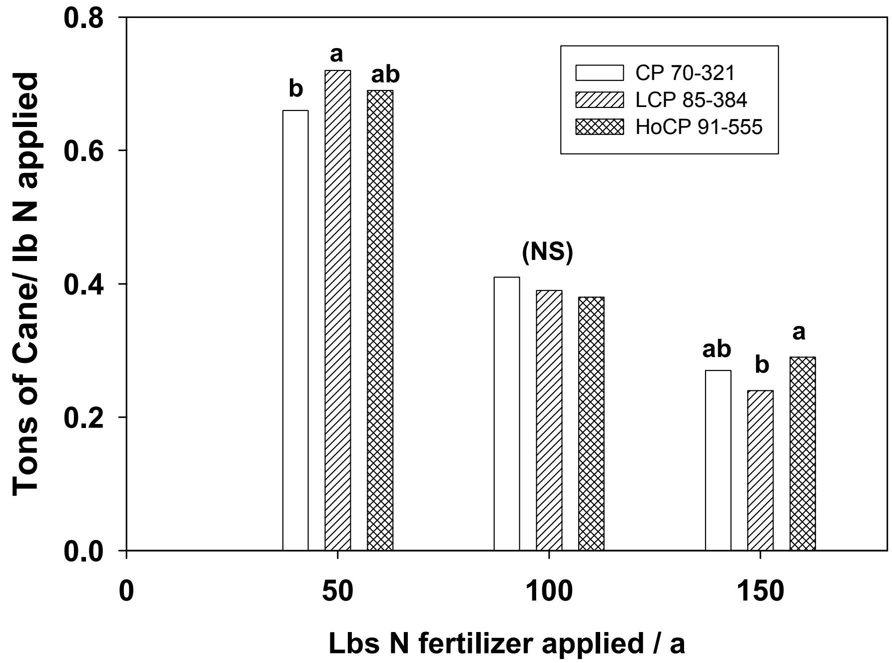

Fig. 6. The N -use efficiency differences among sugarcane varieties changes with with increasing N application rates.

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

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SUMMARY

Mixing 2 T/A of calcium silicate slag into the soil prior to planting produced significantly higher (P<.10) sugar/acre yields than all other treatments except where 1 T/A of slag was placed under the cane at planting. The failure of the 2 T/A calcitic lime treatment to produce comparable yields to the 2 T/A slag treatment suggests that the yield response to slag was due to silica and not calcium, though the disparity in yield between the 1 T/A application rates of slag and lime was not significant at the 10% probability level.

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 the plants' resistance against attack by insects and diseases, and it 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/A each year) from soil. Monosilicic acid is rapidly used by the plant, 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 show that all were deficient or very deficient in monosilic acid.

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 inch 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 were 39,400 ppm for the lime, and 133,000 ppm for the slag. The respective analysis of the lime vs. slag were: 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 two T/A of silicate slag into the soil before planting produced significantly ($P<.10$) more sugar per acre, as an average of the plant cane and first stubble crops, than all treatments except where 1 T/A of slag was placed under the cane at planting. The significantly higher yields resulting from the application of 2 T/A of slag compared to the 2 T/A calcitic lime treatment is an indication that the yield response was silica induced and not calcium induced.

Table 1. The effects of treatments on sugar/acre yields averaged over both crops.

T#	Lime	Silica slag	Placement	Yield, lb sugar/acre
	T/A	T/A		
1	0	0	-	6,377
2	1	-	mixed into rows	6,194
3	2	-	mixed into rows	6,277
4	-	1	mixed into rows	6,446
5	-	2	mixed into rows	7,140
6	-	1	placed under cane	6,775
LSD 0.10				655

EFFECT OF HIGH GYPSUM APPLICATION RATES ON SUGARCANE YIELDS FOR A HEAVY-TEXTURED SOIL

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SUMMARY

As an average of plant cane and two stubble crops, sugar/acre yields of HoCP91-555 on Alligator clay were significantly ($P<.10$) increased with the application of 5 or 15 T/A of gypsum. The difference in sugar/acre between the check and the 20 T/A gypsum treatment (an application rate calculated to bring the Ca/Mg ration to approximately 7:1) was not significant. Gypsum lowered CRS but increased tonnage. The addition of compost and liquid biologicals was ineffectual in enhancing yield.

INTRODUCTION

Research in Louisiana shows that application of high amounts of gypsum (5-10 T/A) can result in significant (12%) yield responses in stubble crops on heavy-textured soils. There is also a school of thought that says, "Optimum crop yields cannot be obtained on heavy-textured soils unless the Ca/Mg ratio of soil (based on % CEC) is close to 7:1." We conducted our study to test this theory and to determine the effect of gypsum application rates on crop yields and soil moisture and physical properties.

MATERIALS AND METHODS

An Alligator clay soil was selected for use in this study. Initial soil analysis (3385 and 630 ppm Ca and Mg, respectively, with a CEC of 21.2) indicated that it would require 17.3 T/A of gypsum to bring the Ca/Mg ratio (based on % CEC) up to the desired 7:1 value. To achieve this goal 0, 1.5, 5, 10, 15, and 20 T/A of gypsum were broadcast applied to experimental plots on August 23, 1999, and incorporated into the soil. Prior to incorporation the 1.5 T/A gypsum treatment also received 1.5 T/A of by-product lime and 15 gallon/A of a liquid biological solution. In May of 2000 this treatment also received 1 T/A of UL-L bagasse compost.

A 6x6 Latin square experimental design was used in the experiment. All treatments were replicated six times. Plots consisted of three 5 foot 10 inch by 40 foot rows, with a 10-foot alley at the ends of all plots. All experimental plots were separated by three border rows on each side that did not receive gypsum. The experiment was planted in September 1999 with first progeny Kleentek variety HoCP 91-555 at four stalks and a lap of two joints.

Cane was grown to maturity each year using standard cultural practices. Plant populations were determined in September each year. The test was harvested (plant cane) in early December 2000 using a two-row soldier harvester, and plots were weighed with a weigh rig. In 2001 and 2002, stubble cane was harvested with a combine harvester. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane.

RESULTS AND DISCUSSION

Table 1 shows that the experimental treatments affected (P>0.10) all measured variables. Cane and sugar yields for the check were lower (P<.10) than for the 5 and 15 T/A gypsum treatments, as an average of three crop years. Sugar/acre treatment means for cane receiving gypsum in different amounts (treatments 2 through 6), however, did not differ significantly. Gypsum appeared to depress CRS but increase tonnage.

Our experiment was initiated to determine whether adjusting the % base saturation of Ca/Mg to 7.0 would result in increased sugarcane yields. It was also meant to test the effect of gypsum on soil moisture and physical properties, and their influence on crop yields. Data on the effects of our treatments on soil moisture and resistance to penetration by a soil penetrometer will be reported on at a later date.

Table 1. Effect of gypsum treatments on sugarcane yield variables averaged across three years.

T#	Gypsum	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
	T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	1.60	46.1	194.7	26.6	5090
2	5.0	1.62	48.3	184.2	30.0	5490
3	10.0	1.67	47.4	183.1	29.2	5350
4	15.0	1.65	47.7	184.3	30.1	5490
5	20.0	1.66	49.5	184.9	29.3	5300
6	1.5[+]	1.68	47.6	182.4	28.5	5200
LSD 0.10		0.08	1.8	5.1	1.2	320
LSD 0.25		0.06	1.2	3.5	0.8	220

[%]This treatment also received 1.5 T/A of Domino by-product lime when the gypsum was applied 15 G/A (on 8/23/99) of liquid biologicals, and 1 T/A of UL-L compost in April 2000.

EFFECT OF POWER PERK ON SUGARCANE YIELD VARIABLES AND SOIL WATER AND PENETRATION RESISTANCE

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SUMMARY

Sugarcane was indifferent to the application of Power Perk. Averaged over three crops, the application of up to 30 G/A of Power Perk did not increase sugar yield (P=.11). Furthermore, soil penetrometer resistance and soil moisture were not influenced significantly by this product.

INTRODUCTION

Power Perk is a liquid product produced by OrganiCal Inc., and is registered as an agricultural mineral and soil conditioner. This product has a pH of approximately 0.4 and is meant to be diluted at least 1:20 with water before application. It is currently used on construction sites and golf courses as a soil conditioner to correct and/or increase water percolation in clay and saline/sodic soils. Promoters of this product claim that it will reduce the expansion index of clay soils so that water can percolate through it and, thereby, reduce resistance to root growth. Since the heavy-textured soils used to grow sugarcane in south Louisiana are known to have drainage problems, we decided to test this product.

OBJECTIVES

To determine the effect of Power Perk application rates and methods of application on:

1) Soil water concentration and soil penetration resistance.
2) Sugarcane yield variables across a four-year cane cycle.

MATERIALS AND METHODS

An Alligator clay soil was selected for use in the study. First progeny Kleentek variety HoCP 91-555 was planted at three stalks and a lap of two joints in September of 1999. The experiment used a 6x6 Latin square design with six replications. Experimental plots consisted of three 5 foot 10 inch by 40 foot rows, with a 10-foot alley at the ends of the plots. All treatment plots were separated from adjacent treatments by three border rows.

Experimental treatments were applied immediately after planting. The Power Perk was diluted 1:10 with water before application. Treatments 2-4 were applied as a broadcast spray (from furrow-to-furrow). Treatments 5 and 6 had their Power Perk applied two ways: half in a narrow (one inch) band (in the furrow between the rows) and the other half in a 4-inch band on the row top.

Cane was grown to maturity using standard cultural practices, and plant populations were determined for each plot before harvest. The experiment was harvested in 2000 with a two-row soldier harvester and weighed with a weigh rig. In 2001 and 2002 the plots were harvested by a combine harvester and weighed with a portable weigh wagon. A 10-stalk sample was taken from each plot each year to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane. Soil penetrometer resistance (using a soil pentrometer) and soil moisture (using dry weight differences) was measured down to 6 inches on August 28 and October 11 in 2001 and July 17 in 2002.

RESULTS AND DISCUSSION

Table 1 shows that the sugar/acre yield of sugarcane was not affected by any application rate of Power Perk, as an average of the three crops. Also, none of the components of yield, plant population, tonnage, and CRS responded to this product (data not shown). The data in Table 2 reveal that Power Perk treatments did not affect soil moisture or soil penetrometer resistance as an average of all samplings during the three crop years.

Table 1. The yield response of HoCP 91-555 to the application of Power Perk as an average of three crops.

T#	Power Perk	Sugar Yield
	G/A	lb/A
1	0 – furrow to furrow	5160
2	10 - “ “ “	5200
3	20 - “ “ “	5140
4	30 - “ “ “	4770
5	5 in furrow +5 over row top	4740
6	10 in furrow + 10 over row top	5210
LSD = .10		NS

Table 2. Effect of Power Perk treatments on soil penetrometer resistance and soil moisture as an average of samplings during three crops.

T#	Power Perk	Soil penetrometer resistance	Soil moisture
	G/A	lb/in^2	%
1	0	401	25.5
2	10 - furrow to furrow	382	25.7
3	20 - " " "	362	26.1
4	30 - " " "	389	26.0
5	5 in furrow +5 over row top	369	25.8
6	10 in furrow + 10 over row top	395	25.9
LSD 0.10		NS	NS

IMPACT OF PAPER MILL SLUDGE ON SUGAR CANE PRODUCTION AND YIELDS

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SUMMARY

The pH of soil increased from 7.1 to 7.4 at both the 10- and 20-ton sludge rates at approximately seven months following the application of the paper mill sludge. Further, there was an increase of over 35% (1365 to 1855 ppm) in the available calcium from the 0 to the 20-ton 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. The increase in available calcium and sodium for the 10-ton rate was intermediate between the 0 and 20-ton rate. There was little effect of paper mill sludge on the availability of K, Mg, and P at either the 10- or 20- ton rate. Further, there was no apparent increase in the organic matter content between the 0 and 20-ton rate. Paper mill sludge can increase soil pH and the availability of both calcium and sodium and could be considered for use in acid soils or where available calcium is low.

For the plant-cane crop, there were no significant differences among treatments, including sludge rates at 0, 10, and 20 tons per acre, starter fertilizer rates at 0, and 15-45-45 or spring nitrogen rates at 0-0-0, 80-0-0, and 160-0-0, or combination of treatments (interactions) on the yield of sugar per acre (TRS/A), tons cane per acre (TC/A) or sugar per ton of cane (TRS/TC).

No significant differences were found in the yield of sugar per acre (TRS/A) and tons of cane per acre (TC/A) in the first-stubble crop. However, there was a significant interaction between sludge treatments and the yield of (TRS/TC). There were no differences in TRS/TC at either the 0 and 10-ton per acre sludge rate and the 0-0-0, 80-0-0, and 160-0-0 spring nitrogen rates; however, there was a significant reduction in TRS/TC at the 20-ton sludge rate where the 160-0-0 spring nitrogen rate was applied in 2001 and again in 2002. Although there were no differences in TRS/TC in 2001 at any of the sludge rates and spring nitrogen rates in the plant-cane crop, there was a significant difference in TRS/TC for the 20-ton sludge rate in the first-stubble crop. No significant differences were found in 2002 in the yield of TRS/A, TC/A, and TRS/TC at either starter fertilizer rates. However, there was a significant increase in both TRS/A and TC/A as the rate of nitrogen was increased in the spring of both 2001 and 2002.

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 improve plant survival and growth. The result can be increased yields with lowered fertilizer requirements and less soil, pesticide, and nutrient loss in runoff.

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 a mulch, a lime source, and an amendment to increase soil organic matter content. The sludge material has a pH of 8.9 and is comprised of approximately 30% calcium and 0.5% sodium on a dry weight basis.

PROCEDURES

The overall experiment was arranged in a randomized complete block design with four replications. Sludge treatments (0, 10 and 20 tons per acre) were arranged in a split plot design with starter fertilizer treatments (0 and 15-45-45) and spring N treatments (0-0-0, 80-0-0, and 160-0-0) arranged in a factorial design. Each of the 18 plots per replication was two rows wide (12 feet) by 24 feet long with a 4-foot buffer between plots. Sludge and starter fertilizer treatments were applied in the furrow at planting on October 16, 2000, while spring N treatments were applied in April 2001 to the plant-cane crop and April 2002 to the first-stubble crop. Standard cultural practices were applied to the experimental area with respect to control of weeds and insect pests.

Ten-stalk samples, taken at random along the row, were removed from each plot on December 3, 2001, in the plant-cane crop and December 18, 2002, in the first-stubble crop. All stalks were stripped of all leaves and topped approximately 4-6 inches 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 ton of cane (TRS/TC). Plots then were harvested on the same dates 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 fitted with load cells and the weights recorded. From these data, the yield of tons cane per acre (TC/A) and yield of theoretical recoverable sugar per acre (TRS/A) were calculated for each plot. The data for TRS/A, TC/A, and TRS/TC 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 ($P = 0.05$).

Data were also collected before and after the application of paper mill sludge for various soil parameters including pH, macro and micro nutrient content as well as organic matter content.

RESULTS AND DISCUSSION

Soil test results just before and after the application of the paper mill sludge are shown in Table 1. It appeared that the pH of the soil showed a slight increase at the 20-ton 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 20-ton 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. The increase in available calcium and sodium for the 10-ton rate was intermediate between the 0 and 20-ton rate. There appeared to be no effect of paper mill sludge on the availability of K, Mg, and P at either the 10- or 20-ton rate. Further, there was no apparent increase in the organic matter content between the 0 and 20-ton rate. Paper mill sludge can increase soil pH and the availability of both calcium and sodium and could be considered for use in acid soils or where available calcium is low.

For the plant-cane crop, there were no significant differences among treatments, including sludge, starter fertilizer, or spring nitrogen applications, or combination of treatments (interactions) on the yield of sugar per acre (TRS/A), tons cane per acre (TC/A), or sugar per ton of cane (TRS/TC) cane, or sugar yield (Tables 2, 3, 4 and 5). However, 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. Research with compost applications on other crops does not generally show significant yield increases until the second year. It is for this reason that the experiment was kept for a second year to determine if the addition of the sludge treatments would have a positive impact on yield in the first-stubble crop.

Results for the first-stubble crop are shown in Tables 6, 7, 8, and 9. No significant differences were found in the yield of sugar per acre (TRS/A) and tons of cane per acre (TC/A) (Table 7). However, there was a significant interaction between sludge treatments and the yield of sugar per ton of cane (TRS/TC) (Table 6). There were no differences in TRS/TC at either the 0 and 10-ton per acre sludge rate and the 0-0-0, 80-0-0, and 160-0-0 spring nitrogen rates; however, there was a significant difference in TRS/TC at the 20-ton per acre sludge rate and the three spring nitrogen rates (Table 7). Although there were no differences in TRS/TC in 2001 at any of the sludge rates and spring nitrogen rates in the plant-cane crop, there was a significant difference in TRS/TC for the 20-ton sludge rate in the first-stubble crop. Previous experiments have shown that increased levels of nitrogen can cause a reduction in TRS/TC; however, this is the first evidence of an interaction between sludge and nitrogen rates. Where the rate of nitrogen was increased in both the spring of 2001 and 2002, there was a significant reduction in TRS/TC at harvest in 2002. No significant differences were found in 2002 in the yield of TRS/A, TC/A, and TRS/TC at either starter fertilizer rates (Table 8). However, there was a significant increase in both TRS/A and TC/A as the rate of nitrogen was increased in the spring of both 2001 and 2002 (Table 9). This is not unusual because LCP 85-384 does not apparently respond to high nitrogen rates in the plant-cane crop; however, in subsequent stubble crops, there is usually an increase in yield with increased nitrogen rates.

Because of the interaction that occurred between sludge rates and spring nitrogen rates, it is recommended that this experiment be harvested again in the second-stubble crop.

ACKNOWLEDGMENTS

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Table 1. Soil test results conducted at the Louisiana State University Soil Testing Laboratory for the site where the paper mill sludge was applied at the St. Gabriel test site.

	Sludge		Ca	K	Mg	Na	P	Bases	OM
Sample date	Tons/ac	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	10	7.4	1510	91	307	33	326	10.4	1.13
April 2001	20	7.4	1855	108	347	37	333	12.6	1.22

Table 2. Mixed model analysis of fixed effect terms for the Paper Mill Sludge test harvested on December 3, 2001, in the plant-cane crop of the sugarcane variety, LCP 85-384, conducted at the St. Gabriel Research Station.

			Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
Source	Num df	Den df		Pr > F	
Sludge	2	9	0.28	0.68	0.32
Starter	1	45	0.32	0.83	0.11
Spring	2	45	0.54	0.45	0.12
Sludge*Starter	2	45	0.47	0.09	0.03
Sludge*Spring	4	45	0.24	0.47	0.37
Starter*Spring	2	45	0.63	0.98	0.57
Sludge*Starter*Spring	4	45	0.20	0.20	0.01

Table 3. Means of sludge treatments for yields of sugar per acre, tons cane per acre, and sugar per ton in the plant-cane crop of LCP 85-384 harvested on December 3, 2001, at the St. Gabriel Research Station.

Sludge	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
tons/ac	lbs/ac	tons/ac	lbs/ton
0	8684	44.0	197
10	8210	43.2	190
20	8457	44.1	192
Significance (0.05)	NS	NS	NS

Table 4. Means of starter fertilizer treatments for yields of sugar per acre, tons cane per acre, and sugar per ton in the plant-cane crop of LCP 85-384 harvested on December 3, 2001, at the St. Gabriel Research Station.

Starter Fertilizer	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
	lbs/ac	tons/ac	lbs/ton
0-0-0	8380	43.9	191
15-45-45	8521	43.7	195
Significance (0.05)	NS	NS	NS

Table 5. Means of spring nitrogen rate treatments for yields of sugar per acre, tons cane per acre, and sugar per ton in the plant-cane crop of LCP 85-384 harvested on December 3, 2001, at the St. Gabriel Research Station.

Nitrogen rate	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
	lbs/ac	tons/ac	lbs/ton
0-0-0	8549	44.1	194
80-0-0	8358	44.1	190
160-0-0	8445	43.2	196
Significance (0.05)	NS	NS	NS

Table 6. Mixed model analysis of fixed effect terms for the Paper Mill Sludge test harvested on December 18, 2002 in the first-stubble crop of the sugarcane variety, LCP 85-384, conducted at the St. Gabriel Research Station.

Source	Num df	Den df	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
			Pr > F		
Sludge	2	9	0.91	0.81	0.29
Starter	1	45	0.96	0.88	0.54
Spring	2	45	0.04	0.01	0.01
Sludge*Starter	2	45	0.65	0.76	0.32
Sludge*Spring	4	45	0.47	0.36	0.03
Starter*Spring	2	45	0.57	0.45	0.99
Sludge*Starter*Spring	4	45	0.53	0.22	0.78

Table 7. Means for sludge and spring nitrogen treatments for yields of sugar per acre, tons cane per acre and sugar per ton in the first-stubble crop of LCP 85-384 harvested on December 18, 2002 at the St. Gabriel Research Station[1].

Sludge	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC) lbs/ton						
Tons/ac	lbs/ac	tons/ac	Spring nitrogen rate						Significance
			0-0-0		80-0-0		160-0-0		
0	8343	31.7	267		256		266		NS
10	8545	32.2	270		268		259		NS
20	8429	32.7	271	A	260	AB	243	B	P < 0.05
Significance (P=0.05)	NS	NS							

[1] Nitrogen (32%) and potassium applied in the spring of 2002 at the rate of 120 pounds per acre and 80 pounds per acre, respectively. Means in a row followed by the same letter are non significant at P < 0.05.

Table 8. Means of starter fertilizer treatments for yields of sugar per acre, tons cane per acre and sugar per ton in the first-stubble crop of LCP 85-384 harvested on December 18, 2002 at the St. Gabriel Research Station[1].

Starter Fertilizer	Sugar per acre (TRS/A)	Tons per acre (TC/A)	Sugar per ton (TRS/TC)
	lbs/ac	tons/ac	lbs/ton
0-0-0	8445	32.2	263
15-45-45	8432	32.3	261
Significance (P=0.05)	NS	NS	NS

[1] Nitrogen (32%) and potassium applied in the spring of 2002 at the rate of 120 pounds per acre and 80 pounds per acre, respectively.

Table 9. Means of spring nitrogen rate treatments for yields of sugar per acre, tons cane per acre and sugar per ton in the first-stubble crop of LCP 85-384 harvested on December 18, 2002 at the St. Gabriel Research Station[1].

Nitrogen rate	Sugar per acre (TRS/A)		Tons per acre (TC/A)	
	lbs/ac		tons/ac	
0-0-0	7982	B	29.7	B
80-0-0	8584	AB	32.8	A
160-0-0	8750	A	34.2	A
Significance (0.05)	P < 0.05		P < 0.05	

1 Nitrogen (32%) and potassium applied in the spring of 2002 at the rate of 120 pounds per acre and 80 pounds per acre, respectively. Means in a column followed by the same letter are non significant at P < 0.05.

FIELD DECAY OF SUGARCANE MULCH RESIDUE AND ITS EFFECTS ON METRIBUZIN AND ATRAZINE RETENTION AND RELEASE

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Best management practices such as minimum and no-till are needed in order to minimize soil losses and the movement of applied agricultural chemicals off-site. We are not aware of published research that has been carried out on correlating the effectiveness of sugarcane mulch residue remaining on the soil surface over time, following harvest, on the retention of applied herbicides, leaching losses in the runoff, and their downward movement in the soil profile. In this study, field and laboratory studies were conducted to determine weather-induced changes in sugarcane mulch residue composition. Change in atrazine and metribuzin retention characteristics of the mulch residues as they decay in the field was quantified. A relationship between atrazine and metribuzin retention of the residue and the lignin content on a mass basis of the residue was also quantified.

Field Decay of Mulch Residue

Bulk samples of sugarcane residue (varieties LCP85-384 and CP70-321) were collected from field plots at the St. Gabriel Sugar Research Station. The 384 variety was grown on a Sharkey clay soil, and the 321 variety was grown on a Commerce silt loam. Mulch samples were collected immediately after combine harvesting of the crop. To quantify the rate of decay of the mulch residue, bulk samples were collected over time following harvest. The decay of mulch residue for CP70-321 was monitored following harvest of the third stubble during 1999-2000 only, whereas the LCP85-84 variety was monitored following three successive growing seasons (plantcane, and first and second stubbles) during 2000 to 2003 (see Figure 1). The sugarcane residue was collected randomly within each plot, by measuring 6-8, 1 m^2 areas and collecting all surface mulch within that area. The residue was dried at 55°C for 24 hours and weighed. A portion of dry residue was cut into 1cm sections for batch equilibrium studies, while some of the residue was ground to a powder and mixed for homogeneity as required for fiber analysis

For CP70-321, the amount of mulch on the soil surface decreased from 3.58±0.95 tons/acre on December 17, 1999, to 0.740±0.143 on August 18, 2000. The average yield for CP70-321 was 26.85 tons/acre. For the LCP85-84, average yields for the 2000 and 2001 growing seasons were 31.98 tons/acre and 36.53 tons/acre, respectively. The surface residue decreased from 1.70±0.308 to 0.64±0.239 tons/acre within a four-month period for the 2000 season, and the 2001 season decreased from 2.58±0.642 to 0.870±0.247 tons/acre in five months. Rainfall data shows the 2000 growing season was the third driest on record. This resulted in a lower yield for the plantcane than the first stubble. Such a difference may be attributed to differences in crop variety and 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 losses per acre over time. For CP70-321 grown on Commerce silt loam, the estimated rate of decay was 0.0105 ± 0.00178 tons/acre/day. Whereas for variety LCP85-384 grown on Sharkey clay, the rates of degradations were of 0.0153 ± 0.00054, 0.0075± 0.00169, 0.0062± 0.00998 tons/acre/day for the three growing seasons (plantcane, first and second stubble), respectively.

Adsorption – Desorption:

Adsorption-desorption by mulch residue was carried out using batch equilibration technique (Zhu and Selim, 2000). Six ^{14}C-atrazine/metribuzin spike samples having initial concentrations (C_i) ranging from 2.98 to 29.8 mg L^{-1} for atrazine and from 2 to 98 mg L^{-1} for metribuzin in 0.005 M $CaCl_2$ solution were used. Adsorption was initiated by mixing 1g of dried and cut sugarcane residue with 30 mL of the various herbicide concentration solutions in a 40-mL Teflon centrifuge tube. The mixtures were shaken for each specific reaction time and centrifuged at 3500 × g for 10 minutes before sampling. A 0.5-mL aliquot was sampled from the supernatant at set reaction times. The mixtures were returned to the shaker after each sampling. The collected samples were analyzed using liquid scintillation counting (LSC).

Desorption commenced immediately after the last adsorption time step (24-h). Each desorption step was conducted by replacing the supernatant with atrazine / metribuzin free 0.005 M $CaCl_2$ solution and shaking for 24 hours. Ten desorption steps were carried out with a total desorption time of 10 days. After the tenth step, two further extractions using pure methanol were carried out. The residue used for desorption studies was from sugarcane variety LCP85-384 grown on Sharkey soil and was collected from the field on March 20, 2002.

Adsorption isotherms represent the amount sorbed versus concentration of herbicide in the soil solution. A family of adsorption isotherms for metribuzin by the mulch residue ais shown in Figure 2. Such relationships clearly illustrate metribuzin affinity by the mulch residue as well the extent of retention with time of reactions. Adsorption isotherms are often described by either a linear type model ($S = K_d C$) or nonlinear (Freundlich) type equilibrium model ($S = K_f C^N$), where S is the amount of herbicide sorbed (mg kg^{-1} soil), and 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 15.9 to 23.09 cm^3/g after 24 and 504 hours, respectively (see Table 1). The metribuzin K_d values increased with reaction times from 10.3 to 14.6 cm^3/g after 24 and 504 hours, 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 hours of reaction time (see Figure 3). 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 K_d values for atrazine and metribuzin discussed above were an order of magnitude higher than that found for soils such as our Commerce silt loam soil. This was expected since organic matter is the principal soil component affecting the adsorption of many herbicides in the soil environment. Specifically, for Commerce soil K_d values for atrazine ranged from 2.095 to 2.352 mL/g after 24 and 384 hours of reaction time, respectively. The corresponding values for metribuzin were 1.18 to 1.52 mL/g after 24 and 384-h of reaction time, respectively. These K_d

values for Commerce soil were measured in our laboratory and clearly exhibit limited kinetic behavior for both atrazine and metribuzin when compared to the mulch residue.

The retention capability of the mulch residue versus time of decay in the field following harvest is depicted in Figure 4. Here we quantified the atrazine and metribuzin retention to find out the changes of adsorption characteristics due to weather-induced changes in the field following harvest. Specifically, the K_d values were measured using 24 hour batch adsorption and for individual mulch samples for two growing season (2000-2001 and 2001-2002). As expected, atrazine retention was much higher than that for metribuzin (Table 2). Striking is that the retention was similar over the two growing seasons and did not change significantly with the time of decay in the field. Such a finding is of significance and implies that only one K_d value is needed to quantify the retention behavior and that such value is nearly time invariant. Such a conclusion is valid for both herbicides. Our results are consistent with those of Dao (1991) for metribuzin adsorption on chopped wheat straw versus time following harvest. The only exception is that a lower retention value was reported from samples obtained immediately after harvest followed by little if any increase in retention over the succeeding five months.

The extent of release or desorption of the herbicides sorbed was also quantified. Following 24 hour adsorption, 10-consecutive 24 hour desorption steps were carried out using successive dilution methods. Metribuzin desorbed an average of 93 ± 3.07% of the original amount adsorbed, all concentrations with the exception of 10mg L^{-1}, recovered over 90% of adsorbed. The desorption of atrazine yielded an average of 87 ± 5.21% of the amount adsorbed after 24 hours of shaking (see Table 3).

Neutral Detergent Fiber during Decay:

The residue from the 2001-2002 sampling dates was analyzed for neutral detergent fiber (NDF) and acid detergent fiber (ADF) and was carried out at the Southeast Research Station. NDF is the fraction of the plant that contains hemicellulose, cellulose and lignin. ADF is the sub-fraction of NDF consisting of mainly lignin and cellulose. The NDF and ADF values are used as indicators of lignin, cellulose, and hemicellulose content of sugarcane residue on a mass basis. Neutral detergent fiber and acid detergent fiber were analyzed using the methods described by Goering and Van Soest (1970), which were modified by excluding decalin. Additionally, 2.0 mL of a 2% (w/v) "-amylase solution and 0.5 g sodium sulfite were added at the beginning of the NDF procedure (Van Soest and Robertson, 1980). A linear relationship between Kd vs ADF was obtained for both atrazine and metribuzin with moderate slopes of 0.19 and 0.11 ml/g, respectively (see Figure 5).

Following harvest, the amount of residue in the field decreased by an average of 1.34 tons/acre over a five-month period. The percentage of ADF in the mulch increased slightly as time in the field increased. The content of the residue has higher amounts of lignin with a higher adsorption capacity with time. Therefore the residue has the ability, on a mass basis, to adsorb increasing amounts of herbicides with time in the field. However, such an increase is at best modest (see Table 4). This is consistent with metribuzin and lignin relationships described by Dao (1991). Dao (1991) argues that the increase in the percentage of lignin of intact wheat straw is caused by the decay of cellulose. Moreover, he assumed that lignin accounted for most of the sorption sites for metribuzin by the residue. In two separate batch studies, a purified cellulose fraction did not show significant retention of metribuzin or atrazine (Dao, 1991, and Abdelhafid et al. (2000). Increased sorption capacity of decaying straw was thus associated with a decline in cellulose concentration or conversely the lignin enrichment of the straw (Dao, 1991).

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We wish to thank Dr. Brad Venuto of the Louisiana State University Agricultural Center - Southeast Research Station, for his assistance in carrying out the fiber analysis.

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 March 23, 2001.

Atrazine					
Retention	Freundlich Model			Linear Model	
Time (d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
1	19.36 ± 1.82	0.92 ± 0.03	0.997	15.90 ± 0.22	0.987
2	20.01 ± 3.10	0.92 ± 0.02	0.999	16.50 ± 0.16	0.993
7	23.32 ± 3.10	0.89 ± 0.04	0.994	17.65 ± 0.37	0.971
14	25.29 ± 1.62	0.90 ± 0.02	0.999	19.46 ± 0.25	0.989
21	26.55 ± 1.57	0.89 ± 0.01	0.999	20.08 ± 0.26	0.989
Metribuzin					
Retention	Freundlich Model			Linear Model	
Time (d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
1	13.72 ± 2.46	0.94 ± 0.04	0.995	11.20 ± 0.20	0.986
2	17.20 ± 2.78	0.90 ± 0.04	0.995	11.56 ± 0.22	0.984
7	16.94 ± 2.39	0.93 ± 0.03	0.997	12.91 ± 0.20	0.990
14	17.85 ± 2.08	0.92 ± 0.02	0.998	13.47 ± 0.18	0.992
21	17.66 ± 2.20	0.95 ± 0.03	0.997	14.72 ± 0.19	0.993

Table 2. Linear and Freundlich model parameters for atrazine and metribuzin adsorption by the sugarcane (LCP85-384) mulch residue, for different sampling times.

Atrazine					
Age	Freundlich Model			Linear Model	
of Residue(d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
12	22.62 ± 3.10	0.87 ± 0.05	0.990	16.21 ± 0.36	0.966
40	18.28 ± 3.51	0.92 ± 0.07	0.989	14.92± 0.39	0.956
63	20.67 ± 2.26	0.92 ± 0.04	0.996	16.72 ± 0.27	0.982
127	18.46 ± 1.32	0.93 ± 0.02	0.999	15.65 ± 0.16	0.993
153	22.69 ± 2.63	0.89 ± 0.04	0.996	17.18 ± 0.31	0.978
187	18.24 ± 1.54	0.94 ± 0.03	0.998	15.93 ± 0.18	0.991
Metribuzin					
Age	Freundlich Model			Linear Model	
of Residue(d)	Kf (mL g^{-1})	N	r^2	Kd (mL g^{-1})	r^2
12	10.90 ± 4.02	0.95 ±0.09	0.980	9.23 ± 0.32	0.951
40	8.49 ± 2.12	1.02 ± 0.06	0.992	9.47 ± 0.20	0.981
63	8.76 ± 2.09	1.04 ± 0.05	0.993	10.47 ± 0.22	0.983
127	10.57 ± 0.42	1.01 ± 0.00	1.000	11.11 ± 0.04	0.999
153	11.56 ± 0.67	0.96 ± 0.01	1.000	10.07 ± 0.06	0.998
187	12.10 ± 0.73	0.97 ± 0.01	0.999	10.97 ± 0.06	0.998

Table 3. Acid detergent fiber (ADF) and neutral detergent fiber (NDF) analysis for sugarcane (LCP85-384) mulch residue at different residue ages.

Age of	Average %*		Kd values (mL/g)	
Residue(d)	ADF**	NDF***	Atrazine	Metribuzin
12	47.410	70.895	16.213	9.239
40	47.850	72.475	14.922	9.916
63	50.475	73.595	16.728	10.876
127	51.695	75.470	15.652	11.111
153	52.920	76.770	17.189	10.077
217	53.975	76.155	15.932	10.977

*ADF and NDF are percentages of total dry mass of residue.
**Acid Detergent Fiber (ADF) includes lignin and cellulose.
***Neutral Detergent Fiber (NDF) includes lignin, cellulose and hemicellulose.

Table 4. Mass balance of applied atrazine and metribuzin following 24 hour adsorption, 10 desorptions, and methanol extraction for mulch residue collected 153 days post-harvest (March 20, 2002).

Herbicide	Initial concentration µg/mL	Total amount absorbed µg/g	Total amount desorbed µg/g	Total amount desorbed % of adsorbed	Total amount retained % of input	Amount of Methanol extracted from residue µg/g	Amount of residual % of input
	2.00	17.67	16.05	90.85	2.71	0.37	2.09
Metribuzin	10.00	86.31	76.19	88.29	3.37	1.62	2.83
	20.00	156.52	148.87	95.13	1.27	3.60	0.67
	40.00	299.32	288.49	96.41	0.90	6.47	0.36
	70.00	525.44	499.63	95.08	1.23	10.93	0.71
	100.00	751.59	696.78	92.71	1.83	17.21	1.25
	2.98	38.20	29.51	77.28	9.71	0.28	9.40
Atrazine	5.96	69.22	62.47	90.26	3.78	0.61	3.44
	11.98	139.61	119.70	85.74	5.54	1.28	5.19
	17.96	195.03	174.03	89.46	3.90	1.41	3.64
	23.95	259.23	237.83	91.76	2.98	2.17	2.68
	29.01	313.68	274.54	87.63	4.50	2.25	4.24

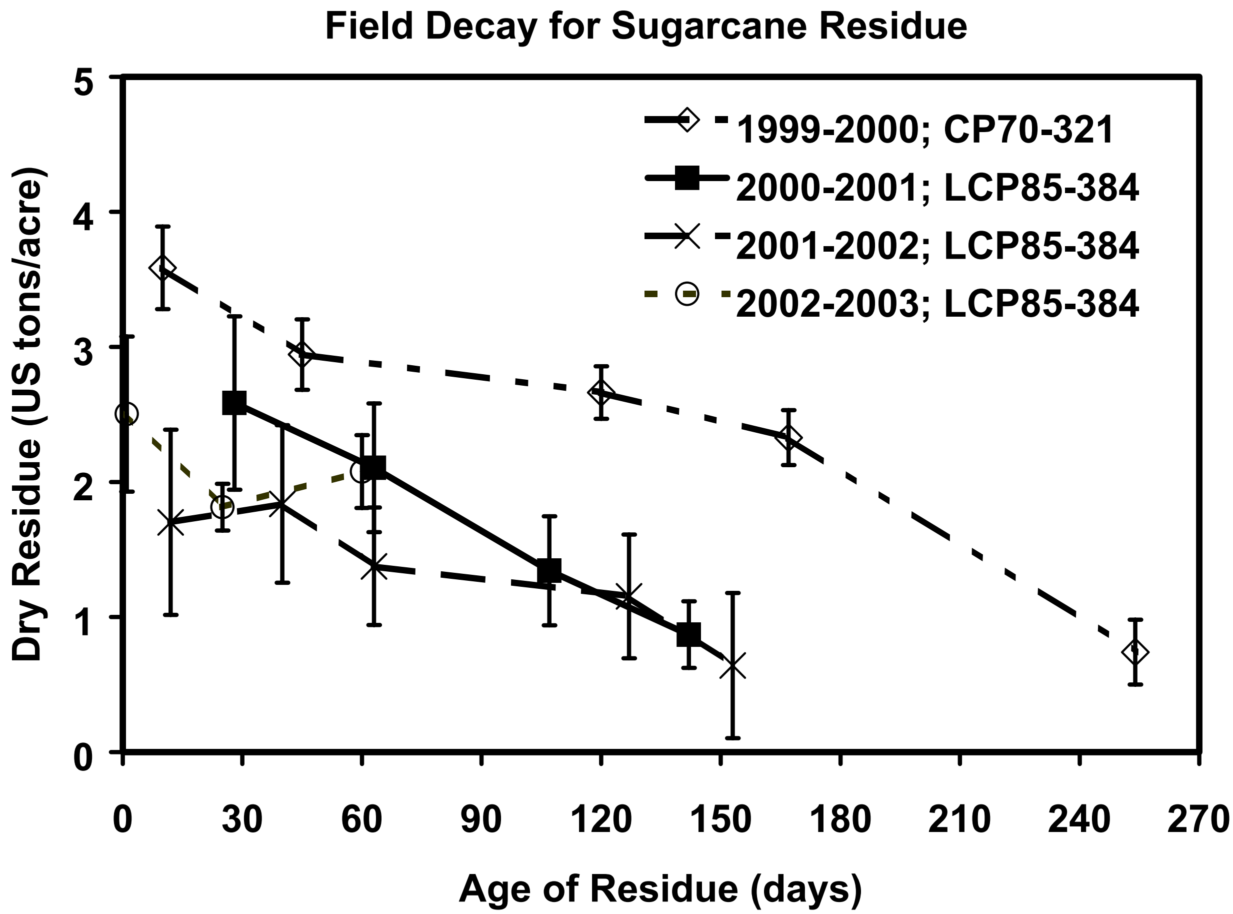

Figure 1. Field decay of sugarcane residue following harvest of CP70-321 and LCP85-384.

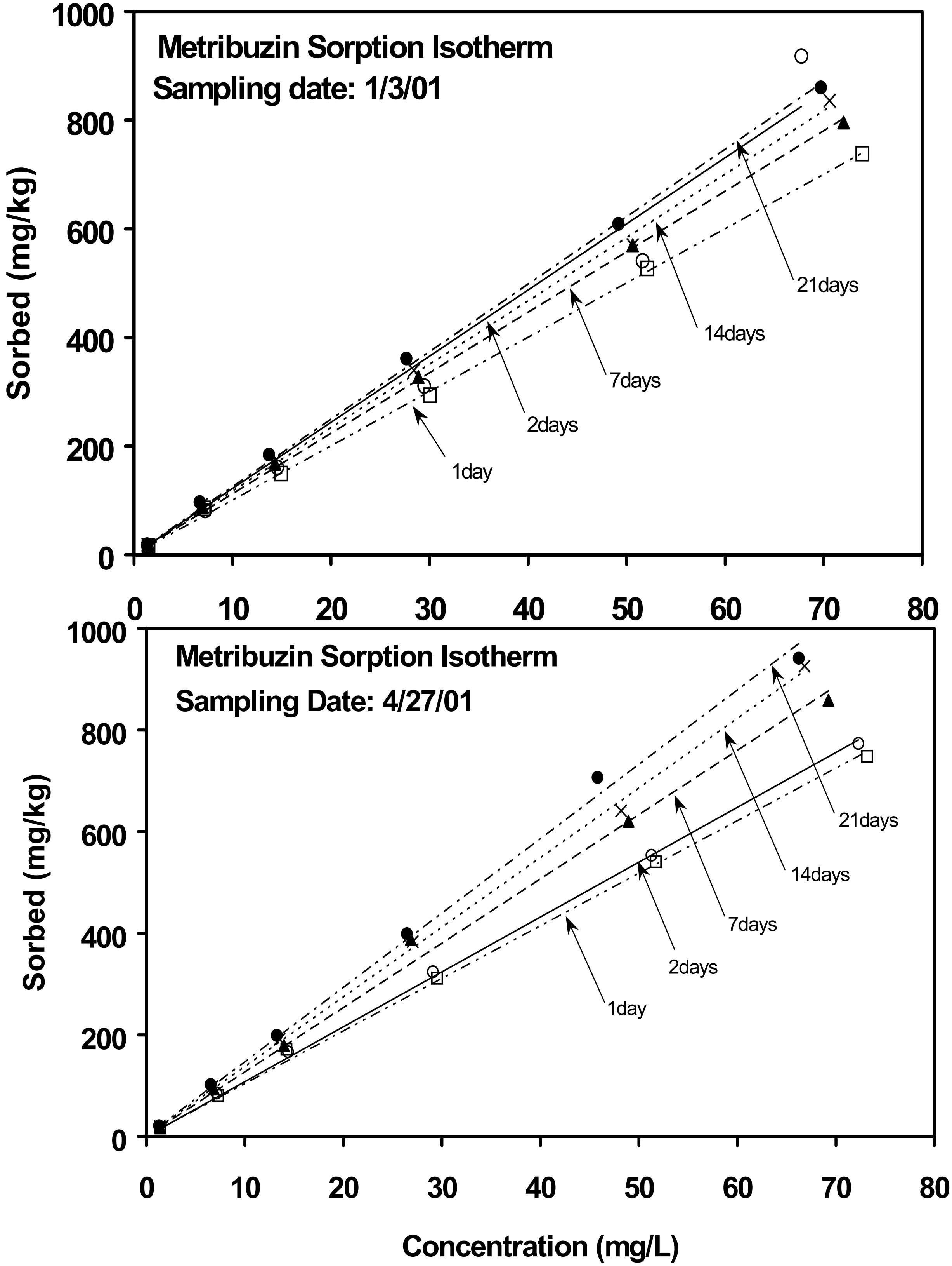

Figure 2. Metribuzin adsorption isotherms by mulch residue sampled on January 3, 2001 and April 27, 2001. The sugarcane (LCP85-384) was harvested on December 8, 2000.

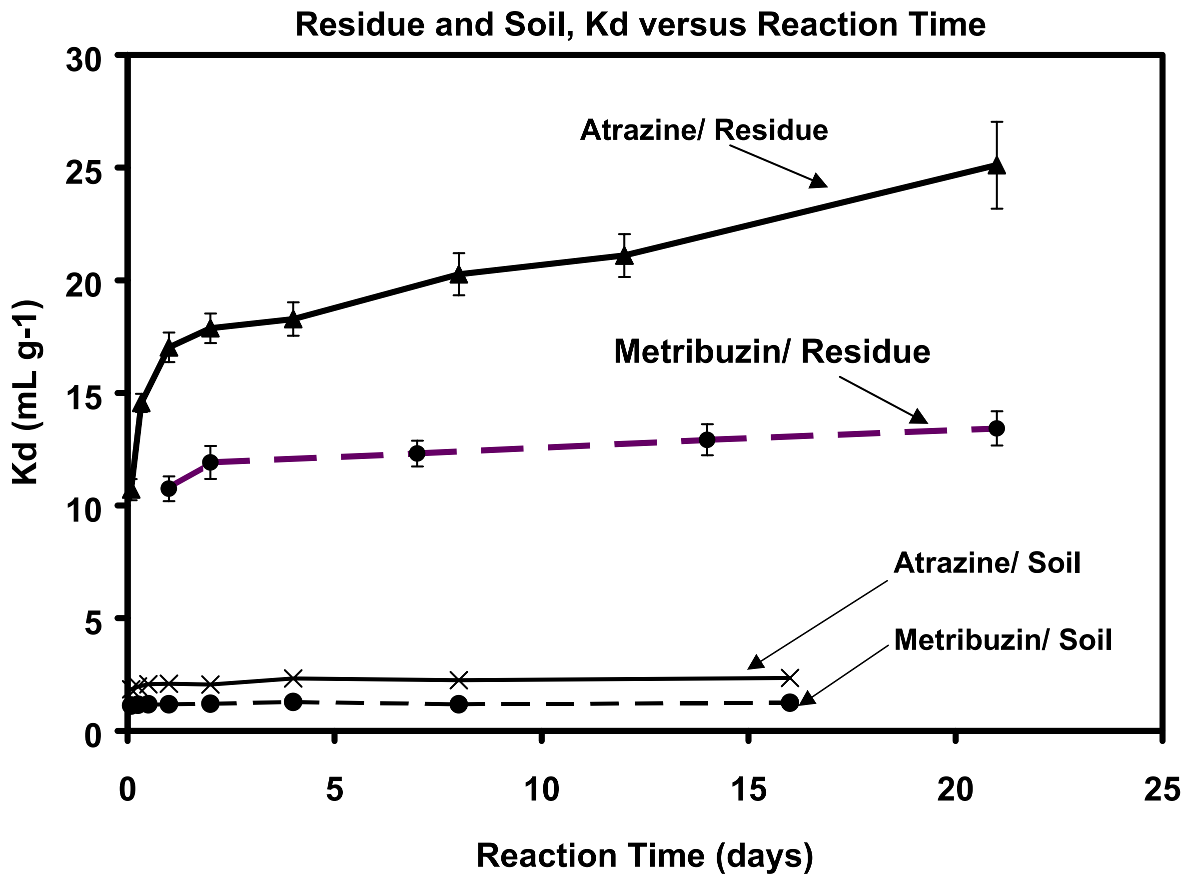

Figure 3. Measured atrazine and metribuzin distribution coefficient (Kd) versus reaction time during adsorption for sugarcane (LCP85-384) mulch residue and Commerce silt loam. Error bars represent one standard deviation.

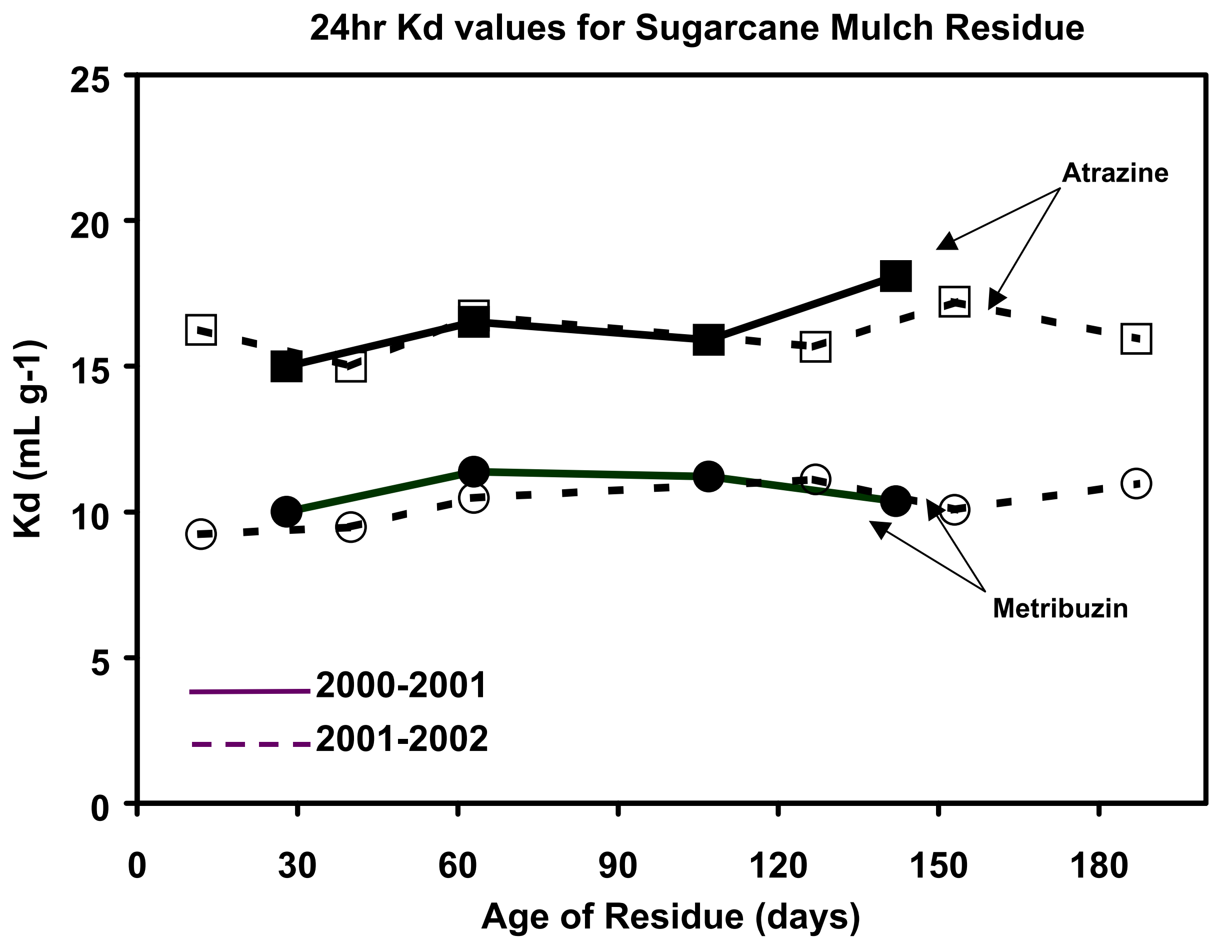

Figure 4. Values of the distribution coefficient (Kd) after 24 hours sorption for atrazine and metribuzin for 2001 and 2002 sugarcane residue (LCP85-384) versus residue age.

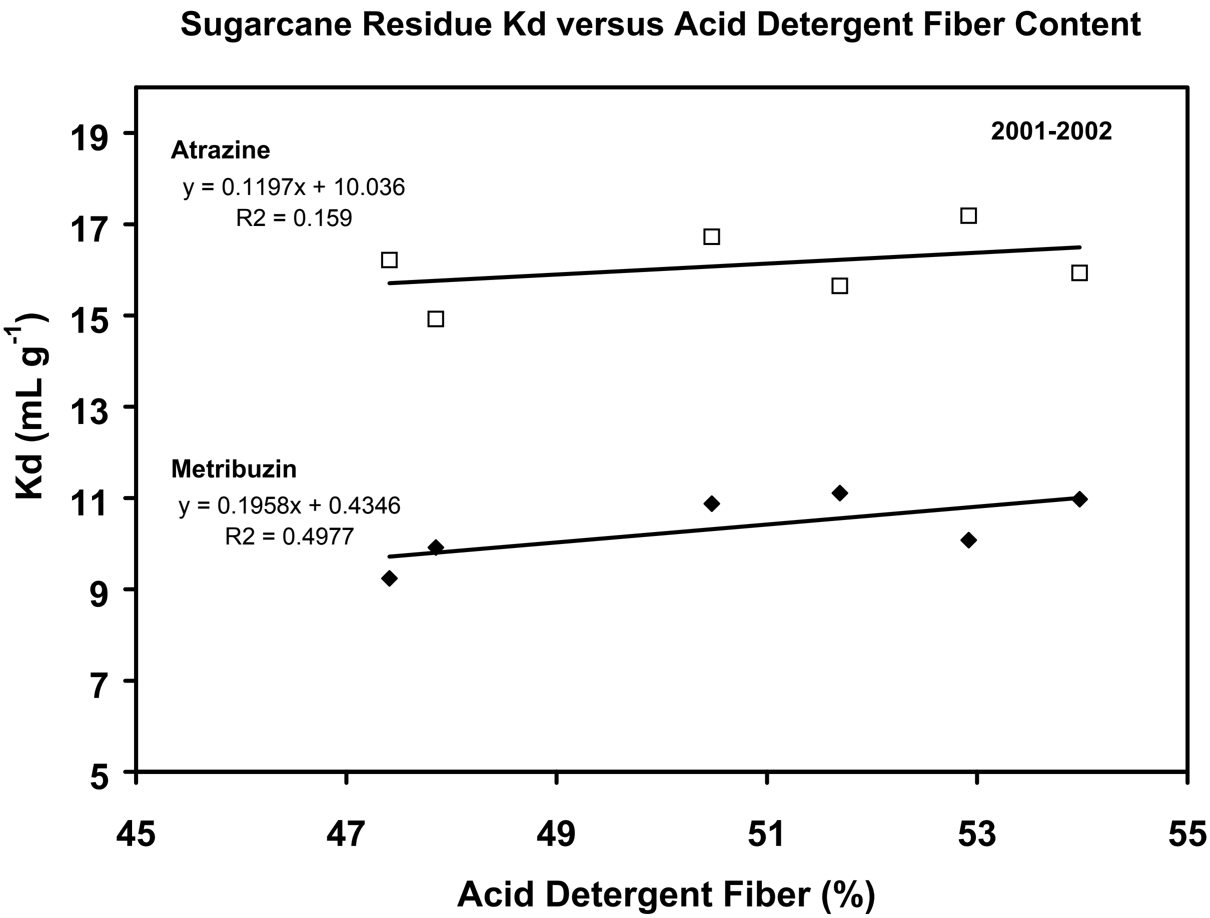

Figure 5. Relationship between atrazine and metribuzin Kd for sugarcane residue (LCP85-384) and acid detergent fiber content at different sampling dates (see Table 3).

ECONOMIC RESEARCH IN SUGARCANE IN 2002

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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 2002 crop year was 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 2002. Total investment in planting costs were estimated to be $982.16 per acre planted. This cane was assumed to be hand planted in 2001, and the estimated costs include expenses for fallow operations, seedbed preparation, purchase of cultured seedcane, and hand planting. Table 3 presents estimated total investment in planting costs associated with standing fields of propagated seedcane (first expansion) in 2002. In this case, it is assumed cultured seedcane was planted in 2000, then harvested and replanted in 2001. Total investment in planting costs were estimated to be $594.85 per acre planted. This cost includes the allocated portion of hand planted cultured seedcane harvested and replanted mechanically. Table 4 presents estimated total investment in planting costs associated with standing fields of plantcane in 2002. Total costs were estimated to be $520.62 per planted acre and represent costs associated with two expansions of cultured seedcane. This cost value represents the total cost of planting 1 acre of sugarcane that will be harvested for sugar (plantcane). Allocated values of this planting cost to stubble crops were estimated at $390 per acre for first stubble, $260 per acre for second stubble, and $130 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, first stubble, second stubble, and third stubble (base yield of 33 tons plantcane, 34 tons first stubble, 32 tons second stubble, 30 tons third stubble).

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

[3] Assumes standard land rotation of 20% each of fallow, plantcane, first stubble, second stubble, and third 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 Seedcane Planting Costs in 2002

Year	Operation	Cost Per Acre	Allocation Percentage	Allocated Planting Cost
2001	Fallow and Seedbed Preparation	$231.62	100%	$231.62
	Cultured Seedcane	$499.75	100%	$499.75
	Hand Plant	$250.79	100%	$250.79
				$982.16

Total costs associated with planting cultured seedcane in 2001.

Table 3. Allocated Propagated Seedcane Planting Costs in 2002

Year	Operation	Cost Per Acre	Allocation Percentage	Allocated Planting Cost
2000	Fallow and Seedbed Preparation	$215.86	20%	$43.17
	Cultured Seedcane	$494.96	20%	$98.99
	Hand Plant	$221.36	20%	$44.27
2001	Fallow and Seedbed Preparation	$231.62	100%	$231.62
	Harvest 1st Propagated Seedcane	$73.91	20%	$14.78
	Mechanical Plant	$162.02	100%	$162.02
				$594.85

Total costs associated with planting propagated seedcane (first expansion) in 2001.

ALTERNATIVES TO THE USE OF THE CHEMICAL RIPENER POLADO (GLYPHOSATE) IN ENHANCING THE YIELD OF SUGAR IN LOUISIANA SUGARCANE DURING THE 2002 CROP

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SUMMARY

In the first of two field studies conducted in 2002, the chemical ripeners Polado, Arsenal and Fusilade, at various rates, significantly increased the yield of theoretical recoverable sugar per acre (TRS/A) when compared to control (untreated) plots at 54 days after treatment (DAT) in the second-stubble crop of the variety LCP 85-384. All three ripeners also increased the yield of theoretical recoverable sugar per ton of cane (TRS/TC) at 34 and 54 DAT when compared to control. Further, the TRS/TC for the Polado and Arsenal treatments were significantly higher than the two rates of Fusilade tested at 54 DAT. Polado appeared to have the greatest negative impact on mean stalk weight (MSW) at both 34 and 54 DAT; however, this might have been a cumulative effect of having applied the same treatments to the same plots in both 2001 and 2002. The estimated yield of tons cane per acre (TC/A) was derived from MSW and millable stalk counts taken prior to the 2002 harvest. There were no significant differences in stalk counts between control and either the Polado or Fusilade treatments. However, Arsenal at the two rates tested actually stimulated shoot development, which meant a significantly higher millable stalk count at harvest the year after the initial treatment. All ripener treatments in 2002 significantly increased the purity of juice when compared to control at both 34 and 54 DAT. There was further differentiation in the purity of juice among ripener treatments, with Polado and Arsenal treatments generally resulting in higher values.

In the second study, 10 chemical ripeners, A13013A, Accent, Arsenal, Kayphol, MON 37500, Oust, Palisade, Polado, Polado plus Takeup and Touchdown, at various rates, were tested on the third-stubble crop of the variety LCP 85-384. A significant increase in TRS/A was noted for A13013A at 2.87 oz/A, Polado at 8 oz/A, Polado at 6 oz/A plus Takeup and Touchdown at 8 oz/A at 49 DAT. The TRS/A for the other rates of these three ripeners as well as the low rate of Arsenal approached significance. At 37 DAT, there was a significant increase in TRS/TC for A13013A, Arsenal, Polado, Polado plus Takeup and Touchdown at all rates tested as well as the high rate of Palisade. At 49 DAT, all treatments with the exception of Accent, Kayphol, and MON 37500 at the rates tested significantly increased TRS/TC. There were no significant differences in MSW among any of the treatments when compared to control at either 37 or 49 DAT although large numerical differences were noted. Most of the ripeners tested also increased the purity of the juice when compared to control at both 37 and 49 DAT. However, purity of

juice was significantly reduced by the application of Kayphol when harvested at 37 DAT. TC/A was the product of MSW by a constant of 40,000 stalks per acre. Using these calculations, there was a significant reduction in TC/A for two rates of Polado, 4 and 6 oz/A, when compared to control. There was also a large reduction in the TC/A for the Arsenal treatment at the high rate, 9.2 oz/A, that approached significance.

Both Polado and Touchdown are glyphosate derivatives; therefore, only Arsenal offers new chemistry to compete with glyphosate as a proven chemical ripener under the conditions and the varieties found in Louisiana. Additional studies are indicated with A13013A to determine its efficacy across varieties and years.

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 as chemical ripeners that hasten sugarcane maturation and increase sugar yield (Nickell 1984). Glyphosate [isopropylamine salt of N-(phosphonomethyl)glycine], one of the most effective chemical ripeners used on a world-wide basis, apparently influences the way dry matter is partitioned, increasing the ratio of sucrose to fiber (Osgood et al. 1981). However, glyphosate treatment usually means a decreased cane yield in the crop being treated by slowing cane growth after treatment, thus reducing stalk weight. In Louisiana, the effectiveness of glyphosate (Polado) (manufactured by Monsanto) for ripening sugarcane is strongly dependent upon variety, treatment-harvest interval, and growing season (Legendre and Finger 1987). 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 and a treatment-harvest interval of 35 – 49 days. Polado is not labeled for plant-cane crops in these states because of possible phytotoxicity to crown buds, which could adversely affect regrowth (stubbling), thus reducing stands and yields in the stubble crop. Slow stand development in spring is commonly observed in Polado-treated sugarcane in Louisiana. Millhollon and Legendre (1996) found that annual glyphosate 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 be very sensitive.

Currently, Polado is used on approximately 350,000 acres in Louisiana, netting the state's sugarcane growers, processors, and landlords an estimated $35 million in increased gross revenues each year. However, since Polado is not labeled for plant-cane use, typically causes a loss of cane yield in the crop being treated, and has the potential for causing yield reduction in the subsequent stubble crop, additional research is needed to find alternative ripeners that can be used on the plant-cane crop, can be used at reduced treatment-harvest intervals, have little or no impact on cane yield, and will not affect the subsequent stubble crop. Further, there is the possibility that glyphosate-tolerant sugarcane varieties that would effectively eliminate the use of glyphosate as a ripener will be developed in the near future. From 1983 to 1986, Legendre (unpublished data), while employed by the USDA-ARS, SRRC, Sugarcane Research Unit at Houma, showed that two products, Fusilade (manufactured by Syngenta) and Arsenal (manufactured by BASF), had the potential to ripen sugarcane under Louisiana conditions; however, the testing of both products was discontinued by their respective companies for company reasons.

PROCEDURES

The first experiment was conducted in the second-stubble crop of the sugarcane variety LCP 85-384. Sugarcane was cultivated and fertilized according to recommended practices; insecticides were applied as required. The chemical treatments were applied 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), was added to all spray solutions. The experiment consisted of six treatments: Polado at 0.2 lb a.e. /A (6 oz/A); Arsenal at 0.143 and 0.214 lb/A; Fusilade at 0.0625 and 0.0875 lb/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 foot long with a 5-foot alley and with buffer rows on either side of treated row, arranged in a randomized complete block design with five replications. The same treatments were applied to the first-stubble crop and harvested in 2001.

Fifteen-stalk samples, taken at random along the row, were removed from each plot on September 24 and October 14 (34 and 54 days after treatment (DAT), respectively). All stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). Data collected and/or calculated included mean stalk weight 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). On October 14 (54 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 by use of load cells, and the weights recorded. From these data, 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 lodged condition of the crop as a result of wind and rain associated with Tropical Storm Isidore and Hurricane Lili and record rainfall during the harvest, weighed cane yields were highly variable because of excessive field soil (mud) and trash in harvested cane. As a result, estimated yields were used in lieu of weighed yields. Millable stalk counts were taken in each plot on August 16, 2002, and used in estimating the yield of tons cane per acre by multiplying these numbers by the mean stalk weight for each treatment.

The second experiment was conducted in the third-stubble crop of the sugarcane variety LCP 85-384. Sugarcane was cultivated and fertilized according to recommended practices; insecticides were applied as required. The chemical treatments were applied on September 4, 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), was added to all spray solutions. The experiment consisted of 17 treatments: A13013A at 2.87 and 5.75 oz/A, Accent at 0.5 oz/A, Arsenal at 8 and 9.2 oz/A, Kayphol at 2.0 qt/A, MON 37500 at 0.5 oz/A, Oust at 0.282 oz/A, Palisade at 0.111 and 0.223 oz/A, Polado at 4, 6, and 8 oz/A, Polado at 6 oz/A plus Takeup at 1.0 pt/A, Touchdown at 4, 8, and 10.6 oz/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 25 feet long with a 5-foot alley and with buffer rows on either 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 October 11 and 23 (37 and 49 days after treatment (DAT), respectively). All stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). Data collected and/or calculated included mean stalk weight 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). On October 23 (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 by use of load cells and the weights recorded. From these data, 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. Estimated yields were again used in the second study for the reasons given above associated with the lodged conditions of the cane and the wet field conditions. In the second study, estimated yield was calculated by multiplying mean stalk weight for each treatment by a constant population of 40,000 stalks. It was estimated that the field in which the test was conducted had a uniform stalk population of 40,000 stalks per acre. All plots, therefore, were assumed to have the same number of stalks.

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

Table 1 shows the effect of the three chemical ripeners applied in the first study on mean stalk weight (MSW) at 34 and 54 days after treatment (DAT). Polado appeared to have the greatest negative impact on MSW at both 34 and 54 DAT; however, this might have been a cumulative effect of having applied the same treatments to the same plots in both 2001 and 2002. In the 2001 study, Polado caused a significant reduction in MSW only at 49 DAT when compared to control (Data not shown). Table 2 shows the effect of the three chemical ripeners on the yield of theoretical recoverable sugar per ton of cane (TRS/TC) for the two harvest dates. All three ripeners increased TRS/TC at 34 and 54 DAT when compared to control. Further, the TRS/TC for the Polado and Arsenal treatments were significantly higher than the two rates of Fusilade tested at 54 DAT. Table 3 shows the effect of the three chemical ripeners on juice purity at the two sampling dates. All ripener treatments significantly increased the purity of juice when compared to control at both 34 and 54 DAT. There was further differentiation in the purity of juice among ripener treatments, with Polado and Arsenal treatments generally resulting in higher values. Table 4 shows the effect of the three chemical ripeners on the yield of tons cane per acre (TC/A), TRS/TC, and TRS/A at 54 DAT. All three ripeners significantly increased the yield of theoretical recoverable sugar per acre (TRS/A) when compared to control (untreated) plots at 54 DAT. The estimated yield of TC/A was derived from mean stalk weight and millable stalk counts taken prior to the 2002 harvest. There was no difference between TC/A for Polado and the low rate of Fusilade when compared to the control. The TC/A for the two Arsenal treatments was significantly higher than control, undoubtedly because of the higher numbers of millable stalks (Table 5) at harvest as a result of the previous year's treatment. There were no significant differences in millable stalks between control and either the Polado or Fusilade treatments. However, Arsenal at the two rates tested actually stimulated shoot development, which meant a significantly higher stalk count at harvest. It is apparent that Arsenal has commercial potential for ripening sugarcane in Louisiana. However, commercialization decisions rest with BASF, the manufacturer.

The effect of the 10 chemical ripener treatments on MSW is shown in Table 6. There were no significant differences in MSW between any of the treatments when compared to control at either 37 or 49 DAT although large numerical differences were noted. Undoubtedly, the lodged condition of the crop had an impact on the variability in MSW at harvest. Table 7 shows the effect of the various ripener treatments on TRS/TC. At 37 DAT, there was a significant increase in TRS/TC for A13013A, Arsenal, Polado, Polado plus Takeup and Touchdown at all rates tested as well as the high rate of Palisade. On the other hand, all treatments with the exception of Accent, Kayphol, and MON 37500 at the rates tested significantly increased TRS/TC at 49 DAT. Most of the ripeners tested also increased the purity of the juice when compared to control at both 37 and 49 DAT (Table 8). However, purity of juice was actually significantly reduced in cane by the application of Kayphol when harvested at 37 DAT. Table 9 shows the effect of the various chemical ripeners on TC/A, TRS/TC, and TRS/A at 49 DAT. TC/A was the product of MSW times a constant of 40,000. Using these calculations, there was a significant reduction in TC/A for two rates of Polado, 4 and 6 oz/A, when compared to control. There was also a large reduction in the TC/A for the Arsenal treatment at the high rate, 9.2 oz/A, that approached significance. A significant increase in TRS/A was noted for A13013A at 2.87 oz/A, Polado at 8 oz/A, Polado at 6 oz/A plus Takeup and Touchdown at 8 oz/A. The TRS/A for the other rates of these three ripeners as well as the low rate of Arsenal approached significance.

These data show that Polado and possibly Arsenal at the rates tested are effective in increasing both TRS/TC and TRS/A for the sugarcane variety LCP 85-384, while Arsenal at the low rate has minimal impact on TC/A. The millable stalk counts obtained from plots treated the previous year show that at harvest of the following year Arsenal, at the rates studied, can actually increase the number of millable stalks in the subsequent stubble crop. Both Polado and

Touchdown are glyphosate derivatives; therefore, only Arsenal offers new chemistry to compete with glyphosate as a proven chemical ripener under the conditions and the varieties found in Louisiana. Additional studies are indicated with A13013A to determine its efficacy across varieties and years.

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Table 1. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on mean stalk weight (MSW) of the sugarcane variety LCP 85-384 in the second-stubble crop when harvested at 34 and 54 days after treatment (DAT)[12].

		Mean stalk weight (lb)	
		DAT	
Treatment	Rate	34	54
Polado	0.200 lb/A	1.39 B	1.44 ABC
Arsenal	0.143 lb/A	1.53 AB	1.61 A
Arsenal	0.214 lb/A	1.54 AB	1.37 BC
Fusilade	0.062 lb/A	1.51 AB	1.48 AB
Fusilade	0.087 lb/a	1.58 A	1.28 C

[1] Treatment date, August 21, 2002; Harvest dates, September 24 (34 DAT) and October 14 (54 DAT)
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 2. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on the yield of theoretical recoverable sugar per ton of cane (TRS/TC) of the sugarcane variety LCP 85-384 in the second-stubble crop when harvested at 34 and 54 days after treatment (DAT)[12].

		TRS/TC	
		DAT	
Treatment	Rate	34	54
Control	-	169 C	200 C
Polado	0.200 lb/A	240 A	276 A
Arsenal	0.143 lb/A	220 AB	264 A
Arsenal	0.214 lb/A	231 A	274 A
Fusilade	0.062 lb/A	207 B	236 B
Fusilade	0.087 lb/a	221 AB	235 B

[1] Treatment date, August 21, 2002; Harvest dates, September 24 (34 DAT) and October 14 (54 DAT)
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 3. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on the juice purity of the sugarcane variety LCP 85-384 in the second-stubble crop when harvested at 34 and 54 days after treatment (DAT) [1,2].

		Purity (%)	
		DAT	
Treatment	Rate	34	54
Control	-	78.6 B	81.0 D
Polado	0.200 lb/A	84.2 A	87.7 AB
Arsenal	0.143 lb/A	84.3 A	87.2 ABC
Arsenal	0.214 lb/A	84.6 A	88.2 A
Fusilade	0.062 lb/A	82.9 A	86.0 BC
Fusilade	0.087 lb/a	84.3 A	85.5 C

[1] Treatment date, August 21, 2002; Harvest dates, September 24 (34 DAT) and October 14 (54 DAT)
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 4. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on estimated yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC) and estimated yield of theoretical recoverable sugar per acre (TRS/A) of the sugarcane variety LCP 85-384 in the second-stubble crop when harvested 54 days after treatment (DAT) [1,2].

		TC/A	TRS/TC	TRS/A
Treatment	Rate	(tons)	(lb)	(lb)
Control	-	39.5 AB	200 C	6,632 B
Polado	0.200 lb/A	36.1 B	276 A	8,700 A
Arsenal	0.143 lb/A	43.0 A	264 A	9,446 A
Arsenal	0.214 lb/A	43.5 A	274 A	10,052 A
Fusilade	0.062 lb/A	40.8 AB	236 B	8,451 A
Fusilade	0.087 lb/a	44.3 A	235 B	9,854 A

[1] Treatment date, August 21, 2002; Harvest date, October 14, 2002 (54 DAT)
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 5. Millable stalk counts in the second-stubble crop following the application of the chemical ripeners Polado, Arsenal, and Fusilade in August 2001 to the sugarcane variety LCP 85-384 in the first-stubble crop [12].

		Millable stalk count
Treatment	Rate	(number)
Control	-	51,561 B
Polado	0.200 lb/A	52,025 B
Arsenal	0.143 lb/A	56,338 A
Arsenal	0.214 lb/A	56,439 A
Fusilade	0.062 lb/A	53,826 AB
Fusilade	0.087 lb/a	55,931 A

[1] Treatment date, August 23, 2001; Millable stalk counts taken on August 16, 2002
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 6. Effect of various chemical ripeners on mean stalk weight (MSW) of the sugarcane variety LCP 85-384 in the third-stubble crop when harvested at 37 and 49 days after treatment (DAT)[1].

		Mean stalk weight (lb)	
		DAT	
Treatment	Rate	37	49
Control	-	1.38	1.44
A13013A	2.87 oz/A	1.39	1.46
A13013A	5.75 oz/A	1.25	1.35
Accent	0.50 oz/A	1.34	1.26
Arsenal	8.00 oz/A	1.44	1.41
Arsenal	9.20 oz/A	1.29	1.25
Kayphol	2.00 qt/A	1.46	1.32
MON 37500	0.50 oz/A	1.48	1.42
Oust	0.28 oz/A	1.43	1.35
Palisade	0.11 lb/A	1.33	1.38
Palisade	0.22 lb/A	1.42	1.42
Polado	4.00 oz/A	1.48	1.21
Polado	6.00 oz/A	1.33	1.23
Polado	8.00 oz/A	1.41	1.37
Polado + Takeup	6.00 oz/A 1.00 pt/A	1.38	1.42
Touchdown	4.00 oz/A	1.41	1.36
Touchdown	8.00 oz/A	1.50	1.43
Touchdown	10.6 oz/A	1.32	1.44
LSD (P=0.05)		NS	NS

[1] Treatment date, September 4, 2002; Harvest dates, October 11 (37 DAT) and October 23 (49 DAT).

Table 7. Effect of various chemical ripeners on the yield of theoretical recoverable sugar per ton of cane (TRS/TC) of the sugarcane variety LCP 85-384 in the third-stubble crop when harvested at 37 and 49 days after treatment (DAT)[1].

		TRS/TC (lb)	
		DAT	
Treatment	Rate	37	49
Control	-	204	191
A13013A	2.87 oz/A	235	232
A13013A	5.75 oz/A	232	242
Accent	0.50 oz/A	204	193
Arsenal	8.00 oz/A	241	226
Arsenal	9.20 oz/A	246	226
Kayphol	2.00 qt/A	190	202
MON 37500	0.50 oz/A	213	203
Oust	0.28 oz/A	218	220
Palisade	0.11 lb/A	208	214
Palisade	0.22 lb/A	222	216
Polado	4.00 oz/A	241	232
Polado	6.00 oz/A	259	242
Polado	8.00 oz/A	253	242
Polado + Takeup	6.00 oz/A 1.00 pt/A	246	243
Touchdown	4.00 oz/A	249	235
Touchdown	8.00 oz/A	236	230
Touchdown	10.6 oz/A	251	238
LSD (P=0.05)		18	16

[1] Treatment date, September 4, 2002; Harvest dates, October 11 (37 DAT) and October 23 (49 DAT)

Table 8. Effect of various chemical ripeners on the juice purity of the sugarcane variety LCP 85-384 in the third-stubble crop when harvested at 37 and 49 days after treatment (DAT) [1].

		Purity (%)	
		DAT	
Treatment	Rate	37	49
Control	-	82.6	75.7
A13013A	2.87 oz/A	84.0	79.2
A13013A	5.75 oz/A	83.8	79.8
Accent	0.50 oz/A	81.6	75.7
Arsenal	8.00 oz/A	85.8	78.5
Arsenal	9.20 oz/A	86.6	78.1
Kayphol	2.00 qt/A	80.0	77.2
MON 37500	0.50 oz/A	82.9	77.3
Oust	0.28 oz/A	83.6	78.8
Palisade	0.11 lb/A	83.0	78.9
Palisade	0.22 lb/A	84.8	78.9
Polado	4.00 oz/A	84.7	79.1
Polado	6.00 oz/A	86.5	80.2
Polado	8.00 oz/A	85.6	79.6
Polado + Takeup	6.00 oz/A 1.00 pt/A	85.2	79.5
Touchdown	4.00 oz/A	85.3	79.2
Touchdown	8.00 oz/A	85.1	79.2
Touchdown	10.6 oz/A	85.8	79.2
LSD (P=0.05)		2.4	2.4

[1] Treatment date, September 4, 2002; Harvest dates, October 11 (37 DAT) and October 23 (49 DAT)

Table 9. Effect of various chemical ripeners on estimated yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC) and estimated yield of theoretical recoverable sugar per acre (TRS/A) of the sugarcane variety LCP 85-384 in the third-stubble crop when harvested 49 days after treatment (DAT) [1].

Treatment	Rate	TC/A (tons)	TRS/TC (lb)	TRS/A (lb)
Control	-	28.8	191	5,539
A13013A	2.87 oz/A	29.1	232	6,757
A13013A	5.75 oz/A	27.0	242	6,544
Accent	0.50 oz/A	25.3	193	4,873
Arsenal	8.00 oz/A	28.1	226	6,347
Arsenal	9.20 oz/A	24.9	226	5,640
Kayphol	2.00 qt/A	26.3	202	5,320
MON 37500	0.50 oz/A	28.3	203	5,745
Oust	0.28 oz/A	27.1	220	5,956
Palisade	0.11 lb/A	27.6	214	5,904
Palisade	0.22 lb/A	28.4	216	6,114
Polado	4.00 oz/A	24.2	232	5,651
Polado	6.00 oz/A	24.6	242	5,981
Polado	8.00 oz/A	27.5	242	6,641
Polado + Takeup	6.00 oz/A 1.00 pt/A	28.4	243	6,857
Touchdown	4.00 oz/A	28.6	235	6,572
Touchdown	8.00 oz/A	28.8	230	6,851
Touchdown	10.6 oz/A	27.2	238	6,411
LSD (P=0.05)		4.1	16	1,054

[1] Treatment date, September 4, 2002; Harvest date, October 23 (49 DAT)

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