SUGARCANE RESEARCH

ANNUAL PROGRESS REPORT

2001

This report is from 2001 only and should be regarded as preliminary. Complete research is reported in appropriate Louisiana Agricultural Experiment Station and Louisiana Cooperative Extension Service publications and/or other professional publications.

LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER
WILLIAM B. RICHARDSON
CHANCELLOR AND CHALKLEY FAMILY ENDOWED CHAIR

LEO J. GUEDRY, EXECUTIVE VICE CHANCELLOR

LOUISIANA AGRICULTURAL EXPERIMENT STATION
WILLIAM H. BROWN
VICE CHANCELLOR AND DIRECTOR

LOUISIANA COOPERATIVE EXTENSION SERVICE
PAUL D. COREIL, VICE CHANCELLOR AND DIRECTOR

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 2001.

Important parts of the 2001 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.**

Table of Contents

PLANT PATHOLOGY

WEED CONTROL

CULTURAL PRACTICES

SOIL FERTILITY - SECTION 1

SOIL FERTILITY - SECTION 2

AN OVERVIEW OF 2001 ACTIVITIES IN THE LOUISIANA "L" SUGARCANE VARIETY DEVELOPMENT PROGRAM

Kenneth A. Gravois
Sugar Research Station

The primary objective of the Louisiana Agricultural Experiment Station (LAES) 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 LAES is carried out by a team of scientists (Table 1). The LAES 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 outfield test locations. Outfield testing is conducted by personnel of the LAES, 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 (plant cane, 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 LAES Sugarcane Breeding and Variety Development Team in 2001.

Team Member	Budgetary Unit	Responsibility
Kenneth Gravois	Sugar Research Station	Program Leader
Keith Bischoff	Sugar Research Station	Selection
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
Joel Hebert	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
Harold Schexnayder, Sr.	St. Gabriel Research Station	Farm Manager

A total of 97,898 seedlings from 233 crosses from the 2000 crossing series were planted in the field in the spring of 2001. A total of 93,790 seedlings survived transplanting. The 96% survival was excellent after transplanting in mid-April. The majority of the seedlings were from crosses of commercial varieties and elite experimental varieties. Selection will be carried out in 2002 when the seedlings are in the first stubble crop.

Photoperiod treatments to induce flowering began on May 31 and continued until September 10. Flowering in 2001 was excellent, with 531 crosses being made. Germination tests were conducted in December and indicated excellent germination for the 2001 crossing campaign. Seed production for 2001 was 569,552.

In the fall of 2001, individual selection was practiced on 38,422 first stubble seedlings that represented the 1999 crossing series. Family selection (top 82% in 2001) was utilized based on information from the cross appraisal study. Of the 38,422 clones, 3,369 were selected and planted to establish the first-line trials.

Established procedures were used to advance superior clones of the 1998 crossing series from first-line trials to second-line trials (759 clones) and of the 1997 crossing series from second-line trials to increase trials (392 clones). After preliminary ratings for cane yield and plant type in August, clones with acceptable ratings were further evaluated for lodging, borer damage, presence of disease, presence of pith/tube, and Brix/sugar per ton.

The best 37 experimental varieties from the 1996 crossing series were assigned permanent variety designations in the fall of 2001. Newly assigned varieties were entered in replicated nursery trials at three on-station locations (St. Gabriel Research Station, USDA Ardoyne Farm, Iberia Research Station). "L" and "HoCP or Ho" varieties of the 2001 assignment series were exchanged in the fall of 2001 to plant cooperative infield and nursery tests the following year.

Experimental varieties were replanted in infield and off-station nursery tests (13 varieties of the 2000 series), introduced to the outfield tests (four varieties of the 1999 series), and planted in outfield tests (two varieties of the 1997 series and two varieties of the 1998 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" experimental clones through stages of testing in 2001 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 2001.

Series	Stage of Testing	Number of experimental varieties
L 1997	Outfield - Replanted and harvested as plant cane; Off-station nurseries - 2nd stubble harvested	2
L 1998	Outfield - Planted; On-station nurseries - 2nd stubble harvested; Off-station nurseries - 1st stubble harvested	2
L 1999	Outfield - Introduced; On-station Nurseries 1st stubble harvested; Off-station nurseries - plant cane harvested.	4
L 2000	On-station nurseries plant cane harvested; Off-station nurseries planted.	13
L 2001	Assignment - On-station nurseries planted	37

Progress in the LAES Sugarcane Variety Development Program would not be possible without the financial support of the director of the LAES and the Louisiana sugar industry through the American Sugar Cane League.

Rainfall for 2001 at the St. Gabriel Research Station is reported in Table 3. Total rainfall for the year was 67.76 inches, which was 119 percent of normal annual rainfall. A dry spring (April and March) was followed by an excessively wet June. Tropical storm Allison contributed to June rainfall that was 399% of normal precipitation. Freezing temperatures during the winter of 2000-2001 contributed to less than normal amounts of sugarcane rust. Pith in experimental varieties was low compared to other years, likely because of a more normal rain fall pattern during the growing season.

Table 3. 2001 rainfall reported by date at the St. Gabriel Research Station, St. Gabriel, Louisiana.

January	**Rainfall (in.)**	**Comments**
7	0.60	
9	0.01	
11	0.19	
15	0.60	
16	0.52	
18	0.16	
19	0.45	
24	0.01	

	Rainfall (in.)	**Comments**
29	1.13	
	3.67	76% Normal
February		
9	0.84	
12	0.01	
13	0.02	
16	0.09	

	Rainfall (in.)	Comments
25	0.22	
28	1.16	
	2.34	74% Normal
March		
1	0.25	
2	0.15	
3	1.8	
9	0.72	
12	1.55	
14	1.77	
17	0.15	
24	0.20	
27	0.10	
28	2.05	
	8.74	189% Normal
April		
24	2.25	54% Normal
May		
8	0.48	
11	0.12	
22	0.20	
31	0.70	
	1.50	35% Normal
June		
4	0.65	
5	3.60	

	Rainfall (in.)	Comments
6	6.40	
7	5.90	
8	1.70	
9	0.30	
10	1.7	
21	0.20	
27	0.20	
28	0.10	
29	0.15	
	20.90	399% Normal
July		
4	0.12	
5	3.80	
11	1.80	
12	0.10	
21	0.62	
26	0.36	
27	0.05	
28	1.60	
29	0.90	
31	0.13	
	9.48	159% Normal
August		
1	0.46	
2	0.03	
5	0.73	
6	0.37	
7	0.51	

	Rainfall (in.)	Comments
8	0.33	
10	0.79	
11	0.20	
12	0.17	
14	1.00	
15	0.85	
19	0.08	
26	0.03	
27	0.07	
28	0.03	
29	0.24	
30	0.02	
31	0.40	
	6.31	112% Normal
September		
1	0.35	
2	1.46	
4	1.35	
6	0.45	
7	0.37	
8	0.12	
9	0.04	
21	0.07	
	4.21	95% Normal
October		
5	0.04	
6	0.39	

	Rainfall (in.)	Comments
10	0.70	
11	1.00	
12	0.15	
13	2.50	
	4.78	153% Normal
November		
22	0.13	
23	0.04	
24	0.32	
28	0.05	
29	0.47	
	1.01	25% Normal
December		
13	1.32	
17	0.54	
22	0.18	
28	0.50	
31	0.03	
	2.57	46% Normal
TOTAL 2001	**67.76**	**119% NORMAL**

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

2001 PHOTOPERIOD AND CROSSING IN THE
LOUISIANA "L" SUGARCANE VARIETY DEVELOPMENT PROGRAM

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

Photoperiod induction and crossing are the first stages in the Louisiana "L" 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 from the most desirable crosses. Viable "true" seed is seed that has a sufficient germination count. This seed will then be advanced to the seedling stage of the Sugarcane Variety Development Program.

Cuttings of potential parent varieties used for the 2001crossing season were planted in the fall of 2000. 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 2001, the cuttings were then transferred to can culture. In early April, the cans were moved from the greenhouse to the photoperiod rail carts. Soluble fertilizer applications were continued on a biweekly basis. Fertilization was discontinued in early- to mid-May to condition the plants for floral induction. Three additional applications of dry granular fertilizer (8-24-24, one Tbs/can) were applied to the cans during July, August, and September. A reduced nitrogen ratio makes a higher C:N ratio, which is more desirable for the ease of flowering.

Natural lighting and six light-tight chambers (photoperiod bays) were used to impose photoperiod treatments. To prevent overwhelming the crossing facilities, two flowering peaks were planned for late September and early October. Records of varietal flowering, past photoperiod response, and pollen production were used to determine the most appropriate photoperiod treatment for each variety. Poor flowering varieties or those varieties with no flowering history were generally scheduled within the late peak and the shortest inductive treatments (bays 1 and 2). The first photoperiod treatments were begun 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, 2000, 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 2001 (Tables 1-2). Total flowering percentage for the six bays was 55% which was comprised from 1,553 stalks. With an adequate germination rate, this is more than adequate tassels to accomplish sufficient seed production. In 2001, our newest commercial variety, HOCP 91-555, flowered for the first time in our program. Four tassels were acquired from eight total stalks. Because of its low pollen quantity, it was used mainly as a female. Although we have had problems achieving tassels from LHO83-153 variety, five tassels were

obtained from nine total stalks. The mean flowering dates (Table 1) were earlier than in years past with the exception of Bay 1.

Crossing began on September 7 and ended on November 9, 2001. A total of 861 tassels of 100 varieties were used to produce 529 total crosses yielding 569,552 viable seed with 509,992 seed produced from biparental crosses (Table 3). The germination of seed from biparental crosses was high (average 151 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 being photoperiod induction. Close attention was made in maintaining high relative humidity levels within the crossing house. Seed production in 2001was excellent for the Louisiana "L" Sugarcane Variety Development Program.

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, 2001. Conditions for natural flowering were good. The data collected will be used to gage photoperiod response for the upcoming crossing season.

Table 1. Summary of 2001 photoperiod treatments†.

Bay	Cart	Treatment Start Date	Days of Constant Photoperiod	Date Photoperiod Decline Started	Days of Declining Photoperiod		Mean Flowering Date	Total Stalks	Percent Flowered
					Peak 1	Peak 2			
1	A	June 26	34	July 30	62	77	Oct 31±6	93	28
1	B	June 26	34	July 30	62	77	Nov 5±5	91	10
1	C	June 26	34	July 30	62	77	Nov 4±3	90	11
2	A	June 16	34	July 20	72	87	Oct 9±9	81	81
2	B	June 16	34	July 20	72	87	Oct 3±11	87	69
2	C	June 16	34	July 20	72	87	Oct 3±11	94	67
3	A	May 30	37	July 6	87	102	Sept 26±9	83	87
3	B	May 30	37	July 6	87	102	Sept 24±12	91	71
3	C	May 30	37	July 6	87	102	Sept 23±11	92	72
4	A	May 30	37	July 6	87	102	Oct 2±11	84	65
4	B	May 30	37	July 6	87	102	Oct 3±10	89	53
4	C	May 30	37	July 6	87	102	Oct 12±9	82	43
5	A	June 4	36	July 10	82	97	Oct 6±12	84	73
5	B	June 4	36	July 10	82	97	Oct 15±12	83	30
5	C	June 4	36	July 10	82	97	Oct 25±10	78	31
6	A	May 30	41	July 10	82	97	Oct 6±13	79	89
6	B	May 30	41	July 10	82	97	Oct 6±12	84	58
6	C	May 30	41	July 10	82	97	Oct 8±14	88	66

† Decline rate = 1 minute/day; all bays were heated.

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	240	1553	861	4.89	3.59	4.9	86
					±1.52	±1.64	±1.5	±13

† 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 2001 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	455	509,992	1125 ± 1312	1077 ±1201	151 ± 141
Polycross	18	19,388	1077 ±947	750 ± 702	137 ± 132
Self	56	40,172	718 ± 942	715 ± 944	102± 131
Total	529	569,552	1079 ± 1271	1027 ± 1168	145 ± 140

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

		Total Varieties		Varieties Flowering			
Total Cans	Cans used	Known flowering response	Unknown flowering response	Known flowering response	Unknown flowering response	Mean stalks per can	Mean tassels per can†
-- number --							
108	13	1	12	1	6	3.4 ± 1.3	3.4 ± 1.3

† Based upon cans with tassels.

Table 5. Varietal flowering summary in 2001 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	34	82±2	6±1	8	2	25
CP70-321	37	88±5	7	8	4	50
CP77-405	34	69±3	4±1	3	3	100
CP78-317	34	92±4	5±1	9	2	22
CP79-318	34	84±4	5±1	10	5	50
CP79-348	39±1	69±1	3	8	4	50
CP82-550	41	.	.	5	.	.
CP83-644	39±1	99±3	7	20	8	40
CP91-572	34	66	.	9	6	67
HO89-889	40±1	97±2	5±1	7	4	57
HO95-988	36	90±2	5	24	16	67
HOCP00-961	38±1	62±1	6	12	12	100
HOCP85-845	37	96±3	4	40	26	65
HOCP88-739	38±1	95±3	6	17	9	53
HOCP89-846	35	86±2	6	30	22	73
HOCP90-941	39±1	70±1	4	11	11	100
HOCP91-552	35	81±3	4	20	18	90
HOCP91-555	39±1	106±2	7	8	4	50
HOCP92-618	37	86±1	4	8	8	100
HOCP92-624	35	71±2	7	44	29	66
HOCP92-648	35	81±2	7	35	19	54
HOCP94-806	37	106±3	5	10	9	90
HOCP95-951	37	73±1	5	13	13	100
HOCP96-509	37	106±2	5	33	9	27
HOCP96-522	34	76±5	5	17	11	65
HOCP96-540	36	81±2	4	29	24	83
HOCP96-561	37	94±1	4	19	14	74
HOCP97-606	36	87±3	5	32	12	38
HOCP97-609	36	82±2	5	27	26	96
HOCP97-621	35	84±2	4	18	13	72
HOCP97-645	37	101±3	5	10	3	30
HOCP98-741	38±1	83±4	5±1	10	6	60
HOCP98-771	37	119±4	7	4	2	50
HOCP98-776	35	79±3	5	14	14	100
HOCP98-778	36	99±4	5	14	9	64
HOCP98-781	34	70±5	5±1	8	6	75
HOCP99-804	34	.	.	15	.	.
HOCP99-808	34	.	.	12	.	.
HOCP99-825	39±1	83±3	6	10	8	80
HOCP99-833	34	97±2	5±1	7	5	71
L00-247	34	.	.	12	.	.
L00-249	39±1	98±1	5	12	5	42
L00-254	38±1	109±2	5±1	13	6	46
L00-255	39±1	.	.	8	.	.

Table 5. Continued.

VARIETY	Days of Constant Photoperiod	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
L00-257	36±1	81±5	3	9	2	22
L00-259	38±1	98±2	4±1	12	4	33
L00-260	38±2	83±5	4	4	4	100
L00-261	38±1	.	.	10	.	.
L00-263	34	.	.	5	.	.
L00-264	38±1	86±5	7	10	5	50
L00-266	38±1	90	3	12	1	8
L00-268	39±1	96±6	4±1	12	4	33
L00-271	37±1	79±2	4	11	5	45
L00-273	37±1	90±1	5	8	3	38
L00-275	38±1	.	.	10	.	.
L00-278	37±1	.	.	7	.	.
L75-056	35±1	66	3	7	1	14
L89-113	39±1	92±3	3	20	11	55
L91-255	35	73±6	5±1	22	6	27
L91-281	35	76±2	5	19	13	68
L92-312	39±1	94±3	3	11	9	82
L92-321	36	90±8	6±1	8	2	25
L93-363	35	68	5	13	3	23
L93-386	39±1	88±3	5±1	8	7	88
L93-391	39±1	96±3	6	10	10	100
L93-399	39±1	97±3	7	12	11	92
L94-426	36	79±1	6	33	29	88
L94-428	37	91±5	5	26	14	54
L94-432	39	89±2	4	21	16	76
L94-433	38±1	115±4	3	5	3	60
L96-040	36	85±2	4	10	9	90
L96-092	38±1	111±4	4±1	15	3	20
L97-128	35	75±2	6	23	20	87
L97-137	39±1	80±7	5±1	14	5	36
L98-197	36	83±3	4±1	12	3	25
L98-207	35	86±2	4	49	17	35
L98-209	37	93±2	4	29	25	86
L99-213	37	98	4	9	2	22
L99-214	35	92±2	6±1	17	3	18
L99-221	36	75±2	6	11	11	100
L99-226	38	85±2	4	20	19	95
L99-231	38±1	103±7	6	12	5	42
L99-233	35	71±2	4	20	14	70
L99-234	36±1	74±1	4	10	10	100
L99-238	39±1	103±1	5±1	6	4	67
L99-240	37	.	.	7	.	.
LCP81-010	35	79±2	5	27	16	59
LCP82-089	39±1	87±4	3±1	16	6	38

Table 5. Continued.

Table 7. Continued.

VARIETY	Days of Constant Photoperiod	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
LCP83-137	39±1	105±8	6±1	8	2	25
LCP85-313	39±1	95±5	7	12	6	50
LCP85-384	36	87±1	3	110	67	61
LCP86-454	37	83±4	4±1	22	5	23
LCP87-492	34	72±1	6	12	6	50
LHO83-153	38±1	83±3	6	9	5	56
LHO92-314	39±1	96±2	4±1	16	12	75
TUCCP77-042	35	90±1	5	29	20	69
US80-004	37	101±5	6±1	6	2	33
US96-002	37	91±3	7	5	3	60
US99-002	34	88±2	6	5	4	80
US99-004	34	94±2	6±1	4	4	100

Table 6. Summary of varietal response to natural photoperiod in 2001.

VARIETY	First Flower Date	Mean Flower Date	Flowers
HOCP00-961	337	342±6	5
L00-247	354	354	2
L00-259	341	348±7	4
L00-266	354	354	3
L00-268	354	354	3
LCP85-384	354	354	2
US99-002	337	339±2	5

Table 7. Crosses and seed made in 2001 sorted by cross number.

CROSS	FEMALE	MALE	SEED
XL01-001	HOCP92-624	HOCP91-552	6898
XL01-002	HOCP91-552	HOCP91-552	2095
XL01-003	HOCP92-624	L99-233	6923
XL01-004	L99-233	L99-233	1458
XL01-005	L97-128	L99-233	405
XL01-006	HOCP92-624	HOCP00-961	511
XL01-007	HOCP00-961	HOCP00-961	59
XL01-008	L75-056	01P1	92
XL01-009	HOCP91-552	01P1	694
XL01-010	LCP81-010	01P2	0
XL01-011	HOCP00-961	01P2	87
CROSS	FEMALE	MALE	SEED
XL01-012	HOCP92-648	HOCP95-951	35
XL01-013	L97-128	HOCP95-951	0
XL01-014	L93-363	HOCP95-951	0
XL01-015	HOCP95-951	HOCP95-951	0
XL01-016	L93-363	HOCP98-776	0
XL01-017	HOCP98-776	HOCP98-776	0
XL01-018	L99-221	L91-255	30
XL01-019	L97-128	L91-255	0
XL01-020	L91-255	L91-255	11
XL01-021	L97-128	HOCP90-941	0
XL01-022	HOCP92-624	HOCP90-941	9
CROSS	FEMALE	MALE	SEED
XL01-023	L99-221	HOCP90-941	8
XL01-024	LCP81-010	HOCP90-941	133
XL01-025	HOCP90-941	HOCP90-941	30
XL01-026	L97-128	HOCP96-540	27
XL01-027	HOCP92-624	HOCP96-540	58

Table 7. Continued.

CROSS	FEMALE	MALE	SEED
XL01-028	L99-221	HOCP96-540	16
XL01-029	L91-281	HOCP96-540	240
XL01-030	HOCP96-540	HOCP96-540	251
XL01-031	HOCP92-624	HOCP98-776	5
XL01-032	L99-221	HOCP98-776	0
XL01-033	L91-281	HOCP98-776	194
XL01-034	HOCP00-961	HOCP90-941	101
XL01-035	L91-281	HOCP90-941	43
XL01-036	L94-426	HOCP90-941	59
XL01-037	HOCP92-648	HOCP90-941	41
XL01-038	HOCP97-609	HOCP90-941	0
XL01-039	L94-426	CP79-348	11
XL01-040	CP79-348	CP79-348	172
XL01-041	HOCP00-961	HOCP96-540	8
XL01-042	L94-426	HOCP96-540	106
XL01-043	HOCP92-648	HOCP96-540	118
XL01-044	HOCP92-624	HOCP95-951	23
XL01-045	L94-426	HOCP95-951	14
XL01-046	HOCP92-624	HOCP85-845	0
XL01-047	L94-426	HOCP85-845	0
XL01-048	L97-128	HOCP85-845	0
XL01-049	HOCP85-845	HOCP85-845	158
XL01-050	LCP86-454	LCP85-384	891
XL01-051	HOCP98-781	LCP85-384	299
XL01-052	L94-426	LCP85-384	282
XL01-053	L94-428	LCP85-384	110
XL01-054	HOCP90-941	LCP85-384	760
XL01-055	HOCP98-741	LCP85-384	1116
XL01-056	LCP85-384	LCP85-384	335
XL01-057	HOCP98-781	HOCP96-540	533
XL01-058	L94-428	HOCP96-540	589
XL01-059	HOCP95-951	HOCP96-540	809
XL01-060	CP70-321	L99-226	38
XL01-061	HOCP98-781	L99-226	227
XL01-062	HOCP92-624	L99-226	707
XL01-063	L94-426	L99-226	38
XL01-064	HOCP97-609	L99-226	264
XL01-065	HOCP00-961	L99-226	49
XL01-066	L99-226	L99-226	165
XL01-067	L94-426	L99-234	162
XL01-068	HOCP90-941	L99-234	240
XL01-069	L91-281	L99-234	700
XL01-070	HOCP00-961	L99-234	54
XL01-071	HOCP97-609	L99-234	91
XL01-072	L99-234	L99-234	439
XL01-073	HOCP00-961	L97-137	166
XL01-074	L91-281	L97-137	870
XL01-075	HOCP90-941	L97-137	351
XL01-076	HOCP95-951	L97-137	977
XL01-077	L97-137	L97-137	72
XL01-078	HOCP95-951	LCP82-089	734
XL01-079	HOCP97-609	LCP82-089	709
XL01-080	L99-226	LCP82-089	836
XL01-081	LCP82-089	LCP82-089	1281
XL01-082	HOCP92-624	LCP85-384	295
XL01-083	HOCP92-648	LCP85-384	1483
XL01-084	HOCP96-522	LCP85-384	122
XL01-085	L99-226	LCP85-384	895
XL01-086	CP77-405	LCP85-384	2376
XL01-087	HOCP98-781	LCP85-384	0
XL01-088	L91-255	LCP85-384	235
XL01-089	L94-426	LCP85-384	263
XL01-090	HOCP89-846	LCP85-384	218
XL01-091	HOCP95-951	CP79-348	718
XL01-092	HOCP97-609	CP79-348	69
XL01-093	HOCP98-776	CP79-348	1199
XL01-094	HOCP97-609	HOCP00-961	142
XL01-095	HOCP98-776	HOCP00-961	527
XL01-096	L98-197	HOCP00-961	1342
XL01-097	HOCP97-609	HOCP89-846	214
XL01-098	HOCP98-776	HOCP89-846	26
XL01-099	HOCP89-846	HOCP89-846	25
XL01-100	HOCP91-552	HOCP96-540	1041
XL01-101	HOCP92-648	HOCP96-540	1175
XL01-102	HOCP95-951	HOCP96-540	281
XL01-103	HOCP90-941	L98-209	61
XL01-104	HOCP92-624	L98-209	661
XL01-105	L94-426	L98-209	93
XL01-106	L98-209	L98-209	730
XL01-107	HOCP92-648	L99-234	386
XL01-108	HOCP95-951	L99-234	143
XL01-109	HO95-988	LCP85-384	1211
XL01-110	HOCP85-845	LCP85-384	1160
XL01-111	HOCP89-846	LCP85-384	339
XL01-112	HOCP92-648	LCP85-384	1283

Table 7. Continued.

XL01-113	LCP82-089	LCP85-384	496	XL01-155	HOCP88-739	LCP85-384	489
XL01-114	HOCP96-522	LCP85-384	512	XL01-156	L92-321	LCP85-384	0
XL01-115	L00-264	LCP85-384	440	XL01-157	LCP81-010	LCP85-384	3017
XL01-116	L00-271	LCP85-384	310	XL01-158	L96-040	LCP85-384	1128
XL01-117	L94-426	LCP85-384	430	XL01-159	HOCP89-846	LCP85-384	482
XL01-117.5	HO91-572	LCP85-384	460	XL01-160	HOCP85-845	HOCP92-618	2026
XL01-118	HO95-988	HOCP89-846	96	XL01-161	HOCP92-624	HOCP92-618	3662
XL01-119	HOCP96-522	HOCP89-846	481	XL01-162	HOCP98-741	HOCP92-618	6234
XL01-120	HOCP96-540	HOCP89-846	862	XL01-163	L00-271	HOCP92-618	107
XL01-121	LCP85-384	HOCP89-846	704	XL01-164	L96-040	HOCP92-618	641
XL01-122	HOCP92-624	L91-255	4977	XL01-165	HOCP89-846	HOCP92-618	2509
XL01-123	HOCP96-522	L91-255	567	XL01-166	L99-226	HOCP92-618	2349
XL01-124	HOCP96-540	L91-255	3959	XL01-167	LCP87-492	HOCP92-618	189
XL01-125	HOCP97-606	L91-255	325	XL01-168	LCP85-384	HOCP92-618	1018
XL01-126	HOCP98-776	L91-255	811	XL01-169	HOCP92-618	HOCP92-618	408
XL01-127	HOCP92-624	HOCP96-561	111	XL01-170	HOCP98-776	L99-233	3589
XL01-128	HOCP96-522	HOCP96-561	520	XL01-171	HOCP99-825	L99-233	44
XL01-129	HOCP99-825	HOCP96-561	38	XL01-172	L94-426	L99-233	473
XL01-130	HOCP96-561	HOCP96-561	65	XL01-173	L96-040	L99-233	906
XL01-131	HOCP92-624	HOCP98-741	1173	XL01-174	L99-226	L99-233	3082
XL01-132	HOCP97-609	HOCP98-741	657	XL01-175	LCP85-384	L99-233	2271
XL01-133	HOCP99-825	HOCP98-741	72	XL01-176	L99-233	L99-233	1990
XL01-134	HOCP98-741	HOCP98-741	957	XL01-177	HOCP98-776	HOCP96-540	3002
XL01-135	HOCP92-624	L00-257	861	XL01-178	L99-221	HOCP96-540	380
XL01-136	HOCP99-825	L00-257	24	XL01-179	L99-234	HOCP96-540	832
XL01-138	L00-257	L00-257	43	XL01-180	HOCP97-606	01P3	45
XL01-139	HOCP96-522	L98-209	117	XL01-181	HOCP97-609	01P3	1637
XL01-140	L00-271	L98-209	76	XL01-182	L94-428	01P3	2069
XL01-141	L94-426	L98-209	118	XL01-183	L98-197	01P3	1035
XL01-142	HOCP92-624	L99-226	124	XL01-184	CP77-405	L98-207	3783
XL01-143	HOCP96-522	L99-226	188	XL01-185	LCP81-010	L98-207	2382
XL01-144	HOCP96-540	L99-226	1466	XL01-186	L99-234	L98-207	2603
XL01-145	HOCP92-624	L99-234	1469	XL01-187	L98-207	L98-207	285
XL01-146	L94-426	L99-234	142	XL01-188	HOCP85-845	L99-233	3569
XL01-147	L97-137	L99-234	392	XL01-189	LCP81-010	L99-233	4482
XL01-148	L97-137	L94-428	673	XL01-190	LCP86-454	L99-233	695
CROSS	FEMALE	MALE	SEED	CROSS	FEMALE	MALE	SEED
XL01-149	L99-221	L94-428	931	XL01-191	LHO83-153	L99-233	353
XL01-150	L99-233	L94-428	505	XL01-192	HOCP97-609	L99-233	4536
XL01-151	LCP81-010	L94-428	1068	XL01-193	L00-260	L99-233	1514
XL01-152	HOCP97-609	HO91-572	816	XL01-194	L96-040	L99-233	824
XL01-153	HO91-572	HO91-572	0	XL01-195	L99-234	L99-233	1264
XL01-154	LHO83-153	LCP85-384	832	XL01-196	LCP85-384	01P4	1541

Table 7. Continued.

CROSS	FEMALE	MALE	SEED
XL01-198	L98-209	01P4	1310
XL01-199	L99-226	01P4	666
XL01-200	L99-234	01P4	1530
XL01-201	HOCP85-845	HOCP96-540	1335
XL01-202	L93-386	HOCP96-540	1217
XL01-203	L00-271	HOCP96-540	379
XL01-204	L94-432	HOCP96-540	281
XL01-205	L96-040	HOCP96-540	285
XL01-206	L99-221	HOCP96-540	1083
XL01-207	HOCP96-540	HOCP96-540	2067
XL01-208	HOCP92-624	L94-426	350
XL01-210	L00-260	L94-426	124
XL01-211	L97-128	L94-426	215
XL01-212	L99-221	L94-426	170
XL01-213	LCP87-492	L94-426	47
XL01-214	L94-426	L94-426	15
XL01-215	TUCCP77-042	LCP85-384	104
XL01-216	HOCP97-621	LCP85-384	5654
XL01-217	LCP81-010	LCP85-384	1918
XL01-218	LCP86-454	LCP85-384	2573
XL01-219	US96-002	LCP85-384	779
XL01-220	HO95-988	TUCCP77-042	966
XL01-221	HOCP89-846	TUCCP77-042	1984
XL01-222	L97-128	TUCCP77-042	432
XL01-223	L98-209	TUCCP77-042	915
XL01-224	CP70-321	TUCCP77-042	24
XL01-225	HOCP92-618	TUCCP77-042	2071
XL01-226	HOCP99-825	TUCCP77-042	9
XL01-227	L94-432	TUCCP77-042	788
XL01-228	LCP86-454	TUCCP77-042	1828
XL01-229	TUCCP77-042	TUCCP77-042	138
XL01-230	HO95-988	HOCP97-609	778
XL01-231	HOCP85-845	HOCP97-609	3074
XL01-232	HOCP91-552	HOCP97-609	1258
XL01-233	HOCP97-609	HOCP97-609	1310
XL01-234	HOCP97-621	L98-207	6639
XL01-235	L91-255	L98-207	1130
XL01-236	L94-426	L98-207	475
XL01-237	L94-432	L98-207	2538
XL01-238	LCP81-010	L98-207	2869
XL01-239	HO95-988	L94-428	724
XL01-240	HOCP92-624	L94-428	1237
XL01-241	L94-428	MISC	613
XL01-242	L94-428	L94-428	480
XL01-244	HO95-988	L89-113	620
XL01-245	HOCP92-624	L89-113	1189
XL01-246	L94-426	L89-113	257
XL01-247	L94-432	L89-113	1552
XL01-248	L96-040	L89-113	268
XL01-249	L99-226	L89-113	3572
XL01-250	LCP81-010	L89-113	1866
XL01-251	HO95-988	HOCP96-540	1879
XL01-252	HOCP92-618	HOCP96-540	1291
XL01-253	HOCP97-606	HOCP96-540	35
XL01-254	TUCCP77-042	HOCP96-540	139
XL01-255	HOCP98-776	L91-281	532
XL01-256	HOCP99-825	L91-281	725
XL01-257	L94-426	L91-281	777
XL01-258	L94-432	L91-281	1379
XL01-259	L97-128	L91-281	417
XL01-260	LCP81-010	L91-281	5214
XL01-261	LCP85-384	L91-281	1108
XL01-262	L91-281	L91-281	19
XL01-263	L99-226	TUCCP77-042	2951
XL01-264	L94-426	TUCCP77-042	254
XL01-265	HOCP89-846	TUCCP77-042	0
XL01-266	TUCCP77-042	TUCCP77-042	180
XL01-267	HOCP97-606	TUCCP77-042	202
XL01-268	L97-128	TUCCP77-042	704
XL01-269	L94-432	TUCCP77-042	687
XL01-270	HOCP89-846	LCP85-384	2215
XL01-271	HOCP92-618	LCP85-384	991
XL01-272	L91-281	LCP85-384	1874
XL01-273	L93-399	LCP85-384	1009
XL01-274	L94-432	LCP85-384	1202
XL01-275	HO95-988	LCP85-384	1961
XL01-276	LCP85-384	LCP85-384	490
XL01-277	HO95-988	L98-207	1679
XL01-278	HOCP85-845	L98-207	2344
XL01-279	HOCP92-624	L98-207	2073
XL01-280	L98-207	L98-207	257
XL01-281	HOCP92-624	L92-312	1799
XL01-282	L94-432	L92-312	1186
XL01-283	LCP81-010	L92-312	2452

Table 7. Continued.

XL01-284	L92-312	L92-312	741
XL01-285	HOCP89-846	HOCP98-741	785
XL01-286	HOCP97-606	HOCP98-741	13
XL01-287	L98-209	HOCP98-741	779
XL01-288	L97-128	HOCP98-741	101
XL01-289	L99-221	HOCP98-741	44
XL01-290	HOCP98-741	HOCP98-741	163
XL01-291	L00-257	01P4	1169
XL01-292	L00-271	01P4	195
XL01-293	L00-273	HOCP96540	352
XL01-294	L99-226	HOCP96-540	3515
XL01-295	L00-268	HOCP96-540	2497
XL01-296	HOCP92-618	HOCP96-540	2127
XL01-297	L99-214	HOCP97-621	1391
XL01-298	HOCP96-561	HOCP97-621	931
XL01-299	L00-260	HOCP97-621	1231
XL01-300	CP89-846	HOCP97-621	2634
XL01-301	HOCP97-621	HOCP97-621	2923
XL01-302	LCP81-010	LCP82-089	3354
XL01-303	HOCP96-561	LCP82-089	1537
XL01-304	L97-128	LCP82-089	1489
XL01-305	LCP82-089	LCP82-089	3268
XL01-306	HOCP92-648	L94-426	1439
XL01-307	HOCP97-606	L94-426	26
XL01-308	HOCP89-846	L94-426	194
XL01-309	L00-264	L94-432	2441
XL01-310	HOCP96-561	L94-432	1066
XL01-311	L91-281	L94-432	2989
XL01-312	LH083-153	L94-432	47
XL01-313	L94-432	L94-432	361
XL01-314	CP79-318	L98-209	2409
XL01-315	HOCP88-739	L98-209	95
XL01-316	HOCP92-624	L98-209	340
XL01-317	HOCP92-648	L98-209	0
XL01-318	L93-391	L98-209	2222
XL01-319	LCP81-010	L98-209	2459
CROSS	FEMALE	MALE	SEED
XL01-320	CP89-846	L98-209	3519
XL01-321	L98-209	L98-209	1847
XL01-322	CP79-318	LCP85-384	2121
XL01-323	HO95-988	LCP85-384	1437
XL01-324	HOCP88-739	LCP85-384	317
XL01-325	L93-391	LCP85-384	1850
XL01-326	HOCP92-618	LCP85-354	968
XL01-327	L93-399	LCP85-384	644
XL01-328	US96-002	LCP85-384	859
XL01-329	HOCP92-648	HOCP97-609	1468
XL01-330	L93-399	HOCP85-845	1228
XL01-331	L94-432	HOCP85-845	2173
XL01-332	L97-128	HOCP85-845	444
XL01-333	HOCP96-540	L89-113	4137
XL01-334	HOCP96-561	L89-113	1068
XL01-335	HOCP97-609	L89-113	1256
XL01-336	CP65-357	L92-312	2197
XL01-337	CP70-321	L92-312	183
XL01-338	CP79-318	L92-312	2350
XL01-339	LCP81-010	L92-312	2967
XL01-340	HOCP96-509	L92-312	3235
XL01-341	HOCP99-825	L92-312	363
XL01-342	HOCP88-739	L99-226	55
XL01-343	LHO92-314	L99-226	1447
XL01-344	HO95-988	L99-226	2315
XL01-345	HOCP92-648	L99-226	1543
XL01-346	HOCP97-609	L99-226	1079
XL01-347	HOCP98-776	L99-226	973
XL01-348	HOCP97-609	LCP82-089	998
XL01-349	LOO-273	LCP82-089	261
XL01-350	L96-040	LCP82-089	825
XL01-351	LHO92-314	LCP85-384	1560
XL01-352	HOCP97-621	01P5	3412
XL01-353	L00-266	01P5	2326
XL01-354	L98-207	01P5	1504
XL01-355	TUCCP77-042	01P5	76
XL01-356	CP83-644	HOCP97-621	1466
XL01-357	HOCP92-648	HOCP97-621	1063
XL01-358	HOCP94-806	HOCP97-621	1819
XL01-359	HOCP97-609	HOCP97-621	1733
XL01-360	L94-426	HOCP97-621	1020
XL01-361	L98-209	HOCP97-621	627
CROSS	FEMALE	MALE	SEED
XL01-362	L99-231	HOCP97-621	2612
XL01-363	L99-233	HOCP97-621	1980
XL01-364	LCP85-384	HOCP97-621	739
XL01-365	CP83-644	HOCP96-561	588
XL01-366	HO89-889	HOCP96-561	2568
XL01-367	HOCP85-845	HOCP96-561	1899

Table 7. Continued.

XL01-368	HOCP92-648	HOCP96-561	1785
XL01-369	L91-281	HOCP96-561	788
XL01-370	LCP85-313	HOCP96-561	84
XL01-371	US80-004	HOCP96-561	2300
XL01-372	TUCCP77-042	HOCP96-561	73
XL01-373	LHO83-153	HOCP96-561	241
XL01-374	HOCP96-540	HOCP96-561	4319
XL01-375	HOCP97-645	HOCP96-561	41
XL01-376	HOCP96-561	HOCP96-561	163
XL01-377	L93-391	L92-312	412
XL01-378	L94-428	L92-312	2672
XL01-379	L99-231	L92-312	1970
XL01-380	L98-209	L92-312	1016
XL01-381	L92-312	L92-312	248
XL01-382	CP83-644	LHO92-314	1092
XL01-383	L99-214	LHO92-314	1271
XL01-384	L99-231	LHO92-314	2500
XL01-385	L98-209	LHO92-314	832
XL01-386	LCP85-384	LHO92-314	2079
XL01-387	LHO92-314	LHO92-314	68
XL01-388	LCP86-454	LCP85-384	3313
XL01-389	L93-399	LCP85-384	1143
XL01-390	L93-391	LCP85-384	1070
XL01-391	L00-273	LCP85-384	191
XL01-392	L00-264	LCP85-384	437
XL01-393	L00-259	LCP85-384	275
XL01-394	HOCP92-648	LCP85-384	1342
XL01-395	HOCP96-561	HOCP85-845	646
XL01-396	HOCP99-825	HOCP85-845	183
XL01-397	TUCCP77-042	HOCP85-845	72
XL01-398	HOCP85-845	HOCP85-845	364
XL01-399	HOCP97-606	L94-428	367
XL01-400	L00-249	L94-428	237
XL01-401	L00-264	L94-428	469
XL01-402	L93-399	HOCP97-621	1104
XL01-403	HOCP98-778	HOCP97-621	2026
CROSS	FEMALE	MALE	SEED
XL01-404	L94-432	HOCP97-621	1957
XL01-405	CP65-357	L99-226	109
XL01-406	HOCP88-739	L99-226	150
XL01-407	HOCP92-648	L99-226	244
XL01-408	L99-226	L99-226	319
XL01-409	HOCP88-739	LCP85-384	274

XL01-410	HOCP96-540	LCP85-384	1141
XL01-411	HOCP98-778	LCP85-384	439
XL01-412	LCP85-313	LCP85-384	340
XL01-413	TUCCP77-042	LCP85-384	140
XL01-414	US96-002	LCP85-384	1167
XL01-415	HOCP97-645	L98-209	0
XL01-416	L93-399	L98-209	301
XL01-417	TUCCP77-042	L98-209	353
XL01-418	CP83-644	HOCP98-778	1637
XL01-419	L89-113	HOCP98-778	2155
XL01-420	HOCP97-606	HOCP98-778	18
XL01-421	HO89-889	LHO92-314	3448
XL01-422	L94-426	LHO92-314	739
XL01-423	L97-128	LHO92-314	378
XL01-424	HOCP89-846	HOCP96-561	1316
XL01-425	LCP82-089	HOCP96-561	1338
XL01-426	LCP83-137	HOCP96-561	860
XL01-427	HO95-988	HOCP96-561	638
XL01-428	HOCP92-648	HOCP96-561	655
XL01-429	HOCP96-509	HOCP96-561	504
XL01-430	HOCP88-739	LCP85-384	472
XL01-431	HOCP94-806	LCP85-384	6130
XL01-432	CP83-644	L99-226	157
XL01-433	L92-321	L99-226	640
XL01-434	HOCP94-806	L99-226	1389
XL01-435	HOCP96-509	L99-226	2390
XL01-436	L93-399	L99-226	91
XL01-437	L94-426	L99-226	326
XL01-438	L99-226	L99-226	297
XL01-439	HO89-889	L99-233	6138
XL01-440	HOCP94-806	L99-233	386
XL01-441	L99-214	L99-233	418
XL01-442	L99-233	L99-233	1772
XL01-443	L96-040	LCP85-384	1937
XL01-444	TUCCP77-042	LCP85-384	429
XL01-445	HOCP96-509	LCP85-384	5244
CROSS	FEMALE	MALE	SEED
XL01-446	CP70-321	L98-209	94
XL01-447	CP79-318	L98-209	2551
XL01-448	US80-004	L98-209	1616
XL01-449	CP83-644	HOCP96-540	1941
XL01-450	HOCP91-555	HOCP96-540	981
XL01-451	HOCP97-645	HOCP96-540	180

Table 7. Continued.

CROSS	FEMALE	MALE	SEED
XL01-452	HOCP96-540	HOCP96-540	4220
XL01-453	HO89-889	HOCP85-845	823
XL01-454	L00-249	HOCP85-845	366
XL01-455	L93-399	HOCP85-845	887
XL01-456	L99-238	L94-432	4284
XL01-457	L00-249	L94-432	1027
XL01-458	HOCP98-741	L94-432	3054
XL01-459	CP83-644	L99-238	2907
XL01-460	HO95-988	L99-238	1281
XL01-461	TUCCP77-042	L99-238	509
XL01-462	L99-238	L99-238	267
XL01-463	HOCP97-606	L96-092	1059
XL01-464	US99-002	L96-092	2412
XL01-465	HOCP85-845	L96-092	1061
XL01-466	L96-092	L96-092	2327
XL01-467	HOCP91-555	HOCP96-509	1396
XL01-468	LCP85-313	HOCP96-509	724
XL01-469	HOCP96-561	HOCP96-509	902
XL01-470	HOCP96-509	HOCP96-509	211
XL01-471	HOCP91-552	CP79-318	1415
XL01-472	HOCP98-778	CP79-318	526
XL01-473	L98-207	CP79-318	1300
XL01-474	CP79-318	CP79-318	87
XL01-475	HOCP85-845	HO95-988	409
XL01-476	HOCP91-555	HO95-988	37
XL01-477	L98-207	HO95-988	24
XL01-478	HO95-988	HO95-988	0
XL01-479	HOCP96-509	LCP85-384	349
XL01-480	HOCP98-778	LCP85-384	929
XL01-481	TUCCP77-042	LCP85-384	192
XL01-482	L00-254	LCP85-384	828
XL01-483	L98-207	HOCP85-845	2167
XL01-484	US99-002	HOCP85-845	2499
XL01-485	US99-004	HOCP85-845	3997
XL01-486	US99-002	HOCP94-806	1148
XL01-487	L96-040	HOCP94-806	56
XL01-488	L97-137	HOCP94-806	240
XL01-489	HOCP98-778	L92-312	106
XL01-490	CP78-317	L92-312	40
XL01-491	HOCP98-781	L92-312	36
XL01-492	CP83-644	L98-209	579
XL01-493	HOCP88-739	L98-209	102
XL01-494	L94-428	L98-209	32
XL01-495	CP83-644	L99-226	5996
XL01-496	HOCP91-555	L99-226	678
XL01-497	L93-391	L99-226	292
XL01-498	L91-255	HOCP96-509	359
XL01-499	HOCP92-648	HOCP96-509	2022
XL01-500	HOCP89-846	HOCP96-509	1228
XL01-501	LCP85-313	HOCP97-609	533
XL01-502	L00-254	HOCP97-609	4503
XL01-503	US99-002	HOCP97-609	3765
XL01-504	HOCP97-609	HOCP97-609	437
XL01-505	LHO92-314	L98-209	2737
XL01-506	L89-113	L98-209	1078
XL01-507	HOCP99-833	L98-209	211
XL01-508	L00-254	L98-209	4969
XL01-509	US99-004	L98-209	1957
XL01-510	L93-399	L98-209	237
XL01-511	L98-209	L98-209	1820
XL01-512	HOCP88-739	HOCP91-552	9
XL01-513	HOCP98-776	HOCP91-552	7797
XL01-514	L99-231	HOCP91-552	2039
XL01-515	CP78-317	HOCP91-552	396
XL01-516	HOCP91-552	HOCP91-552	1836
XL01-517	HOCP96-522	L98-209	832
XL01-518	HOCP98-771	L98-209	0
XL01-519	L93-391	L98-209	24
XL01-520	L98-209	L98-209	1042
XL01-521	HOCP91-555	LCP85-384	40
XL01-522	HOCP89-846	HO95-988	17
XL01-523	US99-004	HO95-988	0
XL01-524	HOCP91-555	HOCP98-776	231
XL01-525	HOCP98-776	HOCP98-776	145
XL01-526	HOCP99-833	HOCP85-845	84
XL01-527	HOCP92-624	HOCP85-845	254
XL01-528	L99-231	HOCP85-845	383
XL01-529	HOCP92-624	HOCP96-540	388
XL01-530	HOCP96-522	HOCP96-540	62
XL01-531	HOCP98-778	HOCP96-540	41
TOTAL			569,552

Table 7. Continued.

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS
OF THE LOUISIANA "L" SUGARCANE VARIETY
DEVELOPMENT PROGRAM FOR THE YEAR 2001

K. P. Bischoff, K. A. Gravois, A. J. Orgeron, G. L. Hawkins, and J. J. Hebert
Sugar Research Station

SUMMARY

In the selection phase of the Louisiana "L" 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 98,371 seedlings from 211 crosses were planted in the field in the spring of 2001. The majority of these seedlings are progeny of crosses among commercial and elite experimental varieties. In the fall of 2001, family selection was practiced on the 46,783 stubble seedlings surviving the winter. This selection resulted in the planting of 3,371 6-foot first-line trial plots. At the same time, superior clones were also selected and advanced through subsequent stages (759 to second line trials, 392 to the increase stage). Assignment of permanent "L01" numbers were given to the 37 best clones of the 1996 crossing series.

PROCEDURES

In the selection stage of the Louisiana 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 98,371 seedlings from 211 crosses of the 2000 crossing series were planted to the field in the spring of 2001 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2001, individual selection was practiced on the 46,783 stubble single stools of the 1999 crossing series that survived the winter. The 3,371 clones selected and advanced from the single stools were planted in 6-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 1998 crossing series were rated for cane yield and pest resistance in August of 2001 (Table 3). After screening for cane yield rating, acceptable clones were further evaluated for pest resistance (diseases and borer injury), stalk quality, and Brix (Table 3). This second stage of advancement was concluded with the planting of 759 clones in 16-foot second-line trial plots.

Stalk counts were made on the 735 plant cane second-line trial plots of the 1997 crossing series in August 2001. Based on these counts and the previously described criteria, 392 clones were planted in two 16-foot plots representing the increase stage of the program (Table 4). One replication is planted

in light soil, and the other replication is planted in heavy soil. These clones will be candidates for assignment in 2002. Of the 206 candidates from the first stubble crop of the second-line trials, the best 37 clones from the 1996 crossing series were assigned permanent “L01" numbers (Table 5). These newly assigned “L01" varieties were then planted in replicated nursery trials at three on-station locations (St. Gabriel Research Station, Iberia Research Station, and USDA Ardoyne Farm).

The advancement summary of clones from crosses made in 1996 through 1999 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. Results of the 2000 crossing series plant cane cross appraisal in 2001 are presented in Table 7.

Table 1. Summary of selections, advancements and assignments made during 2001 by the Louisiana, “L”, Sugarcane Variety Development Program’s personnel.

	Crosses				Advanced to			
Crossing series	Progeny test	Selection program	Plants surviving transplanting	Over-wintered plants	1st line	2nd line	Increase	On-Station Nurseries (L01 Assignments)
			------------------------------ number of clones --------------------------------					
X96	239	252	63468	49213	3392	705	206	37
X97	75	174	71416	48322	3901	735	392	
X98	125	193	64467	54794	3012	759		
X99		312	74263	46783	3371			
X00	76	211	98371					

Table 2. Dates of seedling and line trials planted or harvested in 2001.

Crossing Series	Test	Crop	Date Planted	Date Harvested
X00	Seedlings	Planted	4/16 - 20/01	
X00	Progeny Test	Planted	4/20/01	12/7 -10/01
X99	Seedlings	First Stubble	4/7 - 24/00	
X99	First Line Trials	Planted	9/14 - 9/17/01	
X98	First Line Trial	Plant Cane	9/7 - 14/00	
X97	First Line Trial	First Stubble	9/13- 17/00	10/29/01
X98	Second Line Trial	Planted	9/26/01	
X97	Second Line Trial	Plant Cane	9/20/00	11/26/01
X96	Second Line Trial	First Stubble	9/23/99	10/8/01
X95	Second Line Trial	Second Stubble	10/19/98	10/3/01
X97	Light Soil Increase	Planted	10/2/01	
X96	Light Soil Increase	Plant Cane	9/26/00	10/28/01
X95	Light Soil Increase	First Stubble	10/5/99	10/18/01
X94	Light Soil Increase	Second Stubble	10/27/98	10/1/01
X97	Heavy Soil Increase	Planted	10/2/01	10/8/00
X96	Heavy Soil Increase	Plant Cane	9/26/00	12/7/01
X95	Heavy Soil Increase	First Stubble	10/5/99	10/16/01
X94	Heavy Soil Increase	Second Stubble	10/27/98	10/1/01

Table 3. Numbers of experimental clones dropped for identified faults in the 1998 crossing series first-line trials.

Trait	Fault	
	Frequency	Percent
-------------------------------- 3012 clones enter first round of evaluation ----------------------------		
Initial Selection (Rating)	1655	54.9
--------------------------------1357 clones enter second round of evaluation--------------------------		
Borers	27	0.9
Leaf Scald	4	0.1
Lodged	58	1.9
Pith / Tube	179	5.9
Short	24	0.8
Diameter	46	1.5
Smut	19	0.6
Other	10	0.4
-- 2022 clones dropped --		
---------------------------- 990 clones enter third round of evaluation ------------------------------		
Brix	231	7.7
Clones advanced to second clonal trial	759	25.2

Table 4. Number of experimental clones dropped for identified faults in the 1997 crossing series second-line trial prior to advancement to the increase stage.

Trait	Fault	
	Frequency	Percent
-------------------------------- 735 clones enter first round of evaluation ----------------------------		
Stalk count <85 per plot	244	33.2
Lodged	39	5.3
Pith / Tube	36	4.9
Short	11	1.5
Diameter	2	0.3
Smut	7	1.0
Borers	4	0.5
-- 343 clones dropped --		
Clones advanced to Increase stage	392	53.3

Table 5. Mean yield data of 2001 “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
CP70-321	CP61-039	CP57-614	8099	48.6	169	2.89	33124
LCP85-384	CP77-310	CP77-407	9980	58.7	170	2.12	55660
HOCP85-845	CP72-370	CP77-403	8088	41.4	199	2.25	36300
L2001-279	LCP85-384	HOCP93-754	9591	56.5	170	1.86	60803
L2001-280	L93-363	LCP85-384	11308	45.1	250	1.97	45829
L2001-281	LCP86-429	LCP85-384	11096	58.2	191	2.27	51274
L2001-282	LHO92-307	HOCP92-678	8901	49.9	178	2.34	42653
L2001-283	L93-365	LCP85-384	9525	47.6	200	2.56	37208
L2001-284	CP65-357	LCP85-384	9274	56.9	163	2.22	51274
L2001-285	LCP85-384	HOCP93-754	10157	58.9	172	1.91	61710
L2001-286	LHO92-307	HOCP92-678	9608	48.0	200	2.52	38115
L2001-287	L93-363	LCP85-384	11436	56.4	203	2.22	50820
L2001-288	L93-363	LCP85-384	9874	53.3	185	2.35	45375
L2001-289	LCP81-010	LCP85-384	10477	59.4	176	2.62	45375
L2001-290	L94-424	LCP85-384	10919	61.1	179	2.45	49913
L2001-291	L93-363	LCP85-384	10473	42.5	247	1.89	44921
L2001-292	CP65-357	LCP85-384	13552	61.9	219	3.21	38569
L2001-293	CP65-357	LCP85-384	13975	68.4	204	1.97	69424
L2001-294	L93-365	L92-312	12200	67.9	180	2.20	61710
L2001-295	HOCP85-845	L94-432	9126	45.9	199	2.25	40838
L2001-296	CP65-357	LCP85-384	16604	67.8	245	2.90	46736
L2001-297	HOCP92-648	LCP85-384	15528	75.5	206	2.43	62164
L2001-298	HOCP92-648	LCP85-384	9009	55.0	164	2.33	47190
L2001-299	L93-365	LCP85-384	14767	71.9	205	2.64	54450
L2001-300	LCP86-422	LCP85-384	12540	75.4	166	2.66	56719
L2001-301	HOCP93-749	LCP85-384	12053	54.7	220	2.71	40384
L2001-302	HOCP92-648	HO89-889	10752	51.5	209	2.16	47644
L2001-303	LCP85-313	CP79-348	9811	52.7	186	2.30	45829
L2001-304	HOCP93-749	LCP85-384	13116	61.9	212	3.10	39930
L2001-305	HOCP92-624	CP77-310	9776	52.6	186	1.87	56265
L2001-306	HOCP93-767	L94-431	14278	65.6	218	2.45	53543
L2001-307	HOCP93-746	LCP85-384	9987	47.8	209	2.34	40838
L2001-308	HOCP88-739	LCP85-384	12104	61.5	197	2.58	47644
L2001-309	HOCP93-746	LCP85-384	9615	51.0	188	1.63	62618
L2001-310	HOCP93-746	L88-063	9895	57.7	172	1.73	66701
L2001-311	HOCP88-739	LCP85-384	13683	80.6	170	2.03	79406
L2001-312	HOCP93-746	LCP85-384	8758	44.7	196	2.29	39023
L2001-313	HOCP93-767	L93-365	10011	44.5	225	2.18	40838
L2001-314	HOCP88-739	LCP85-384	7483	47.9	156	1.76	54450
L2001-315	HOCP93-746	LCP85-384	9013	51.9	174	2.22	46736

Table 6. Continued.

Table 6. Advancement summary of crosses in the 1996 through 1999 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
1996 Crossing Series										
CP65-357	CP77-407	72	9	81	4	95	0	35	0	46
CP65-357	HOCP85-845	209	26	80	0	25	0	35	0	46
CP65-357	HOCP91-573	245	26	74	3	64	0	35	0	46
CP65-357	HOCP93-749	98	0	23	0	25	0	35	0	46
CP65-357	L91-255	157	0	23	0	25	0	35	0	46
CP65-357	L92-319	89	10	78	3	86	1	89	0	46
CP65-357	L94-431	75	32	99	3	90	0	35	0	46
CP65-357	LCP82-089	84	5	59	1	62	0	35	0	46
CP65-357	LCP85-384	750	91	80	35	92	15	96	4	97
CP72-370	CP79-348	248	0	23	0	25	0	35	0	46
CP72-370	HOCP85-845	497	0	23	0	25	0	35	0	46
CP72-370	HOCP91-552	435	0	23	0	25	0	35	0	46
CP72-370	L92-312	150	18	79	7	92	2	93	0	46
CP72-370	LHO92-307	200	0	23	0	25	0	35	0	46
CP77-310	CP72-370	243	0	23	0	25	0	35	0	46
CP77-310	CP77-407	97	14	84	5	94	1	88	0	46
CP77-310	HOCP91-573	200	0	23	0	25	0	35	0	46
CP77-310	HOCP92-618	157	20	81	1	56	0	35	0	46
CP78-357	HOCP93-750	98	15	88	3	84	1	87	0	46
CP78-357	HOCP93-754	112	9	65	4	87	0	35	0	46
CP79-318	HO89-889	103	10	70	5	94	0	35	0	46
CP79-318	HOCP85-845	1143	65	57	14	64	5	76	0	46
CP79-318	HOCP91-573	248	0	23	0	25	0	35	0	46
CP79-318	HOCP92-618	247	0	23	0	25	0	35	0	46
CP79-318	L92-312	245	7	49	1	53	0	35	0	46
CP79-318	L94-431	72	0	23	0	25	0	35	0	46
CP79-318	L94-436	112	0	23	0	25	0	35	0	46
CP79-318	LCP85-384	1281	126	71	20	69	8	83	0	46
CP79-318	LCP85-384	178	0	23	0	25	0	35	0	46
CP79-318	LCP85-384	356	0	23	0	25	0	35	0	46
CP79-318	LHO92-314	725	0	23	0	25	0	35	0	46
CP79-318	US90-018	81	0	23	0	25	0	35	0	46
CP79-318	US92-010	177	0	23	0	25	0	35	0	46
CP79-348	HOCP93-746	68	0	23	0	25	0	35	0	46
CP79-348	HOCP93-765	226	0	23	0	25	0	35	0	46
CP79-348	L92-312	40	8	94	4	99	0	35	0	46
CP82-550	CP79-348	108	12	77	3	81	0	35	0	46

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
CP82-550	HOCP92-624	118	9	64	5	91	0	35	0	46
CP82-550	L91-255	92	0	23	0	25	0	35	0	46
CP82-550	LCP82-089	322	33	72	3	60	0	35	0	46
CP83-644	CP84-730	104	7	61	2	75	0	35	0	46
CP83-644	HOCP85-845	179	16	67	5	81	3	94	0	46
CP83-644	HOCP91-527	197	0	23	0	25	0	35	0	46
CP83-644	HOCP93-749	347	0	23	0	25	0	35	0	46
CP83-644	L91-255	462	51	77	4	59	0	35	0	46
CP83-644	L92-312	284	17	59	2	57	0	35	0	46
CP83-644	L94-431	43	5	78	3	97	1	98	0	46
CP83-644	L94-438	428	0	23	0	25	0	35	0	46
CP83-644	LCP82-089	237	0	23	0	25	0	35	0	46
CP83-644	LCP85-313	240	41	90	4	71	1	75	0	46
CP83-644	LCP85-384	367	0	23	0	25	0	35	0	46
CP83-644	LCP86-454	277	0	23	0	25	0	35	0	46
CP84-730	HOCP85-845	383	0	23	0	25	0	35	0	46
CP84-730	L92-312	300	32	75	5	71	2	83	0	46
CP84-730	LCP85-384	231	22	70	3	66	0	35	0	46
CP88-702	L91-255	104	0	23	0	25	0	35	0	46
CP88-702	LCP85-384	438	38	66	3	56	2	79	0	46
CP89-805	LCP85-384	235	0	23	0	25	0	35	0	46
CP89-805	LCP85-384	247	0	23	0	25	0	35	0	46
CP89-831	HOCP85-845	282	0	23	0	25	0	35	0	46
CP89-831	HOCP91-527	103	18	91	8	98	2	95	0	46
CP89-831	LCP82-089	85	0	23	0	25	0	35	0	46
CP89-831	LCP85-384	214	31	85	6	82	3	93	0	46
CP89-831	US90-018	109	25	97	8	98	2	94	0	46
HO89-889	LCP82-089	620	0	23	0	25	0	35	0	46
HOCP85-845	HOCP93-765	482	0	23	0	25	0	35	0	46
HOCP85-845	L89-136	201	9	53	3	69	1	80	0	46
HOCP85-845	L94-432	482	10	47	4	58	2	74	1	93
HOCP88-739	CP72-370	180	0	23	0	25	0	35	0	46
HOCP88-739	CP77-310	104	21	94	4	89	0	35	0	46
HOCP88-739	CP77-407	100	0	23	0	25	0	35	0	46
HOCP88-739	HO89-889	106	0	23	0	25	0	35	0	46
HOCP88-739	HOCP85-845	367	0	23	0	25	0	35	0	46
HOCP88-739	L91-255	218	8	50	3	67	0	35	0	46
HOCP88-739	L94-431	96	0	23	0	25	0	35	0	46
HOCP88-739	LCP82-089	87	0	23	0	25	0	35	0	46

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
HOCP88-739	LCP85-384	248	16	60	11	91	3	90	0	46
HOCP88-739	LCP85-384	679	123	92	19	82	9	92	3	94
HOCP88-739	LCP86-454	133	0	23	0	25	0	35	0	46
HOCP88-739	LCP87-472	248	0	23	0	25	0	35	0	46
HOCP90-923	CP79-348	494	148	98	19	89	8	94	0	46
HOCP90-923	HOCP92-618	249	0	23	0	25	0	35	0	46
HOCP90-923	HOCP92-618	177	0	23	0	25	0	35	0	46
HOCP90-923	HOCP93-749	225	0	23	0	25	0	35	0	46
HOCP90-923	L91-255	179	0	23	0	25	0	35	0	46
HOCP90-923	L94-436	197	0	23	0	25	0	35	0	46
HOCP90-923	LHO92-314	96	0	23	0	25	0	35	0	46
HOCP91-527	L92-312	31	4	82	0	25	0	35	0	46
HOCP91-527	L92-319	162	0	23	0	25	0	35	0	46
HOCP91-575	CP70-321	227	16	62	2	59	1	77	0	46
HOCP91-575	HOCP93-750	92	7	64	0	25	0	35	0	46
HOCP91-575	L91-255	104	17	89	3	83	0	35	0	46
HOCP91-575	L93-365	448	25	57	7	69	2	78	0	46
HOCP91-575	LCP85-384	103	15	85	4	90	0	35	0	46
HOCP91-575	LCP86-454	461	0	23	0	25	0	35	0	46
HOCP92-618	CP79-348	235	0	23	0	25	0	35	0	46
HOCP92-618	US92-010	99	4	52	1	61	0	35	0	46
HOCP92-624	CP77-310	194	3	46	1	55	1	81	1	96
HOCP92-624	HOCP85-845	493	0	23	0	25	0	35	0	46
HOCP92-624	L91-255	95	0	23	0	25	0	35	0	46
HOCP92-624	LCP85-384	488	71	85	7	68	4	84	0	46
HOCP92-645	HOCP93-765	232	0	23	0	25	0	35	0	46
HOCP92-645	L91-255	101	0	23	0	25	0	35	0	46
HOCP92-645	LCP86-422	59	4	61	0	25	0	35	0	46
HOCP92-648	HO89-889	94	4	53	2	76	2	97	1	98
HOCP92-648	HOCP85-845	452	48	74	8	72	1	71	0	46
HOCP92-648	HOCP91-573	483	0	23	0	25	0	35	0	46
HOCP92-648	HOCP92-618	230	46	94	20	98	3	92	0	46
HOCP92-648	HOCP92-618	80	17	95	0	25	0	35	0	46
HOCP92-648	HOCP93-744	240	0	23	0	25	0	35	0	46
HOCP92-648	HOCP93-749	384	0	23	0	25	0	35	0	46
HOCP92-648	L92-312	241	4	47	3	65	0	35	0	46
HOCP92-648	L92-319	227	11	55	4	72	1	77	0	46

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
HOCP92-648	L94-431	79	12	87	3	89	0	35	0	46
HOCP92-648	LCP85-384	460	72	88	10	77	6	92	2	94
HOCP92-648	LHO92-314	228	0	23	0	25	0	35	0	46
HOCP92-648	LHO92-314	148	0	23	0	25	0	35	0	46
HOCP92-648	LHO92-314	214	0	23	0	25	0	35	0	46
HOCP92-648	US80-004	245	19	64	4	70	1	74	0	46
HOCP92-654	CP70-321	91	0	23	0	25	0	35	0	46
HOCP92-654	HOCP85-845	228	0	23	0	25	0	35	0	46
HOCP92-654	L92-312	187	0	23	0	25	0	35	0	46
HOCP92-654	L92-319	97	0	23	0	25	0	35	0	46
HOCP92-654	L92-319	102	0	23	0	25	0	35	0	46
HOCP92-654	LCP82-089	457	0	23	0	25	0	35	0	46
HOCP92-654	LCP86-454	47	0	23	0	25	0	35	0	46
HOCP92-664	HOCP92-624	252	23	68	1	53	0	35	0	46
HOCP92-664	HOCP93-749	225	0	23	0	25	0	35	0	46
HOCP92-664	L92-319	91	17	93	2	77	0	35	0	46
HOCP92-664	L93-365	246	0	23	0	25	0	35	0	46
HOCP92-664	L94-438	102	6	58	0	25	0	35	0	46
HOCP92-664	LCP86-454	101	4	52	1	60	0	35	0	46
HOCP93-744	CP77-407	175	0	23	0	25	0	35	0	46
HOCP93-744	CP77-407	190	6	50	1	55	0	35	0	46
HOCP93-744	HOCP85-845	263	0	23	0	25	0	35	0	46
HOCP93-744	LCP85-384	395	0	23	0	25	0	35	0	46
HOCP93-744	LCP87-472	188	0	23	0	25	0	35	0	46
HOCP93-744	LHO92-307	155	0	23	0	25	0	35	0	46
HOCP93-744	LHO92-307	181	0	23	0	25	0	35	0	46
HOCP93-746	HOCP85-845	416	0	23	0	25	0	35	0	46
HOCP93-746	HOCP93-750	101	0	23	0	25	0	35	0	46
HOCP93-746	L88-063	104	17	89	3	83	2	95	1	98
HOCP93-746	L93-363	100	14	83	0	25	0	35	0	46
HOCP93-746	LCP85-384	340	58	90	16	93	12	98	4	99
HOCP93-749	CP77-310	97	7	62	2	76	2	96	0	46
HOCP93-749	HOCP85-845	148	0	23	0	25	0	35	0	46
HOCP93-749	HOCP92-618	86	13	86	3	87	2	98	0	46
HOCP93-749	HOCP92-624	111	25	97	3	80	0	35	0	46
HOCP93-749	L88-063	96	0	23	0	25	0	35	0	46

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
HOCP93-749	L92-312	35	20	99	6	99	2	99	0	46
HOCP93-749	LCP82-089	251	13	56	2	57	1	72	0	46
HOCP93-749	LCP85-384	95	0	23	0	25	0	35	0	46
HOCP93-749	LCP85-384	424	49	78	14	86	8	95	2	95
HOCP93-749	LCP86-454	109	9	66	1	59	1	85	0	46
HOCP93-749	US92-010	100	0	23	0	25	0	35	0	46
HOCP93-750	US90-018	100	0	23	0	25	0	35	0	46
HOCP93-767	CP89-805	100	0	23	0	25	0	35	0	46
HOCP93-767	HOCP92-618	90	0	23	0	25	0	35	0	46
HOCP93-767	L93-365	459	26	57	7	69	2	76	1	93
HOCP93-767	L94-431	179	9	56	2	61	2	89	1	97
HOCP93-767	LCP86-422	103	0	23	0	25	0	35	0	46
L78-063	HOCP85-845	370	18	55	1	52	1	71	0	46
L88-063	L91-255	81	11	83	3	88	1	91	0	46
L90-181	HOCP91-552	34	5	86	0	25	0	35	0	46
L90-181	HOCP92-618	234	0	23	0	25	0	35	0	46
L90-181	HOCP93-750	192	11	57	1	55	0	35	0	46
L90-181	LCP86-454	633	51	66	1	51	0	35	0	46
L90-191	CP72-370	98	9	69	2	75	0	35	0	46
L90-191	HOCP92-618	196	0	23	0	25	0	35	0	46
L91-255	HOCP91-573	222	7	50	4	73	1	78	0	46
L92-312	L91-255	220	0	23	0	25	0	35	0	46
L92-319	HOCP92-664	112	10	67	2	73	0	35	0	46
L93-363	CP70-321	95	0	23	0	25	0	35	0	46
L93-363	HOCP92-618	79	12	87	0	25	0	35	0	46
L93-363	L92-312	88	9	72	2	78	1	90	0	46
L93-363	LCP85-384	344	37	76	20	96	8	98	4	98
L93-363	US90-018	186	22	79	6	85	2	88	0	46
L93-365	HOCP92-624	255	12	54	1	52	0	35	0	46
L93-365	L92-312	214	16	63	8	88	1	80	1	95
L93-365	LCP85-384	680	90	83	21	85	9	92	2	94
L93-378	HOCP93-765	242	19	64	3	65	0	35	0	46
L93-378	LHO92-314	194	19	71	0	25	0	35	0	46
L93-397	US90-018	82	0	23	0	25	0	35	0	46
L94-407	LCP85-384	229	0	23	0	25	0	35	0	46
L94-407	LCP85-384	252	17	61	3	62	0	35	0	46

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
L94-422	L92-319	167	11	60	3	73	1	82	0	46
L94-422	L94-431	175	0	23	0	25	0	35	0	46
L94-424	LCP85-384	672	34	56	15	78	1	70	1	92
L94-428	L93-365	232	9	51	1	54	0	35	0	46
L94-428	LCP86-454	232	17	63	1	54	0	35	0	46
L94-431	L92-312	79	10	81	2	80	0	35	0	46
L94-431	LCP85-313	87	0	23	0	25	0	35	0	46
L94-433	HOCP93-754	225	18	65	3	67	1	77	0	46
L94-433	L92-319	213	0	23	0	25	0	35	0	46
LCP81-010	CP70-321	248	12	55	3	64	1	73	0	46
LCP81-010	CP72-370	439	29	60	8	74	2	78	0	46
LCP81-010	HOCP85-845	712	12	47	2	52	0	35	0	46
LCP81-010	HOCP93-765	232	0	23	0	25	0	35	0	46
LCP81-010	L89-136	238	0	23	0	25	0	35	0	46
LCP81-010	L94-432	233	0	23	0	25	0	35	0	46
LCP81-010	LCP85-384	2368	67	49	18	57	7	72	1	92
LCP81-010	LHO92-307	138	0	23	0	25	0	35	0	46
LCP82-089	HOCP91-552	220	2	46	0	25	0	35	0	46
LCP83-137	HO89-889	54	12	96	1	74	0	35	0	46
LCP83-137	HOCP93-750	106	19	92	3	83	1	86	0	46
LCP83-137	LCP85-384	170	28	89	5	84	0	35	0	46
LCP83-137	LCP86-422	233	52	96	12	94	2	85	0	46
LCP85-313	CP70-321	46	13	98	1	77	0	35	0	46
LCP85-313	CP77-407	248	3	46	0	25	0	35	0	46
LCP85-313	CP79-348	501	13	48	7	67	3	82	1	92
LCP85-313	CP79-348	230	24	74	3	66	1	76	0	46
LCP85-313	HOCP85-845	251	32	81	6	79	1	72	0	46
LCP85-313	HOCP92-618	753	70	69	18	79	6	84	0	46
LCP85-313	HOCP93-750	79	0	23	0	25	0	35	0	46
LCP85-313	L91-255	99	6	59	3	84	1	87	0	46
LCP85-313	L94-431	256	12	54	1	52	0	35	0	46
LCP85-313	LCP82-089	165	7	53	1	56	0	35	0	46
LCP85-313	LHO92-314	252	0	23	0	25	0	35	0	46
LCP85-384	HOCP93-754	41	4	71	3	97	3	99	2	99
LCP86-422	HOCP93-749	91	0	23	0	25	0	35	0	46
LCP86-422	HOCP93-750	205	8	51	0	25	0	35	0	46

Table 6. Continued.

			1st Line		2nd Line		Increase		Assignment	
Female	Male	Survive	No.	Rank pcnt'l	No.	Rank pcnt'l	No.	Rank pcnt'l	No.	Rank pcnt'l
LCP86-422	L92-312	62	0	23	0	25	0	35	0	46
LCP86-422	LCP85-384	207	37	92	11	95	2	86	1	95
LCP86-429	CP70-321	223	0	23	0	25	0	35	0	46
LCP86-429	CP72-370	251	0	23	0	25	0	35	0	46
LCP86-429	CP72-370	36	0	23	0	25	0	35	0	46
LCP86-429	CP77-310	232	23	71	2	58	0	35	0	46
LCP86-429	CP77-407	218	19	66	4	74	1	79	0	46
LCP86-429	HOCP92-618	167	0	23	0	25	0	35	0	46
LCP86-429	HOCP92-618	81	18	96	5	96	0	35	0	46
LCP86-429	HOCP93-744	79	0	23	0	25	0	35	0	46
LCP86-429	HOCP93-750	85	9	74	4	93	1	90	0	46
LCP86-429	HOCP93-765	211	0	23	0	25	0	35	0	46
LCP86-429	HOCP93-765	242	0	23	0	25	0	35	0	46
LCP86-429	L91-255	103	11	75	1	60	1	87	0	46
LCP86-429	L94-432	241	0	23	0	25	0	35	0	46
LCP86-429	LCP85-384	167	17	72	2	63	1	82	1	97
LCP86-429	LCP85-384	597	0	23	0	25	0	35	0	46
LCP86-454	HOCP93-750	243	25	73	3	65	2	84	0	46
LCP86-454	HOCP93-765	242	0	23	0	25	0	35	0	46
LCP86-454	L92-312	237	34	84	5	76	1	75	0	46
LCP86-454	L93-363	99	12	80	7	97	0	35	0	46
LCP87-023	CP78-2114	46	8	91	0	25	0	35	0	46
LCP87-023	HOCP91-576	108	12	77	4	88	0	35	0	46
LCP87-023	HOCP92-618	220	0	23	0	25	0	35	0	46
LCP87-023	HOCP92-678	108	0	23	0	25	0	35	0	46
LCP87-023	HOCP93-746	53	0	23	0	25	0	35	0	46
LCP87-023	L94-432	236	0	23	0	25	0	35	0	46
LCP87-023	LHO92-307	106	0	23	0	25	0	35	0	46
LCP87-472	HOCP93-765	245	0	23	0	25	0	35	0	46
LCP87-472	L94-432	250	7	48	3	63	0	35	0	46
LHO83-153	L91-255	90	8	67	4	91	0	35	0	46
LHO92-307	CP70-321	212	8	51	3	68	1	80	0	46
LHO92-307	CP72-370	237	0	23	0	25	0	35	0	46
LHO92-307	HOCP85-845	461	86	93	21	92	1	71	0	46
LHO92-307	HOCP92-678	398	41	73	7	72	3	83	2	96
LHO92-307	LCP85-384	1107	0	23	0	25	0	35	0	46

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
LHO92-314	CP84-730	77	19	98	2	80	1	91	0	46
LHO92-314	L92-312	93	13	83	1	61	1	88	0	46
US78-020	L91-255	104	0	23	0	25	0	35	0	46
US78-020	LCP82-089	183	6	50	3	70	1	81	0	46
US79-010	CP72-370	93	18	93	5	95	2	97	0	46
US79-010	HOCP85-845	86	13	86	1	62	0	35	0	46
US79-010	L92-319	102	0	23	0	25	0	35	0	46
US79-010	LCP82-089	81	14	90	0	25	0	35	0	46
US90-021	CP72-370	106	10	69	4	88	0	35	0	46
US90-021	HOCP91-552	222	46	95	7	85	2	85	0	46
US90-021	HOCP93-765	250	27	76	7	81	1	73	0	46
US90-021	L89-136	240	54	97	6	79	1	75	0	46
US90-027	HOCP92-664	117	0	23	0	25	0	35	0	46
1997 Crossing Series										
CP77-310	HOCP85-845	237	0	14	0	20	0	25	.	.
CP77-310	HOCP92-618	333	26	62	4	64	1	55	.	.
CP77-310	HOCP92-618	246	20	65	3	65	0	25	.	.
CP77-310	US78-020	81	0	14	0	20	0	25	.	.
CP77-407	CP88-769	220	0	14	0	20	0	25	.	.
CP77-407	LCP82-089	105	23	96	6	97	5	98	.	.
CP79-318	CP87-609	243	0	14	0	20	0	25	.	.
CP79-318	CP94-856	241	19	64	0	20	0	25	.	.
CP79-318	HO94-850	335	15	41	3	59	1	55	.	.
CP79-318	HO95-988	341	0	14	0	20	0	25	.	.
CP79-318	HOCP85-845	247	15	48	0	20	0	25	.	.
CP79-318	HOCP92-618	247	19	62	2	49	1	58	.	.
CP79-318	L88-072	238	22	73	2	53	0	25	.	.
CP79-318	US78-020	109	7	52	1	59	0	25	.	.
CP79-348	L91-255	484	21	40	8	70	2	60	.	.
CP80-356	LCP82-089	246	17	55	0	20	0	25	.	.
CP82-550	L91-255	243	19	62	0	20	0	25	.	.
CP83-644	LCP85-384	722	57	64	21	86	10	81	.	.
CP84-1198	TCP87-3388	344	6	32	0	20	0	25	.	.
CP84-722	LCP82-089	240	9	38	0	20	0	25	.	.

Table 6. Continued.

			1st Line		2nd Line		Increase		Assignment	
				Rank		Rank		Rank		Rank
Female	Male	Survive	No.	pcnt'l	No.	pcnt'l	No.	pcnt'l	No.	pcnt'l
CP85-830	US78-020	229	17	58	5	79	0	25	.	.
CP87-626	HOCP95-950	112	0	14	0	20	0	25	.	.
CP88-769	HOCP85-845	111	14	87	0	20	0	25	.	.
CP89-805	LCP85-336	108	0	14	0	20	0	25	.	.
CP89-831	HOCP94-806	243	30	86	4	70	4	85	.	.
CP89-843	LCP86-454	480	11	33	2	45	1	53	.	.
CP89-845	CP91-534	234	20	69	7	86	5	92	.	.
CP94-1996	LHO83-153	244	11	41	2	51	0	25	.	.
HO93-771	HOCP92-678	236	15	52	5	78	4	86	.	.
HO93-771	HOCP93-775	235	23	76	10	94	9	97	.	.
HO93-771	LHO83-153	345	38	82	4	64	2	64	.	.
HO94-850	L95-482	939	39	40	8	55	3	56	.	.
HO95-985	CP88-769	244	20	66	2	51	0	25	.	.
HO95-985	L88-063	111	0	14	0	20	0	25	.	.
HO95-985	L95-461	343	33	75	8	81	4	77	.	.
HO95-985	L96-044	425	0	14	0	20	0	25	.	.
HO95-988	LCP82-089	244	0	14	0	20	0	25	.	.
HOCP85-845	SELF	221	0	14	0	20	0	25	.	.
HOCP85-845	US78-020	250	10	39	0	20	0	25	.	.
HOCP88-739	HO94-850	97	24	98	4	94	1	76	.	.
HOCP88-739	L94-428	108	0	14	0	20	0	25	.	.
HOCP88-739	LCP81-010	194	20	78	3	67	2	76	.	.
HOCP88-739	LCP85-384	105	18	94	5	96	4	97	.	.
HOCP89-846	L96-044	106	0	14	0	20	0	25	.	.
HOCP90-923	LHO83-153	465	15	36	5	63	3	67	.	.
HOCP90-941	HOCP92-618	239	0	14	0	20	0	25	.	.
HOCP90-941	HOCP93-750	938	80	69	29	87	11	77	.	.
HOCP90-941	SELF	421	51	84	4	61	2	64	.	.
HOCP91-542	CP91-559	483	40	67	15	88	4	69	.	.
HOCP92-618	HOCP93-775	485	36	58	4	51	2	59	.	.
HOCP92-618	US95-1001	240	0	14	0	20	0	25	.	.
HOCP92-624	CP79-318	110	17	91	0	20	0	25	.	.
HOCP92-624	CP84-772	1348	11	29	3	42	1	50	.	.
HOCP92-624	HOCP85-845	361	39	80	7	76	3	70	.	.
HOCP92-624	HOCP92-618	250	27	80	4	68	3	78	.	.
HOCP92-624	L94-428	808	115	90	7	58	5	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
HOCP92-624	LCP81-010	493	34	55	6	65	6	78	.	.
HOCP92-624	LCP85-384	245	25	77	2	51	0	25	.	.
HOCP92-624	LCP85-384	1944	238	85	54	85	30	83	.	.
HOCP92-624	LCP85-384	256	33	87	5	77	5	90	.	.
HOCP92-624	US95-1001	341	0	14	0	20	0	25	.	.
HOCP92-631	LHO83-153	503	0	14	0	20	0	25	.	.
HOCP92-648	L90-191	106	14	88	2	74	1	74	.	.
HOCP92-648	L91-255	706	53	60	1	40	1	52	.	.
HOCP92-648	L94-428	230	14	48	2	58	0	25	.	.
HOCP92-648	LCP81-010	232	47	95	9	93	4	87	.	.
HOCP92-648	LCP87-472	493	28	46	4	49	3	65	.	.
HOCP92-648	US90-018	106	0	14	0	20	0	25	.	.
HOCP92-654	HOCP93-752	453	0	14	0	20	0	25	.	.
HOCP93-744	CP77-407	221	0	14	0	20	0	25	.	.
HOCP93-744	HOCP85-845	869	0	14	0	20	0	25	.	.
HOCP93-746	HOCP85-845	1206	111	73	27	80	9	67	.	.
HOCP93-746	L94-426	240	13	44	2	52	1	61	.	.
HOCP93-746	LCP82-089	228	15	53	6	83	6	93	.	.
HOCP93-746	LHO83-153	243	0	14	0	20	0	25	.	.
HOCP93-746	US95-1014	234	23	76	4	71	3	79	.	.
HOCP93-750	HOCP90-941	249	0	14	0	20	0	25	.	.
HOCP93-775	SELF	250	24	74	10	93	4	84	.	.
HOCP93-775	US93-016	245	0	14	0	20	0	25	.	.
HOCP94-806	L91-255	684	0	14	0	20	0	25	.	.
HOCP94-806	L94-428	393	0	14	0	20	0	25	.	.
HOCP95-950	LCP82-089	461	0	14	0	20	0	25	.	.
HOCP96-569	HOCP93-775	487	30	50	6	66	2	58	.	.
L88-063	HOCP92-618	223	0	14	0	20	0	25	.	.
L88-063	L91-255	472	45	74	17	90	12	93	.	.
L88-072	HOCP85-845	1655	75	41	13	48	6	57	.	.
L88-072	L96-044	240	0	14	0	20	0	25	.	.
L89-113	LHO83-153	236	17	56	2	55	0	25	.	.
L89-136	HOCP85-845	237	29	85	2	53	1	62	.	.
L90-191	LCP82-089	476	27	46	5	62	4	70	.	.
L91-255	HOCP85-845	103	17	93	2	76	0	25	.	.
L91-281	CP87-626	251	22	71	5	77	5	91	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
L91-281	LCP81-010	96	26	98	9	99	6	99	.	.
L91-281	LCP84-222	107	15	90	4	91	4	95	.	.
L91-288	HOCP92-618	247	0	14	0	20	0	25	.	.
L92-321	HOCP85-845	234	0	14	0	20	0	25	.	.
L93-363	HOCP85-845	243	20	66	5	78	2	68	.	.
L94-424	LCP85-384	1473	96	52	28	75	21	82	.	.
L94-426	CP84-772	400	97	97	14	90	6	83	.	.
L94-426	L95-477	106	9	69	5	95	4	96	.	.
L94-428	L93-365	109	8	57	3	84	1	72	.	.
L94-428	LCP87-472	108	2	33	1	60	1	73	.	.
L94-432	L91-255	211	19	72	7	89	6	94	.	.
L94-432	LCP81-010	481	19	39	3	47	1	53	.	.
L94-432	LCP86-454	105	23	96	7	98	2	90	.	.
L95-495	CP79-318	232	0	14	0	20	0	25	.	.
L95-495	CP85-830	90	0	14	0	20	0	25	.	.
L95-495	HO95-988	232	20	70	2	56	1	63	.	.
L95-495	HOCP85-845	216	0	14	0	20	0	25	.	.
L96-013	HOCP85-845	243	26	79	4	70	1	59	.	.
L96-024	LCP82-089	465	24	43	10	79	4	71	.	.
L96-044	LCP81-010	104	10	75	0	20	0	25	.	.
L96-048	LCP87-472	242	15	50	1	44	1	60	.	.
L96-051	CP85-830	212	35	93	12	97	4	89	.	.
L96-060	L95-477	611	0	14	0	20	0	25	.	.
L96-060	L96-044	703	0	14	0	20	0	25	.	.
L96-060	LCP82-089	712	0	14	0	20	0	25	.	.
L96-071	LCP82-089	685	51	58	13	75	7	75	.	.
LCP81-010	HOCP85-845	1691	47	35	0	20	0	25	.	.
LCP81-010	HOCP85-845	1405	0	14	0	20	0	25	.	.
LCP81-010	L88-072	456	27	47	2	47	1	54	.	.
LCP81-010	L89-136	110	12	81	2	72	2	88	.	.
LCP81-010	L91-281	1403	51	37	12	56	4	54	.	.
LCP81-010	L94-432	1431	51	37	2	40	1	50	.	.
LCP81-010	L95-477	1064	132	86	25	82	14	81	.	.
LCP81-010	L96-044	105	104	99	8	98	5	98	.	.
LCP81-010	LCP82-089	734	42	46	3	44	0	25	.	.
LCP81-010	LCP85-384	106	9	69	0	20	0	25	.	.

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	.	.
LCP81-010	LCP87-472	893	11	31	0	20	0	25	.	.
LCP81-010	US78-020	914	9	30	2	42	1	51	.	.
LCP82-089	HOCP94-806	679	0	14	0	20	0	25	.	.
LCP82-089	LCP87-472	321	6	33	1	43	1	56	.	.
LCP85-313	HOCP85-845	237	9	38	0	20	0	25	.	.
LCP85-313	HOCP85-845	387	35	72	11	85	5	80	.	.
LCP85-313	HOCP85-845	234	45	95	9	92	3	79	.	.
LCP85-313	L88-072	112	7	51	2	72	2	87	.	.
LCP85-313	LCP82-089	728	39	44	5	48	1	51	.	.
LCP85-313	LCP85-336	105	20	94	1	61	1	74	.	.
LCP85-336	L96-024	109	0	14	0	20	0	25	.	.
LCP85-336	LCP85-384	842	97	82	27	89	14	85	.	.
LCP85-384	HOCP85-845	349	42	83	15	95	12	94	.	.
LCP85-384	US95-1075	461	28	48	4	58	4	71	.	.
LCP86-429	HOCP92-618	109	9	67	2	73	2	89	.	.
LCP86-429	L88-072	436	0	14	0	20	0	25	.	.
LCP86-429	L91-255	940	71	61	13	67	6	66	.	.
LCP86-429	L94-428	484	0	14	0	20	0	25	.	.
LCP86-429	L95-477	227	37	92	7	87	2	72	.	.
LCP86-429	LCP85-336	1167	56	43	2	41	0	25	.	.
LCP86-429	LCP85-384	446	59	88	12	83	9	91	.	.
LCP86-429	LCP87-472	236	16	54	2	55	0	25	.	.
RSB90-22	US95-1014	453	11	34	0	20	0	25	.	.
US78-020	HOCP85-845	240	18	60	1	45	1	61	.	.
US79-010	HOCP94-806	234	32	89	4	71	1	63	.	.
US80-004	LCP84-222	94	7	58	0	20	0	25	.	.
US80-004	LCP87-472	95	15	91	1	62	0	25	.	.
US80-004	US78-020	196	0	14	0	20	0	25	.	.
US90-021	HO94-850	239	19	64	1	45	0	25	.	.
US90-025	US90-020	103	7	54	1	62	0	25	.	.
US90-027	97P2	187	19	77	7	91	7	95	.	.
US90-027	L95-477	230	0	14	0	20	0	25	.	.
US90-20	HOCP92-678	236	0	14	0	20	0	25	.	.
US90-25	US92-11	241	2	29	0	20	0	25	.	.
US92-11	CP88-757	232	0	14	0	20	0	25	.	.

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
US93-16	HOCP93-750	464	49	79	11	82	8	87	.	.
US95-1036	RSB90-24	248	0	14	0	20	0	25	.	.
US96-1	HO93-769	245	29	83	4	68	2	68	.	.
US96-1	SELF	242	0	14	0	20	0	25	.	.
US96-2	HOCP93-775	484	14	35	0	20	0	25	.	.
US96-2	LCP86-454	360	25	55	1	43	0	25	.	.
US96-2	LHO83-153	250	4	31	0	20	0	25	.	.
US96-6	HO94-851	219	0	14	0	20	0	25	.	.
US96-6	SELF	246	0	14	0	20	0	25	.	.
1998 Crossing Series										
CP65-357	98P1	234	20	76	0	14	.	.	.	.
CP78-357	HOCP92-624	448	43	84	11	80	.	.	.	.
CP78-357	HOCP96-561	351	24	64	7	71	.	.	.	.
CP79-318	98P3	85	9	86	3	92	.	.	.	.
CP79-318	HOCP85-845	461	7	25	1	30	.	.	.	.
CP79-318	HOCP89-846	207	14	64	1	41	.	.	.	.
CP79-318	HOCP94-836	351	5	24	0	14	.	.	.	.
CP79-318	HOCP95-947	79	0	11	0	14	.	.	.	.
CP79-318	L95-495	593	44	68	2	34	.	.	.	.
CP79-318	LCP82-089	187	16	77	1	43	.	.	.	.
CP79-318	LCP82-089	242	36	96	9	93	.	.	.	.
CP79-318	LCP85-384	251	34	95	16	98	.	.	.	.
CP79-348	US96-006	657	25	41	2	33	.	.	.	.
CP82-550	L96-045	62	0	11	0	14	.	.	.	.
CP83-644	CP79-318	211	9	44	1	40	.	.	.	.
CP83-644	HO94-856	231	0	11	0	14	.	.	.	.
CP83-644	HOCP85-845	964	27	32	3	34	.	.	.	.
CP83-644	HOCP92-624	245	29	90	9	93	.	.	.	.
CP83-644	HOCP95-947	237	0	11	0	14	.	.	.	.
CP83-644	HOCP96-538	246	29	90	5	72	.	.	.	.
CP83-644	L89-113	93	0	11	0	14	.	.	.	.
CP83-644	L95-477	1616	107	62	49	90	.	.	.	.
CP83-644	L95-495	540	0	11	0	14	.	.	.	.
CP83-644	L96-044	225	0	11	0	14	.	.	.	.
CP83-644	LCP81-010	1306	51	42	18	63	.	.	.	.

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
CP83-644	LCP81-010	232	7	34	2	48	.	.	.	.
CP83-644	LCP82-089	1328	80	56	34	82	.	.	.	.
CP83-644	US80-004	101	8	72	0	14	.	.	.	.
CP85-803	L89-113	221	21	83	9	96	.	.	.	.
HO95-985	HOCP85-845	250	28	88	5	71	.	.	.	.
HO95-985	HOCP85-845	397	7	26	2	42	.	.	.	.
HO95-985	L96-040	227	37	98	6	85	.	.	.	.
HO95-985	LCP81-010	452	9	28	3	44	.	.	.	.
HO95-985	LCP81-010	340	21	57	3	49	.	.	.	.
HO95-985	LCP82-089	238	12	48	3	58	.	.	.	.
HO95-985	LCP85-384	106	12	88	7	98	.	.	.	.
HO95-988	HOCP85-845	250	6	30	1	36	.	.	.	.
HO95-988	L89-113	230	17	68	6	83	.	.	.	.
HO95-988	L94-426	105	14	94	4	95	.	.	.	.
HO95-988	L95-495	109	7	59	1	52	.	.	.	.
HO96-566	HOCP92-624	240	22	82	4	65	.	.	.	.
HO96-566	HOCP96-538	394	48	92	5	58	.	.	.	.
HOCP92-618	LCP81-010	689	0	11	0	14	.	.	.	.
HOCP92-624	HO96-565	91	3	36	0	14	.	.	.	.
HOCP92-624	HOCP85-845	249	20	73	10	95	.	.	.	.
HOCP92-624	HOCP85-845	944	71	69	22	78	.	.	.	.
HOCP92-624	HOCP96-509	103	10	85	3	86	.	.	.	.
HOCP92-624	L89-113	427	32	69	10	79	.	.	.	.
HOCP92-624	L96-040	241	35	96	9	94	.	.	.	.
HOCP92-624	L96-045	643	22	38	7	55	.	.	.	.
HOCP92-624	L96-045	240	19	72	1	38	.	.	.	.
HOCP92-624	L97-121	220	17	71	3	62	.	.	.	.
HOCP92-624	LCP85-384	344	24	65	10	86	.	.	.	.
HOCP92-624	LCP85-384	1146	69	56	30	84	.	.	.	.
HOCP92-648	L96-040	234	15	59	5	76	.	.	.	.
HOCP92-648	L97-121	1179	16	24	2	29	.	.	.	.
HOCP92-648	L97-133	242	16	62	1	38	.	.	.	.
HOCP92-648	LCP81-010	564	29	49	3	43	.	.	.	.
HOCP92-648	LCP82-089	92	7	70	2	76	.	.	.	.
HOCP92-654	98P3	621	0	11	0	14	.	.	.	.
HOCP92-654	HOCP85-845	473	0	11	0	14	.	.	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
HOCP92-654	L94-426	1215	0	11	0	14	.	.	.	.
HOCP92-654	L96-083	480	0	11	0	14	.	.	.	.
HOCP94-836	HOCP95-998	1135	0	11	0	14	.	.	.	.
HOCP96-500	L89-113	543	20	39	11	72	.	.	.	.
HOCP96-500	LCP81-010	497	17	38	2	36	.	.	.	.
HOCP96-500	LCP81-010	470	30	59	8	66	.	.	.	.
HOCP96-500	LCP85-384	901	47	50	12	61	.	.	.	.
HOCP96-515	HO96-565	227	14	57	4	68	.	.	.	.
HOCP96-519	HOCP95-998	591	42	66	15	82	.	.	.	.
HOCP96-519	HOCP96-538	333	9	31	1	33	.	.	.	.
HOCP96-522	HOCP95-947	236	9	41	1	38	.	.	.	.
HOCP96-522	LCP82-089	508	24	46	8	65	.	.	.	.
HOCP96-538	CP78-317	226	0	11	0	14	.	.	.	.
HOCP96-538	HOCP85-845	455	0	11	0	14	.	.	.	.
HOCP96-538	HOCP92-624	233	0	11	0	14	.	.	.	.
HOCP96-538	LCP82-089	1074	45	44	20	69	.	.	.	.
HOCP96-546	HOCP85-845	395	19	47	1	31	.	.	.	.
HOCP96-546	L96-044	665	0	11	0	14	.	.	.	.
HOCP96-561	L96-045	85	0	11	0	14	.	.	.	.
L89-113	LCP82-089	713	27	41	10	63	.	.	.	.
L89-163	HOCP94-836	111	6	51	0	14	.	.	.	.
L89-163	HOCP95-947	430	60	95	13	89	.	.	.	.
L89-163	LCP81-010	1296	14	23	2	28	.	.	.	.
L91-255	HOCP96-561	650	0	11	0	14	.	.	.	.
L91-255	L89-113	384	0	11	0	14	.	.	.	.
L91-255	LCP85-384	533	35	62	9	66	.	.	.	.
L94-428	LCP86-454	234	0	11	0	14	.	.	.	.
L95-461	HO94-856	500	52	85	15	88	.	.	.	.
L95-461	HOCP92-624	244	8	36	3	57	.	.	.	.
L95-461	HOCP94-836	247	7	32	1	36	.	.	.	.
L95-495	CP78-2114	93	5	51	0	14	.	.	.	.
L95-495	HO96-565	220	13	55	2	51	.	.	.	.
L95-495	HOCP85-845	374	0	11	0	14	.	.	.	.
L95-495	HOCP96-500	224	0	11	0	14	.	.	.	.
L95-495	L89-113	414	45	87	13	90	.	.	.	.
L95-495	L96-045	196	0	11	0	14	.	.	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
L95-495	L96-083	77	10	93	1	61	.	.	.	.
L96-040	L96-044	694	58	75	12	67	.	.	.	.
L96-040	L97-149	229	0	11	0	14	.	.	.	.
L96-040	LCP82-089	567	67	90	17	88	.	.	.	.
L96-040	US96-006	245	22	81	5	73	.	.	.	.
L96-045	HOCP85-845	108	8	68	2	69	.	.	.	.
L96-060	HOCP95-998	227	0	11	0	14	.	.	.	.
L96-060	L95-495	349	6	26	1	32	.	.	.	.
L96-060	LCP82-089	344	14	43	3	49	.	.	.	.
L96-072	HOCP85-845	234	12	49	2	47	.	.	.	.
L96-072	HOCP89-846	100	0	11	0	14	.	.	.	.
L96-072	LCP82-089	392	32	74	13	91	.	.	.	.
L96-078	HOCP95-947	107	9	75	1	53	.	.	.	.
L97-104	L97-146	444	29	60	4	50	.	.	.	.
L97-104	LCP82-089	241	21	79	6	81	.	.	.	.
L97-113	L96-044	97	3	34	2	74	.	.	.	.
L97-113	LCP81-010	244	1	23	0	14	.	.	.	.
L97-121	HOCP92-624	101	17	98	7	99	.	.	.	.
L97-121	HOCP96-561	882	40	45	8	51	.	.	.	.
L97-121	LCP81-010	237	26	87	5	75	.	.	.	.
L97-128	HOCP95-998	235	8	38	0	14	.	.	.	.
L97-128	LCP81-010	899	17	27	6	45	.	.	.	.
L97-146	LCP85-384	219	18	74	9	96	.	.	.	.
L97-149	LCP81-010	225	0	11	0	14	.	.	.	.
LCP81-010	HOCP96-550	235	8	38	3	59	.	.	.	.
LCP81-010	L95-495	225	5	29	0	14	.	.	.	.
LCP81-010	L97-149	343	24	65	6	68	.	.	.	.
LCP81-010	LCP82-089	1194	4	22	2	29	.	.	.	.
LCP82-089	HOCP96-527	427	0	11	0	14	.	.	.	.
LCP82-089	L89-113	746	0	11	0	14	.	.	.	.
LCP82-089	LCP86-454	166	0	11	0	14	.	.	.	.
LCP85-384	CP78-2114	314	23	66	6	70	.	.	.	.
LCP85-384	L96-045	221	28	92	6	85	.	.	.	.
LCP85-384	LCP82-089	1223	192	97	28	77	.	.	.	.
LCP85-384	LCP82-089	237	40	99	7	87	.	.	.	.
LCP85-384	LCP86-454	211	7	36	2	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
LCP86-429	L94-428	753	16	28	2	31	.	.	.	.
LCP87-492	CP78-2114	203	26	93	7	92	.	.	.	.
MISC	98P2	231	13	52	3	61	.	.	.	.
MISC	CP78-317	245	21	77	2	46	.	.	.	.
MISC	HOCP85-845	600	35	54	14	78	.	.	.	.
MISC	HOCP92-624	404	35	79	10	80	.	.	.	.
MISC	HOCP96-500	219	19	79	2	51	.	.	.	.
MISC	L89-113	486	25	49	5	54	.	.	.	.
MISC	L89-163	251	23	82	1	36	.	.	.	.
MISC	L94-426	243	23	83	11	97	.	.	.	.
MISC	L95-495	198	8	42	3	64	.	.	.	.
MISC	L96-044	229	13	53	5	77	.	.	.	.
MISC	L96-045	243	29	91	5	74	.	.	.	.
MISC	L97-146	241	14	54	2	46	.	.	.	.
MISC	LCP81-010	101	9	80	0	14	.	.	.	.
MISC	LCP85-384	243	16	62	3	57	.	.	.	.
MISC	LCP86-454	214	5	30	1	40	.	.	.	.
US77-017	HOCP85-845	235	7	34	3	59	.	.	.	.
US77-017	HOCP92-624	247	20	73	3	56	.	.	.	.
US93-015	CP78-2114	228	0	11	0	14	.	.	.	.
US93-015	L96-044	252	0	11	0	14	.	.	.	.
US93-016	CP78-2114	203	12	55	1	42	.	.	.	.
US93-016	L95-495	583	28	47	5	48	.	.	.	.
US93-016	L96-045	247	11	45	3	56	.	.	.	.
US93-016	LCP86-454	38	1	31	1	84	.	.	.	.
US96-006	CP78-2114	234	0	11	0	14	.	.	.	.
US96-006	L97-121	241	0	11	0	14	.	.	.	.
US96-006	L97-155	102	0	11	0	14	.	.	.	.
US96-006	US96-006	206	18	79	1	42	.	.	.	.
1999 Crossing Series										
CP65-357	L95-482	407	16	50	.	.	.	.	.	.
CP65-357	LCP85-384	94	20	99	.	.	.	.	.	.

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
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	.	.	.	.	.	.

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
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	.	.	.	.	.	.
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	.	.	.	.	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
HOCP92-624	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	.	.	.	.	.	.
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	.	.	.	.	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
HOCP96-522	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	.	.	.	.	.	.
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	.	.	.	.	.	.

Table 6. Continued.

Female	Male	Survive	1st Line No.	1st Line Rank pcnt'l	2nd Line No.	2nd Line Rank pcnt'l	Increase No.	Increase Rank pcnt'l	Assignment No.	Assignment Rank pcnt'l
L91-255	LCP85-384	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	.	.	.	.	.	.
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	.	.	.	.	.	.

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
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	.	.	.	.	.	.
US79-010	HOCP92-618	219	14	70	.	.	.	.	.	.

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	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	.	.	.	.	.	.

Table 7. Plant weight and rank summary statistics from the 2000 crossing series plant cane cross appraisal test at the St. Gabriel Research Station in 2001.

Female	Male	Plant Weight Kg/Plant	Pcnt'l
L99-224	L99-233	5.46	98
LCP87-492	L99-233	5.01	97
L94-428	L99-226	4.93	96
L99-224	L91-255	4.87	94
L99-224	L99-226	4.83	93
L99-229	LCP81-010	4.77	92
US79-010	L96-040	4.70	90
L98-207	L99-233	4.69	89
HOCP98-776	LCP81-010	4.59	88
HOCP96-522	L99-226	4.53	86
HOCP97-645	L99-226	4.46	85
L98-209	L99-233	4.46	84
CP79-318	L99-233	4.42	82
CP78-317	L99-229	4.35	81
L99-224	LCP81-010	4.32	80
HOCP96-561	L99-233	4.31	78
HOCP92-624	US80-004	4.25	77
LCP87-492	L91-255	4.24	76
US79-010	L99-234	4.23	75
HOCP96-561	HOCP85-845	4.22	73
LCP86-454	L99-234	4.14	72
L91-281	L99-237	4.08	71
LCP85-384	L99-226	4.07	69
HOCP92-648	HOCP97-609	4.07	68
L93-399	L99-233	4.06	67
L94-432	L99-224	4.05	65
HOCP98-717	L91-255	4.05	64
HOCP92-624	L99-229	4.02	63
L94-426	L99-233	4.02	61
L99-229	LCP85-384	4.00	60
US92-010	L91-281	3.99	59
US96-001	L99-226	3.98	57
US79-010	L94-428	3.94	56
HOCP98-741	HOCP97-609	3.92	55
L90-191	US96-001	3.90	53
CP79-318	HOCP85-845	3.89	52
L93-399	L99-226	3.89	51
HOCP94-867	L99-226	3.87	50
HOCP98-741	HOCP85-845	3.77	48
HOCP98-717	LCP85-384	3.76	47
L98-198	US79-010	3.66	46
L93-399	L99-224	3.61	44
L99-229	L90-191	3.55	43
TUCCP77-042	HOCP92-618	3.54	42
US96-002	L99-226	3.52	40
HOCP92-618	L99-233	3.47	39
HOCP97-645	L98-197	3.46	38
HOCP92-624	L99-226	3.44	36
L99-224	US79-010	3.43	35
HOCP95-950	L99-237	3.40	33
HOCP96-561	L99-229	3.40	33
L99-226	L99-233	3.35	31
HOCP98-776	HOCP85-845	3.34	30
L97-128	LCP85-384	3.33	28
HOCP98-776	L91-281	3.30	27
L98-207	00P5	3.27	26
L97-128	L99-229	3.27	25
L98-158	US79-010	3.27	23
L99-226	HOCP96-540	3.26	22
LCP81-010	L99-234	3.24	21
HOCP97-606	L89-113	3.14	19
HOCP98-776	HOCP97-621	3.08	18
HOCP98-776	L89-113	3.06	17
L99-237	HOCP85-845	2.98	15
HOCP98-743	L98-209	2.98	14
HOCP98-743	L99-226	2.90	13
HOCP98-776	L96-040	2.84	11
L99-226	LCP85-384	2.74	10
HOCP96-561	HOCP98-648	2.70	9
L99-237	HOCP98-648	2.64	7
HOCP91-552	L99-233	2.57	6
L96-040	HOCP98-776	2.27	5
L99-245	HOCP85-845	2.24	3
HOCP98-743	US96-001	1.99	2
L98-197	HOCP96-522	1.67	1

Female Male Plant Weight

2001 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS

J. J. Hebert, K.P. Bischoff, K. A. Gravois,
G. L. Hawkins, H.P. Viator*, and A. J. Orgeron
Sugar Research Station and Iberia Research Station*

E.O. Dufrene and T. L. Tew
USDA-ARS Sugarcane Research Unit

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

One objective of the nursery and infield stages is to identify and select varieties that will perform well across the range of environments a commercial variety will encounter in Louisiana. Nursery tests are initially planted at three on-station locations (USDA-ARS, Ardoyne Farm, Iberia Research Station, and St. Gabriel Research Station) during the year of assignment, and four to five additional and different off-station locations are planted the year after assignment. In 2001, both LSU AgCenter and USDA varieties were planted together both in the nursery and infield trials. 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 plots with 4-foot alleys. The off-station nurseries (Blake Newton Farm, Danny Stoute, and Westfield) were planted in single row, 20-foot plots with 5-foot alleys. The infield tests (Blackberry and Sugarland Farms) 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, CP70-321, HOCP 85-845, and LCP 85-384, were planted in tests for comparison. Beginning in 2001, HOCP91-555 replaced CP70-321 as a check variety.

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

Millable stalk counts for both nursery and infield tests were made in 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 harvested by hand and stripped of leaves 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. Sugar per acre was calculated as the product of sugar per ton and cane yield.

The 2001 sugarcane crop experienced a reasonably normal growing season throughout most of the year. Spring and early summer were dry and followed by excessive rains from tropical storm Allison. Growing conditions for the remainder of the year were good. Warm and dry conditions persisted during most of the fall harvest season, and all locations were harvested before the first freeze. Recommended cultural practices were used at all test locations.

LCP85-384 has been the leading variety in Louisiana since 1998. Approximately, 78% of Louisiana's harvested sugarcane acreage was in LCP85-384 for 2001. 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. 2001 Location, soil texture, and planting and harvest dates for the nursery and infield nursery tests.

					Harvest Dates			Varieties	
Series	Location†	Stage	Soil Texture‡	Planting Date	1999	2000	2001	No. Planted	No. Harvested
1997	Ardoyne*	Nursery	Csl	11/4/97	11/2	10/12	9/26	56	2
1997	St. Gabriel	Infield	Sc	8/25/98	11/15	10/16	10/9	43	2
1997	Gonsoulin	Nursery	Cosl	8/26/98	11/8	9/28	9/26	26	2
1997	Stoute	Nursery	Bsc	8/28/98	11/8	10/25	9/26	26	2
1997	Westfield	Nursery	Sc	8/26/98	11/17	10/25	9/26	26	2
1998	Ardoyne	Nursery	Csl	10/15/98	12/7	11/1	10/18	53	2
1998	Iberia	Nursery	Bsc	10/14/98	12/6	11/1	10/3	53	2
1998	St. Gabriel	Nursery	Sc	10/16/98	11/18	11/1	9/30	53	2
1998	Gonsoulin	Nursery	Cos1	8/13/99		11/30	11/7	44	4
1998	Blackberry	Infield	Csl	8/24/99		11/30	12/4	65	11
1998	Stoute	Nursery	Bsc	8/20/99		11/15	10/16	13	2
1998	Westfield	Nursery	Csl	8/17/99		12/16	11/13	44	4
1999	Ardoyne	Nursery	Csl	10/20/99		11/20	11/19	34	4
1999	Iberia	Nursery	Bsc	10/19/99		11/30	10/25	34	4
1999	St. Gabriel	Nursery	Sc	10/18/99		11/15	10/18	34	4
1999	Blackberry	Infield	Csl	8/17/00			12/4	39	14
1999	Newton	Nursery	Mosl	8/24/00			11/12	39	10
1999	Stoute	Nursery	Bsc	8/18/00			11/15	16	4
1999	Sugarland	Infield	Cosl	8/23/00			12/6	39	13
1999	Westfield	Nursery	Csl	8/21/00			10/18	39	10
2000	Ardoyne	Nursery	Csl	10/12/00			11/19	33	13
2000	Iberia	Nursery	Bsc	10/13/00			11/19	33	13
2000	St. Gabriel	Nursery	Sc	10/12/00			12/9	33	13
2000	Newton	Nursery	Mosl	8/24/01				48	
2000	Stoute	Nursery	Bsc	8/23/01				13	
2000	Westfield	Nursery	Csl	9/18/01				48	
2000	Blackberry	Infield	Csl	8/21/01				48	
2000	Sugarland	Infield	Cosl	8/22/01				47	
2001	Ardoyne	Nursery	Csl	10/18/01				37	
2001	Iberia	Nursery	Bsc	10/22/01				37	
2001	St. Gabriel	Nursery	Sc	10/9/01				37	

Table 1. Continued.

* Harvest date in 1998 was 12/7.

† 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, Csl-Jeanerette silt loam, Sc-Sharkey clay Mosl-Moreland silt loam.

Table2. 2001 Nursery third-stubble means of the 1997 "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	7053		35.1		202		2.00		35166	-
LCP85-384	8223		42.5		198		1.60		52181	
HOCP85-845	6883		33.1		208		1.76		37434	-
L97-128	9378		39.0		241		1.68		46736	
L97-137	9075		44.1		204		1.77		49459	

Table 3. 2001 Infield† second-stubble means of the 1997 "L" assignment series in heavy soil at St. Gabriel 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	3355	-	17.1	-	197	+	1.74		19635	-
LCP85-384	6504		39.3		165		1.75		44954	
HOCP85-845	4492	-	23.3	-	194	+	1.61		29166	-
L97-128	7557		38.2		198	+	1.99		38412	
L97-137	5225	-	31.1	-	169		1.80		34797	-

† Harvested with combine harvester.

Table 4. 2001 Nursery second-stubble means of the 1997 "L" assignment series in light soil at Ronnie 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	5835		30.7		190		1.91		32216	
LCP85-384	6059		37.9		159		1.57		48551	
HOCP85-845	7297		38.0		195		1.95		38796	
L97-128	11069	+	49.5		224		1.87		53316	
L97-137	8470		53.8	+	158		2.04	+	52862	

Table 5. 2001 Nursery second-stubble means of the 1997 "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	6011		34.2		175		1.71		39930	-
LCP85-384	8468		45.9		180		1.43		63752	
HOCP85-845	5536		31.6		175		1.52		41745	-
L97-128	6538		31.3		206		1.75		35846	-
L97-137	7966		44.6		175		1.63		54450	-

Table 6. 2001 Nursery second-stubble means of the 1997 "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	6078	-	30.5	-	199		1.71	+	36300	-
LCP85-384	8916		50.6		175		1.36		75096	
HOCP85-845	7441		37.0	-	202	+	1.83	+	40837	-
L97-128	11005		61.5	+	197		1.89	+	65340	
L97-137	10800		62.2	+	194		1.61		77818	

Table 7. 2001 Nursery second-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	10892		45.5		239		2.56	+	35619	-
LCP85-384	13486		56.2		239		1.75		64206	
HOCP85-845	12258		51.3		239		2.28		44921	-
L98-207	14411		57.1		253		1.80		63298	
L98-209	13280		54.1		246		2.36	+	45829	-

Table 8. 2001 Nursery second-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	7659	39.0	196	2.51	31082 -
LCP85-384	10412	54.5	191	1.74	62618
HOCP85-845	7715	36.9	209 +	2.03	35393 -
L98-207	10994	49.5	222 +	1.78	55584
L98-209	13528	68.5	197	2.45	55584

Table 9. 2001 Nursery second-stubble means of the 1998 "L" assignment series in heavy soil at St. Gabriel 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	5690	35.6 -	158	2.06	34031 -
LCP85-384	9847	68.1	145	1.76	77591
HOCP85-845	3581 -	20.6 -	174	1.43	28813 -
L98-207	8430	48.5	170	1.64	58988 -
L98-209	12223	71.1	171	2.16	65794

Table 10. 2001 Nursery first-stubble means of the 1998 "HOCP" and "L" assignment series in light soil at Ronnie 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	13103 -	50.8 -	258	2.94 +	34666 -
TUCCP77-042	10096 -	41.1 -	246	2.56	32125 -
LCP85-384	17251	65.8	262	2.20	59714
HOCP85-845	11115 -	43.3 -	256	2.38	36481 -
L98-207	15100	56.7	265	1.76	64251
L98-209	17558	66.1	266	2.59	51183 -
HOCP98-741	14255	58.4	244	3.12 +	37389 -

Table 11. 2001 Infield† first-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		Fiber	
	(lbs/A)		(tons/A)	(lbs/ton)		(lbs)		(stalks/A)		%	
CP70-321	8443	-	30.4	280		2.22		27363	-	10.8	
TUCCP77-042	11339		46.1	248	-	2.49		36992		13.3	
LCP85-384	12637		42.7	296		1.95		44150		11.4	
HOCP85-845	10718		37.4	286		2.67	+	28398	-	14.1	+
HOCP96-540	13423		43.6	308		2.59	+	33921		12.2	
L97-128	12546		43.4	289		2.69	+	32368	-	12.9	
L97-137	11350		42.4	267		2.26		37563		12.1	
HOCP97-609	10223		37.3	272		2.27		33036		12.1	
L98-207	9755	-	37.9	259		1.73		43967		12.5	
L98-209	9685	-	32.5	298		2.51		26433	-	13.9	
HOCP98-741	12753		45.9	278		3.19	+	28754	-	14.2	+

† Harvested with combine harvester.

Table 12. 2001 Nursery first-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	6760	-	36.5	-	186	-	2.05		35393	-
LCP85-384	12070		55.7		216		2.16		51728	
HOCP85-845	5316	-	26.2	-	204		2.08		25229	-
L98-207	11869		49.6		240		1.79	-	55539	
L98-209	12396		58.4		212		2.24		52091	

Table 13. 2001 Nursery first-stubble means of the 1998 "HOCP" and "L" assignment series in light 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	12184		43.5	-	280		2.16	+	40293	-
TUCCP77-042	19895		89.6	+	222	-	2.82	+	63525	
LCP85-384	15857		56.5		279		1.81		62436	
HOCP85-845	13987		50.0		281		2.46	+	40656	-
L98-207	18629		66.5		280		2.02		66248	
L98-209	21571	+	81.2	+	266		2.72	+	59532	
HOCP98-741	15707		61.9		253		2.89	+	43016	-

Table 14. 2001 Nursery first-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	13374	-	48.1	-	278		3.03		31763	-
LCP85-384	18920		66.1		286		2.44		54223	
HOCP85-845	13089	-	46.8	-	280		2.40		39023	-
L99-213	15181	-	50.0	-	304		2.19		45829	-
L99-226	18536		64.3		288		3.39	+	38569	-
L99-231	15051	-	52.2	-	288		2.45		42879	-
L99-233	14140	-	50.4	-	279		2.37		42653	-

Table 15. 2001 Nursery first-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	11197		49.8		224		2.74	+	36300	-
LCP85-384	12661		52.9		239		2.09		50593	
HOCP85-845	8614		37.1	-	232		2.15		34712	-
L99-213	11558		50.4		230		1.98		50820	
L99-226	16718		62.7		266	+	3.32	+	37888	-
L99-231	12147		46.1		264		2.45	+	37661	-
L99-233	13868		55.0		252		2.29		48098	

Table 16. 2001 Nursery first-stubble means of the 1999 "L" assignment series in heavy soil at St. Gabriel 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	6479	-	32.0	-	204		2.23		28586	-
LCP85-384	9702		52.0		187		2.10		49913	
HOCP85-845	5110	-	25.9	-	197		2.08		24956	-
L99-213	10510		48.6		217	+	1.86		52181	
L99-226	5712	-	25.9	-	219	+	1.80		28586	-
L99-231	10435		50.1		209	+	2.08		48097	
L99-233	10131		59.3		171		2.23		53316	

Table 17. 2001 Infield† plant cane 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	Fiber	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	%	
CP70-321	8580		29.6		289		2.55		22317	13.2	
LCP85-384	7975		30.9		256		2.32		26655	11.1	
HOCP85-845	8569		30.3		283		2.36		25911	12.6	
L99-213	9605		34.0		283		1.98		34345	15.7	+
L99-226	12371	+	40.3	+	307	+	2.99	+	27409	11.5	
L99-231	7174		25.9		277		2.18		23775	10.9	
L99-233	8699		33.2		258		2.16		30896	13.6	+
HOCP99-804	8729		30.6		285		2.70		23014	12.1	
HOCP99-808	8156		29.5		277		1.85		31907	11.2	
HOCP99-815	8099		28.8		280		2.21		26035	12.6	
HOCP99-825	9184		33.0		277		2.65		24869	12.1	
HOCP99-832	5270		19.6	-	266		1.28	-	31455	10.9	
HOCP99-866	10320		39.5		261		3.16	+	25259	10.6	
HOCP99-870	8741		35.4		247		1.92		37233	13.8	+

† Harvested with combine harvester.

Table 18. 2001 Nursery plant cane 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	14270	60.0		238		3.01		39930	-
LCP85-384	15623	67.1		234		2.41		55584	
HOCP85-845	11999	55.4		216	-	2.58		43106	-
L99-213	13092	51.2		256	+	2.04		50139	
L99-226	21220	79.1		270	+	3.28	+	47190	
L99-231	11762	46.7		252	+	2.40		38796	-
L99-233	15525	66.2		235		2.34		57173	
HOCP99-804	10104	42.6	-	237		2.18		39023	-
HOCP99-808	11746	49.9		236		2.24		44694	
HOCP99-815	15941	64.1		249		2.87		44694	
HOCP99-825	15778	61.7		256	+	2.73		45375	
HOCP99-866	16188	69.1		235		3.87	+	35619	-
HOCP99-870	13981	60.7		230		2.59		46736	

Table 19. 2001 Nursery plant cane 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	9184	40.3	226	2.90	+	27679
LCP85-384	10801	43.4	255	2.25		39023
HOCP85-845	7246	30.3	240	2.22		27225
L99-213	8277	31.7	263	1.44	-	44014
L99-226	16415	63.7	256	2.90	+	43787
L99-231	11818	43.8	271	2.17		39930
L99-233	12436	50.2	249	2.07		49005

Table 20. 2001 Infield† plant cane 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	Fiber	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	%	
CP70-321	11190	+	41.2	+	271		3.08	+	26820	12.6	
LCP85-384	8112		32.3		253		2.24		29876	11.1	
HOCP85-845	10879	+	39.2		277		2.69		29154	12.6	
L99-213	10815	+	36.5		296	+	2.25		32804	15.5	+
L99-226	11017	+	36.3		305	+	2.97	+	24787	11.2	
L99-231	7279		25.8		282		2.29		22960	12.6	
L99-233	8129		32.0		254		1.83		35226	12.2	
HOCP99-804	9153		32.0		286		2.63		24433	10.9	
HOCP99-808	8470		30.0		282		2.14		28159	12.3	
HOCP99-815	11732	+	40.5	+	290		2.38		34453	14.8	+
HOCP99-825	10422	+	39.2		266		2.49		31726	11.8	
HOCP99-866	12685	+	45.3	+	280		3.75	+	24817	10.1	
HOCP99-870	10685	+	38.3		279		1.88		40790	14.3	+

† Harvested with combine harvester.

Table 21. 2001 Nursery plant cane means of the 1999 “HOCP” and “L” assignment series in light 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	16567		64.7		257		2.68	+	48324	-
LCP85-384	14619		59.0		248		1.77		66474	
HOCP85-845	14441		60.8		238		2.40	+	50593	-
L99-213	17428		67.2		252		1.72		79179	
L99-226	22246	+	82.2		272		2.80	+	58307	
L99-231	11048		48.7		228		1.81		53996	
L99-233	15704		67.9		234		1.92		72146	
HOCP99-804	12877		65.3		198		2.21		58988	
HOCP99-808	9978		50.5		194	-	1.88		53769	
HOCP99-815	16188		60.3		268		2.18		55358	
HOCP99-825	15350		74.8		206		2.97	+	50366	-
HOCP99-866	16353		68.0		242		2.99	+	45148	-
HOCP99-870	13957		60.4		232		1.78		68970	

Table 22. 2001 Nursery plant cane 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	8451	-	32.6	-	259		2.57		25410	-
LCP85-384	13811		54.9		251		2.58		42653	
HOCP85-845	12947		55.6		233		2.81		39703	
L00-247	9305	-	46.4		201	-	2.28		40838	
L00-249	9638	-	35.6	-	271		2.28		31309	-
L00-250	9647	-	42.6	-	226	-	2.55		33804	
L00-255	12118		46.4		261		2.66		34939	
L00-257	11033	-	39.5	-	280	+	2.02	-	39023	
L00-259	10528	-	44.8		233		2.44		36754	
L00-263	13819		57.4		240		2.30		49913	
L00-264	13921		60.5		230		2.87		42426	
L00-266	9460	-	38.1	-	248		2.65		28813	-
L00-268	12599		51.6		245		2.36		43787	
L00-270	12122		53.1		231		2.24		46963	
L00-271	8923	-	33.2	-	268		2.15		31989	-
L00-273	10835	-	47.1		230		3.24	+	29040	-

Table 23. 2001 Nursery plant cane 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	9107	33.8	270	2.31	29267 -
LCP85-384	11201	41.5	270	2.21	37661
HOCP85-845	13017	50.0	261	2.93 +	34031
L00-247	8802	35.4	252	2.04	34485
L00-249	7921	29.2	273	1.91	30628
L00-250	8142	34.6	235 -	2.28	30174
L00-255	10929	40.3	271	2.60 +	30855
L00-257	7950	28.9	275	1.91	30401
L00-259	12256	45.4	270	2.36	38569
L00-263	10799	40.1	268	2.07	37888
L00-264	12471	47.2	264	2.67 +	35393
L00-266	10642	41.1	259	2.25	36527
L00-268	13461	49.0	274	2.43	40384
L00-270	12260	46.0	267	2.39	38569
L00-271	9064	33.2	272	2.16	30628
L00-273	8796	34.6	254	2.51	27679 -

Table 24. 2001 Nursery plant cane means of the 2000 "L" assignment series in heavy soil at St. Gabriel 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	12492	46.4 -	269	2.67	34485 -
LCP85-384	14145	61.3	231	2.59	47644
HOCP85-845	12027	51.7	234	2.80	36981
L00-247	10987	58.2	188	2.45	47417
L00-249	11608	48.5	240	2.19 -	44241
L00-250	13336	64.2	208	2.86	44921
L00-255	15637	59.7	261	3.08 +	38796
L00-257	13555	50.3	270	2.57	39476
L00-259	14977	62.7	240	2.74	45602
L00-263	10348	48.6	212	2.30	42426
L00-264	14423	73.3	196	2.82	51954
L00-266	12014	50.8	237	2.40	42653
L00-268	13837	58.4	237	2.72	43106
L00-270	11628	49.2	237	2.23	44241
L00-271	9439 -	38.1 -	248	2.08 -	36754 -
L00-273	11227	52.1	216	2.72	38115

Table 25. 2001 Nursery and Infield second-stubble means of the 1997 "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	5320	-	28.1	-	190	+	1.77	+	32020	-
LCP85-384	7487		43.5		170		1.52		58088	
HOCP85-845	6191		32.5	-	191	+	1.72	+	37636	-
L97-128	9042		45.1		202	+	1.87	+	48228	
L97-137	8115		47.9		169		1.77	+	54982	

Table 26. 2001 Nursery second-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	8081	-	40.0	-	198		2.37	+	33577	-
LCP85-384	11248		59.6		192		1.75		68138	
HOCP85-845	7851	-	36.3	-	207	+	1.92		36376	-
L98-207	11278		51.7		215	+	1.74		59290	
L98-209	13010		64.5		205		2.32	+	55736	

Table 27. 2001 Nursery and Infield first-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	10122	-	40.3		251		2.34		34429	-
TUCCP77-042	12837		57.8		224	-	2.60	+	43832	-
LCP85-384	14454		55.2		263		2.03		54507	
HOCP85-845	10284	-	39.2	-	257		2.40	+	32691	-
L98-207	13838		59.7		261		1.82		57501	
L98-209	15303		59.5		260		2.51	+	47310	
HOCP98-741	13299		54.3		244		3.05	+	36004	-

Table 28. 2001 Nursery first-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	10350		43.3		235	2.67		32216	-
LCP85-384	13761		57.0		237	2.21		51576	
HOCP85-845	8938	-	36.6	-	236	2.21		32897	-
L99-213	12416		49.6		250	2.01		49610	
L99-226	13655		51.0		258	2.83	+	35014	-
L99-231	12544		49.5		254	2.33		42879	
L99-233	12713		54.9		243	2.29		48022	

Table 29. 2001 Nursery and Infield plant cane means of the 1999 “HOCP” and "L" assignment series across locations.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number		Fiber	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)		%	
CP70-321	11958		47.2		256		2.84	+	33214	-	12.9	
LCP85-384	11426		46.5		249		2.20		43523		11.1	
HOCP85-845	10627		43.2		251		2.45		35198	-	12.6	
L99-213	11844		44.1		270	+	1.88	-	48096		15.6	+
L99-226	16654	+	60.3	+	282	+	2.99	+	40296		11.4	
L99-231	9816		38.2	-	262		2.17		35891	-	11.7	
L99-233	12099		49.9		246		2.06		48889		12.9	+
HOCP99-804	9936		41.7		250		2.41		35858	-	11.5	
HOCP99-808	9308		39.1		245		2.01		39127		11.7	
HOCP99-815	12711		47.5		270		2.39		39629		13.7	+
HOCP99-825	12404		51.3		249		2.69	+	37578		12.0	
HOCP99-832	8120		34.2		247		1.31	-	43616		10.9	
HOCP99-866	13607		54.6		253		3.42	+	32205	-	10.3	
HOCP99-870	11562		48.7		245		2.02		47926		14.1	+

Table 30. 2001 Nursery plant cane 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	10016	-	37.6	-	266		2.52		29721	-
LCP85-384	13053		52.5		251		2.46		42653	
HOCP85-845	12664		52.4		243		2.85	+	36905	
L00-247	9698	-	46.7		214	-	2.26		40913	
L00-249	9722	-	37.8	-	261		2.13	-	35393	-
L00-250	10375	-	47.1		223	-	2.56		36300	-
L00-255	12895		48.8		264		2.78	+	34863	-
L00-257	10846		39.5	-	275	+	2.17		36300	-
L00-259	12587		51.0		248		2.51		40308	
L00-263	11655		48.7		240		2.22		43409	
L00-264	13605		60.3		230	-	2.79	+	43258	
L00-266	10705	-	43.3	-	248		2.43		35998	-
L00-268	13299		53.0		252		2.50		42426	
L00-270	12003		49.4		245		2.29		43258	
L00-271	9142	-	34.8	-	263		2.13	-	33124	-
L00-273	10286	-	44.6		234		2.82	+	31611	-

2001 LOUISIANA "HoCP" NURSERY VARIETY TRIALS [1/]

E. O. Dufrene and T. L. Tew
USDA-ARS, SRRC, Sugarcane Research Unit

The nursery testing stage of the USDA sugarcane breeding program 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 planted in three different regions of the sugarcane industry.

USDA nursery tests are 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 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 August. For USDA nursery trials, a 15-stalk sample is hand-cut from each plot during the harvest season and taken to the Juice and Milling Quality Laboratory at Ardoyne Farm, where they are weighed and processed for sucrose analysis. In the replant nurseries, a 10-stalk sample is hand-cut from each plot and sent to the Juice and Milling Quality Laboratory at Ardoyne Farm or the St. Gabriel Sucrose Laboratory. 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 1996 through the 2000 HoCP series were harvested from nursery trials in 2001. The 2001 HoCP assignment series were planted to three locations in 2001. Varieties from the 2000 HoCP series were combined with varieties from the 2000 LSU series and replanted on four commercial farms (two nurseries trials and two infield trials). Test locations, planting dates, and harvest dates can be found in Table 1. Analysis of variance was performed for each test and also for each series by crop. Least significant differences were calculated using Fisher's LSD test. Results from trials harvested in 2001, along with combined analyses where applicable, can be found in Tables 2 to 20.

[1/] HoCP Varieties selected at Houma (Ho), La from seed produced at Canal Point (CP), Fla., from Louisiana parents.

Table 1. 2001 Planting and harvest dates of "HoCP" nursery tests.

				Harvest Dates			
Series	Location[2/]	Soil Texture [3/]	Planting Date	1998	1999	2000	2001
1996	BSP	Csl	9/15/97	11/19	11/04	10/20	10/15
1996	GKF	Sc	9/22/97	11/20	11/03	10/05	10/09
1997	BSP	Csl	9/25/98		11/22	10/20	10/15
1997	GKF	Sc	10/15/98		11/19	10/05	10/09
1997	IRS	Bsc	10/14/98		11/16	10/31	10/23
1998	AFH	Sc	10/07/98		12/06	10/24	10/02
1998	AFL	Csl	10/07/98		12/07	11/15	10/05
1998	STG	Csl	10/23/98		11/23	10/30	10/19
1999	AFL	Csl	10/20/99			11/27	10/31
1999	IRS	Bsc	10/19/99			11/29	10/23
1999	STG	Csl	10/21/99			11/28	11/08
2000	AFL	Csl	10/27/00				11/21
2000	IRS	Bsc	10/31/00				11/26
2000	STG	Csl	10/30/00				12/07
2001	AFL	Csl	10/18/01				
2001	IRS	Bsc	10/23/01				
2001	STG	Csl	10/19/01				

[2/] AFH = Ardoyne Farm Heavy soil in Chacahoula, AFL = Ardoyne Farm Light soil in Chacahoula, BSP = Bon Secour Plantation in St. James, GKF = Godfrey Knight Farm in Thibodaux, IRS = Iberia Research Station in Jeanerette, STG = St. Gabriel Research Station in St. Gabriel.

[3/] Bsc = Baldwin silty clay, Csl = Commerce silt loam, Sc = Sharkey clay

Table 2. Means of the 1996 HoCP and Ho series third-stubble nursery variety trial on a Commerce silt loam soil at Bon Secour Plantation in St. James, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	4360 -	20.8 -	203	1.85	21553 -
LCP 85-384	11235	44.8	250	1.45	62618
HoCP 85-845	9094	38.0	240	1.75	43560
HoCP 96-540	12269	56.4	218	2.02	55811
$LSD_{(.05)}$	5639	20.6	N.S.	N.S.	26645

Table 3. Means of the 1996 HoCP and Ho series third-stubble nursery variety trial on a Sharkey clay soil at Godfrey Knight Farms in Thibodaux, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	4734	21.1	219 +	1.34 +	30855 -
LCP 85-384	5734	30.5	188	0.95	64886
HoCP 85-845	3667	16.7	220 +	1.05	31989 -
HoCP 96-540	8533	37.7	227 +	1.22	61937
$LSD_{(.05)}$	3590	15.8	20	0.36	20507

Table 4. Combined means of the 1996 HoCP and Ho series third-stubble nursery variety trials in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	4547 -	21.0 -	211	1.60 +	26204 -
LCP 85-384	8484	37.7	219	1.20	63752
HoCP 85-845	6381	27.3 -	230	1.40	37775 -
HoCP 96-540	10401	47.0	222	1.62 +	58874
$LSD_{(.05)}$	2570	10.0	N.S.	0.34	12926

Table 5. Means of the 1997 HoCP and Ho series second-stubble nursery variety trial on a Commerce silt loam soil at Bon Secour Plantation in St. James, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	9383	40.1	235	2.17 +	36981 -
LCP 85-384	12028	51.2	234	1.54	66248
HoCP 85-845	8860	36.8	239	1.87	39249 -
HoCP 97-609	9999	39.7	251	1.91	41064
$LSD_{(.05)}$	N.S.	N.S.	N.S.	0.61	26553

Table 6. Means of the 1997 HoCP and Ho series second-stubble nursery variety trial on a Sharkey clay soil at Godfrey Knight Farms in Thibodaux, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	9684	40.3	243	1.82	44014 -
LCP 85-384	9821	42.9	230	1.42	60576
HoCP 85-845	7771	32.4 -	240	1.58	41064-
HoCP 97-609	7836	33.5	232	1.51	44468 -
$LSD_{(.05)}$	N.S.	10.2	N.S.	N.S.	15474

Table 7. Means of the 1997 HoCP and Ho series second-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	9621 -	40.6 -	237	2.63 +	30855 -
LCP 85-384	13180	52.8	250	1.79	58988
HoCP 85-845	8839 -	35.9 -	248	1.86	38569 -
HoCP 97-609	12803	53.8	238	2.51 +	43106 -
$LSD_{(.05)}$	3030	10.5	N.S.	0.41	8337

Table 8. Combined means of the 1997 HoCP and Ho series second-stubble nursery variety trials in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	9563	40.3	238	2.20 +	37283 -
LCP 85-384	11676	49.0	238	1.58	61937
HoCP 85-845	8490 -	35.0 -	242	1.77	39628 -
HoCP 97-609	10213	42.4	240	1.97 +	42879 -
$LSD_{(.05)}$	2564	9.7	N.S.	0.2	7545

Table 9. Means of the 1998 HoCP and Ho series second-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, La., in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	10546	47.9	220	2.39 +	40157 -
LHo 83-153	11186	49.6	225	1.98 +	50139 -
LCP 85-384	12433	55.4	224	1.69	66021
HoCP 85-845	8788 -	37.7 -	233	1.97	38342 -
HoCP 98-741	13462	61.7	218	2.92 +	42199 -
$LSD_{(.05)}$	3462	12.6	13	0.29	6773

Table 10. Means of the 1998 HoCP and Ho series second-stubble nursery variety trial on a Sharkey clay soil at Ardoyne Farm in Chacahoula, La., in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	3854 -	19.7	199	1.26	31309
LHo 83-153	4464	24.1	185	1.38	34939
LCP 85-384	7275	31.9	228	1.51	42199
HoCP 85-845	7135	31.5	227	1.45	43333
HoCP 98-741	8814	40.0	222	2.00 +	39703
$LSD_{(.05)}$	3111	14.1	N.S.	0.16	11895

Table 11. Means of the 1998 HoCP and Ho series second-stubble nursery variety trial on a Commerce silt loam soil at St. Gabriel Research Station in St. Gabriel, La. in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	9734	39.9	243	2.34 +	34258 -
LHo 83-153	7253	35.0	207	1.64	42653
LCP 85-384	10512	50.4	205	1.79	56038
HoCP 85-845	5689 -	25.2 -	221	1.81	26544 -
HoCP 98-741	12194	55.0	222	2.76 +	39930 -
$LSD_{(.05)}$	4258	17.3	N.S.	0.40	15978

Table 12. Combined means of the 1998 HoCP and Ho series second-stubble nursery variety trial in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	8044 -	35.8 -	221	1.99 +	35241 -
LHo 83-153	7634 -	36.2 -	206	1.67	42577 -
LCP 85-384	10073	45.9	219	1.66	54753
HoCP 85-845	7204 -	31.5 -	227	1.74	36073 -
HoCP 98-741	11490	52.2	221	2.56 +	40611 -
$LSD_{(.05)}$	1650	6.7	20	0.14	5504

Table 13. Means of the 1999 HoCP series first-stubble nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, La., in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	11744	43.4	270 -	2.64 +	32897 -
LCP 85-384	14477	49.7	291	1.94	51274
HoCP 85-845	12463	44.2	282	2.28	38796 -
HoCP 99-804	12766	46.7	274 -	2.30 +	40384 -
HoCP 99-808	12523	43.8	287	1.83	47871
HoCP 99-815	11053 -	39.9	277	1.79	44694
HoCP 99-825	13001	47.3	275 -	2.43 +	38796 -
HoCP 99-866	13948	53.4	261 -	2.62 +	41064 -
HoCP 99-870	10651 -	41.8	255 -	1.66	50593
$LSD_{(.05)}$	3308	11.6	16	0.35	10043

Table 14. Means of the 1999 HoCP series first-stubble nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	11797	53.7	221	2.79 +	38342 -
LCP 85-384	13066	53.1	245	2.05	51728
HoCP 85-845	8711	37.5	231	2.12	35393 -
HoCP 99-804	12750	52.8	242	2.40	44014
HoCP 99-808	10119	40.9	247	1.78	46283
HoCP 99-815	11500	48.0	240	2.11	45375
HoCP 99-825	12628	51.1	249	2.59	39249 -
HoCP 99-866	11577	49.0	239	2.94 +	33124 -
HoCP 99-870	10884	49.0	222	1.93	51047
$LSD_{(.05)}$	N.S.	N.S.	N.S.	0.66	9394

Table 15. Means of the 1999 HoCP series first-stubble nursery variety trial on a Sharkey clay soil at St. Gabriel Research Station in St. Gabriel, La., in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	12532 -	46.5 -	268	2.82	32897 -
LCP 85-384	20205	75.8	267	2.44	62391
HoCP 85-845	11057 -	40.6 -	273	2.34	34712 -
HoCP 99-804	15543	54.4 -	286	2.52	43333 -
HoCP 99-808	17848	61.2	287	2.41	50593 -
HoCP 99-815	14877	54.8 -	272	2.92	37661 -
HoCP 99-825	17655	64.8	272	2.87	45148 -
HoCP 99-866	11762 -	48.3 -	244	2.72	35619 -
HoCP 99-870	12944 -	55.3 -	234	1.93 -	57626
$LSD_{(.05)}$	5591	15.4	36	0.50	8668

Table 16. Combined means of the 1999 HoCP series first-stubble nursery variety trials in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	12025 -	47.9 -	253 -	2.75 +	34712 -
LCP 85-384	15916	59.5	268	2.14	55131
HoCP 85-845	10744 -	40.8 -	262	2.25	36300 -
HoCP 99-804	13686	51.3	267	2.40	42577 -
HoCP 99-808	13497 -	48.6 -	274	2.00	48249 -
HoCP 99-815	12477 -	47.6 -	263	2.27	42577 -
HoCP 99-825	14428	54.4	265	2.63 +	41064 -
HoCP 99-866	12429 -	50.2 -	248 -	2.76 +	36603 -
HoCP 99-870	11493 -	48.7 -	237 -	1.84 -	53089
$LSD_{(.05)}$	2354	8.4	14	0.27	4850

Table 17. Means of the the 2000 HoCP and Ho series plant cane nursery variety trial on a Commerce silt loam soil at Ardoyne Farm in Chacahoula, La., in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	12266	45.6	270 +	3.07 +	29721 -
LCP 85-384	12336	51.5	238	2.36	44014
HoCP 85-845	12473	46.9	266 +	2.87 +	32897 -
HoCP 00-905	14355	57.7	249	2.64	43787
HoCP 00-909	11214	44.5	252	2.98 +	29948 -
HoCP 00-912	9383	44.9	209 -	3.15 +	28813 -
HoCP 00-914	14218	54.0	265 +	2.98 +	36527
HoCP 00-917	10955	42.8	256	2.18	39476
HoCP 00-920	14463	57.2	253	2.84	40384
HoCP 00-921	9895	38.1 -	260	2.25	33804 -
HoCP 00-923	10794	45.3	236	2.92 +	31536 -
HoCP 00-925	9087 -	33.4 -	271 +	1.75 -	38115
HoCP 00-926	11168	41.6	268 +	2.31	36073 -
HoCP 00-927	12744	49.7	256	2.53	39249
HoCP 00-928	15408	56.7	272 +	3.16 +	35846 -
HoCP 00-930	15871 +	56.2	282 +	3.01 +	37434
HoCP 00-931	13292	54.5	244	3.39 +	32216 -
HoCP 00-932	13413	48.3	277 +	3.32 +	29040 -
HoCP 00-933	12740	56.0	227	2.94 +	38115
HoCP 00-934	11866	43.3	274 +	3.04 +	28586 -

Table 17. Continued.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 00-935	11789	49.3	239	2.62	37208
HoCP 00-936	11152	41.8	267 +	2.47	33804
HoCP 00-937	11765	41.5	283 +	2.40	34712 -
HoCP 00-938	11530	45.7	252	2.89 +	31763 -
HoCP 00-939	16348 +	62.5	262	2.87 +	43560
HoCP 00-940	11087	39.8 -	279 +	2.41	33124 -
HoCP 00-941	13671	59.3	230	3.60 +	32897 -
HoCP 00-942	13636	49.8	274 +	2.83	35166 -
HoCP 00-943	10767	38.2 -	282 +	2.16	35393 -
HoCP 00-945	14501	56.4	258	2.86 +	39703
HoCP 00-947	9686	32.9 -	298 +	2.34	27906 -
HoCP 00-948	12541	47.5	264 +	2.59	36754
HoCP 00-949	10774	40.4	267 +	2.28	35619 -
HoCP 00-950	13849	46.5	299 +	2.77	33578 -
HoCP 00-951	12878	47.6	270 +	2.24	42653
HoCP 00-953	12852	49.8	258	2.97 +	33578 -
HoCP 00-957	12033	44.8	268 +	2.52	35619 -
Ho 00-960	16370 +	71.2 +	230	2.84	50139
$LSD_{(.05)}$	3135	11.3	25	0.50	7654

Table 18. Means of the 2000 HoCP and Ho series plant cane nursery variety trial on a Baldwin silty clay soil at Iberia Research Station in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	13620	47.6	287	2.89 +	32897 -
LCP 85-384	12181	48.2	253	2.18	44468
HoCP 85-845	11227	41.1	273	2.74 +	30174 -
HoCP 00-905	12837	51.4	250	2.67	38569
HoCP 00-909	11274	41.5	272	2.87 +	29040 -
HoCP 00-912	8799	36.4 -	243	2.77 +	26318 -
HoCP 00-914	10093	37.2	268	2.66	27906 -
HoCP 00-917	10717	48.8	217 -	2.15	45602
HoCP 00-920	11090	44.1	253	2.45	35846 -
HoCP 00-921	10488	45.1	234	2.39	37661 -
HoCP 00-923	8477 -	41.7	203 -	2.42	34485 -

Table 18. Continued.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 00-925	8609 -	31.5 -	273	2.11	29948 -
HoCP 00-926	10813	41.4	264	2.13	38342
HoCP 00-927	11030	41.3	267	2.38	34712 -
HoCP 00-928	9418	35.1 -	268	2.73 +	25864 -
HoCP 00-930	11447	46.7	244	2.80 +	33351 -
HoCP 00-931	10203	39.4	259	2.63	29948 -
HoCP 00-932	15693	59.7	259	3.47 +	34031 -
HoCP 00-933	13204	54.6	243	2.85 +	38342
HoCP 00-934	14617	58.4	249	3.09 +	37661 -
HoCP 00-935	11100	49.3	225	2.37	41745
HoCP 00-936	8584 -	35.7 -	240	1.90	37888 -
HoCP 00-937	15419	51.7	298 +	2.80 +	36981 -
HoCP 00-938	10058	39.8	254	2.67	29721 -
HoCP 00-939	12893	47.5	271	2.56	37208 -
HoCP 00-940	12640	46.6	272	2.90 +	31989 -
HoCP 00-941	11351	49.8	228	3.17 +	31536 -
HoCP 00-942	11468	44.4	259	2.50	35619 -
HoCP 00-943	7560 -	31.7 -	238	1.85	34258 -
HoCP 00-945	10063	39.3	256	2.55	30855 -
HoCP 00-947	11220	39.2	286	2.07	38115 -
HoCP 00-948	11763	41.9	280	2.70 +	31082 -
HoCP 00-949	9133	36.6 -	249	2.62	27906 -
HoCP 00-950	14224	49.2	288 +	2.79 +	35166 -
HoCP 00-951	12212	46.7	261	2.25	41518
HoCP 00-953	10224	40.2	254	2.32	34712 -
HoCP 00-957	10863	44.0	247	2.50	35393 -
Ho 00-960	11670	52.5	222	2.49	42199
Ho 00-961	8573 -	38.7	223	2.03	38796
$LSD_{(.05)}$	3559	11.6	35	0.50	6233

Table 19. Means of the 2000 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 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	13009	55.2	235	3.14 +	35166 -
LCP 85-384	10921	53.3	205	2.15	49686
HoCP 85-845	13162	50.8	259 +	2.71 +	37434 -
HoCP 00-905	13456	61.5	218	3.00 +	41291 -
HoCP 00-909	12370	48.3	256 +	2.66	36300 -
HoCP 00-912	10116	57.8	176	3.11 +	37434 -
HoCP 00-914	8305	38.9 -	215	2.18	35846 -
HoCP 00-917	11531	56.6	206	1.97	57399 +
HoCP 00-920	11149	53.2	209	2.75 +	38796 -
HoCP 00-921	10703	47.0	228	2.35	40157 -
HoCP 00-923	10975	53.8	205	2.83 +	38115 -
HoCP 00-925	8766	36.2 -	242 +	1.85	39249 -
HoCP 00-926	10214	46.6	219	2.43	38569 -
HoCP 00-927	11839	52.8	224	2.47	42879 -
HoCP 00-928	13559	53.7	252 +	2.79 +	38569 -
HoCP 00-930	13550	53.6	253 +	2.70 +	39930 -
HoCP 00-931	9071	47.5	190	2.90 +	32670 -
HoCP 00-932	11893	54.1	218	3.76 +	28813 -
HoCP 00-933	11075	61.6	179	2.82 +	43560
HoCP 00-934	10907	52.1	210	2.98 +	34712 -
HoCP 00-935	10757	55.2	194	2.64	41972 -
HoCP 00-936	8340	42.3	198	1.74	48551
HoCP 00-937	13731	51.8	265 +	2.43	42653 -
HoCP 00-938	13760	58.0	237	2.81 +	41291 -
HoCP 00-939	14952 +	62.4	241	2.73 +	45602
HoCP 00-940	13690	52.8	260 +	2.61	40384 -
HoCP 00-941	11052	47.6	234	2.79 +	34258 -
HoCP 00-942	14352 +	58.2	247 +	2.94 +	39476 -
HoCP 00-943	11903	53.2	225	2.23	47644
HoCP 00-945	12070	54.1	224	2.66	40838 -
HoCP 00-947	10919	45.4	241	2.18	41745 -
HoCP 00-948	11676	49.5	237	2.65	37434 -
HoCP 00-949	11610	50.2	231	2.59	38796 -
HoCP 00-950	15981 +	62.4	257 +	2.82 +	44468
HoCP 00-951	12775	54.4	237	2.32	46963
HoCP 00-953	13716	56.6	243 +	3.04 +	37208 -
HoCP 00-957	11447	55.5	204	2.68 +	41291 -

Table 19. Continued.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
Ho 00-960	11553	68.7 +	168	3.07 +	44921
Ho 00-961	8093	47.1	173	1.75	53769
$LSD_{(.05)}$	3227	13.3	37	0.53	6755

Table 20. Combined means of the 2000 HoCP and Ho series plant cane nursery variety trials in 2001.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	12965	49.5	264 +	3.03 +	32594 -
LCP 85-384	11813	51.0	232	2.23	46056
HoCP 85-845	12287	46.2	266 +	2.77 +	33502 -
HoCP 00-905	13549	56.9	239	2.77 +	41216 -
HoCP 00-909	11619	44.8	260 +	2.83 +	31763 -
HoCP 00-912	9433 -	46.4	210 -	3.01 +	30855 -
HoCP 00-914	10872	43.4 -	249	2.60 +	33426 -
HoCP 00-917	11068	49.4	226	2.10	47493
HoCP 00-920	12234	51.5	238	2.68 +	38342 -
HoCP 00-921	10362	43.4 -	241	2.33	37208 -
HoCP 00-923	10082	46.9	215	2.72 +	34712 -
HoCP 00-925	8821 -	33.7 -	262 +	1.90	35771 -
HoCP 00-926	10732	43.2 -	251	2.29	37661 -
HoCP 00-927	11871	47.9	249	2.46	38947 -
HoCP 00-928	12795	48.5	264 +	2.89 +	33426 -
HoCP 00-930	13623	52.2	260 +	2.83 +	36905 -
HoCP 00-931	10856	47.1	231	2.97 +	31611 -
HoCP 00-932	13666	54.0	251 +	3.52 +	30628 -
HoCP 00-933	12340	57.4	216	2.87 +	40006 -
HoCP 00-934	12463	51.2	244	3.04 +	33653 -
HoCP 00-935	11215	51.3	219	2.54 +	40308 -
HoCP 00-936	9359 -	39.9 -	235	2.04	40081 -
HoCP 00-937	13638	48.4	282 +	2.54 +	38115 -
HoCP 00-938	11783	47.8	248	2.79 +	34258 -
HoCP 00-939	14731 +	57.4	258 +	2.72 +	42123 -
HoCP 00-940	12472	46.4	270 +	2.64 +	35166 -
HoCP 00-941	12025	52.2	230	3.19 +	32897 -

Table 20. Continued.

Variety	Sugar per acre	Tons per acre	Sugar per ton	Weight per stalk	Stalks per acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
HoCP 00-942	13152	50.8	260 +	2.76 +	36754 -
HoCP 00-943	10077	41.0 -	248	2.08	39098 -
HoCP 00-945	12211	49.9	246	2.69 +	37132 -
HoCP 00-947	10608	39.1 -	275 +	2.20	35922 -
HoCP 00-948	11994	46.3	260 +	2.65 +	35090 -
HoCP 00-949	10506	42.4 -	249	2.50	34107 -
HoCP 00-950	14685 +	52.7	281 +	2.79 +	37737 -
HoCP 00-951	12622	49.6	256 +	2.27	43711
HoCP 00-953	12264	48.8	252 +	2.78 +	35166 -
HoCP 00-957	11448	48.1	240	2.57 +	37434 -
Ho 00-960	13198	64.1 +	207 -	2.80 +	45753
Ho 00-961	8600 -	42.8 -	204 -	1.92	45671
$LSD_{(.05)}$	1884	6.9	19	0.29	3921

2001 USDA INFIELD VARIETY TRIALS AT ARDOYNE FARM

E.O. Dufrene and T. L. Tew
USDA-ARS, SRRC, Sugarcane Research Unit

Infield variety tests have traditionally been planted one, two, and three years after assignment at Ardoyne Farm in Chacahoula, La. In 1999, the USDA program began planting an off-station infield trial (at Blackberry Farms in Vacherie, La.) in conjunction with the breeding program at the LSU AgCenter. In 2000, an additional location was planted at Sugarland Acres in Youngsville, La. It is now standard practice to plant varieties that are active the year after assignment to infield tests at these two locations. Besides these tests, one additional test is still planted at Ardoyne Farm with varieties that are advanced for further testing two years after assignment.

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 2001. In late 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 in late April. Prowl (3 qt/A) was broadcast just prior to layby in mid-May. Atrazine (2 lb/A) was broadcast in late June. Fields were monitored for sugarcane borer infestations through the growing season. Confirm (6 oz./A) was applied by airplane on July 27 and September 3 in 2001.

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 obtained 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 6. An analysis of variance was performed for each test. Least significant differences were calculated using Fisher's LSD test, where appropriate.

Table 1. 2001 Planting and harvest dates of infield tests at Ardoyne Farm.

Series	Location†	Soil Texture‡	Planting Date	Harvest Dates 1999	2000	2001	Varieties No. Planted	No. Harvested*
1995	AFH	Sc	8/31/98	11/18	**	10/03	8	1
1996	AFL	Csl	8/27/98	11/29	11/14	10/05	38	1
1997	AFL	Csl	10/3/98	11/30	11/22	10/05	39	1
1997	AFL	Csl	8/20/99		11/22	11/02	12	3
1998	AFL	Sc	10/2/00			11/15	10	4
1999	AFH	Sc	9/27/01				10	

† 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.
** Plots were unharvestable because of physical damage by wildlife.

Table 2. Means of the 1995 Ho series second-stubble infield variety test on heavy soil at Ardoyne Farm in 2001.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
CP 70-321	1374	7.7	167	1.22	12238
LCP 85-384	3902	21.6	182	1.31	32983
HoCP 85-845	3548	16.5	215	1.39	23813
Ho 95-988	5186	28.2	182	1.43	39931
$LSD_{0.05}$	2918	14.5	NS	NS	22153

Table 3. Means of the 1996 HoCP and L series second-stubble infield variety test on light soil at Ardoyne Farm in 2001.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	3860 -	16.9 -	229	1.79 +	19057 -	11.3
LCP 85-384	6059	25.1	241	1.23	40923	11.6
HoCP 85-845	4705	19.9	235	1.40	28275 -	12.6 +
HoCP 96-540	7362	32.5 +	227	1.66	39172	10.9 -
$LSD_{0.05}$	1674	6.5	NS	0.43	7272	0.5

Table 4. Means of the 1997 HoCP series second-stubble infield variety test on light soil at Ardoyne Farm in 2001.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	4935 -	19.9 -	248	1.54	25873 -	11.6
LCP 85-384	6688	29.3	228	1.57	37648	10.0
HoCP 85-845	5536 -	21.9 -	252 +	1.63	26835 -	13.1
HoCP 97-609	4707 -	22.1 -	212	1.67	26361 -	11.5
$LSD_{0.05}$	1093	6.0	22	NS	7997	NS

Table 5. Means of the 1997 HoCP and L series first-stubble infield variety test on light soil at Ardoyne Farm in 2001.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	8407	31.9	263	2.69 +	23735 -	11.8
LCP 85-384	8461	31.8	266	1.73	36567	12.0
HoCP 85-845	8562	32.5	264	2.13	30969	13.3 +
L 97-128	9893	35.7	278	1.92	37393	12.3
L 97-137	9359	37.5	249	1.77	42884	11.5
HoCP 97-606	7806	33.5	233 -	1.81	36911	12.6
HoCP 97-609	7620	30.1	253	1.80	34179	11.9
$LSD_{0.05}$	NS	6.9	29	0.70	10557	0.9

Table 6. Means of the 1998 HoCP and L series plant cane infield variety test on heavy soil at Ardoyne Farm in 2001.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
CP 70-321	8025 -	31.5 -	254	2.49	25351 -	13.4
LCP 85-384	10256	40.0	257	2.13	37644	13.7
HoCP 85-845	8012 -	29.5 -	271 +	2.45	24363 -	16.0 +
TUCCP 77-42	8031 -	34.0 -	236 -	2.90 +	23478 -	15.7 +
L 98-207	9871	37.8	261	1.92	39506	15.3 +
L 98-209	9658	38.0	254	2.40	31712	13.1
HoCP 98-741	10182	38.1	267	3.21 +	23753 -	13.0
$LSD_{0.05}$	1051	3.9	14	0.44	8038	1.5

2001 OUTFIELD VARIETY TRIALS[1]

A.J. Orgeron and K.A. Gravois
Sugar Research Station

D.D. Garrison
USDA-ARS, Sugarcane Research Unit

W.R. Jackson and H.L. Waguespack, Jr.
American Sugar Cane League

The outfield variety trials are the final stage of testing experimental varieties for their potential commercial production in Louisiana. Results from these trials are used in both variety advancement and crossing decisions. The outfield variety trials are cooperatively conducted at 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 harvestability 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 2001 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. Plots harvested were three rows wide (6- foot rows) and 32-feet long with a 5-foot alley between plots. Two locations (Alma and Glenwood) harvested in 2001 had two-row plots that were 50 feet long with 5-foot alleys. All tests planted in 2001 had two-row plots that were 50 feet long with 5-foot alleys. Test plots harvested by combine were weighed with an electronic weigh wagon with load cells mounted on each axle and the 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 harvest 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

[1]The data for this report 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.

those commonly achieved by growers. No adjustment is made to stalk weight to account for leaf trash.

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 -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 78% of the sugarcane acreage in 2001. 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.

Ten experimental varieties were introduced to the outfield locations for seed increase in 2001 (Table 1). Seven experimental and three commercial varieties were planted at nine outfield locations. Twenty-nine tests were harvested in 2001 including nine plant cane, eight first-stubble, eight second-stubble, three third-stubble, and one fourth-stubble (Table 2).

Varietal yields are reported by crop and trait with overall means and individual location data in the same table (Tables 3-22) and in summary tables by crop (Tables 23-26). One fourth-stubble test was harvested in 2001 at Lanaux plantation (Table 27). Combined analysis of 2000 through 2001 plant-cane crops (Table 28) is included to aid in the evaluation of the experimental variety HOCP96-540. Combined analysis of 1996 through 2001 plant-cane crops (Table 29), 1997 through 2001 first-stubble crops (Tables 30), 1998 through 2001 second-stubble crops (Tables 31), and 1997 through 2001 third-stubble crops (Tables 32) are included to aid in the evaluation of the commercial varieties.

The variety HO95-988 was dropped in 2000, but it was harvested in 2001 to collect data for breeding purposes. The variety continues to perform well in yields of sugar per acre.

The most advanced experimental variety, HOCP96-540, was in both plant-cane and first-stubble tests in 2001. HOCP96-540 had sugar per acre and cane yields that were significantly higher than LCP85-384 in the plant-cane crop. In the first-stubble crop, HOCP96-540 produced significantly higher cane yield than LCP85-384. The variety tends to have a larger stalk size and lower population than LCP85-384. Based on current data and observations, HOCP96-540 is classified as resistant to smut and mosaic and moderately resistant to leaf scald. Data are incomplete on determining HOCP96-540's reaction to the sugarcane borer. HOCP96-540 is an erect variety and harvested well in outfield tests. The parents of HOCP96-540 are LCP86-454 x LCP85-384.

L97-128 had the highest sugar per acre in the plant-cane outfield tests. The variety had sugar per acre, cane yield, and sugar per ton significantly higher than LCP85-384 in the plant-cane crop. L97-128 tends to have a larger stalk size and lower population than LCP85-384. The variety is resistant to mosaic and leaf scald, moderately resistant to smut, and susceptible to the sugarcane borer. L97-128 is an erect variety and harvested well in outfield tests. The parents of L97-128 are LCP81-10 x LCP85-384.

Table 1. 2001 Commercial and experimental varieties planted in the outfield.

Commercial Varieties	Experimental Varieties		Experimental Varieties Introduced to the Outfield		
LCP85-384	TucCP77-42	HOCP97-609	L99-213	HOCP99-804	HOCP989-825
HOCP85-845	HOCP96-540	L98-207	L99-226	HOCP99-808	HOCP99-866
HOCP91-555	L97-128	L98-209	L99-231	HOCP99-815	HOCP99-870
	L97-137		L99-233		

Table 2. Harvest and planting dates for all outfield locations harvested in 2001.

Location	Parish	2001 Plant Date	Plant cane		First stubble		Second stubble		Third stubble	
			2001 Harvest Date	2000 Plant Date	2001 Harvest Date	1999 Plant Date	2001 Harvest Date	1998 Plant Date	2001 Harvest Date	1997 Plant Date
Allain	St. Mary	9/19	10/25	09/27	10/25	09/14	10/25	10/01	**	**
Alma	Pointe Coupee	9/14	12/14	08/30	**	**	**	**	**	**
Bon Secour	St. James	9/8	12/03	08/24	12/03	09/13	10/24	09/25	**	**
Georgia	Lafourche	9/15	11/08	09/19	11/08	08/24	11/08	10/21	**	**
Glenwood	Assumption	9/25	11/27	08/23	10/30	08/26	10/30	09/22	10/30	09/09
Lanaux†	St. John	9/05	12/06	09/06	11/07	09/15	11/07	10/06	10/18	9/18
Levert-St.John	St. Martin	9/19	12/04	09/01	11/01	08/18	11/01	09/29	**	**
Magnolia	Terrebonne	10/4	10/26	10/04	10/23	08/23	10/23	10/02	**	**
R.Hebert	Iberia	9/27	12/05	09/05	11/30	08/25	10/16	09/24	11/30	9/16

† Lanaux 4th stubble test harvested on 10/18/01 and planted on 10/01/96 .

** No test harvested at this location.

Table3. Plant cane sugar per acre for four commercial and four experimental varieties at nine outfield locations in 2001.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/A)					
CP70-321	5719 -	4965	10025	7947	5976 -	8194	8138 -	8514	6245 -	7325
LCP85-384	6923	4986	9611	8438	7090	8241	9333	7952	7638	7801
HOCP85-845	5912 -	5283	9117	7655	5814 -	9324	7794 -	7315	6269 -	7165 -
HOCP91-555	6748	5969 +	10093	7790	6642	8353	8768	7294	7719	7708
HOCP96-540	7031	5585 +	11679	11508 +	7544	10539 +	10546 +	8963	8802 +	9133 +
L97-128	7543	6228 +	12950 +	9222	8154 +	10365 +	10511 +	10332 +	8777 +	9342 +
L97-137	6956	5375	10330	7078	7030	8364	8195 -	8612	8628	7841
HOCP97-609	6414	5057	9773	7567	6700	9306	8960	8526	8133	7826

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 4. Plant cane cane yield for four commercial and four experimental varieties at nine outfield locations in 2001.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(tons/A)					
CP70-321	22.7 -	19.5 -	37.2	32.1	23.9	30.0	30.2	29.6	22.8 -	27.6 -
LCP85-384	29.0	22.9	34.8	31.1	27.5	32.8	34.0	27.5	27.5	29.7
HOCP85-845	24.4 -	21.7	38.0	31.9	24.0	34.7	32.6	27.4	23.9	28.7
HOCP91-555	27.8	25.1 +	26.9	30.0	25.4	32.8	32.9	26.3	27.9	29.5
HOCP96-540	29.8	23.6	42.2 +	41.9 +	30.2	41.0 +	38.9 +	30.6	31.3 +	34.4 +
L97-128	28.2	24.0	43.5 +	35.5 +	30.2	38.5 +	38.0 +	35.3 +	32.5 +	34.0 +
L97-137	27.9	23.3	37.4	27.7 -	30.1	39.7 +	35.0	30.2	32.2 +	31.5
HOCP97-609	26.8	21.2 -	33.3	29.0	27.2	34.9	33.6	30.1	29.0	29.5

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 5. Plant cane sugar per ton for four commercial and four experimental varieties at nine outfield locations in 2001.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/ton)					
CP70-321	252	255 +	275	247	250	273	269	287	275	265
LCP85-384	238	217	277	273	258	252	275	290	278	262
HOCP85-845	242	244 +	240 -	241	242	269	239 -	267	263	249 -
HOCP91-555	243	238 +	274	259	262	255	267	278	276	261
HOCP96-540	236	237	276	275	250	257	271	293	281	264
L97-128	268 +	259 +	297	260	270	269	276	293	271	274 +
L97-137	249	231	277	256	233 -	212	234 -	285	268	249 -
HOCP97-609	240	239 +	294	261	246	267	267	284	280	264

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 6. Plant cane stalk weight for four commercial and four experimental varieties at nine outfield locations in 2001.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs)					
CP70-321	2.11	2.47 +	2.33	2.48 +	2.50	2.32	2.46	2.88 +	2.46	2.45 +
LCP85-384	2.14	1.94	2.05	1.99	2.10	1.97	2.49	2.24	2.40	2.15
HOCP85-845	2.38	2.40 +	2.68 +	2.49 +	2.25	2.86 +	2.55	2.42	2.31	2.48 +
HOCP91-555	2.36	2.03	2.17	1.80	1.98	2.00	2.36	2.05	2.46	2.13
HOCP96-540	2.84 +	2.45 +	2.77 +	2.67 +	2.50	2.66 +	2.90 +	2.59	2.66	2.67 +
L97-128	2.76 +	2.53 +	2.65 +	2.84 +	3.04 +	2.83 +	3.12 +	2.72	3.12 +	2.84 +
L97-137	2.37	2.27	2.17	1.99	2.42	1.82	2.18	2.64	2.18	2.23
HOCP97-609	2.55 +	2.37 +	2.48	2.51 +	2.59 +	2.51 +	2.46	2.48	2.48	2.49 +

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 7. Plant cane stalk number for four commercial and four experimental varieties at nine outfield locations in 2001.

	Heavy		Light							
Variety	Allains	Magnolia	Alma	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(stalks/A)					
CP70-321	21511 -	15886 -	32302	25969 -	19306 -	26025	24623	20548	18545 -	22746 -
LCP85-384	27235	23848	33864	31301	26335	33477	27321	24952	22962	27922
HOCP85-845	20620 -	18170 -	28351	25599 -	21378	24579 -	25639	22824	20807	23107 -
HOCP91-555	23861	24858	34284	33208	25856	32749	27986	25644	22815	27918
HOCP96-540	20967 -	19348 -	30926	31711	24221	30930	26803	23674	23561	25794
L97-128	20806 -	19106 -	33378	25143 -	20027 -	27168	24505	26028	20929	24121 -
L97-137	23618	20663	35000	28123	25146	45052 +	32485 +	23837	29617 +	29282
HOCP97-609	20996 -	18302 -	27755	23192 -	20995 -	28574	27510	24299	23508	23903 -

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 8. First-stubble sugar per acre for four commercial and two experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/A)				
CP70-321	3406 -	4340	8143	7303 -	5804 -	5699 -	9491	6436	6328 -
LCP85-384	4896	4750	9386	8638	9442	7513	10757	7309	7836
HOCP85-845	3987 -	5274	7634 -	6274 -	8391	5612 -	9670	5790 -	6579 -
HOCP91-555	5595	5661	7536 -	7547	8622	6776	10988	7363	7511
HO95-988	5054	5416	10301	8406	9982	7275	12039	8533 +	8376
HOCP96-540	5329	6170 +	10145	7332 -	9881	8212	12053	8684 +	8476

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.

Table 9. First-stubble cane yield for four commercial and two experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(tons/A)				
CP70-321	13.7 -	16.2	30.6	28.1 -	21.9 -	21.3 -	32.6	26.5 -	23.9 -
LCP85-384	19.1	16.9	34.2	32.4	33.6	28.4	37.7	31.8	29.2
HOCP85-845	16.5 -	19.3 +	28.8 -	24.3 -	30.5	23.1 -	35.0	25.7 -	25.4 -
HOCP91-555	20.5	19.7 +	27.9 -	26.9 -	30.4	23.8 -	38.3	29.6	27.1
HO95-988	20.7	21.8 +	35.6	29.1	35.4	28.1	40.8	34.9	30.8 +
HOCP96-540	21.8 +	22.0 +	38.4	28.6	37.9	32.9 +	42.2	37.8 +	32.7 +

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.

Table 10. First-stubble sugar per ton for four commercial and two experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/ton)				
CP70-321	249	267	266	260	266	268	291	244	264
LCP85-384	256	281	274	267	282	264	285	231	268
HOCP85-845	242	275	266	259	276	243 -	276	227	258
HOCP91-555	273	288	270	281	284	285 +	287	249	277
HO95-988	244	248	289	288 +	282	258	295	244	269
HOCP96-540	244	281	265	256	261 -	250	286	231	259

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.

Table 11. First-stubble stalk weight for four commercial and two experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs)				
CP70-321	1.47	1.95	3.02 +	2.59 +	2.04	2.54 +	2.97 +	2.31 +	2.36 +
LCP85-384	1.65	1.67	1.98	1.92	1.77	1.91	2.00	1.62	1.81
HOCP85-845	1.61	2.02	2.40 +	1.98	2.10	1.99	2.43	1.91	2.06 +
HOCP91-555	1.58	1.44	1.73	1.88	1.77	2.02	1.73	1.82	1.75
HO95-988	1.85	2.07 +	2.64 +	2.32 +	2.37	2.50 +	2.54 +	2.36 +	2.33 +
HOCP96-540	1.59	1.86	2.27	2.35 +	2.02	2.45 +	2.58 +	2.40 +	2.19 +

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.

Table 12. First-stubble stalk number for four commercial and two experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(stalks/A)				
CP70-321	18847	16747	20364 -	21821 -	21523 -	16693 -	22207 -	22720 -	20115 -
LCP85-384	23558	20420	35328	33717	39052	30001	37983	39773	32479
HOCP85-845	20442	19197	24161 -	24760 -	29390 -	23274 -	28966 -	26879 -	24634 -
HOCP91-555	26396	27821 +	32194	28529 -	34232	24154	44263 +	32493 -	31260
HO95-988	22397	21107	26993 -	25313 -	30061 -	23762 -	32764	29785 -	26523 -
HOCP96-540	27409	23776	34062	24477 -	37517	27222	32999	31502 -	29870

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.

Table 13. Second-stubble sugar per acre for four commercial and one experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(lbs/A)				
CP70-321	4451 -	3863	6768 -	7486	7182	7572	6825 -	4493 -	6100 -
LCP85-384	5869	4094	9278	7824	8664	8159	7947	7548	7413
HOCP85-845	3695 -	4785	7530 -	7444	8857	7660	6433 -	5970 -	6549 -
HOCP91-555	5342	4657	**	7778	8732	8520	8792 +	6910	7394
HO95-988	5105	4859	8723	9425 +	9188	8895	8948 +	8662	7956

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.
** Variety HOCP91-555 was not planted.

Table 14. Second-stubble cane yield for four commercial and one experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(tons/A)				
CP70-321	19.1 -	13.6	29.4 -	29.6	26.6 -	28.1	31.6 -	20.9 -	24.9 -
LCP85-384	23.6	13.0	37.9	30.9	33.0	30.8	35.0	30.0	29.2
HOCP85-845	15.3 -	16.1	28.7 -	28.4 -	31.2	29.0	27.4 -	24.5	25.3 -
HOCP91-555	20.8	14.3	**	28.5 -	29.7	28.8	33.9	26.0	26.7 -
HO95-988	21.5	16.6 +	34.0	34.1 +	33.3	31.7	36.6	33.0	30.0

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.
** Variety HOCP91-555 was not planted.

Table 15. Second-stubble sugar per ton for four commercial and one experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
				(lbs/ton)					
CP70-321	232	283 -	231	253	269	270	216	216 -	247 -
LCP85-384	249	317	245	254	262	265	228	252	259
HOCP85-845	241	297	263	262	267	264	235	245	259
HOCP91-555	257	325	**	273 +	294 +	296 +	260 +	265	280 +
HO95-988	238	292 -	257	277 +	275	280	245	262	266

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.
** Variety HOCP91-555 was not planted.

Table 16. Second-stubble stalk weight for four commercial and one experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
				(lbs)					
CP70-321	2.13 +	1.77 +	2.24 +	2.30	2.05	2.69 +	2.40	2.35	2.24 +
LCP85-384	1.68	1.26	1.79	2.04	1.68	2.02	1.85	1.70	1.75
HOCP85-845	1.69	1.55 +	1.71	2.19	2.01	2.34	1.98	1.77	1.91 +
HOCP91-555	1.62	1.22	**	1.79	1.65	1.96	1.71	1.58	1.64
HO95-988	1.79	1.70 +	1.88	2.29	2.16 +	2.42 +	2.11	2.15	2.06 +

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.
** Variety HOCP91-555 was not planted.

Table 17. Second-stubble stalk number for four commercial and one experimental varieties at eight outfield locations in 2001.

	Heavy		Light						
Variety	Allains	Magnolia	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Mean
					(stalks/A)				
CP70-321	17965 -	15401 -	26450 -	25882	26070 -	21010 -	26898 -	19436 -	22444 -
LCP85-384	28364	20842	42740	30743	39418	30460	38045	36596	33225
HOCP85-845	18094 -	20768	34109 -	26018	33005	25190 -	28049 -	28735 -	26616 -
HOCP91-555	25820	23555	**	32215	37188	29408	39671	33089 -	32555
HO95-988	24246	19672	37196	30007	31609	26379 -	35565	31696 -	29410 -

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.
†† Variety HO95-988 was dropped, but was harvested to collect data for breeding purposes.
** Variety HOCP91-555 was not planted.

Table 18. Third-stubble sugar per acre for four commercial varieties at three outfield locations in 2001.

Variety	Light Glenwood	Light Lanaux	Light R. Hebert	Mean
		(lbs/A)		
CP70-321	2888 -	4554 -	6277 -	4573 -
LCP85-384	7946	5952	9315	7738
HOCP85-845	7106	6838	8208	7384
HOCP91-555	6368	5143	8870	6794

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 19. Third-stubble cane yield for four commercial varieties at three outfield locations in 2001.

Variety	Light Glenwood	Light Lanaux	Light R. Hebert	Mean
		(tons/A)		
CP70-321	11.2 -	19.6 -	22.9 -	17.9 -
LCP85-384	30.4	25.8	32.5	29.6
HOCP85-845	27.3	27.9	28.7	28.0
HOCP91-555	24.3	20.4 -	28.8	24.5

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 20. Third-stubble sugar per ton for four commercial varieties at three outfield locations in 2001.

Variety	Glenwood	Lanaux	R. Hebert	Mean
		(lbs/ton)		
CP70-321	257	232	272	254
LCP85-384	261	230	286	259
HOCP85-845	260	246	286	264
HOCP91-555	261	252 +	308	274

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 21. Third-stubble stalk weight ton for four commercial varieties at three outfield locations in 2001.

Variety	Light						Mean	
	Glenwood		Lanaux		R. Hebert			
					(lbs)			
CP70-321	2.09	+	2.21	+	2.24		2.18	+
LCP85-384	1.58		1.42		1.95		1.65	
HOCP85-845	1.90		1.86	+	1.97		1.91	+
HOCP91-555	1.42		1.62		1.81		1.61	

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 22. Third-stubble stalk number for four commercial varieties at three outfield locations in 2001.

Variety	Light						Mean	
	Glenwood		Lanaux		R. Hebert			
					(stalks/A)			
CP70-321	10739	-	17736	-	20519	-	16331	-
LCP85-384	38674		36836		33720		36410	
HOCP85-845	28783 -		29788		29281		29284	
HOCP91-555	34801		25303	-	32076		30727	

† Significant differences, higher or lower, from LCP85-384 are indicated next to the value by a plus(+) or minus(-), respectively.

Table 23. 2001 plant cane means from nine outfield locations: Allains, 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)	
CP70-321	7325		27.6	-	265		2.45	+	22746	-
LCP85-384	7801		29.7		262		2.15		27922	
HOCP85-845	7165	-	28.7		249	-	2.48	+	23107	-
HOCP91-555	7708		29.5		261		2.13		27918	
HOCP96-540	9133	+	34.4	+	264		2.67	+	25794	
L97-128	9342	+	34.0	+	274	+	2.84	+	24121	-
L97-137	7841		31.5		249	-	2.23		29282	
HOCP97-609	7826		29.5		264		2.49	+	23903	-

Table 24. 2001 first-stubble means from eight outfield locations: Allains, 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	6328	-	23.9	-	264		2.36	+	20115	-
LCP85-384	7836		29.2		268		1.81		32479	
HOCP85-845	6579	-	25.4	-	258		2.06	+	24634	-
HOCP91-555	7511		27.1		277		1.75		31260	
HO95-988	8376		30.8		269		2.33	+	26523	-
HOCP96-540	8476		32.7	+	259		2.19	+	29870	

Table 25. 2001 second-stubble means from eight outfield locations: Allains, 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	6100	-	24.9	-	247	-	2.24	+	22444	-
LCP85-384	7413		29.2		259		1.75		33225	
HOCP85-845	6549	-	25.3	-	259		1.91	+	26616	-
HOCP91-555	7394		26.7	-	280	+	1.64		32555	
HO95-988	7956		30.0		266		2.06	+	29410	-

Table 26. 2001 third-stubble means from three outfield locations: Glenwood, 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	4573	-	17.9	-	254		2.18	+	16331	-
LCP85-384	7738		29.6		259		1.65		36410	
HOCP85-845	7384		28.0		264		1.91	+	29284	
HOCP91-555	6794		24.5		274		1.61		30727	

Table 27. 2001 fourth-stubble means from Lanaux 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	5680	-	24.3	-	233		2.13		22971	-
CP72-370	4461	-	18.1	-	248		1.77		20534	-
CP79-318	7085		30.1	-	235		1.98		30981	-
LCP82-089	6203	-	27.6	-	224		1.81		30720	-
LHO83-153	5318	-	25.9	-	205		1.75		29829	-
LCP85-384	7430		33.7		221		1.80		38085	
HOCP85-845	7290		32.0		228		2.06		31137	
HOCP91-555	8060		30.7		264	+	1.77		34766	

Table 28 Combined plant cane means across outfield locations from 2000 to 2001.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	7413		28.5		258		2.53	+	22298	-
LCP85-384	7947		29.9		265		2.08		29117	
HOCP85-845	7170	-	29.5		243	-	2.51	+	23339	-
HOCP91-555	8027		30.1		258		2.16		29040	
HOCP96-540	9366	+	35.7	+	261		2.67	+	26982	-

Table 29. Combined plant cane means across outfield locations from 1996 to 2001.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	7868	-	29.8	-	263	-	2.74	+	21999	-
LCP85-384	8804		32.8		268		2.31		28752	
HOCP85-845	7847	-	32.0		245	-	2.62	+	24585	-
HOCP91-555	8397	-	31.8		264	-	2.32		27723	-

Table 30. Combined first-stubble means across outfield locations from 1997 to 2001.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	7679	-	28.5	-	270		2.50	+	22900	-
LCP85-384	9077		33.4		272		1.98		34052	
HOCP85-845	7988	-	30.9	-	258	-	2.28	+	27297	-
HOCP91-555	8509	-	30.8	-	275		1.96		31840	-

Table 31. Combined second-stubble means across outfield locations from 1998 to 2001.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	6743	-	26.5	-	255	-	2.29	+	23269	-
LCP85-384	8105		30.8		264		1.72		36444	
HOCP85-845	7433	-	29.0	-	255	-	2.02	+	28795	-
HOCP91-555	7549	-	27.5	-	275	+	1.64	-	33771	-

Table 32. Combined third-stubble means across outfield locations from 1999 to 2001.

Variety	Sugar per Acre		Cane Yield		Sugar per Ton		Stalk Weight		Stalk Number	
	(lbs/A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)	
CP70-321	5966	-	22.9	-	259		2.30	+	19855	-
LCP85-384	7810		29.6		264		1.67		35929	
HOCP85-845	8142		31.5		259		2.14	+	29533	-
HOCP91-555	7621		27.6		275	+	1.72		32493	

SUCROSE LABORATORY AT ST. GABRIEL

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

More than 3,600 samples were processed at the St. Gabriel Sucrose Laboratory during the 2001 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 tested a new clarifier, Octapol®, developed by Baddley Chemical to measure the juice pol. Compared to the ABC Clarifier the Octapol® was found to clarify fresh and stale sugarcane juice while 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 3,613 samples. 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.

Table 1. Number of sugarcane samples processed at the St. Gabriel Sucrose Laboratory during the 2001 harvest season.

Project Area	Leader	Number of Samples
Agronomy	Chuck Kennedy	491
Entomology	Eugene Reagan	80
Iberia Research Station	William Hallmark	716
	Howard Viator	35
Plant Pathology and Crop Physiology	Jeffrey Hoy	216
	James Griffin	185
LCES	Ben Legendre	11
USDA	Ted Kornecki	36
Sugar Research Station	Line Trials	893
	Infield	10
	Increase	144
	Nursery	312
	Planting Rate	72
	Germination	298
	Kenneth Gravois	114
TOTAL		3613

LAES SUGARCANE TISSUE CULTURE LABORATORY

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

During the 2001-2002 production season, more than 30,000 plantlets were regenerated in the Louisiana Agricultural Experiment Station tissue culture laboratory. A total of 28,700 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 at Table 1. To minimize somaclonal variation, plantlets from all cultivars were generated through meristem production method.

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

Cultivar	Meristem production
CP 70-321	1,296
LCP 85-384	19,998
HoCP 91-555	4,810
HoCP 96-540	1,002
L97-137	72
L98-207	82
CP 89-2143	1,440
TOTAL	28,700

THE 2001 LOUISIANA SUGARCANE VARIETY SURVEY

B. L. Legendre and K. A. Gravois
St. Gabriel Research Station and Sugar Research Station

A sugarcane variety survey was conducted during the summer of 2001 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 year from growers in their respective parishes. Ten varieties were named in the survey. They were: CP 65-357; CP 70-321; CP 72-370; CP 74-383; CP 79-318; LCP 82-89; LHo 83-153; LCP 85-384; HoCP 85-845; and HoCP 91-555. Crop-year was divided into four categories. They were: plant-cane, first-stubble, second-stubble and third-stubble and older crops. Some information was also collected from the local Farm Service Agency office when the Agents had difficulty in obtaining all the needed information from the growers. Since this information was collected during the growing season and included input from many persons, acreages may differ from the final total crop acreage figures collected at harvest.

Actual acreages at harvest for each parish, regional totals, and the statewide total are shown in Table 1. Figure 1 shows the parishes in which sugarcane is grown in the State. The statewide total of acreage reported in the survey was 482,080 acres although the final acreage reported by Agents in December 2001 was 493,773 acres. It is important to note that the total acreage of 482,080 is not the “official” total sugarcane acreage in Louisiana; however, it does represent approximately 97.6% of the final reported acreage. Total acres for the 2001 survey for each Region based on the 493,733 acres for the State were as follows: 211,175 acres for the Teche Region; 174,514 acres for the River-Bayou Lafourche Region; and 108,084 acres for the Northern Region.

The estimated statewide sugarcane acreage in percent by variety and crop year is shown in Table 2. The leading variety for 2001 was LCP 85-384, with 78% of the total acreage followed by CP 70-321 with 8% and HoCP 85-845 with 7%. These three varieties, along with HoCP 91-555, are the only four varieties currently recommended for commercial planting in Louisiana (Legendre 2001). LCP 85-384 has been the leading variety since 1998 when it occupied 43% of the state’s acreage (Table 7). No other variety occupied more than 1% in the current survey (Table 2). Only two varieties, LCP 85-384 and HoCP 91-555, showed an increase in the acreage grown in 2001when compared to the previous year (Table 7). LCP 85-384, released for commercial planting in 1993, is the first variety to reach more than 70% of the total acreage since CP 65-357, released in 1973, when it occupied 71% of the acreage grown in the early 1980’s. LCP 85-384 is a high yielding, excellent stubbling variety. 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.

In recent years, there has been a tendency to increase the number of years of a crop cycle because of better stubbling varieties, particularly LCP 85-384 and HoCP 85-845, and relatively mild winters in both1998 and 1999. Whereas the normal crop cycle consisted of a plant-cane

and two stubble crops, many growers today are now keeping third- and older stubble, extending their crop cycle to four or five years. In 2001, 19.1%, or more than 93,000 acres, was in third- or older stubble (Table 2), an increase of 8,000 acres from the previous year (Legendre and Gravois 2000). There was also a significant increase from 25.2% to 28.5% in the amount of cane kept as second-stubble from 2000 to 2001, respectively. Conversely, this meant that there was less plant-cane in 2001 (23.6%) when compared to the amount of plant-cane in 2000 (27.8%). Table 3 shows the distribution of plant-cane and stubble crops by region. The percentage of the crop made up by plant-cane, first-stubble, second-stubble and third- and older stubble varied from region to region with the Northern Region having the lowest percentage of plant-cane but the highest percentages of first- and second-stubble crops.

The percentage in sugarcane acreage by variety and crop year for the three regions is shown in Tables 4, 5 and 6. LCP 85-384 is the leading variety for all three regions. Its percentages range from 75% in the River-Bayou Lafourche Region to 79% in both the Teche and Northern Region. CP 70-321 is the second leading variety in both the Teche Region (12%) and Northern Region (10%) followed by HoCP 85-845 with 5% in both regions while HoCP 85-845 is the second leading variety in the River-Bayou Lafourche Region (12%) followed by CP 70-321 with 4%. No other variety occupies more than 2% of the total area in any of the Regions. It is interesting to note that the percentage of planted area for LCP 85-384 for both the plant-cane and first-stubble crops generally exceeded 80% for all three regions in the 2001 survey.

Sugarcane variety trends over the last five years are shown in Table 7. Only two varieties, LCP 85-384 and HoCP 91-555, increased in 2001 from the previous year by 7 and 1 percentage points, respectively. All other varieties either decreased in area or remained the same from the previous year. CP 70-321 had the largest decrease at 5 percentage points. HoCP 91-555, released in 1999, increased in planted area in all regions from the previous year (Tables 4, 5 and 6) but still occupies only 1% of the total area grown to sugarcane in the state. The acreage planted to HoCP 85-845 had shown an upward trend from 1997 until 1999; however, the acreage decreased by 1 percentage point between 2000 and 2001.

It is anticipated that LCP 85-384 will continue to gain in popularity for the near term because of its superior yielding ability in tons of cane and sugar per acre and will remain the top variety in the state until comparable or superior varieties are released for commercial production from the breeding program. It is further anticipated that the remaining varieties will continue to decrease in total acreage with the possible exception of HoCP 91-555. This variety is being considered as a possible alternative to LCP 85-384 by some growers; however, it is not anticipated that this variety will ever gain the acceptance by growers as did LCP 85-384. From outfield test data, HoCP 91-555 is a high yielding, good stubbling variety (Guillot *et al.*2002). It is mostly erect in growth habit and suited to both soldier and combine harvesting systems; whereas, LCP 85-384 frequently lodges and is brittle and difficult to harvest when lodged. It is better suited for combine harvesting.

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 that took the time and effort to respond to the survey from their Agents.

References

Guillot, D.P., Garrison, D.D., Jackson, W.R. and Waguespack, Jr., H.L. 2002. A report on the 2000 outfield variety tests. Sugar Bull. 80(6):15-18.

Legendre, B.L. 2001. Sugarcane Production Handbook – 2001. Louisiana State University Agric. Center Pub. 2859

Legendre, B.L. and Gravois, K. 2001. The 2000 Louisiana Variety Survey. Sugar Bull. 79(10):17-21.

Table 1. Estimated total sugarcane acres by parish and region for 2001[1].

Teche Region		River-Bayou Lafourche Region		Northern Region	
Parish	Acres	Parish	Acres	Parish	Acres
Acadia	4,679	Ascension	15,303	Avoyelles	21,942
Calcasieu	6,058	Assumption	41,876	East Baton Rouge	530
Cameron	500	Iberville	36,224	Evangeline	2,474
Iberia	63,537	Lafourche	31,525	Pointe Coupee	31,566
Jeff Davis	8,400	St. Charles	2,750	Rapides	14,225
Lafayette	16,319	St. James	25,236	St. Landry	21,888
St. Martin	36,100	St. John	10,700	West Baton Rouge	15,459
St. Mary	44,026	Terrebonne	10,900		
Vermillion	32,056				
Total	211,175	Total	174,514	Total	108,084
Total all regions: 493,773					

[1] Estimates are based on 2001 variety survey information from County Agents.

Figure 1. Louisiana sugarcane growing parishes

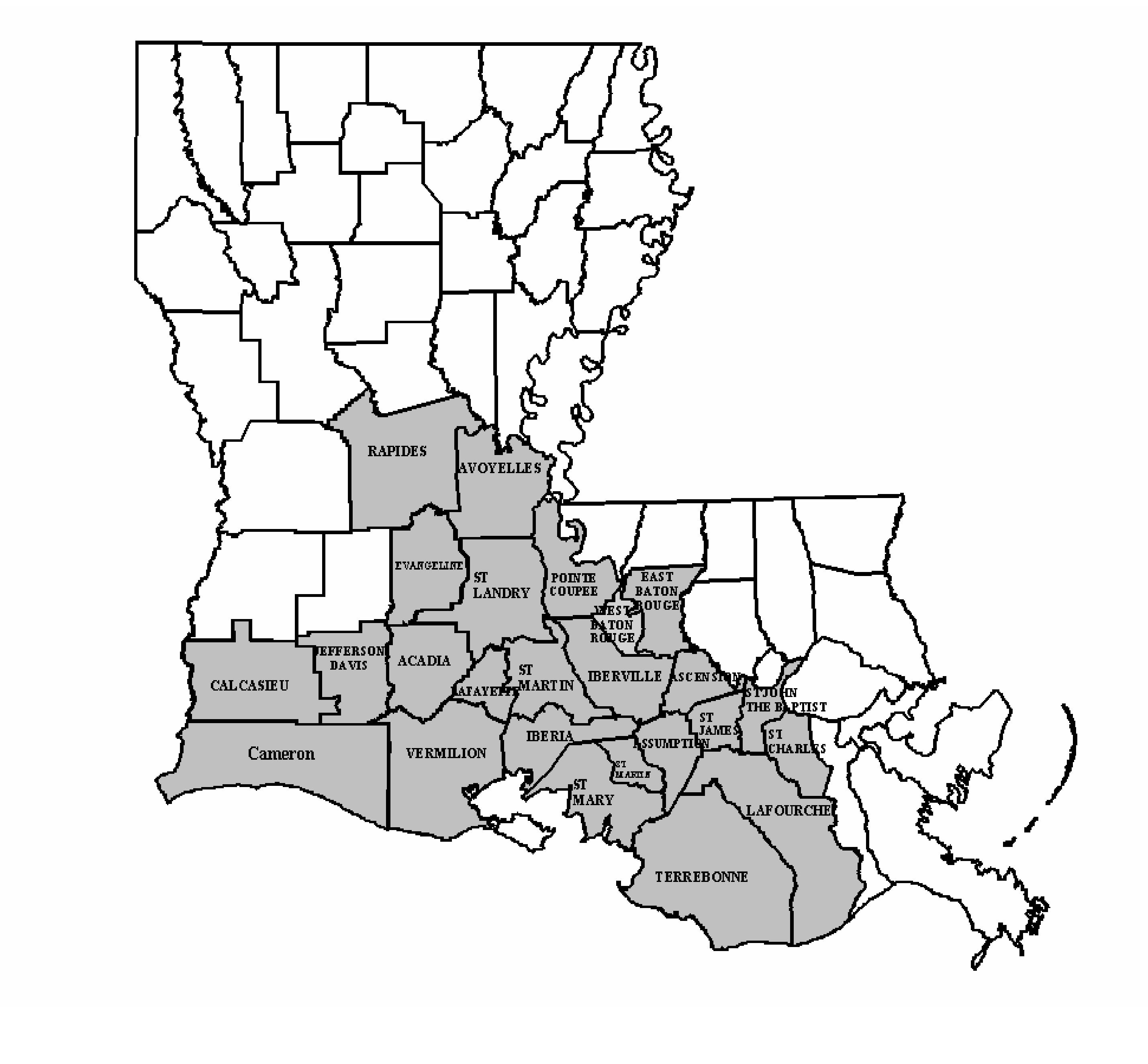


Table 2. Estimated statewide sugarcane acreage percentage by variety and crop year, 2001[1].

Variety	Plant-Cane	First-Stubble	Second-Stubble	Third-Stubble And Older	Total
	---%---				
CP 65-357	<1	<1	1	2	1
CP 70-321	1	7	12	13	8
CP 72-370	<1	1	1	<1	1
CP 74-383	<1	<1	<1	<1	<1
CP 79-318	0	<1	<1	0	<1
LCP 82-89	<1	1	2	2	1
LHo 83-153	<1	1	1	2	1
LCP 85-384	88	81	72	72	78
HoCP 85-845	5	7	9	8	7
HoCP 91-555	4	1	<1	<1	1
Others	<1	<1	1	1	1
Total Acres Percent Total Crop (%)	120,072 23.6	140,687 28.8	139,520 28.5	93,494 19.1	493,733

[1]Based on 2001 variety survey information from County Agents.

Table 3. Estimated sugarcane distribution by Region and crop year, 2001[1].

Crop Year	Teche	River Bayou Lafourche	Northern	State Total
Plant-Cane Acres %	 51,526 24.4	 47,469 27.2	 21,077 19.5	 120,072 23.6
First-Stubble Acres %	 55,117 26.1	 49,038 28.1	 36,532 33.8	 140,687 28.8
Second-Stubble Acres %	 60,185 28.5	 47,991 27.5	 31,344 29.0	 139,520 28.5
Third-Stubble and Older Acres %	 44,347 21.0	 30,016 17.2	 19,131 17.7	 93,494 19.1
Total Acres	211,175	174,514	108,084	493,773

[1]Based on 2001 variety survey information from County Agents.

Table 4. Estimated Teche Region acreage percentage by variety and crop year, 2001[1].

Variety	Plant-Cane	First-Stubble	Second-Stubble	Third-Stubble And Older	Total
CP 65-357	<1	0	1	1	<1
CP 70-321	8	10	15	16	12
CP 72-370	1	1	1	<1	1
CP 74-383	<1	<1	<1	0	<1
CP 79-318	0	<1	<1	0	<1
LCP 82-89	<1	2	2	3	2
LHo 83-153	0	<1	<1	<1	<1
LCP 85-384	84	81	74	75	79
HoCP 85-845	4	4	6	5	5
HoCP 91-555	2	1	<1	<1	1
Others	<1	<1	<1	1	<1

[1]Based on 2001 variety survey information from County Agents.

Table 5. Estimated River-Bayou Lafourche Region sugarcane acreage percentage by variety and crop year, 2001[1].

Variety	Plant-Cane	First-Stubble	Second-Stubble	Third-Stubble And Older	Total
CP 65-357	<1	1	1	1	1
CP 70-321	2	3	6	8	4
CP 72-370	<1	1	2	1	1
CP 74-383	0	0	0	0	0
CP 79-318	0	<1	<1	0	<1
LCP 82-89	<1	1	2	1	1
LHo 83-153	1	2	3	4	2
LCP 85-384	85	76	69	69	75
HoCP 85-845	8	13	15	15	12
HoCP 91-555	3	1	<1	<1	1
Others	1	<1	1	1	1

[1]Based on 2001 variety survey information from County Agents.

Table 6. Estimated Northern Region sugarcane acreage percentage by variety and crop year, 2001[1].

Variety	Plant-Cane	First-Stubble	Second-Stubble	Third-Stubble And Older	Total
CP 65-357	0	<1	1	6	1
CP 70-321	1	7	17	15	10
CP 72-370	0	<1	<1	0	<1
CP 74-383	<1	<1	1	<1	<1
CP 79-318	0	<1	1	0	<1
LCP 82-89	1	1	1	0	1
LHo 83-153	<1	<1	1	1	<1
LCP 85-384	87	85	71	72	79
HoCP 85-845	2	4	6	6	5
HoCP 91-555	9	1	<1	0	2
Others	<1	1	1	1	1

[1]Based on 2001 variety survey information from County Agents.

Table 7. Louisiana sugarcane variety trends 1997-2001[1].

	% of State total acreage by year					
Variety	1997	1998	1999	2000	2001	1 yr. Change
CP 65-357	6	3	1	1	1	0
CP 70-321	35	29	20	13	8	-5
CP 72-370	7	5	3	2	1	-1
CP 74-383	2	1	<1	<1	<1	0
CP 79-318	3	2	1	<1	<1	0
LCP 82-89	10	7	5	2	1	-1
LHo 83-153	4	3	3	2	1	-1
LCP 85-384	29	43	58	71	78	+7
HoCP 85-845	4	6	8	8	7	-1
HoCP 91-555	<1	<1	<1	<1	1	1
Others	<1	1	<1	<1	1	1

[1]Based on annual variety survey reports from County Agents in sugarcane-producing parishes, 1997-2001.

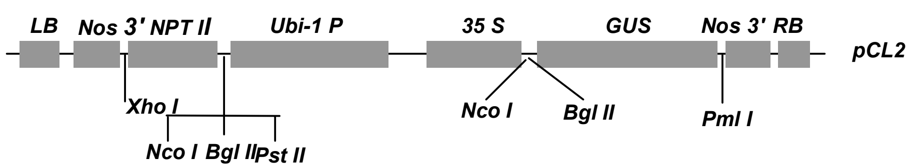
DEVELOPMENT OF DNA TRANSFORMATNON TECHNOLOGY FOR LOUISIANA SUGARCANE

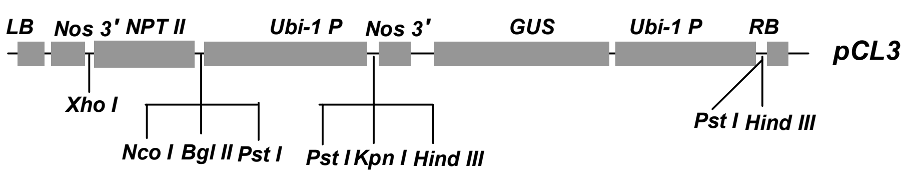
D. Liu, J. Oard, and K. A. Gravois*

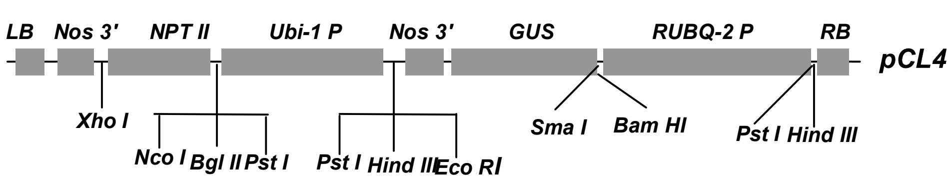
Agronomy Department and *Sugar Research Station

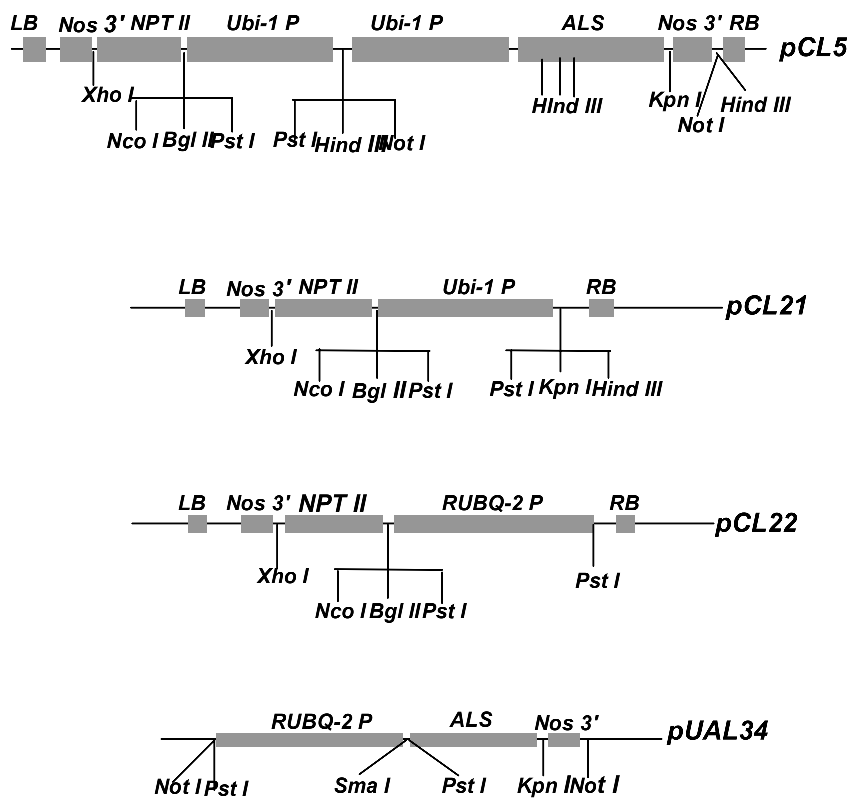
Construction of DNA transformation vectors

Discovery and evaluation of new DNA regulatory elements and efficient selection agents are urgently needed for effective gene transfer technology in Louisiana sugarcane. Our previous research in 2000 showed that various selection agents such as hygromycin were not suitable for Louisiana sugarcane due to variable responses in different callus types, ages and physiological status. However, the NPT II gene which confers resistance to the compound kanamycin was shown to be an effective agent for selection of transformed cells. Moreover, we found that the 35S promoter that drives expression in various DNA vectors such as pCAMIA2301 functioned so poorly that gene expression was not detected. In contrast, we found that the rice and maize ubiquitin promoters could serve as strong, constitutive regulatory elements that drive strong gene expression in Louisiana sugarcane. Based on these results, we recently constructed seven new DNA vectors containing the NPT II, GUS, and ALS genes under control of the ubiquitin promoters. The following vectors have been constructed for the sugarcane transformation. Schematic representation of the vectors as restriction maps is shown below:









The plasmids pCL3 and pCL4 were used in the transformation of sugarcane via particle bombardment and *Agrobacterium*-mediated methods, and were shown to function at high levels (Liu and Oard, unpublished results). In related work these two plasmids showed high expression levels in rice shoot apices which demonstrates the utility of these vectors in different plant tissue and organs. Plasmids pCL21 and pCL22 can be used in the combination with pUAUA2 (Ubi-1 – ALS), constructed by S. Oard, or with pUAL34 for co-transformation studies. Plasmid pCL5 can be used to transfer ALS herbicide resistant gene into sugarcane by indirect selection.

Transient gene expression via *Agrobactrium* and particle bombardment methods

The plasmids pCL2, pLC3 and pCL4 were introduced into *Agrobacterium* strain LBA4404 and AGL1 by electroporation. The resulting strains were used to infect calli o f sugarcane variety LCP-384 and GUS gene expression was determined by histochemical assays. The results showed that pCL4 with the rice ubiquitin promoter produced the highest GUS expression, levels while pCL2 containing the 35S promoter failed to give visible blue GUS transformed cells. Use of the *Agrobacterium* strain LBA4404 produced higher level of GUS expression than AGL1, and the *vir* gene inducer acetonsyringone was indispensable for gene expression in the AGL1 strain.

Gene transformation via particle bombardment

Two target tissues, leaf segment and callus were used in the particle bombardment transformation studies. Leaf segments bombarded with plasmids pCL2, pCL3 and pCL4 showed

GUS gene expression, but the intensity and size of GUS blue spots varied greatly. The vector pCL4 produced the highest GUS blue spots, which was 27.8 times and 1.8 times higher than pCL2 and pCL3, respectively, by histochemical assays, and 29.1 times and 1.6 times than pCL2 and pCL3, respectively, by fluorescent assays.

Calli were bombarded separately with plasmids pCL2, pCL3 and pCL4. GUS gene expression was observed in the calli bombarded with all plasmids, but the differences among three plasmids were quite different. Vector pCL4 produced the best results with dark blue spots and sectors, which was 30 times and 1.5 times higher than pCL2 and pCL3, respectively, by histochemical assays, and 27 times and 1.4 times higher than pCL2 and pCL3, respectively, by fluorescent assays. These results showed that RUBQ2 and Ubi-1 promoters facilitated high gene expression levels in leaf and callus of Louisiana sugarcane.

Stable plant transformation and field test of transgenic sugarcane

Calli bombarded with pCL2, pCL3 and pCL4 were placed under selection using the antibiotic geneticin. Resistant calli were obtained in three separate experiments with particle bombardment after four rounds of selection. The resultant calli from pCL3 and pCL4 showed strong GUS reaction by histochemical assays and fluorescent assays. The GUS reaction was also observed in the shoot and leaf segments of transformed plants. These results showed that NPT II gene under the control of ubi-1 promoter was a reliable selectable marker, and successful transformation procedures for sugarcane have been developed.

PCR assays were used to test the presence of the NPT II gene in the transgenic plants. Results showed that NPT II gene was integrated in the transgenic plants. About 150 plants were generated from the resistant calli bombarded with pCL3, and 66 of them were tested for the presence of the NPT II protein using an ELISA assays. A total of 60 plants were positive for the NPT II protein, indicating that the NPT II gene was expressed in the transgenic plants and foreign genes can be efficiently expressed in variety LCP85-384. A total of 93 individual transformed plants derived from LCP85-384 were transplanted to the St. Gabriel Sugar Research Station on October 8, 2001. This material will be evaluated in 2002 for expression of GUS and NPTII genes and phenotypic variation among the different transformed lines.

Transformation for herbicide resistance

The plasmid pUAUA2 containing Ubi-1-ALS cassette and plasmid pCL4 containing the Ubi-1-NPT II cassette were used to co-bombard the calli, and selected under the antibiotics geneticin. Resistant calli were obtained after four rounds of selection, and transferred onto 2, 4-D free medium for regeneration. About 60 shoots were regenerated from resistant calli. Shoots from this material have been transplanted to green house for further analysis. Another co-transformation experiment was carried out using plasmid pCL21 containing Ubi-1- NPT II and plasmid containing RUBQ2-ALS cassette. Resistant calli were obtained from bombarded calli after selection, and transferred onto 2,4-D free medium for regeneration. Transgenic plants have been produced and are currently growing in the greenhouse. Transformation using the plasmid pCL5 was carried out, and selection for resistant calli is under way.

AERIAL INSECTICIDE CONTROL OF THE SUGARCANE BORER

T. E. Reagan[1], C. D. McAllister[1], F. R. Posey[1], T. L. Bacon[1], and W.H. White[2]
[1]Department of Entomology and [2]USDA-ARS Sugarcane Research Unit, Houma, La.

Insecticidal control of the SCB was evaluated in a randomized complete block design with five replications using the variety LCP 85-384 (Rep 1-plant cane, Reps 2-5-first ratoon) at Armalise Plantation, Belle Rose, La. (Assumption Parish). Treatments were applied with water using a Recip/Grumman AgCat aircraft (28-foot spray width), calibrated to deliver 2 gpa. Treatments were randomly assigned to field plots ranging in size from 2.0 to 4.4 acres each (3-7 swaths/plot). All insecticide treatments were applied with the surfactant Latron CS-7 at the rate of 0.25% vol/vol. SCB infestations were monitored weekly by randomly examining 25 stalks in the center portion of each plot throughout the season for live SCB larvae in the leaf sheaths. Plots were treated when threshold levels were at 5% of the sugarcane stalks infested with larvae in the leaf sheaths. SCB monitoring continued weekly after the initial treatment (16 July), and on 15 August, plots were again treated. Weekly monitoring continued into September with the SCB population never again reaching the threshold. Relative soil–surface associated arthropod abundance was assessed using pitfall traps. Three pitfall traps were placed in the center row of each plot at intervals of 100-, 120-, and 140-foot spacings. Contents of the traps in ethylene glycol were collected on 8 August, 31 August, and 14 September, and specimens were sorted in the laboratory.

Confirm-, Karate-, and Fury-treated plots had significantly lower percent bored internodes and percent season infestation of SCB than the untreated check plots (Table 1). Additionally, both Karate and Fury exhibited a significantly shorter SCB length of control 29 days after treatment based on weekly infestation counts. Confirm did not significantly affect populations of ants or other non-target arthropods counted in pitfall traps (Table 2). Fury- and Karate-treated plots had significantly fewer ants than untreated check plots. Differences were not detected in spider populations among any of the insecticides compared to the untreated check plots. This research suggests that Confirm, Karate, and Fury effectively control SCB infestations and may be used in an effective integrated pest management program in Louisiana sugarcane. All three materials now have EPA Section 3 labels for sugarcane borer management.

Table 1. Aerial application insecticide study for control or the sugarcane borer, Armalise Plantation, Belle Rose, La., 2001.

Treatment/ formulation	Rate (amt/acre)	% SCB Live Laval Infestation				% SCB Season Infestation	% Bored Internodes	Moth Emergence
		10 DAT	17 DAT	24 DAT	29 DAT			
Untreated check	--	11.2a	8.8a	11.2a	26.4a	15.3a	9.7a	7,700.0a
Confirm 2F	8.0 oz	1.6b	4.0b	4.0b	9.6c	3.2b	2.1b	0.0a
Karate Z	2.0 oz	0.0b	1.6b	4.0b	16.0b	3.7b	1.5b	1167.0a
Fury 1.5EC	3.37 oz	0.8b	0.8b	6.4b	24.0b	6.0b	2.5b	933.0a

Means followed by the same letter within a column are not significantly different (P=0.05, LSD).
Insecticide treatments were applied on 16 July and 15 August.

Table 2. Arthropod abundance in a sugarcane field, Armalise Plantation, Belle Rose, La., 2001.

Treatment/ formulation	Rate amt/acre	Season Arthropod Abundance		
		Ants	Crickets	Spiders
Untreated check	--	12.1a	4.6ab	2.2a
Confirm 2F	8.0 oz	6.7a	6.0bc	3.1a
Karate Z	2.0 oz	3.1b	3.7a	3.4a
Fury 1.5EC	3.37 oz	4.4b	6.8c	3.7a

Means followed by the same letter within a column are not significantly different (P=0.05, LSD).
Insecticide treatments were applied on 16 July and 15 August.

ASSESSMENT OF REGIONAL INSECT PEST MANAGEMENT
IN LOUISIANA SUGARCANE, 2000 AND 2001

T. E. Reagan[1], F. R. Posey[1], C. D. McAllister[1], T. L. Bacon[1], M. E. Salassi[2], and W. H. White[3]

[1]Department of Entomology, [2]Department of Agricultural Economics
& Agribusiness, and [3]USDA-ARS Sugar Research Unit, Houma, La.

An experimental assessment of insect pest management was conducted in Louisiana sugarcane over eight production regions which were selected for comparison of sugarcane borer (SCB), *Diatraea saccharalis*, spring dead hearts, SCB and other insect pest insecticidal controls, end-of-season bored internodes (and adult emergence), and yield. In each region, two management units were chosen to compare: two plant-cane and two stubble fields in SCB-susceptible varieties versus moderate or resistant varieties. A total of 117 fields were sampled across the primary Louisiana sugarcane production regions in 2000 and 98 fields in 2001. The varieties sampled were LCP85-384 or HoCP91-555 (both SCB susceptible) and HoCP85-845, CP70-321, LCP86-454, or LHo83-153 (all SCB resistant).

Regions included in this survey were as follows: Central (Rapides Parish), Southwest (Jefferson Davis Parish), Upper River (Pointe Coupee and Iberville parishes), Upper Lafourche (Assumption Parish), Lower Lafourche (Terrebonne and Lafourche parishes), Vermilion (Vermilion and Lafayette parishes), Teche (St. Martin and Iberia parishes), and Lower River (St. James Parish). With cooperation from the respective growers, licensed consultants, and county agents, spring dead heart sampling, stand counts, insecticide use, and end of season SCB bored internode frequency and adult emergence holes were compared with the yields of the sampled fields. During the dead heart survey, borer larvae were collected and reared out for parasite (parasitoid) determination.

Of the 5,350 stalks (65,081 total internodes) evaluated for the eight regions, 1,331 of the internodes were bored, for a total average of 2%, and SCB spring dead hearts averaged 277 per acre for the 2000 growing season. Results indicated a year of very light insect pressure, with most fields receiving only one or less application of insecticide because of the severity of the drought that farmers faced during this growing season. An exception to the drought occurred in the Central Louisiana region where early rains were received (Table 1 compares borer incidence and control in above normal rainfall versus drought conditions for each region), and some fields required three applications for SCB control, with infestations reaching as high as 20% live larvae in the leaf sheaths. One field surveyed required four applications of insecticide. Some of these same farmers also were faced with an outbreak of the recently discovered sugarcane aphid, *Melanaphis sacchari* (Zehntner), and the yellow sugarcane aphid, *Sipha flava* (Forbes), requiring additional insecticide treatments. Regardless of the traditional levels of SCB infestation in any particular sugarcane region, borer infestations and need for control were overwhelmingly decreased under reduced rainfall conditions.

In comparison, of the 3,100 stalks (39,807 total internodes) evaluated in 2001 in the eight regions, 1,470 of the internodes were bored, for a total average of 3.7%, with SCB spring dead hearts averaging 278 per acre. Tables 2 provides analyzed means from the dead heart assessment for each region during the 2000 and 2001 production seasons. Results indicated a year having closer to normal SCB pressure because of rainfall more evenly spread throughout the regions, with most fields receiving one or less application of insecticide. In a few fields throughout the sugarcane-growing regions, two applications of insecticide were required for SCB control.

Table 1. Rainfall and borer incidence and control comparison in the eight regions of the Louisiana sugarcane industry in 2000 and 2001.

Selected Regions	Inches of rainfall (± normal)[a]				# of Insecticide applications	% SCB bored internodes[b]
	FEB & MAR	APR & MAY	JUN & JUL	AUG & SEP		
2000						
Central	8.3 (-2.1)	12.3 (+3.0)	7.5 (-1.4)	3.1 (-5.5)	2.5	4.1a
Southwest	2.6 (-5.9)	9.7 (+0.1)	8.2 (-2.3)	6.5 (-4.1)	0.0	2.9ab
Upper River	2.8 (-8.2)	1.9 (-8.2)	8.6 (-1.3)	2.0 (-8.3)	0.1	2.8ab
Upper Lafourche	9.2 (-0.1)	1.0 (-8.6)	8.1 (-5.1)	11.5 (-2.3)	0.0	2.5abc
Lower Lafourche	5.7 (-5.1)	0.9 (-8.3)	13.0 (+0.6)	10.4 (-3.1)	0.2	2.0bc
Vermilion	3.1 (-5.0)	3.0 (-6.2)	8.1 (-4.9)	9.0 (-3.2)	0.0	1.3bc
Teche	2.5 (-5.7)	1.1 (-7.7)	12.0 (-1.3)	9.6 (-2.7)	0.0	1.3bc
Lower River	4.2 (-6.7)	1.2 (-7.9)	6.8 (-5.1)	8.9 (-2.8)	0.1	0.7c
2001						
Central	14.7 (+4.4)	4.0 (-5.2)	12.8 (+3.9)	11.0 (+2.4)	1.0	1.7b
Southwest	11.2 (+2.6)	1.8 (-7.8)	17.1 (+6.6)	21.8 (+11.2)	1.0	2.5ab
Upper River	14.0 (+3.0)	2.3 (-7.8)	25.7 (+15.8)	12.0 (+1.7)	0.8	6.3a
Upper Lafourche	9.4 (+0.1)	2.7 (-6.9)	28.9 (+15.7)	14.8 (+1.0)	0.5	2.3ab
Lower Lafourche	7.8 (-3.1)	0.2 (-8.9)	23.9 (+11.5)	14.9 (+2.3)	1.0	2.0b
Vermilion	11.8 (+3.6)	3.7 (-5.6)	26.5 (+13.5)	18.7 (+6.6)	0.5	5.4ab
Teche	12.7 (+4.4)	4.2 (-4.6)	17.6 (+4.3)	24.5 (+12.2)	0.8	1.8b
Lower River	9.7 (-1.3)	7.9 (-1.1)	24.6 (+12.6)	13.2 (+1.5)	0.5	3.8ab

[a]Values in parentheses represent the amount the measured rainfall total was above or below a normal average
[b]Sugarcane borer (SCB) bored internodes values represent a mean of 16 fields evaluated in each region each year except the Southwest region, which had eight fields evaluated each year, and means followed by the same letter in a column for the designated year are not significantly different ($P \leq 0.05$, LSD).

Table 2. SCB dead heart assessment in the Louisiana sugarcane industry in 2000 and 2001.

	SCB Dead Hearts Per Acre	
Selected Regions	2000	2001
Central	675a	130b
Southwest	167b	550ab
Upper River	150b	158ab
Upper Lafourche	406ab	158ab
Lower Lafourche	113b	625a
Vermilion	248b	300ab
Teche	219b	175ab
Lower River	238b	125b

Each value represents a mean of 16 fields evaluated in each region each year except the Southwest region, which had 8 fields evaluated each year, and means followed by the same letter in a column are not significantly different ($P \leq 0.05$, LSD).

SUGARCANE BORER MANAGEMENT THRESHOLD ASSESSMENT ON FOUR COMMERCIAL VARIETIES

T. E. Reagan, F. R. Posey, C. D. McAllister, and T. L. Bacon
Department of Entomology

Four sugarcane borer (SCB) insecticide management regimes were studied in a four replication randomized complete block experiment on each of four varieties planted in the fall of 2000 at the Sugar Research Station, St. Gabriel, La. The study conducted during the 2001 season was designed to assess SCB injury, potential area-wide moth production, and yield loss of resistant and susceptible varieties under different intensity levels (different thresholds) of pest management. The variables were the four commercially grown sugarcane varieties in Louisiana, (1) SCB resistant (CP70-321, HoCP85-845) and susceptible varieties (LCP85-384, HoCP91-555) and (2) four regimes of SCB insecticidal control (based on 5% and/or 10% larval SCB infestation thresholds and a non treatment threshold).

SCB larval infestations were monitored weekly with leaf sheath sampling. Plots (0.01 acre, three rows each) were treated when infestation levels reached the designated threshold levels set by the indicated treatment regimes. Confirm® (tebufenozide), with the surfactant Latron® CS-7, was tank mixed at the rate of 6 oz/acre and 0.25% vol/vol, respectively. All three rows in each plot were treated using a CO_2 sprayer mounted on an all-terrain vehicle. The spray boom covering two rows on one side and one row on the other contained one flat fan spray nozzle per 6 feet of row width at 10 GPA and 35 psi. Infestations were assessed on the two outside rows, and the integrity of the center row was preserved for yield evaluation. In addition, because of enhanced experimental variability caused by naturally occurring arthropod predation, especially from fire ants, two applications of the soil pesticide chlorpyrifos (Lorsban®) were broadcast for arthropod predator suppression at the soil level. Data collected included number of dead hearts per acre (sugarcane shoots killed by SCB larvae), percent SCB bored internodes, SCB adult moth emergence, and yield loss. Data were analyzed using PROC GLM with means separated by LSD.

As shown in Table 1 and Figures 1 and 2, when using the >5% SCB infestation threshold (5%) or the 5% early and 10% late threshold (5%/10%), differences were not detected in percent bored internodes or average percent infestation. There were different numbers of applications of insecticide required to control SCB infestations and reduced infestation levels below the designated thresholds in this study. The variety HoCP91-555 (highly susceptible) required three applications of insecticide during the growing season for 5% and 5%/10% management regimes. In comparison, LCP85-384 (susceptible) required three insecticide applications for the 5% management threshold, but only two insecticide applications for the 5%/10% management threshold. The resistant variety HoCP85-845 required two applications in the late part of the season for the 5% threshold and only one application in the late part of the growing season for the 5%/10% threshold. CP70-321 required only one application made in the late part of the growing season under the 5% and the 5%/10% management regimes. The average season percentage of SCB infestation was similar on the 5% and 5%/10% management thresholds for all varieties (Table 2). Moth emergence was significantly higher for variety HoCP91-555 at the 10% threshold than for all other varieties at the 5% and 5%/10% management thresholds.

Management Regimes

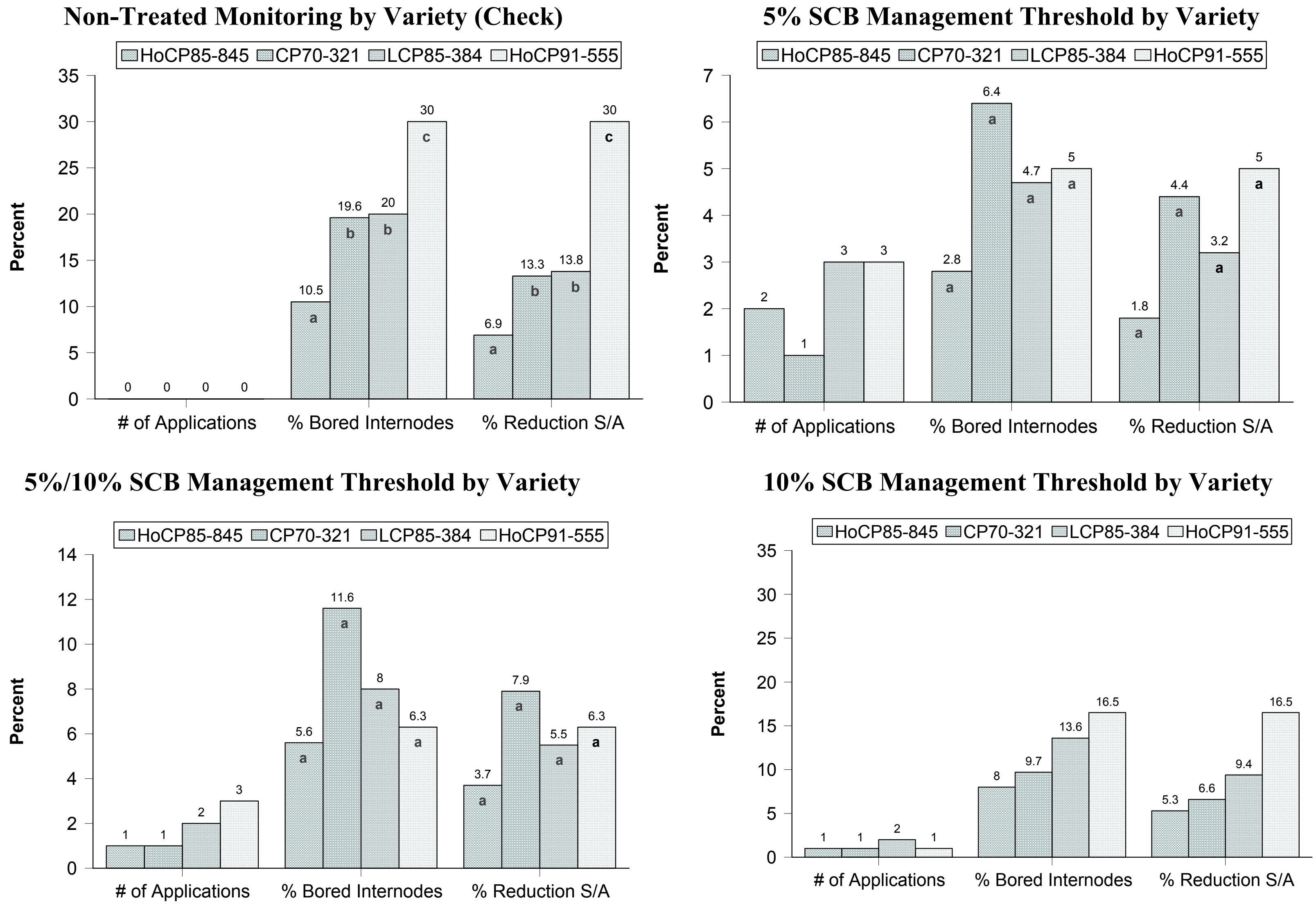
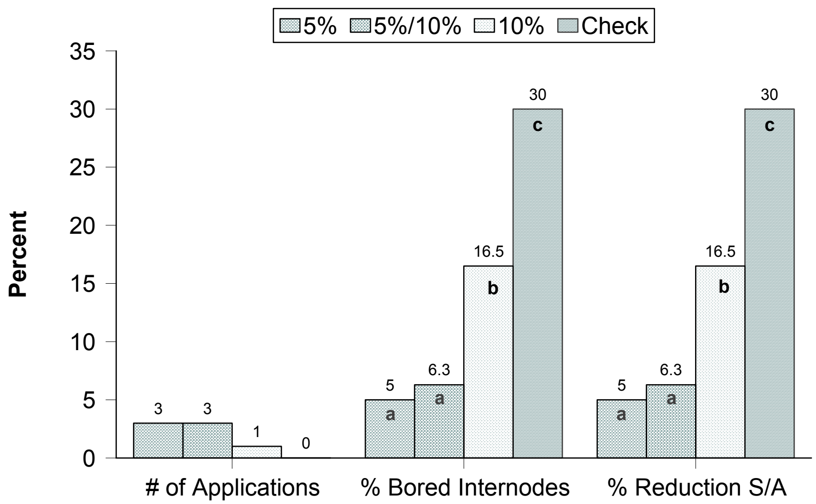


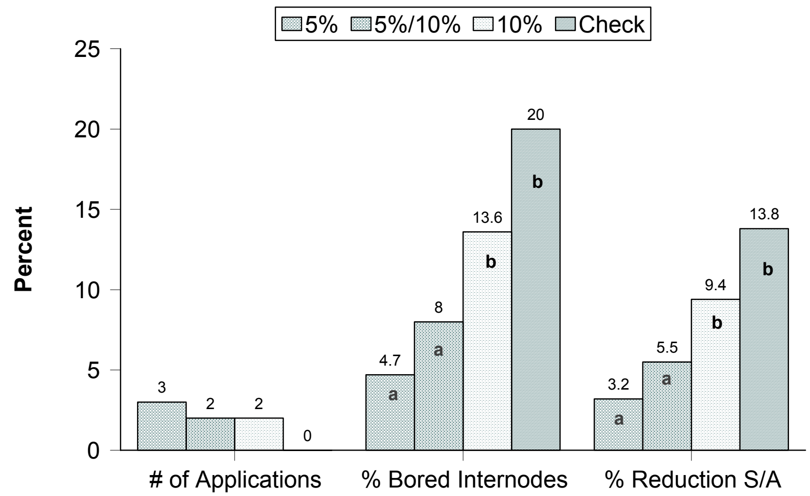
Figure 1. Management threshold by sugarcane variety showing the various parameters studied. % Reduction S/A= Percent reduction in sugar/acre. Means followed by the same letter within each group are not significantly different, (P≤0.05, LSD). Economic Injury Level for SCB on sugarcane has generally been considered around the 10% level of bored internodes.

Varieties

HoCP 91-555: SCB highly Susceptible

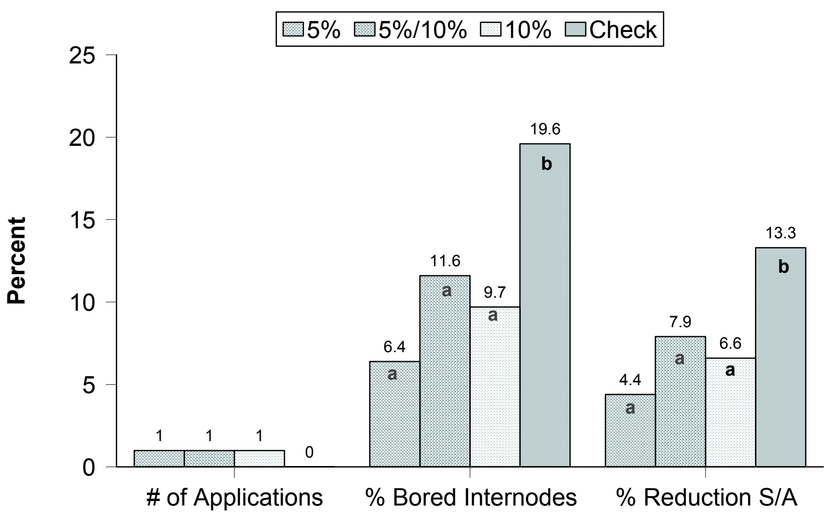


LCP 85-384: SCB Susceptible



CP 70-32

1: Moderately Resistant



HoCP 85-845: SCB Resistant

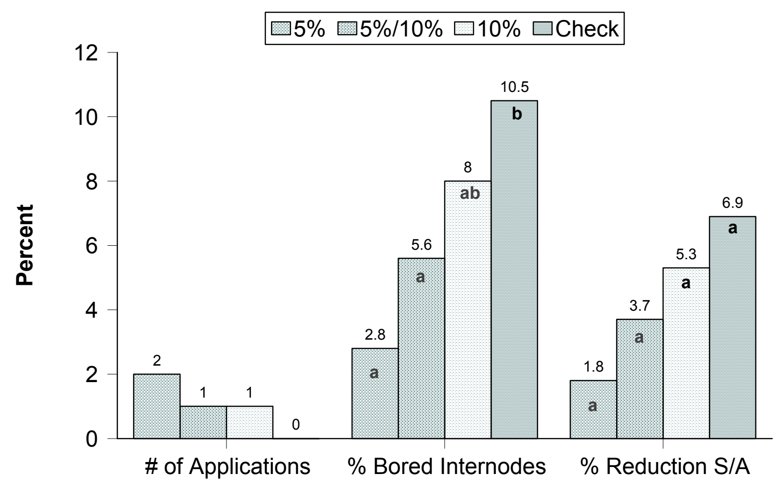


Figure 2. Represents sugarcane varieties under different SCB larval management thresholds. The above legend treatment thresholds in order are: greater than 5% season-long management threshold; greater than 5% early-season and greater than 10% late-season management threshold; greater than 10% season-long management threshold; non-treated monitoring by variety (Check). % Reduction S/A = Percent reduction in sugar/acre. Means followed by the same letter within each group are not significantly different, (P#0.05, LSD).

Table 1. Season-long sugarcane borer injury assessment, St. Gabriel Sugar Research Station, St. Gabriel, La., 2001.

Treatment		Number of Insecticide Applications	% Bored Internodes[c,d]	Estimated % Yield Loss[e]/Acre	Moth Emergence[f]/Acre	Deadhearts[g]/Acre
Variety[a]	Management[b]					
HoCP85-845	5%	2	2.8f	1.8g	1000b	50ab
LCP85-384	5%	3	4.7ef	3.2fg	2500b	0b
HoCP91-555	5%	3	5.0ef	5.0efg	0b	0b
HoCP85-845	5%/10%	1	5.6ef	3.7efg	2500b	50ab
HoCP91-555	5%/10%	3	6.3def	6.3efg	1500b	0b
CP70-321	5%	1	6.4def	4.4efg	1500b	75a
HoCP85-845	10%	1	8.0def	5.3efg	1000b	50ab
LCP85-384	5%/10%	2	8.0def	5.5efg	5500b	0b
CP70-321	10%	1	9.7cdef	6.6efg	6000b	75a
HoCP85-845	Non-treated	--	10.5cde	6.9efg	4000b	50ab
CP70-321	5%/10%	1	11.6cde	7.9def	4000b	75a
LCP85-384	10%	2	13.6bcd	9.4cde	2500b	0b
HoCP91-555	10%	1	16.5bc	16.5bc	14500a	0b
CP70-321	Non-treated	--	19.6b	13.3bcd	16500a	75a
LCP85-384	Non-treated	--	20.0b	13.8bc	5000b	0b
HoCP91-555	Non-treated	--	30.0a	30.0a	15000a	0b

[a]Susceptible varieties include HoCP91-555 and LCP85-384; resistant varieties include HoCP85-845 and CP70-321; [b]Managements are as follows: 5%: Greater than 5% SCB management threshold over entire season; 5%/10%: Greater than 5% SCB management threshold early season and greater than 10% SCB management threshold late season; Non-treated: Never treated; 10%: Greater than 10% SCB management threshold over entire season; [c]25 stalks per plot were evaluated for bored internodes; [d]Means within a column followed by the same letter are not significantly different (P#0.05, LSD); [e]Moth emergence reflects number of moths per acre; [f]Sugarcane shoots killed by SCB; [g]Estimated percent yield loss was calculated using conversion factors from White 2000, based on a per internode basis.

Table 2. Season-long sugarcane borer infestation with respect to different economic threshold levels and sugarcane varieties, St. Gabriel Sugar Research Station, St. Gabriel, La., 2001.

Treatment		Insecticide Application Date	Percent SCB Larval Infestation[a] Sample Dates					
Variety	Management[b]		6 Jul	16 Jul	26 Jul	9 Aug	20 Aug	3 Sept
HoCP91-555	5%	Jul 6, Aug 24, Sep 5	7.5ab	2.5b	0.0b	12.5ab	12.5ab	12.5cd
LCP85-384	5%	Jul 17, Aug 24, Sep 5	0.0b	17.5a	12.5a	7.5ab	7.5ab	7.5d
HoCP85-845	5%	Aug 24, Sep 5	5.0ab	5.0b	5.0ab	7.5ab	7.5ab	12.5cd
CP70-321	5%	Aug 24	0.0b	0.0b	2.5b	0.0b	10.0ab	2.5d
HoCP91-555	5%/10%	Jul 6, Aug 24, Sep 5	12.5a	5.0b	2.5b	15.0a	15.0a	15.0cd
LCP85-384	5%/10%	Jul 17, Sep 5	0.0b	7.5b	5.0ab	2.5ab	7.5ab	12.5cd
HoCP85-845	5%/10%	Sep 5	5.0ab	0.0b	0.0b	5.0ab	5.0ab	15.0cd
CP70-321	5%/10%	Sep5	0.0b	2.5b	5.0ab	5.0ab	5.0ab	12.5cd
HoCP91-555	Non-treated	--	0.0b	2.5b	0.0b	10.0ab	10.0ab	22.5bc
LCP85-384	Non-treated	--	0.0b	2.5b	2.5b	0.0b	0.0b	30.0ab
HoCP85-845	Non-treated	--	0.0b	2.5b	2.5b	10.0ab	2.5ab	15.0cd
CP70-321	Non-treated	--	7.5ab	0.0b	2.5b	2.5ab	10.0ab	30.0ab
HoCP91-555	10%	Sep 5	10.0a	5.0b	2.5b	10.0ab	10.0ab	37.5a
LCP85-384	10%	Aug 24, Sep 5	5.0ab	5.0b	2.5b	7.5ab	12.5ab	15.0cd
HoCP85-845	10%	Aug 24	0.0b	0.0b	2.5b	7.5b	12.5ab	5.0d
CP70-321	10%	Sep 5	0.0b	0.0b	5.0ab	10.0ab	7.5ab	12.5cd

[a]Percent live larvae based on 40 stalks/treatment.
[b]Managements are as follows: 5%: Greater than 5% SCB management threshold over entire season; 5%/10%: Greater than 5% SCB management threshold early season and greater than 10% SCB management threshold late season; Non-treated: Never treated; 10%: Greater than 10% SCB management threshold over entire season.
[c]Susceptible varieties include HoCP91-555 and LCP85-384; resistant varieties include HoCP85-845 and CP70-321.
[d]Means within a column followed by the same letter are not significantly different by LSD (P#0.05).

SMALL PLOT ASSESSMENT OF INSECTICIDES AGAINST THE SUGARCANE BORER

T. E. Reagan, F. R. Posey, C. D. McAllister, and T. L. Bacon
Department of Entomology

Nine insecticide treatments were evaluated for control of SCB in a randomized complete block design with six replications in a field of first ratoon LCP85-384 sugarcane at the LSU AgCenter Sugar Research Station, St. Gabriel, La. (Iberville Parish). Insecticide treatments were applied to 3-row plots (6 ft x 40 ft) using a CO_2 sprayer mounted on an all-terrain vehicle with an 8005 flat fan nozzle (one nozzle per row) delivering 20 gpa at 35 psi. Prior to test initiation, Lorsban 15G (15 lb/acre) was applied on 10 July to suppress fire ant predation on SCB larvae. Initial 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 were made on 21 August when re-infestation reached 5% in the Confirm 2F treated plots. SCB damage was assessed by counting bored internodes, moth emergence holes, and total number of internodes per stalk from 90 randomly selected stalks (15 stalks/plot) in each treatment (8 November). The study site received 6.54 and 6.35 inches of rainfall during the evaluation period of July and August respectively. Following ANOVA, means were separated with LSD.

All insecticide treatments significantly reduced % bored internodes compared to the check, but the Dimilin-treated plots displayed a higher percentage of bored internodes than the other treatments. Plots treated with Karate demonstrated significantly lower % bored internodes than plots treated with Intrepid at 4.0 oz/A and Dimilin. All insecticide treatments had significantly fewer moth emergence holes/acre than the untreated check. As a result of this research, both Dimilin and Intrepid have been discontinued from further consideration for SCB control in Louisiana management programs. Fury received a permanent Section 3 label in the fall of 2001.

Table 1. Effect of small plot insecticidal test on (SCB) *Diatraea saccharalis* (F.), St. Gabriel Research Station, 2001.

Treatment[a]/formulation	Rate (ai/acre)	% Bored internodes	No. of exit holes/acre[b]
Karate Z	1.92 oz	6.2d	556b
Baythroid 2E	2.1 oz	6.7cd	2,777b
Fury 1.5EC	3.2 oz	6.7cd	556b
Isomer 0.8EC	1.6 oz	10.4cd	5,556b
Intrepid 2F	6.0 oz	11.7cd	5,556b
Confirm 2F	8.0 oz	12.4cd	2,778b
Intrepid 2F	4.0 oz	12.7c	2,222b
Dimilin 2L	8.0 oz	23.4b	8,333b
Untreated Check	–	36.6a	65,000a

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

VARIETAL RESISTANCE RESEARCH WITH THE SUGARCANE BORER

T. E. Reagan[1], F. R. Posey[1], K. P. Bischoff[2], K. A. Gravois[2],
C. D. McAllister[1], and T. L. Bacon[1]
[1]Department of Entomology and [2]Sugar Research Station

Sugarcane resistance to the sugarcane borer (SCB), *Diatraea saccharalis*, is categorized as a combination of physical characteristics that hinders boring (rind hardness, leaf-sheath appression), variety specific tolerance to boring, and antibiosis mechanisms that contribute to differences in survival of bored in larvae. The extent of this resistance also is influenced by the severity of infestations. Heavy borer pressure results in more bored internodes, even in varieties considered highly resistant. Several factors contributing to seasonal area-wide SCB infestation levels include weather conditions, predator and parasite numbers, and indigenous borer populations. Expansive acreage of cultivars with elevated moth production increases endemic SCB populations and imposes additional pressure on the remaining acreage of resistant varieties. This is of particular significance in major periods of late summer and fall SCB buildup, such as was experienced in most of the industry during 2001. For this reason, we also report moth production for each cultivar in these tests.

Test plots for assessing SCB varietal resistance in the 1998 HoCP and 1999 L series experimental varieties cultivars, and four commercial varieties, were planted September 22, 2000, at Glendale Plantation, Killona, La. A randomized block design replicated four times was used with each block containing two plots of the commercial varieties CP70-321, LHo83-153, HoCP91-555, and LCP85-384, and one plot for each block of the HoCP-98 and L-99 cultivars. No chemical controls for SCB were applied in the test, and natural control from fire ants was suppressed by applying granular Lorsban in late June. A 15-stalk sample was cut from each plot on October 25, 2001, (four replications = 60 stalks each of HoCP-98 and L-99 varieties and 120 stalks per commercial cultivar). Sample stalks were examined to determine the number of bored internodes, moth emergence holes, and the total number of internodes.

Experimental variety L99-231 had the most bored internodes (28.9%) and the highest moth production, with 17,347 moths per acre produced. Commercial variety HoCP91-555 also had a higher level of bored internodes at 18.4%. LHo83-153 had the lowest bored internodes (8.2%), followed by CP70-321, and LCP85-384 at 9.9% and 12.1%, respectively.

Because of low SCB populations caused by drought conditions in 2000, the test plot for assessing SCB varietal resistance in the 1997 HoCP and 1998 L series varieties, and three commercial varieties planted September 22, 1999, at Glendale Plantation, Killona, La., was reassessed in the first stubble stage in 2001. A randomized block design replicated four times was used with each block containing two plots of the commercial varieties CP70-321, HoCP85-845, and LCP85-384 and one plot for each block of the HoCP-97 and L-98 varieties. No chemical controls for SCB were applied in the test, and natural control from fire ants was also suppressed by applying granular Lorsban in late June. A 15-stalk sample was cut from each plot on October 12, 2001, (four replications = 60 stalks per each of HoCP-97 and L-98 cultivar and 120 stalks per commercial cultivar). Sample stalks were examined to determine the number of bored internodes, moth emergence holes, and the total number of internodes.

Experimental variety L98-207 and commercial variety LCP85-384 had the most bored internodes (17.8% and 15.2%, respectively). L98-209 and HoCP85-845 had the highest moth production at 10,652 and 10,010 moths per acre produced, respectively. HoCP97-609 had the lowest bored internodes (12.1%), followed by L98-209 and HoCP85-845 at 12.3% and 13.1%, respectively.

Host plant resistance to target pest insects remains an important component of the sugarcane IPM system providing growers with a proven methodology for minimizing the economic impact of the sugarcane borer. Resistant varieties reduce pest damage at little or no cost to the grower. Our research now provides additional assessment criteria for selecting resistant cultivars. Incorporating the cultivar's pest survival rating better allows us to flag varieties that will enhance SCB populations in an area. Quantifying the impact of adult SCB emergence involves little additional data collection and enhances the efficiency and value of the entomological component in sugarcane breeding and varietal development at the LSU Agricultural Center.

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

Table 1. Sugarcane borer damage and moth production on 1998 HoCP series, 1999 L series varieties, and four commercial varieties during 2001, Glendale Plantation, Killona, La. Test was planted September 22, 2000, and samples cut October 25, 2001.

Variety	% Bored internodes	Stalks/acre	Moths/acre production
L99-231	28.9a	35,891	17,347a
HoCP98-741	25.3ab	36,386	12,735abc
L99-233	25.0ab	48,889	15,482ab
TUCCP77-042	24.0ab	44,214	11,054abcd
L99-226	21.0abc	40,296	11,417abcd
HoCP91-555	18.4abcd	31,429	6,024bcd
L99-213	17.6bcd	48,096	10,421abcd
LCP85-384	12.1cd	43,523	3,627cd
CP70-321	9.9d	33,214	3,045d
LHo83-153	8.2d	34,326	2,288d

Means followed by the same letter are not significantly different ($P \leq 0.05$, LSD).
Stand counts provided by Dr. Kenneth Gravois, Sugar Research Station.

Table 2. Sugarcane borer damage and moth production in first stubble 1997 HoCP series, 1998 L series varieties, and three commercial varieties during 2001, Glendale Plantation, Killona, La. Test was planted September 22, 1999; first stubble samples harvested October 25, 2001.

Variety	% Bored internodes	Stalks/acre*	Moths/acre production
L98-207	17.8a	57,934	9,656a
LCP85-384	15.2a	46,851	7,809a
CP70-321	13.3a	33,493	8,373a
HoCP85-845	13.1a	30,799	10,010a
L98-209	12.3a	49,163	10,652a
HoCP97-609	12.1a	40,561	6,760a

Means followed by the same letter are not significantly different ($P \leq 0.05$, LSD).
Stand counts provided by Dr. Kenneth Gravois, Sugar Research Station.

EVALUATION OF LOUISIANA SUGARCANE VARIETIES AGAINST TWO EXOTIC INSECT PESTS CAUSING ECONOMIC DAMAGE IN TEXAS.

T.E. Reagan [1], B.L. Legendre [2], M. Setamou[3], and M.O. Way[3]
[1]Department of Entomology, [2]Louisiana Cooperative Extension Service,
[3]Texas A&M Research and Extension Centers at Weslaco and Beaumont, respectively.

The **Mexican rice borer (MRB)**, *Eoreuma loftini* (Dyar), is a potentially serious threat to rice and sugarcane in Texas and Louisiana. In 1980, MRB was discovered from Mexico in the Lower Rio Grande Valley (LRGV) of Texas, and it immediately became a serious pest of sugarcane, causing a complete crop failure in some fields. Since invading the Texas rice belt (TRB) in the late 1980s, the MRB has become an increasingly severe problem. A recently completed insecticide experiment in rice sustained a 50% yield loss in untreated plots. Sugarcane yield loss studies at Weslaco have shown that 25% MRB bored internodes causes as much as a $250 economic loss in sugar per acre. Without adequate controls, the MRB is on the verge of becoming a major problem to these multi-state agricultural systems.

In view of the poor history of research success on biological control and insecticides to control MRB, proactive efforts were undertaken to plant and assess the relative resistance to MRB exhibited by four Louisiana recommended commercial varieties (LCP 85-384, HoCP 85-845, CP 70-321, and HoCP 91-555) and a fifth former Louisiana variety (NCo 310) that was planted as a susceptible check. Both NCo 310 and CP 70-321 are currently grown in LRGV as commercial varieties. There were six replications of each variety (each plot one row by 20 foot long) in this experiment conducted at the Weslaco Station Annex. The varieties LCP 85-384, HoCP 85-845, and HoCP 91-555 were transported disease- and insect-free from Louisiana. No insecticide was used during the growing season. However, there was irrigation at regular intervals, which tended to cause the experiment to be less attractive to MRB.

The percent MRB bored internode assessment of varieties in this experiment (planted 10/2/00) evaluated on 11/1/01 using a Tilby stalk-splitting machine is shown in Table 1. It is noted that the relative adult (moth) emergence values (distinguished by an oval-shaped exit hole on the stalk) also are presented for this MRB assessment.

Table 1. Susceptibility of Louisiana commercial varieties to the Mexican rice borer, Weslaco, TX, 2001.

Variety	% Bored internodes	Moth emergence/acre
HoCP 91-555	13.8a	7040ab
LCP 85-384	13.2a	11280a
NCo 310	8.7ab	1920bc
CP 70-321	7.7ab	2380bc
HoCP 85-845	5.8b	1550c
Least Significant Difference	*6.25*	*5454*

Means within a column followed by the same letter are not significantly different, LSD $P \leq 0.05$. A randomized complete block design with five replications, and 20 stalks/plot was used.

Both sugarcane borer (SCB) susceptible varieties (HoCP 91-555 and LCP 85-384) are also susceptible to MRB, with LCP 85-384 significantly more susceptible than the previously known MRB highly susceptible NCo 310 (when moth emergence is considered). HoCP 85-845 is significantly more MRB resistant than either LCP 85-384 or HoCP 91-555.

The **sugarcane lace bug**, *Leptodictya tabida* (Herrich-Schaeffer) (Hemiptera: Tingidae), is present on sugarcane in Florida, Texas, and Hawaii, as well as in numerous countries throughout the Caribbean area. It is often considered a relatively minor insect pest. However, at times, numbers of this leaf-feeding, sap-sucking insect can become high enough to cause entire fields in a region to appear pale green, with an obvious impact on photosynthesis. These conditions, sometimes averaging over 1000 lace bugs per plant, were present in several areas of LRGV of Texas in late July and early August of 2001.

Assessment of lace bug infestations (both immature nymphs and adults) on the test of Louisiana sugarcane varieties was initiated in the last week of July, with data summarized as shown in Table 2.

Table 2. Louisiana sugarcane varietal susceptibility to the sugarcane lace bug (Tingidae) in studies at the Weslaco Texas A&M Research Station Annex, July, 2001[1].

Variety	% Plants Infested	Total adults and nymph[2]	% Nymphs[3] (immatures)
NCo 310	97.3c	1151.6a	68.6c
CP 70-321	57.3b	216.4b	43.7b
LCP 85-384	84.0bc	604.6ab	64.7c
HoCP 85-845	61.3b	155.8b	40.3b
HoCP 91-555	36.0a	19.8b	34.6a

[1]15 plants sampled (all leaves) in each plot. Six-replication experiment with 20 ft. one-row plots. Means within each column followed by the same letter are not significantly different, ($P<0.05$, LSD).
[2]Adult and nymph forms per 15 plants sampled in each plot.
[3] % in nymphal stage of total number of lace bugs counted.

Varietal differences were observed showing that substantially fewer lace bugs occurred in HoCP 91-555, which was more resistant than variety NCo 310 and LCP 85-384. Data included both plant and leaf infestation levels, lace bug densities per plant, and the proportion of immature (nymphal stage) to total lace bug infestation numbers. The substantially reduced proportion of immatures in HoCP 91-555 was an indication of plant resistance. The sugarcane lace bug has not been observed in Louisiana sugarcane or in the 1,000-acre production near Beaumont, Texas.

MONITORING MOVEMENT OF THE MEXICAN RICE BORER TOWARD SUGARCANE AND RICE IN THE UPPER TEXAS RICE BELT AND WESTERN LOUISIANA, AND EVALUATION OF INSECTICIDE MANAGEMENT OPTIONS

T. E. Reagan[1], M. O. Way[2], and F. R. Posey[1]

[1]Department of Entomology and
[2]Texas Agricultural Research and Extension Center
1509 Aggie Drive, Beaumont, TX 77713

As a follow-up to pheromone trap sampling for the Mexican rice borer (MRB), *Eoreuma loftini* (Dyar) (Lepidoptera: Crambidae), adjacent to sugarcane fields in Southeast Texas and Southwest Louisiana in 2000, cooperative studies between Texas A&M and the LSU AgCenter were undertaken in the summer and fall of 2001 to define the insect's present range. Using twice weekly monitoring of pheromone traps in nine Texas counties and seven Louisiana parishes, new MRB locations were found in Austin and Harris counties in Texas. (See Figure 1 for relative locations). The insect still is not known to occur in Louisiana, but it now appears in relatively high populations within 50 - 60 miles of the new sugarcane production area near Beaumont, Texas, (Austin, Harris Calhoun, Colorado, Jackson, Matagorda, and Wharton counties), and within 120 miles of sugarcane in Southwest Louisiana (See Table 1). In addition to pheromone trap assessment, larval infestations in rice and other grasses have been discovered in many of the newly invaded areas. 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.

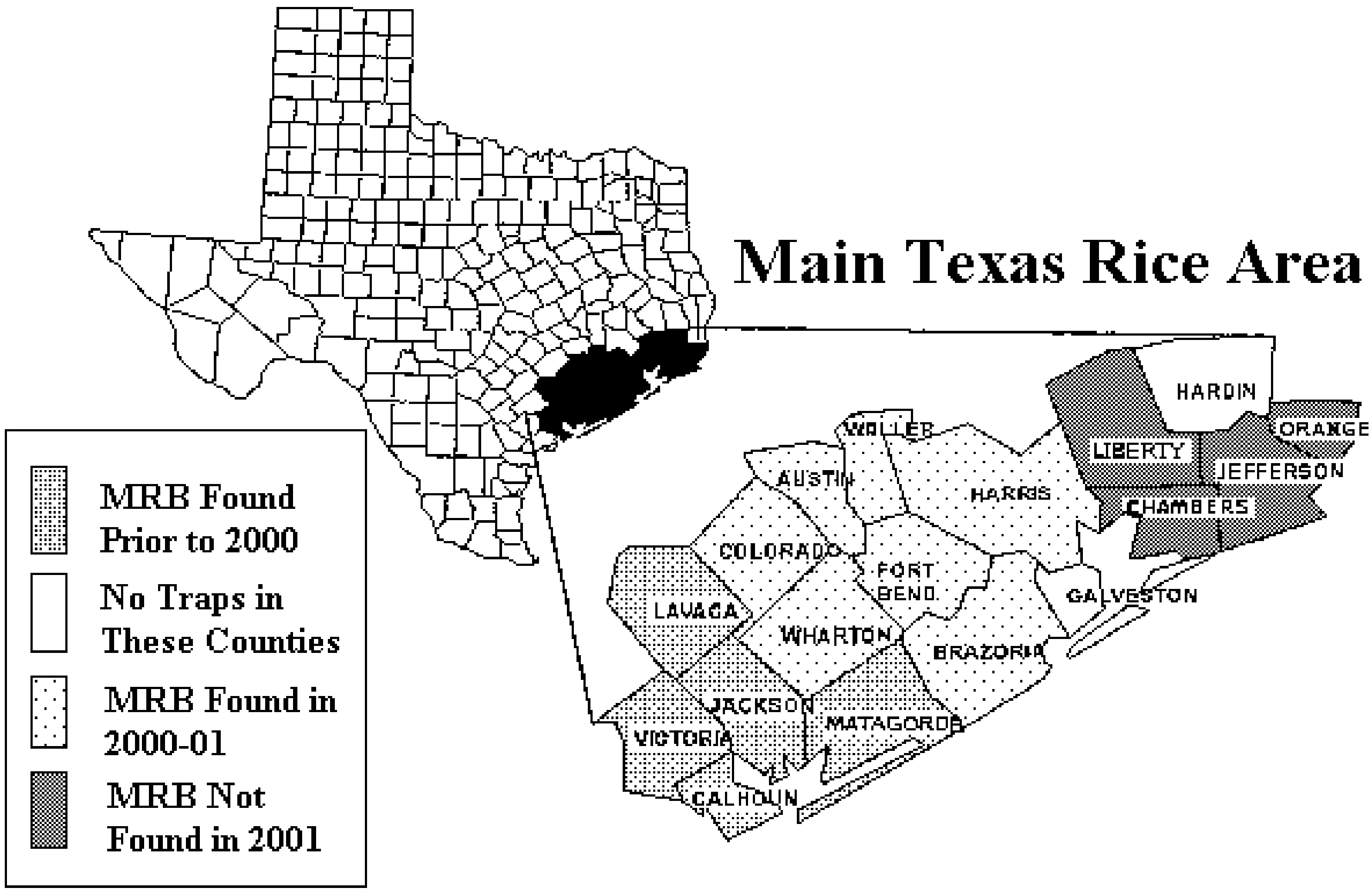
Management studies involving varietal resistance and insecticide control also were assessed with cooperators in the USDA, LSU AgCenter, and Texas A&M Systems, as well as with chemical industry colleagues and the Rio Grande Valley Sugar Growers Association. The most promising MRB pesticidal controls in sugarcane, though inadequate compared to the sugarcane borer standards, were cyfluthrin (Baythroid®) and the ecdysone agonist tebufenozide (Confirm®). Replicated variety assessment to determine relative MRB resistance of rice and sugarcane has shown at least 4.5-fold differences in susceptibility among selected commercially available varieties. MRB has proven to be a very severe pest of sugarcane in South Texas and Mexico, and it would be an especially serious problem to Louisiana growers under drought conditions similar to those experienced in recent years (particularly because most of the Louisiana growers have no facility to irrigate).

Table 1. Pheromone trap collections of Mexican rice borer (*Eoreuma loftini*) moths in Southeast Texas during 2001[1.]

Texas Counties	May	June	July	August	September	October	November
New Discovery							
Austin	45	146	190	114	--	--	--
Harris	23	289	330	176	143	358	330
Previously Known Counties							
Calhoun	--	477	326	225	--	--	--
Colorado	96	159	65	116	57	240	140
Jackson	128	155	44	85	24	84	74
Matagorda	--	445	134	293	185	588	--
Wharton	102	398	223	241	53	461	242
No MRB Collected							
Liberty	--	0	0	0	--	--	--
Orange	--	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 were replaced monthly.

Figure 1. Map of Mexican Rice Borer Pheromone Trapping in the Main Texas Rice Area (Southeast Texas), 2001.



PATHOLOGY RESEARCH

J. W. Hoy[1], L. B. Grelen[1], C. F. Savario[1], J. Q. Paccamonti[1], and C. D. McAllister[2]
Department of Plant Pathology and Crop Physiology[1]
Department of Entomology[2]

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 selecting disease-resistant varieties. Stalk rot research is a component of research on billet planting reported separately.

RATOON STUNTING DISEASE

A fifth year of testing for RSD was conducted during 2001 as part of the Sugarcane Disease Detection Lab operations. RSD was monitored in fields on commercial farms, in the LAES Variety Selection program, in the American Sugar Cane League Variety Release Program, in the local quarantine described below, and at all levels of Kleentek® seedcane production (Table 1). In 1997, the first year of on-farm testing, the infection levels considered as 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 with RSD within fields averaged 83, 51, and 12%, respectively. By 2000, these statistics had decreased to 35, 14, and 2%, respectively, and the numbers decreased again in 2001, when the averages were 16, 7, and less than 1%, respectively. RSD incidence no longer exhibits a typical pattern for a mechanically spread disease, in which infection levels increase progressively with more harvests and higher levels of disease are detected in stubble crops. Instead, detected RSD incidence was low for sampled fields in all years of the crop cycle (Table 2).

This steadily decreasing incidence of disease represents a major positive development for the industry. Factors associated with decreasing RSD incidence over this period have been use of healthy seedcane produced through micropropagation and widespread planting of LCP 85-384, a variety with some resistance to the spread of RSD. The average percentage of fields with RSD detected was 5.4% for LCP 85-384 during 2001, and the average stalk infection frequency was only 0.5%. With a continued effort to plant healthy seedcane of LCP 85-384, many growers are eliminating RSD from their farms. This will provide a great advantage in the future when high-yielding but RSD-susceptible varieties are released.

LOCAL QUARANTINE

Six promising experimental varieties, L 97-128, L 97-137, L 98-207, L 98-209, HoCP 97-606, and HoCP 97-609, were processed through the local quarantine to provide healthy plant material to establish foundation stock plants that will provide meristems for micropropagation of Kleentek® seedcane. Three stalks from different plants of each variety were tested for RSD, leaf scald, and sugarcane yellow leaf virus, soaked for 48 hours, heat-treated at 50 C for 3 hours, planted in a screened greenhouse, and observed for disease symptoms for 6 months. The greenhouse plants were then re-tested for the three diseases, stalk sections were given the long soak, long hot water

treatment, and single-bud cuttings were released for planting.

SUGARCANE YELLOW LEAF

Sugarcane yellow leaf virus (SCYLV) is present in all areas of the state, and research is under way to determine the potential impact in LCP 85-384 under Louisiana conditions. 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). A total of 8,609 samples were run through the lab. Testing of Kleentek® seedcane sources detected the virus in some fields. There is no evidence yet that SCYLV poses a serious threat to LCP 85-384. The plant-cane yields from an experiment comparing plantings established with either infected or non-infected seedcane (conducted in cooperation with M. P. Grisham at the USDA/ARS Sugarcane Research Unit Ardoyne experimental farm) did not detect a significant yield loss in LCP 85-384 caused by infection. Nonetheless, when a problem was detected in a seedcane field, cane was not sold from that field, and sampling of seedcane fields will be continued.

A graduate student research project conducted by Chris McAllister under the supervision of T. E. Reagan and J. W. Hoy has been initiated to evaluate entomological and pathological aspects of sugarcane yellow leaf. One component will be a study of the distribution and rates of disease spread and increase. A survey of fields in multiple parishes, including Ascension, Iberia, Rapides, and St. Mary, detected the virus in 10 of 16 (63%) fields picked at random and sampled (approximately 50 leaves per field). The infection level within an infected field averaged 9% and ranged from 2-45%. However, infection levels as high as 65% were detected in stubble fields previously known to have diseased cane. The rate of disease increase from one season to the next in these fields ranged from none to nearly a four-fold increase. On average, the infection level doubled. Two plant-cane experiments were established at single locations in Iberville and Rapides parishes to study the initial occurrence, patterns of spread, and rates of disease increase during the growing season. This will be determined in plots consisting of a 12 x 12 grid of contiguous quadrats. Two additional plots will be established during spring 2002 in stubble fields known to be infected with SCYLV. Additional extensive survey work also is planned.

ROOT DISEASE

A basic research project is attempting to improve our understanding of the effects of soilborne pathogens and root disease on sugarcane 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 microbial community that is detrimental to cane growth. This can be seen in the “new ground” effect observed by many growers when they plant in soil that has no recent history of sugarcane cultivation. Methods have been developed that allow the separation of the total DNA from the microbial community in a soil sample and amplification of part of the genome that codes for ribosomal subunit. This DNA fragment may eventually be used to identify and compare microorganisms present in “new” and “old” cane soil communities. Differences have been detected in types of culturable microorganisms that are present and substrate utilization profiles. The hope is that an improved understanding of the effects of the

total soil microbial community on cane 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 during 2001 addressed the potential effects of a new group of herbicides, including Milestone, Spartan, and Valor, on root disease. This research was conducted by J. H. Daugrois, a visiting scientist, in cooperation with J. L. Griffin. Evidence from other crops has suggested that these herbicides might have the ability to induce a phenomenon known as systemic acquired resistance that can limit infection by pathogens and reduce disease severity. Field observations have suggested that slight unexplained sugarcane growth increases sometimes occurred in herbicide evaluation experiments, so this project was initiated to attempt to determine if these herbicides were having any effects on sugarcane root disease. It was determined that these herbicides are detrimental to growth of the organism that causes Pythium root rot in culture. However, no conclusive evidence was found in three greenhouse tests for reduced root rot severity or increased plant growth resulting from herbicide treatments. In a field experiment, one Spartan and one Valor treatment increased millable stalk population.

SELECTION OF DISEASE-RESISTANT VARIETIES

Experimental varieties in the selection program are screened and rated for resistance to mosaic, smut, and leaf scald. Natural mosaic infection levels were determined in breeding program outfield yield trials. Little infection was detected (Table 4). Two of eight experimental varieties showed a trace of infection, and HoCP 97-606 had an average mosaic infection level of 4.6% across all locations.

Smut resistance was evaluated in experimental varieties in an inoculated test in which stalks were dipped in a smut spore suspension, then planted during August 2000. Smut infection levels were determined during July 2001 and compared to infection levels in varieties with known resistance reactions. Within the experimental varieties, 17 (57%), 13 (33%), and 3 (10%) were rated as resistant, moderately susceptible, and highly susceptible, respectively (Table 5).

Leaf scald resistance was evaluated in the same population using the decapitation inoculation method, in which the shoot is cut above the growing point and lead scald bacteria are sprayed on the cut surface during early June. However, sufficient symptoms to allow evaluation were not produced by the inoculated plants.

Table 1. RSD testing summary for 2001.

Source	Location	No. of fields	No. of varieties	No. of stalks
Louisiana growers	Statewide	276	5	5472
LSUAC	St. Gabriel and Iberia	-	-	390
Variety Release Program	1° and 2° Stations	-	14	797
Kleentek	Foundation stock	-	3	20
Kleentek	1° increase farms	22	4	449
Kleentek	2° increase farms	19	3	539
Local Quarantine	LSU AgCenter	-	9	38
Research	LSU AgCenter	-	7	200
Totals		317		7905

Table 2. RSD field and stalk infection frequencies in different crop cycle years for all varieties combined during 2001.

Crop year	Total number of fields	Average field infection (%)	Total number of stalks	Average stalk infection (%)
Plant cane	132	6.8	2628	0.8
First stubble	74	8.1	1471	1.0
Second stubble	30	3.3	595	0.2
Older stubble	26	3.8	501	0.4
Unknown	14	7.1	277	0.4
Total	276	6.6	5472	0.7

Table 3. Sugarcane yellow leaf virus testing summary for 2001.

Source	Location	No. of fields	No. of varieties	No. of stalks
Louisiana growers	Statewide	16	1	792
Kleentek	Foundation stock	-	8	51
Kleentek	1^{o} increase farms	54	4	1729
Kleentek	2^{o} increase farms	34	4	1281
Local Quarantine	LSU AgCenter	-	-	88
Research	LSU AgCenter	-	-	4668
Totals		95	8	8609

Table 4. Sugarcane mosaic natural infection levels in yield trials on farms (outfield tests).

Variety	Infection (%)	Rating[a]	Variety	Infection (%)	Rating[a]
CP 70-321	3.17	2	HoCP 96-509	0.02	2
LCP 85-384	0.01	2	HoCP 96-540	0.00	1
HoCP 85-845	0.11	2	L 97-128	0.00	1
HoCP 91-555	0.05	2	L 97-137	0.00	1
L 95-462	0.00	1	HoCP 97-606	4.60	2
Ho 95-988	0.01	2	HoCP 96-609	0.00	1

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

Table 5. 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	43	8	HoCP98-778	7	3
CP 70-321	3	2	HoCP98-781	2	2
CP 73-351	30	6	L 99-213	1	2
CP 74-383	23	5	L 99-214	46	8
TucCP 77-42	2	2	L 99-215	10	4
CP 79-348	2	2	L 99-221	0	1
CP 81-335	7	3	L 99-225	15	4
L 95-462	7	3	L 99-226	10	4
L 97-128	5	3	L 99-227	16	4
L 97-137	4	2	L 99-229	6	3
HoCP97-606	0	1	L 99-230	4	2
HoCP97-609	12	4	L 99-231	2	2
L 98-207	4	3	L 99-233	10	4
L 98-209	3	2	L 99-234	8	3
HoCP98-718	44	8	L 99-236	0	1
HoCP98-734	0	1	L 99-238	12	4
HoCP98-741	23	5	L 99-240	10	4
HoCP98-771	10	4	L 99-243	72	9
HoCP98-776	3	2			

[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

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

and

K. A. Gravois
Sugar Research Station

Sugarcane Seed Response to 2,4-D

Sugarcane growers often use 2,4-D to control morningglories (tie-vines) in late season to facilitate crop harvest. Although considered tolerant to 2,4-D, germination of buds from sugarcane stalks harvested for seed following a late season application can be affected. A field experiment was conducted at the St. Gabriel Research Station in St. Gabriel, La., to evaluate the effect of 2,4-D application timing on LCP 85-384 harvested for seed and planted using both whole stalks and billets.

Using a CO_2 backpack sprayer calibrated to deliver 8 gallons/acre, 2,4-D was applied at 1.5 qt/A (3.8 lb ai/gal) 7, 5, 3, and 1 week before planting. Sugarcane stalks were harvested on September 12, 2000, and planted at a constant seeding rate (two stalks with a 3-node overlap). For the billet planting, whole stalks placed in the opened row were hand cut into 18-inch sections (billets). Sugarcane was covered with 3 to 4 inches of soil, and beds were packed twice. A split plot experimental design with five replications was used. Whole plots consisted of planting method (whole stalk or billet) and sub plots were 2,4-D application timings. A significant application timing by planting method interaction was not observed for any of the parameters measured, but the main effects were significant.

Averaged across planting methods, differences in sugarcane shoot population among 2,4-D timings were observed from mid-October through April, but differences were not observed in September, a year following planting. Sugarcane shoot population was higher for the billet planting method throughout the season regardless of 2,4-D application timing, but stalk height was not affected by planting method. Sugarcane stalk height was reduced when 2,4-D was applied 5, 3, and 1 week before planting when compared to the nontreated control, but a reduction was not observed when applied 7 weeks before planting. Sugarcane and sugar yield were reduced 12 to 15% when 2,4-D was applied 5, 3, and 1 week before planting when compared to the nontreated control, but a reduction was not observed when applied 7 weeks before planting. Regardless of 2,4-D application timing, sugarcane and sugar yield averaged 19 and 18% higher, respectively, for billet planting when compared with whole-stalk planting.

Results show that LCP 85-384 sugarcane was not injured when 2,4-D at 1.5 qt/A was applied 7 weeks before harvest for seed whether planting whole stalks or billets at the same seeding rate. When 2,4-D was applied 5 weeks or closer to planting, however, sugarcane and sugar yield were reduced.

Alternatives for Johnsongrass Control in Sugarcane

In 2001, field experiments were conducted to evaluate CGA 362622 and Regiment as alternatives to Asulox for postemergence johnsongrass control in sugarcane. Additionally, CGA 362622 and Prowl were each applied with Asulox to evaluate their utility. In St. James Parish, La., herbicide treatments were applied to johnsongrass as tall as 24 inches with some plants in the boot stage. By 33 days after treatment, johnsongrass was controlled 69 to 78% with Asulox applied alone at the high rate of 3.34 lb/A (4 quarts) or with Prowl at 0.83 (1 quart) or 3.3 lb/A (4 quarts), and with Asulox at 2.5 lb/A (3 quarts) with Prowl at 3.3 lb/A (4 quarts). The high rate of CGA 362622 (0.028 lb/A) controlled johnsongrass 75%, but Regiment (0.02 lb/A) provided only 46% control. Both CGA 362622 and Regiment caused reddening/purpling of the johnsongrass foliage, stunting, and either no seed head emergence or abnormal seed head emergence. Where Prowl was applied with Asulox, fewer johnsongrass seed heads emerged when compared with Asulox alone. Sugarcane injury 33 days after treatment was not observed for any of the Asulox treatments, but was 18 and 29% for the high rates of CGA 362622 and Regiment, respectively.

Johnsongrass control for Asulox and CGA 362622 applied alone and in combination was evaluated in a noncrop area. Asulox controlled rhizome johnsongrass 71 days after treatment 28, 50, and 87% at 0.83, 1.65 (2 quarts), and 3.34 lb/A, respectively. Control was no more than 46% for CGA 362622 applied at 0.007 and 0.014 lb/A. However, when CGA 362622 was applied at 0.007 lb/A with Asulox at 1.65 lb/A, johnsongrass was controlled 80%. The combination of CGA 362622 at 0.014 lb/A and Asulox at 1.65 lb/A controlled johnsongrass 92%, a level comparable to that for Asulox alone at the labeled rate of 3.34 lb/A. In another experiment conducted in the same area, Asulox controlled johnsongrass 71 days after treatment 68, 76, and 86% for the 1.65, 2.50 and 3.34 lb/A rates, respectively. Prowl applied at 0.83, 1.65 (2 quarts), and 3.3 lb/A with Asulox at 1.65 lb/A controlled johnsongrass 69 to 75%. However, when the rate of Asulox was increased to 2.5 lb/A, control was 88 to 90% when at least 1.65 lb/A of Prowl was added, and equal to Asulox applied alone at 3.34 lb/A. Prowl in combination with Asulox could allow for a reduction in the use rate of Asulox without sacrificing johnsongrass control and for some residual weed control from the Prowl. This combination would also provide an economical benefit to the grower.

Sugarcane Response to Herbicides Applied in Spring and at Layby

An experiment was conducted to evaluate response of three sugarcane varieties, LCP 85-384, HOCP 85-845, and LCP 82-89, to the herbicides CGA 362622, Valor, and Velpar K4 (a premix of Velpar and Karmex). A Prowl + Karmex spring treatment followed by Prowl at layby was included as a standard for comparison. Averaged across herbicide treatments injury tended to be less for LCP 85-384. Sugarcane yield was at least 25% higher for 384 than for the other varieties. Sugar yield was 20% higher for 384 than for 845 (8,560 vs. 7,145 lb/A) and 32% higher for 384 than for 82-89 (8,560 vs. 6,470 lb/A). Averaged across varieties, injury was higher than 30% where CGA 362622 was applied twice (0.014 followed by 0.028 lb/A or 0.028 followed by 0.056 lb/A) and 17% when Valor was applied twice (0.25 followed by 0.125 lb/A). Injury for these treatments was accompanied by a reduction in sugarcane plant height in mid-July compared with the Prowl + Karmex standard. Sugarcane yield was reduced compared with the standard 8.2 to 19% where Velpar K4 (2.4 lb/A) or CGA 362622 was applied twice. Sugar yield was reduced 9 to 21% when Velpar K4, CGA 362622, or Valor was applied twice. Results clearly show that multiple applications of some of the newer herbicides can be detrimental to sugarcane growth and yield and that the effect is not variety dependent.

In another experiment, significant injury was observed for Valor applied at 0.25 lb/A on April 12 (20%), but injury for the same rate applied April 4 was 7%. Application of Regiment (0.020 lb/A) on April 12 injured sugarcane 44%. Injury was no more than 14% for the Velpar K4 applied either once or twice at 2.4 lb/A. For the May 29 rating date, sugarcane was injured when Valor was applied 27 days earlier (28%) and when Valor was applied at 0.25 lb/A on April 4 and again at 0.25 lb/A at layby on May 16 (25%). Sugarcane injury at the May rating was 78% where Regiment was applied in mid-April. Sugarcane yield and sugar yield were significantly reduced when Valor was applied postemergence, but not for the Velpar K4 treatments. The excessive injury observed with Regiment resulted in a sugar yield reduction of 36% compared with the standard.

2,4-D Alternatives Research

Use of 2,4-D for late season red morningglory control is prohibited in some parishes. Valor at 0.094 lb/A (3 oz product/A) and Spartan at 0.3 lb/A (6.7 oz/A) were very effective in controlling red morningglory with 24-inch runners when herbicide covered the weed foliage. In another study when morningglory was 72 inches tall and herbicide was applied to the lower 18 inches, Spartan at 0.3 lb/A provided excellent control 28 days after treatment. When applied overtop, Weedmaster at 1 quart/A and 2,4-D at 1 pint/A plus 0.5 or 1 pint/A of Weedmaster controlled 72-inch-tall red morningglory equal to 2,4-D at 1 quart/A.

BILLET PLANTING RESEARCH

J. W. Hoy[1], A. E. Arceneaux[2], and C. F. Savario[1]
Department of Plant Pathology and Crop Physiology[1]
and the Department of Agronomy[2]

Yields were obtained from field experiments on commercial farms comparing billet and whole-stalk planting for two experiments in plant cane, one in first stubble and one in second stubble. These experiments were conducted with the American Sugar Cane League and cooperating growers. Results also were obtained from three plant cane and two first stubble experiments at the Sugar Research Station. The plant cane experiments evaluated the effects of date and rate of billet planting and compared various combinations of fungicides, antitranspirants, and other chemical treatments in a dip-inoculation experiment. The two experiments in first stubble compared billet planting rate and billets and whole stalks with and without starter fertilizer and two rates of billet planting. In addition, an experiment was conducted to evaluate the effect of different chopper harvester settings on physical billet damage. All experiments were conducted with LCP 85-384.

In the two plant cane experiments on farms, stalk population and tonnage and sugar yields were higher in whole-stalk planted rows in only the experiment conducted in Ascension Parish (Table 1). In this experiment, the application of 15-45-45 starter fertilizer did not increase yield (data not shown). Slightly higher yields were recorded in whole-stalk planted rows in the experiment in St. Mary Parish, but the differences were not significant. In another experiment conducted in Ascension Parish, first stubble yields were reduced compared to plant cane, but the yields obtained from billet and whole-stalk planted rows were similar (Table 2). In the experiment in second stubble, one billet treatment was lower and one was similar to whole-stalk planting, and there was no benefit from initial treatments with fungicide, soil insecticide/nematicide, or application of a film coating to billets at planting (Table 3).

In experiments conducted at the Sugar Research Station, the date of billet planting had an effect on stalk population and yield (Table 4), as did the rate of billet planting (Table 5). Five planting dates were compared. Favorable weather conditions allowed plantings to be established at two-week intervals extending over the planting season. The highest yields were obtained from the mid-season planting dates. Tonnage yields were highest for the 31 August and 18 September dates (Table 4). Increasing the rate of billet planting from one to 12 running billets resulted in progressively higher millable stalk populations (Table 5). There were two planting dates in the rate of planting experiment, and stands were higher for the 22 August planting date compared to 18 September. As a result, more yield differences were detected among planting dates in the later planting. The lowest yield was obtained from plots planted with only one running billet at both planting dates. At the 18 September planting date, sugar per acre was higher with the six, nine, and 12 billet planting rates than for the three billet planting rate. Despite the higher stalk population obtained, there was no advantage from planting at the highest two rates. The rate of billet planting was examined in two additional experiments in first stubble. In a small scale experiment comparing four rates of billet planting, first stubble yields were similar for all planting rates (Table 6). In an experiment comparing whole-stalk planting to billets planted at two rates with and without starter fertilizer, the higher yields due to whole-stalk planting and addition of fertilizer detected in plant cane were no longer evident in first stubble (Table 7); yields in all treatments were similar. A high rate of billet planting did not increase yield in either season. In the dip-inoculation experiment, four

antitranspirants and two fungicides applied singly and in combinations along with two additional chemical treatments did not improve millable stalk population in plant cane (Table 8).

In the experiment to evaluate the effect of different harvester settings on the amount of physical damage billets sustain while being cut, differences were detected in number of damaged buds per billet, number of wounds per billet, and frequency of buds with no damage (Table 9). A total of 50 billets were examined with each setting combination. Billet length and bud number per billet did not vary significantly across treatments. Length ranged from 23-24 inches, and the number of buds per billet ranged from 3.2-3.7. Factors associated with lower rates of damage were use of "leg-wraps" around the base-cutter shafts and the special "seed chopper" drums designed to cut longer billets. These two factors also were effective in the experiment conducted in 2000. The effect of the secondary extractor fan was inconsistent. In two previous experiments, damage increased when the secondary fan was engaged in one experiment but not the other. The overall results suggest the secondary fan can cause billet damage, but it is not a major causal factor. The angle of the elevator did not affect billet damage. This factor did not affect billet damage last year, so it appears that the elevator angle is not an important factor affecting damage. A final factor evaluated for the first time this year was the presence or absence of the football-shaped fins on the knock-down roller. There was no apparent benefit from removing the fins. This comparison was included based on observations in previous experiments of damage to stalks evident when the harvester backed away at the conclusion of a treatment. In those experiments slow speed (1 mph) of travel down the row was shown to increase billet damage, and the fins could have been the source of some of the extra damage. Slow speed of travel down the row was not included in this year's experiment.

Mechanical planting increases the amount of physical damage to billets, but the extent of added damage is uncertain. This season a billet experiment was planted the day before the billet damage experiment was conducted. The frequency of billets with no detectable damage in the planting furrow was only 27%, whereas the billets cut the next morning from the same seedcane source with the same harvester settings had an undamaged billet frequency of 58%. No experimental information has been obtained comparing planters or planter settings and the damage caused to billets.

The availability of a Cameco chopper harvester during the entire 2000 season allowed experiments to be conducted, such as the date and rate of planting experiments, that were difficult to conduct on farms. These same experiments were re-planted during late summer and fall 2001, although weather conditions did not allow two-week planting intervals. In addition, small-scale experiments were established comparing billet and whole-stalk planting for HoCP 85-845 and HoCP 91-555.

There is intense interest in billet planting within the Louisiana sugarcane industry. The 2002 growing season will be an important one for assessing billet planting performance. A combination of a planting season with a variety of adverse weather conditions and a winter with widely spaced freezes, including a late freeze in March, created challenging conditions for billet plantings. Factors now known to be associated with poor billet performance that are under the control of the grower include short billet length, excessive physical billet damage, light planting rate, improper depth of cover, poor drainage, and herbicide injury. The addition of fertilizer at planting has improved yields in some, but not all, experiments. No chemical treatment to prevent stalk rot has been identified that consistently improves billet performance.

In most experiments, the yield of whole-stalk planting has been higher during the plant cane crop. However, the yields of whole-stalk and billet plantings have been comparable throughout the entire crop cycle. Most of the experiments have now been conducted with LCP 85-384. Early experiments with CP 70-321 showed it to be erratic in billet planting performance. As other varieties are released, their ability to tolerate billet planting will need to be evaluated. The research results suggest that the highest yields over time will be obtained with whole-stalk planting. However, when cane is badly lodged, it may be necessary to plant billets. Billets are more sensitive to any problem, so good planting practices are very important when planting billets.

Table 1. Plant cane yields of LCP 85-384 for two experiments comparing billet and whole stalk planting on commercial farms.

	Stalks per acre (x1000)		Tons of cane per acre		Sugar per acre (lbs.)	
Planting	Ascension	St. Mary	Ascension	St. Mary	Ascension	St. Mary
Billet	47.6 b	49.3 a	34.4 b	33.1 a	7850 b	7142 a
Whole	50.6 a	52.3 a	41.9 a	35.1 a	9179 a	7535 a

Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 2. Plant cane and first stubble yields of LCP 85-384 from an experiment in Ascension Parish comparing plantings of billets and whole stalks with and without fertilizer (15-45-45) applied at planting.

	Tons of cane per acre[x]		Sugar per acre (lbs.)[x]	
Treatment	2000	2001	2000	2001
Billet	41.5 ab	21.8 ab	8013 ab	5034 ab
Billet + Fertilizer	38.0 b	23.3 ab	7391 b	5398 ab
Whole stalk	38.4 b	19.2 b	7160 b	4352 b
Whole stalk + Fertilizer	45.4 a	24.0 a	8543 a	5726 a

[x] Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 3. Yields of LCP 85-384 from an experiment in Iberia Parish comparing whole stalks, long billets, and short billets treated with Tilt, Thimet, an antitranspirant (film-coating), and Tilt plus antitranspirant.[x]

Treatment	Tons of cane per acre[y]			Sugar per acre (lbs.)[y]		
	1999	2000	2001	1999	2000	2001
Whole stalk	42.5 ab	35.8 a	24.6 a	9712 ab	6991 a	5400 a
Long billet	44.3 a	30.0 b	22.3 ab	10095 a	6115 ab	4453 b
Short billet	44.0 a	33.2 ab	23.8 ab	10299 a	6570 ab	5372 a
Short billet + Tilt	40.6 ab	31.4 b	23.5 ab	9362 ab	6462 ab	5301 ab
Short billet + Thimet	38.0 b	30.8 b	22.8 ab	8778 b	6100 ab	4827 ab
Short billet + Antitranspirant	40.9 ab	29.6 b	22.5 ab	9480 ab	5787 b	4705 ab
Short billet + Tilt + Antitranspirant	37.3 b	32.9 ab	21.2 b	8475 b	6801 a	4903 ab

[x] Tilt (Syngenta, Inc.) is propiconazole fungicide; Thimet (American Cyanamid, Inc.) is phorate, a soil-applied insecticide; and the antitranspirant was Transfilm (PBI/Gordon, Inc.).
[Y] Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 4. Effect of date of planting on plant cane yield of billet planted LCP 85-384.

Date of planting	Stalks/acre (x1000)	Tons of cane per acre	Sugar per acre (lbs.)
August 3	48.3 d	43.3 b	8972 b
August 15	53.1 ab	44.5 b	9296 b
August 31	54.8 a	49.8 a	10402 a
September 18	51.3 bc	49.7 a	9607 ab
September 28	49.2 cd	45.0 b	9200 b

Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 5. Effect of rate of planting on plant cane yield of LCP 85-384 planted on two dates.

	Stalks per acre (x1000)		Tons of cane per acre		Sugar per acre (lbs.)	
Rate	Aug. 22	Sept. 18	Aug. 22	Sept. 18	Aug. 22	Sept. 18
1 billet	50.6 c	40.8 d	56.1 b	46.9 b	9274 b	8018 c
3 billets	68.3 b	50.3 c	66.9 a	57.9 a	11898 a	9484 b
6 billets	74.4 ab	56.7 b	65.4 a	63.6 a	12122 a	10771 a
9 billets	76.6 a	57.9 b	65.2 a	58.3 a	11876 a	10057 ab
12 billets	75.6 a	66.0 a	66.7 a	62.5 a	11876 a	10159 ab

Planting rate is the number of billets running in the furrow. Billets were planted on 22 August and 18 September. Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 6. Effect of billet planting rate on the first stubble yield of LCP 85-384 at the Sugar Research Station during 2001.

Planting rate	Cane yield	Stalk No.	Stalk Wt.	Normal juice Brix	Normal juice Sucrose	Sugar yield
	T/A	1000/A	lbs.	%	%	lbs/A
3 Billets	53.9	53.7	2.00	16.2	13.4	10202
5 Billets	52.9	57.3	2.16	16.0	13.3	9969
7 Billets	55.3	57.2	1.64	15.9	13.2	10259
9 Billets	56.7	58.8	2.02	16.3	13.7	11006
LSD .05 Treatment	NS	NS	0.48	NS	NS	NS

The billets were cut with a combine harvester and hand planted in 1999.

Table 7. First stubble yield comparison of billet and whole-stalk planting, rate of billet planting and starter fertilizer with LCP 85-384 at the Sugar Research Station during 2001.

			First Stubble - 2001				
Planting type and rate	Starter fertilizer	Cane yield	Stalk No.	Stalk Wt.	Normal juice Brix	Normal juice Sucrose	Sugar Yield
		T/A	1000/A	lbs.	%	%	lbs/A
Whole	0-0-0	54.5	57.9	1.58	15.2	12.2	9237
1X Billet	0-0-0	50.9	57.5	1.63	15.4	12.6	8978
2X Billet	0-0-0	49.7	62.7	1.66	16.0	13.3	9365
Whole	45-45-45	51.4	62.7	1.75	15.7	13.0	9376
1X Billet	45-45-45	49.7	57.5	1.83	16.3	13.7	9592
2X Billet	45-45-45	49.5	54.6	1.60	16.0	13.2	9264
LSD .05 Treatments		NS	3.0	NS	0.9	1.1	NS
			Mean Effect				
Whole		52.9	60.3	1.67	15.4	12.6	9307
1X Billet		50.1	57.5	1.73	15.9	13.2	9285
2X Billet		49.6	58.7	1.63	16.0	13.3	9314
	0-0-0	51.7	59.4	1.62	15.6	12.7	9193
	45-45-45	50.0	58.3	1.73	16.0	13.3	9411
LSD .05 Rate Means		NS	2.1	NS	NS	NS	NS
LSD .05 Fall Fert. Mean		NS	NS	NS	NS	NS	NS

Whole-stalk planting consisted of a four running stalk planting rate; 1X Billet consisted of 6-9 running billets; and 2X Billet consisted of 12-18 running billets. Starter fertilizer was applied in the planting furrow in 1999, and normal fertilizer practice was followed in the spring of each crop year.

Table 8. Millable stalk population of LCP 85-384 as affected by fungicides, antitranspirants, and other chemical treatments applied singly and in combination in a dip-inoculation experiment.

Treatment[x]	Stalks per acre (x1000)
Leaf Shield antitranspirant 1:10	53.5
Leaf Shield 1:10 + Tilt fungicide 2.2 ml fp/10 gal	57.4
Wilt Pruf antitranspirant 1:10	46.5
Wilt Pruf 1:10 + Tilt 2.2 ml fp/10 gal	44.4
Transfilm antitranspirant 1:10	47.9
Transfilm 1:10 + Tilt 2.2 ml fp/10 gal	44.7
Tilt 2.2 ml/10 gal	54.4
Hydrostik antitranspirant 1:20	52.4
Dithane fungicide 114 g fp/10 gal	49.1
Leaf shield 1:10 + Dithane 114 g fp/10 gal	52.9
Transfilm 1:10 + Dithane 114 g fp/10 gal	51.2
Agri 50 1:10 dip + 1 L 1:10 drench	46.5
Agri 50 1:50 dip + 1 L 1:50 drench	50.0
Vitazyme 1% dip	55.6
Vitazyme 1% 1 L drench	49.4
Non-treated billets	52.4

[x]Billets were submerged for 10 min and planted as one running billet in single-row, 25-foot plots with four replications. Tilt is propiconazole, Dithane is mancozeb, and Agri 50 contains sodium lauryl sulfate. There were no significant differences among treatments.

Table 9. Effect of chopper harvester settings on billet damage during 2001.

Treatment[1]	Damaged buds/billet	Wounds/ billet	Billets with no damage
Seed choppers, leg wraps, primary fan, 45 degree	0.10 c	0.4 c	72 %
Seed choppers, leg wraps, secondary fan+, 45 degree	0.22 abc	0.6 bc	62 %
Seed choppers, leg wraps, primary fan, 90 degree	0.16 bc	0.5 bc	66 %
Seed choppers, primary fan, 45 degree	0.18 bc	1.2 ab	44 %
Seed choppers, secondary fan+, 45 degree	0.22 abc	1.7 a	52 %
Seed choppers, no fins, secondary fan+	0.14 bc	1.6 a	48 %
Seed choppers, no fins, primary fan	0.18 bc	1.2 ab	56 %
Regular choppers, primary fan	0.38 a	1.7 a	32 %
Regular choppers, secondary fan+	0.30 ab	1.7 a	44 %
Regular choppers, leg wraps, primary fan	0.18 bc	0.6 bc	58 %

[1]Treatments consisted of special seed cutting drums with only one knife per drum designed to cut long billets, regular billet chopping drums with two blades removed to cut long billets, pipe fittings (leg wraps) that couple around the bottom of the base cutter shafts, primary extractor fan only, primary and secondary extractor fans, and aligning the elevator at 45 and 90 degrees. Values within a column followed by the same letter are not significantly different at $P = 0.05$.

CULTURAL AND LAND MANAGEMENT PRACTICES RESEARCH IN SUGARCANE IN 2001

C. Kennedy[1], A. E. Arceneaux[1], J. W. Hoy[2]
Departments of Agronomy[1] and Plant Pathology[2]
in cooperation with St. Gabriel Research Station

SUMMARY

Seven field experiments were conducted in 2001 to test the effects of various cultural and land management practices on yield components of sugarcane. Results from tests on planting practices showed that subsequent cane yields after the plant cane season were higher when planted in August than in October.

Results from date-of-harvest experiments showed sugar yields across varieties in first stubble increased through the harvest season up to 45% above yields in early October. Additionally, yields in the first stubble crop increased when the plant cane crop was harvested later. First stubble sugar yields increased 11% as a result of harvesting plant cane in early December vs October. Cane yields increased 6%.

Planting rates of seed cane as billets or whole stalks produced more response in plant cane than in subsequent stubble crops based on data from 2001. Date of harvest or date of planting had more effect on subsequent yield than seed source or planting rate. However, cane from four running billets showed a 7% decrease in sugar yield compared to use of whole stalks or five running billets.

Covering stubble with soil improved yields of second stubble cane, especially when starter fertilizer was applied to plant cane. Likewise, tilling of harvest residue resulted in soil-covered stubble and higher first stubble sugar yields than when the residue was burned or left undisturbed.

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:

Type and Rate of Planting

The type and rate of seed cane had little effect on subsequent stubble crops (Tables 1, 2, and 3). However, cane from four running billets showed a 7% decrease in sugar yield compared to use of whole stalks or five running billets (Table 4).

Date of Planting

Second stubble cane yield of HoCp 85-845 increased almost 7% and sugar yield 11% with a late (Nov. 1) planting date (Table 1). Alternatively, first stubble sugar yields of this variety and variety LCP 85-384 were about 5% lower when cane was planted in mid-October vs mid-August (Table 4). This apparent opposite response may be caused by weather conditions surrounding the development period of the planted cane in each experiment.

Harvest Date on Subsequent Yields

It is well established that later harvest of sugarcane often results in higher sugar yield. This occurred in 2001 with sugar yields 45% higher on December 3 than on Oct. 9 (Table 5). Date of harvest for earlier crops also can affect subsequent stubble yields. Plant cane harvested in December resulted in subsequent stubble crops that produced 6% more cane (because of a 7% increase in stalk population) and 11% more sugar than stubble crops developing from plant cane harvested in October (Table 5). These results underscore the importance of the crop to perennate and the production inputs that affect it.

Residue Management/Stubble Protection

Soil temperature 3 inches deep in the cane bed of first 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 other treatments (Fig. 1) with the greatest difference occurring between burning and leaving the residue mat. Incorporating the residue and sweeping to the row middle resulted in intermediate temperatures. Minimum soil temperature was lowest for the burn treatment, but never exceeded 45° F. Leaving the residue mat resulted in the highest minimum temperatures, but were usually only 3-4° F higher than those in the burn treatment (Fig. 2). Similar to average daily temperatures, minimum temperatures for sweeping or tilling the residue were intermediate. Using a cultivator to slightly incorporate harvest residue and provide some soil cover over the stubble of HoCP 85-845 resulted in a 12% increase in first stubble sugar yield over the residue-burned check (Table 6). The increase in sugar yield was caused mainly by increased CRS and secondarily by slightly higher average cane yield. Possibly related to these results was the development rate of the stalk population. Although initially higher, stalk populations in the burn plots were lower than those that were tilled (Fig.3). Tillage/soil covering may also have reduced the number of bull shoots of this variety, thus improving the CRS. The number of bull shoots were not determined, however. In a related test, covering stubble with soil generally resulted in about an 11% increase in sugar yield for the second stubble crop of three varities (Table 7). However, HoCP 85-845 was benefitted more consistently by soil cover than either LCP 82-89 or LCP 85-384. The use of 45-45-45 starter fertilizer interacted with cover to produce higher yields

than starter with the check. There were few differences between cover and check treatments when no starter fertilizer was applied with the seed cane.

Table 1. Effect of date of planting, seed size and starter fertilizer on the second stubble cane yield of HoCP 85-845 on the St. Gabriel Research Station, 2001.

Date Of Planting	Seed Stalk Size	Starter Fertilizer N-P-K	Second Stubble Cane - 2001				
			Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
1998		lbs/A	T/A	1000/A	lbs.	%	lbs/A
Sept. 1	Whole	0-0-0	41.7	31.8	2.71	12.8	7411
	Whole	45-45-45	36.3	32.1	2.41	14.0	7219
	Billet	0-0-0	39.8	35.0	2.36	13.9	7851
	Billet	45-45-45	39.5	36.6	2.26	13.3	7396
Nov. 1	Whole	0-0-0	42.4	35.4	2.63	14.1	8511
	Whole	45-45-45	45.5	37.7	2.57	13.3	8550
	Billet	0-0-0	40.2	35.0	2.38	14.8	8563
	Billet	45-45-45	40.2	33.8	2.35	13.2	7473
LSD .05 Treatments			5.4	3.0	0.37	1.2	1307
			Mean Effect				
Sept. 1			39.3	36.3	2.44	13.5	7469
Nov. 1			42.1	33.9	2.48	13.8	8274
	Whole		41.5	34.3	2.58	13.5	7923
	Billets		40.0	35.9	2.34	13.8	7821
		0-0-0	41.0	34.3	2.52	13.9	8084
		45-45-45	40.4	35.8	2.40	13.4	7660
LSD .05 Date Means			2.7	1.5	NS	NS	654
LSD .05 Seed Size Means			NS	NS	0.18	NS	NS
LSD .05 Starter Fertilizer Means			NS	NS	NS	NS	NS

Planted with each seed size on each date in 1998 and harvested as second stubble cane in 2001. For the billet rate, the whole stalks were cut by hand 18 inches long in the planting furrow. Starter fertilizer was applied in the planting furrow in 1998, and normal fertilizer practice was followed in the spring of each crop year.

Table 2. Effect of seed size, rate of planting and starter fertilizer on the first stubble cane yield of LCP 85-384 on the St. Gabriel Research Station, 2001.

Seed Stalk Size and Rate	Starter Fertilizer	Cane Yield	First Stubble - 2001 Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
		T/A	1000/A	lbs.	%	%	lbs/A
Whole	0-0-0	54.5	57.9	1.58	15.2	12.2	9237
1X Billet	0-0-0	50.9	57.5	1.63	15.4	12.6	8978
2X Billet	0-0-0	49.7	62.7	1.66	16.0	13.3	9365
Whole	45-45-45	51.4	62.7	1.75	15.7	13.0	9376
1X Billet	45-45-45	49.7	57.5	1.83	16.3	13.7	9592
2X Billet	45-45-45	49.5	54.6	1.60	16.0	13.2	9264
LSD .05 Treatments		NS	3.0	NS	0.9	1.1	NS
			Mean Effect				
Whole		52.9	60.3	1.67	15.4	12.6	9307
1X Billet		50.1	57.5	1.73	15.9	13.2	9285
2X Billet		49.6	58.7	1.63	16.0	13.3	9314
	0-0-0	51.7	59.4	1.62	15.6	12.7	9193
	45-45-45	50.0	58.3	1.73	16.0	13.3	9411
LSD .05 Rate Means		NS	2.1	NS	NS	NS	NS
LSD .05 Fall Fert. Mean		NS	NS	NS	NS	NS	NS

Planted with each seed size in 1999 and harvested as plant cane in 2000 and first stubble in 2001. The billets were cut with a combine and planted with a mechanical planter. Starter fertilizer was applied in the planting furrow in 1999, and normal fertilizer practice was followed in the spring of each crop year.
Whole = 4 running stalks.
1X Billet = 6-9 running billets.
2X Billet = 12-18 running billets.

Table 3. Effect of rate of planting billets on the yield of LCP 85-384 variety on the St. Gabriel Research Station, 2001.

Planting Rate	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
	First Stubble - 2001					
	T/A	1000/A	lbs.	%	%	lbs/A
	LCP 85-384					
3 Billets	53.9	53.7	2.00	16.2	13.4	10202
5 Billets	52.9	57.3	2.16	16.0	13.3	9969
7 Billets	55.3	57.2	1.64	15.9	13.2	10259
9 Billets	56.7	58.8	2.02	16.3	13.7	11006
LSD .05 Treatment	NS	NS	0.48	NS	NS	NS

The billets were cut with a combine harvester and hand planted in 1999.

Table 4. Effect of date of planting, seed size and rate of planting on the yield of first stubble in two varieties on the St. Gabriel Research Station, 2001.

Cane Variety	Planting Date	Planting Rate	Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
			First Stubble - 2001				
	1999		T/A	1000/A	lbs.	%	lbs/A
LCP 85-384	Aug. 16	3 Whole	48.2	45.0	2.24	14.6	10102
		4 Whole	47.6	44.4	2.37	15.2	10477
		4 Billet	44.8	43.5	2.22	15.3	9821
		5 Billet	47.3	43.1	2.46	15.6	10674
	Oct .13	3 Whole	45.0	41.3	2.34	15.3	9994
		4 Whole	45.2	40.8	2.38	15.2	9906
		4 Billet	43.1	39.6	2.41	14.9	9293
		5 Billet	44.9	39.2	2.52	15.4	10059
HoCP 85-845	Aug. 16	3 Whole	38.2	32.5	2.53	15.3	8475
		4 Whole	36.6	31.3	2.60	15.6	8304
		4 Billet	35.1	29.5	2.65	15.3	7761
		5 Billet	37.2	33.3	2.44	15.3	8208

Table 4. Continued.

Cane Variety	Planting Date	Planting Rate	First Stubble - 2001: Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
	1999		T/A	1000/A	lbs.	%	lbs/A
	Oct. 13	3 Whole	36.4	28.0	2.85	15.0	7872
		4 Whole	36.7	31.8	2.35	15.0	7945
		4 Billet	34.3	33.1	2.30	15.1	7490
		5 Billet	36.7	33.5	2.31	15.1	7988
LSD .05 Treatments			5.6	2.6	0.48	0.8	1052
			Mean Effect				
	Aug. 16		41.9	37.8	2.44	15.3	9228
	Oct. 13		40.3	35.9	2.43	15.1	8818
		3 Whole	41.9	36.4	2.49	15.1	9111
		4 Whole	41.5	37.1	2.43	15.3	9158
		4 Billet	39.3	36.4	2.39	15.1	8591
		5 Billet	41.5	37.3	2.43	15.3	9232
LSD .05 Date			NS	0.9	NS	NS	372
LSD .05 Rate			NS	NS	NS	0.4	526

Plant cane was planted on two dates in 1999. For the billet rates, the whole stalks were cut by hand 18 inches long in the planting furrow.

Table 5. Effect of date of harvest in plant cane and first stubble on the first stubble yield of two varieties on the St. Gabriel Research Station, 2001.

Harvest Date		First Stubble Cane - 2001				
Plant Cane	1^{ST} Stubble	Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
2000	2001	T/A	1000/A	lbs.	%	lbs/A
				HoCP 85-845		
Oct. 1	Oct. 9	29.9	36.8	1.64	11.7	4796
	Nov. 1	31.2	35.9	1.72	12.8	5565
	Dec. 3	32.3	35.1	1.78	13.6	6215
Dec. 1	Oct. 9	34.2	39.8	1.58	12.2	5765
	Nov. 1	35.2	39.5	2.03	12.7	6231
	Dec. 3	38.4	39.5	1.94	14.7	8108
				HoCP 91-555		
Oct. 1	Oct. 9	32.8	45.5	1.64	11.5	5145
	Nov. 1	41.2	47.2	1.65	12.4	7163
	Dec. 3	43.3	45.5	1.79	13.9	8582
Dec. 1	Oct. 9	36.9	49.4	1.63	11.7	5949
	Nov. 1	37.6	48.5	1.63	12.9	6803
	Dec. 3	41.2	47.1	1.63	14.9	8859
LSD .05 Treat.		3.5	1.7	0.25	1.1	1133
				Mean Effect		
Oct. 1		35.1	41.0	1.70	12.7	6244
Dec. 1		37.3	44.0	1.74	13.2	6952
	Oct. 9	33.5	42.9	1.62	11.8	5413
	Nov. 1	36.3	42.8	1.76	12.7	6400
	Dec. 3	38.8	41.8	1.79	14.3	7941
LSD .05 Plant cane		1.5	0.7	NS	0.4	463
LSD .05 1^{st} Stubble		1.8	0.9	0.13	0.5	567

Plant cane was harvested in October and December in 2000. First stubble cane was harvested in October, November and December in 2001.

Fig. 1. The effect of residue management on average daily cane bed temperature at a 3-inch soil depth. Line at 65 degrees indicates minimum temperature for growth.

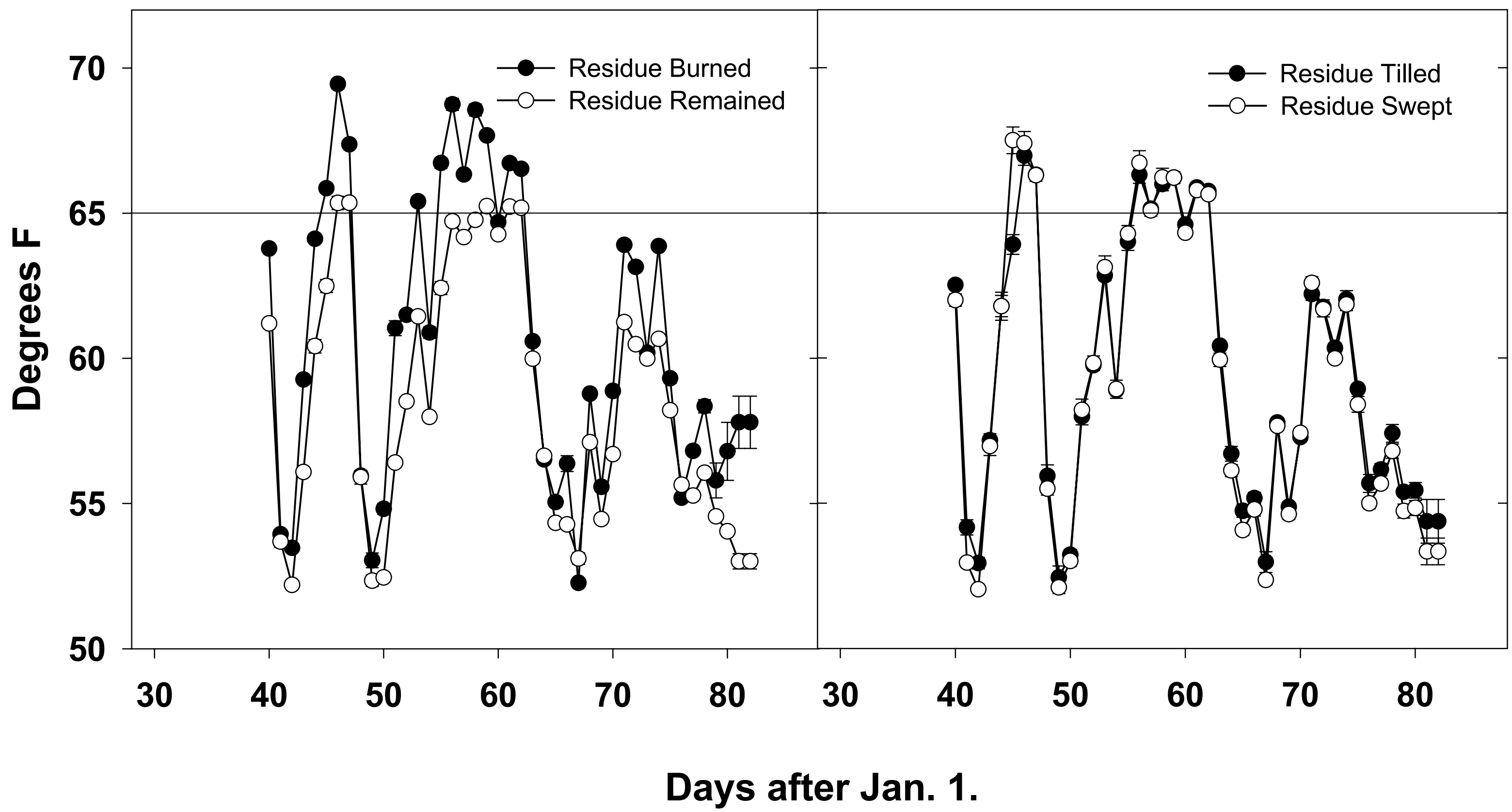


Fig. 2. The effect of residue management on minimum daily cane bed temperature at a 3-inch soil depth.

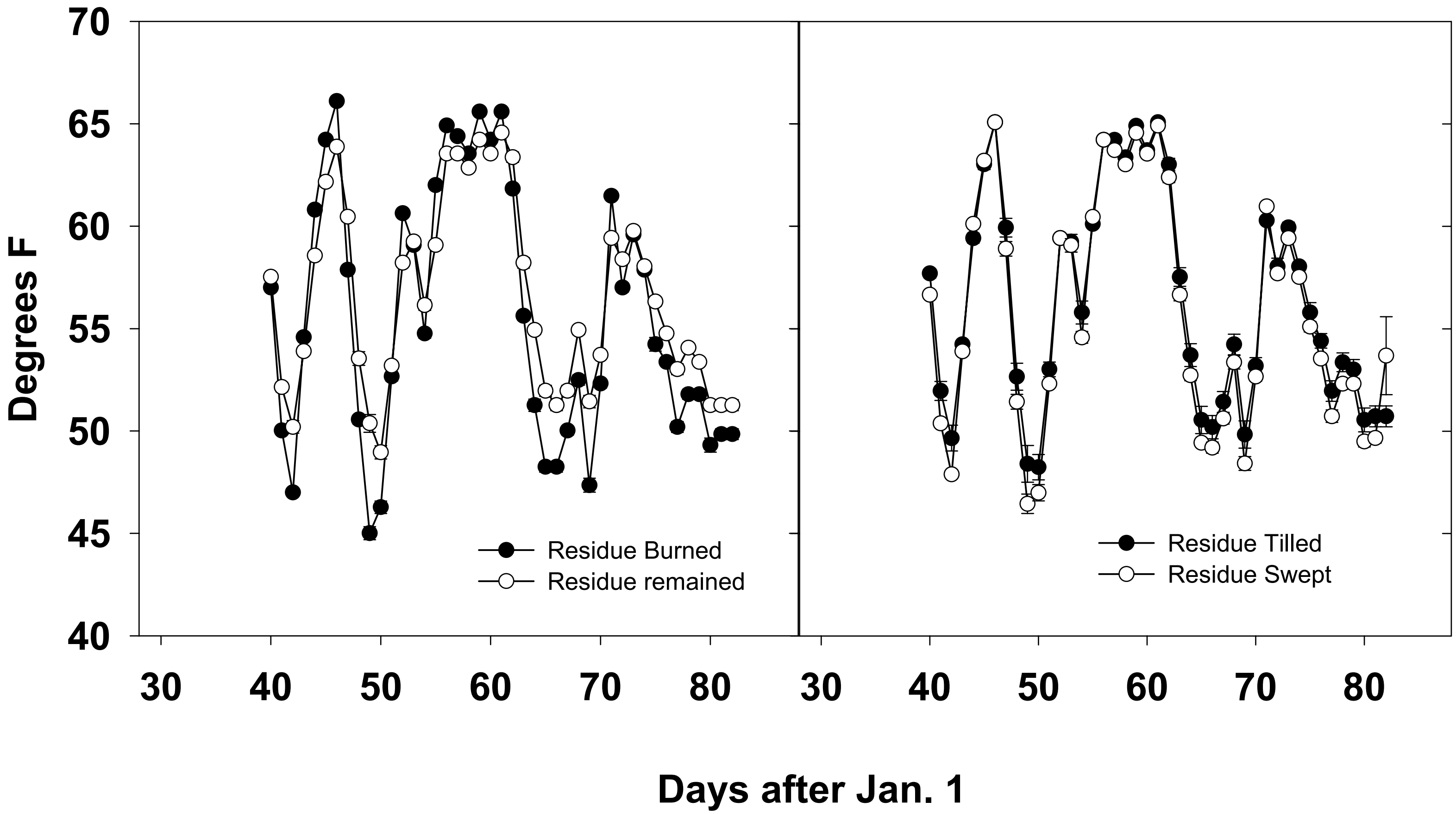


Table 6. Effect of residue management on the first stubble yield of HoCP 85-845 variety on the St. Gabriel Research Station, 2001.

Residue Management Treatment	First Stubble Cane - 2001					
	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
2000	T/A	1000/A	lbs.	%	%	lbs/A
	HoCP 85-845					
Residue	35.5	27.9	2.56	15.3	12.8	6448
Burn	35.3	25.7	2.80	15.8	13.3	6528
Surfactant	34.6	27.7	2.52	15.9	13.4	6541
Sweep	35.2	27.1	2.61	16.3	13.8	6923
Till	37.0	30.5	2.44	16.5	13.9	7312
LSD .05	NS		0.36	0.7	0.8	690

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. Surfactant treatment was 1 qt/ac of non-ionic surfactant, Triton X-100 applied in December, 2000.

Fig. 3. Effect of Residue Management on Stalk Population Development

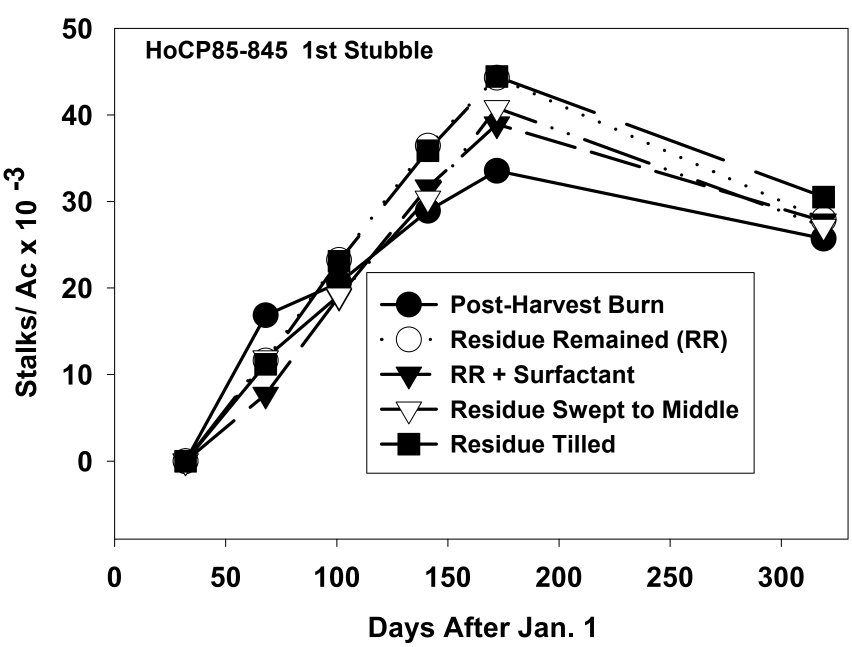


Table 7. Effect of fall applied starter fertilizer and soil cover on second stubble yield of three cane varieties on the St. Gabriel Research Station, 2001.

		Second Stubble Cane - 2001					
Starter Fertilizer $N-P_2O_5-K_2O$	Soil Cover	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice ~~Sucrose~~	Sugar ~~Yield~~
lbs/A		T/A	1000/A	lbs.	%	%	lbs/A
		LCP 82-89					
0-0-0	Check	43.9	43.0	1.98	15.0	11.3	6627
0-0-0	Cover	43.6	44.1	1.98	14.5	10.8	6319
45-45-45	Check	36.3	43.4	1.68	14.9	11.2	5503
45-45-45	Cover	41.6	38.1	1.84	15.1	11.6	6620
		LCP 85-384					
0-0-0	Check	49.9	55.5	1.81	14.7	11.5	7967
0-0-0	Cover	39.3	52.4	1.91	15.8	12.8	7017
45-45-45	Check	38.7	49.8	1.70	15.3	12.2	6557
45-45-45	Cover	44.9	45.9	1.75	15.9	12.8	8011
		HoCP 85-845					
0-0-0	Check	36.3	37.2	1.80	14.2	11.3	5586
0-0-0	Cover	39.1	37.6	2.00	14.7	12.0	6506
45-45-45	Check	33.1	35.7	1.64	15.2	12.6	5837
45-45-45	Cover	41.4	33.8	1.85	15.5	13.0	7580
LSD .05 Treat.		4.6	4.4	0.27	1.3	1.6	1354
		Mean Effect					
0-0-0		42.0	44.9	1.92	14.8	11.6	6654
45-45-45		39.3	41.1	1.74	15.3	12.2	6688
	Check	39.7	44.1	1.77	14.9	11.7	6329
	Cover	41.7	42.0	1.89	15.3	12.2	7012
LSD .05 Fall Fert.		1.9	1.8	0.11	NS	NS	NS
LSD .05 Cover		1.9	1.8	0.11	NS	NS	553

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1998. The cover was applied after plant cane harvest in 1999 and the first stubble harvest in 2000.

LONG-TERM EVALUATION OF THE EFFECTS OF COMBINE TRASH BLANKET ON SOIL NITROGEN AND CARBON
(Cycle One Results)

H. P. Viator
Iberia Research Station

SUMMARY

A study designed to evaluate the long-term consequences and benefits of the trash blanket generated by combine harvesting was initiated using LCP 85-384 plant cane in 1997. For 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). The third ratoon crop of cycle number one was harvested in 2000. Although the measurements are preliminary and slightly variable, the trend appears to be toward higher levels of soil nitrogen and carbon on plots where residue was retained. Several full cycles of production will be required before conclusive observations can be drawn.

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 long-term basis.

PROCEDURES

In November 1997, a field of LCP 85-384 plant cane was divided in two and the cane on a third of the rows in each half was burned standing prior to combining. The rows of cane in the remaining two-thirds of each half were green chopped, and the leafy trash residue was broadcast evenly over the field by the combine. Shortly after harvest the trash blanket was 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,

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

and 3) ratoon cane grown on rows from which combine residue was repositioned to the furrow. These same treatments will be initiated with plant cane and imposed for each ratoon crop of at least two cropping cycles (three ratoon crops per cycle). Standard herbicide and cultural practices will be employed for all treatments.

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

RESULTS

Soil organic matter has a significant influence on chemical and physical traits of the soil, contributing major amounts of plant nutrients and providing for water-holding capacity. Soil organic matter tends to decrease with cultivation and with the removal of plant residues. Numerous long-term studies involving cover crops and the retention of plant residue have provided evidence of substantial improvements in soil fertility. Significant increases in soil organic matter have been measured in the soil surface. Several of these long-term studies, however, have clearly shown that meaningful soil organic matter increases require the retention of plant residue for years, if not decades. Though the differences in soil nitrogen and carbon shown in the table below suggest a buildup of fertility where the residue was retained, a considerable amount of additional data will be required before interpretations can be made with certainty.

Preliminary observations on the influence of residue management on soil C and N		
Residue treatment	% carbon in the upper 12"	% nitrogen in the upper 12"
Cane burned standing prior to harvest	1.186	0.112
Combine residue retained	1.274	0.125

SUGARCANE YIELDS LOWERED BY WATER-LOGGED SOILS

H. P. Viator
Iberia Research Station

SUMMARY

Sugarcane grown on plots with water in the row furrows from November 2000 to March 2001 yielded significantly less cane (33.7 vs. 28.8 tons/acre, $P = .02$) and sugar (7,612 vs. 6,309 pounds/acre, $P = .03$) than sugarcane grown on plots without water in the furrows. Even though cane in the dry plots contained more than 12,000 more stalks/acre and was 20 inches taller on the average, this heavier cane completely lodged, resulting in a narrowing of the yield gap between the water-logged and non-water-logged sugarcane plots.

INTRODUCTION

High water table levels, especially during the winter-spring period characterized by low evapotranspiration, saturate the root zone and undermine the development of sugarcane. Significant yield increases in sugarcane have been realized by the lowering of the water table through the use of subsurface tile drains in Louisiana. Numerous ratoon fields, which were deeply rutted during the fall harvest, had water remaining in the rutted furrows from the fall of 2000 to the spring of 2001. It was impossible to remove the water in most of these fields until dry conditions returned in March 2001. This presented an opportunity to evaluate the effects of water logging on ratoon cane and sugar yields.

PROCEDURES

Fifty-foot sections of row, both with and without water in the furrows, were measured within the same production field on January 24, 2001. Each of the two treatments, water logged and dry, was replicated eight times, resulting in a total of 16 plots. Field drains were avoided. Stalk population counts and height measurements were accomplished intermittently during the growing season. Combine-harvested plot weights were determined with a weigh wagon equipped with hydraulic load cells. Data were collected for cane and sugar yields and CRS.

RESULTS

Measurements of plant population and height taken during the grand growth stage revealed that the water-logged cane had 20% fewer stalks per acre and was 17% shorter than the cane on the dry plots, suggesting a projected difference at harvest of approximately 10 tons of cane per acre in favor of the cane on the dry plots. In early September, however, the heavier cane on the dry plots completely lodged. Tons of cane per acre, pounds of sugar per acre and pounds of sugar per ton were 33.7, 7,612 and 226 and 28.8, 6,309 and 219, respectively, for the dry and water-logged plots.

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

THE EVALUATION OF PRECISION FARMING TECHNOLOGIES IN SUGARCANE
(*Observations are preliminary and investigations are ongoing*)

H. P. Viator
Iberia Research Station

J. Flanagan, D. Rester, M. Wolcott
Louisiana Cooperative Extension Service

SUMMARY

An investigation of precision farming technologies was initiated in 2000. Both a conventional approach to evaluating soil fertility and soil electron conductivity are being used to evaluate soil variability in separate studies.

The conventional approach of using geo-referenced cells (1.5 acre cell size) to show variation in soil-test attributes was used to map the variability in soil fertility of a fallow sugarcane field. Simple Pearson correlation coefficients were used to relate the variability in soil fertility and other variables to cellular tonnage and plant cane sugar yields. The strongest association was between lodging and sugar yield (r = .7, *P* = .004), with lodged cells averaging approximately 1,900 pounds of sugar/acre less than cells with erect cane. More moderate associations with yield were calculated for depth of hardpan and soil phosphorus.

Two fallow sugarcane fields were mapped for soil electrical conductivity (EC). Changes in soil EC appeared to be strongly associated with sum of the bases (approximation of cation exchange capacity) and soil organic matter. A strong association is also expected for soil texture (analysis not complete). Consideration is being given to variably applying either or both lime and nitrogen fertilizer based on the management zones (see maps below) depicted by the changes in EC reading within the field, which presumably represent changes in soil texture and CEC.

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.

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

PROCEDURES

Conventional mapping of soil and plant properties: Using a GPS receiver, coordinates for sampling of soil properties were determined. The 28.5-acre fallow field was partitioned using a 1.5-acre grid. Representative soil samples were taken from each cell and submitted to the LSU AgCenter Soil Testing Laboratory for analysis. Data were collected on soil Ca, depth of the hardpan, K, Mg, Na, OM%, P, pH, salts, sum of the bases, and the following plant attributes - lodging, plant height and population, pounds of sugar per acre and per ton, stalk weight, and tons of cane per acre. Simple Pearson correlation coefficients were calculated to determine associations among the measured variables (spatial patterns in soil fertility have not correlated well with yield in numerous studies).

Soil electrical conductivity: Two fields (30.4 and 31.3 acres) were mapped using a Veris 3100 Soil Electrical Conductivity mapping system equipped with DGPS mapping capability. The Veris was operated on approximately 36 foot transects at 5-6 mph and measured EC at two depths in the soil (0-1 foot and 0-3 foot) simultaneously. More than 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 were classified into five classes using the quantile method, which grouped the data with equal numbers of data points. A referenced grid consisting of one-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. Correlation coefficients were calculated between EC and soil test attributes using the total number of field sample points. Bivariate regression analysis was performed on the sample point data, using EC as the dependent variable. Additionally, surface maps created by kriging (a spatial prediction of the value of a variable at an unknown location through use of the spatial correlation among its neighboring points) the 4,500+ EC data points were compared to the sum of the bases surface maps created from the one-acre cellular soil sample points, showing the relationship between EC and the sum of the bases.

PRELIMINARY RESULTS

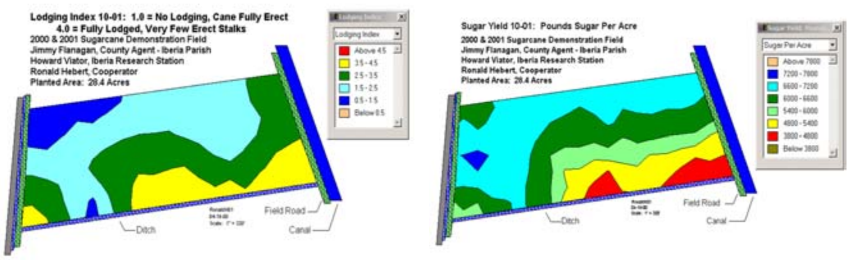
Conventional mapping of soil and plant properties: Yield measurements of plant cane revealed substantial fluctuation among the geo-referenced cells, with tonnage ranging from 20 to 39 tons/acre and sugar ranging from 3,876 to 7,013 lbs/acre among the 19, 1.5-acre cells. This was surprising because field variation for plant height and plant population appeared to be relatively low prior to harvest. The extreme variation in yield appeared to be mostly determined by lodging (see maps below), with lodged and erect plots differing an average of over eight tons/acre. Correlations suggested association between soil pH and yield, soil P and yield, and soil hard pan depth and yield. Consideration is being given to the use of deep subsoiling to mitigate the hardpan dilemma during the next fallow period.

Evaluation of soil electrical conductivity: Sample results are currently being evaluated to determine the prescription for site-specific inputs. It appears that field patterns 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.

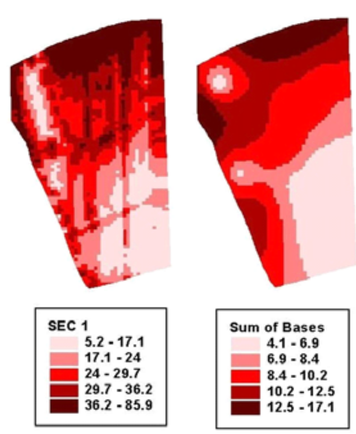
Maps showing apparent spatial relationships

Geo-referenced maps showing lodging and yield relationship

..



- ✓ ***Comparison of EC zones to zones of the sum of bases***
- ✓ ***R^2 = .71***



SOIL FERTILITY RESEARCH IN SUGARCANE IN 2001

C. Kennedy[1], A. Arceneaux[1], W. B. Hallmark[2], B. L. Legendre[3]
Agronomy Department[1], Iberia Research Station[2], and St. Gabriel Research Station[3]

H. Cormier, J. Flanagan, J. Garrett, A. Guidry, B. Joffrion, and R. Loque
Louisiana Cooperative Extension Service

SUMMARY

Four field experiments were conducted in 2000 to test the effects of rates of fertilizers on the yield components of current sugarcane varieties.

Fall- and spring-applied N-P-K fertilizer rates were tested at cycle intervals of fallow-planted cane on Commerce soil. In first stubble cane of HoCP 85-845, the use of plant cane starter fertilizer had no effect on yield when Spring fertilizer applications were made. Moreover, no differences occurred between complete N-P-K fertilizer application and N application only in the spring. Conversely, spring application of 160-40-80 NPK increased the average sugar yields of second stubble CP 70-321 by almost 14% over 160-0-0 averaged across starter fertilizers. Starter fertilizers with a lower N:P ratio had the best residual response when coupled with complete spring-applied fertilizer.

Results of a multi-location outfield test to determine the optimum rate of N fertilizer for LCP 85-384 indicated the optimum rate was on the low end of present recommendations. Several locations, however, did not respond to N inputs at all, indicating the possibility of other limiting factors.

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 first and second stubble of fallow-planted cane:

An experiment was conducted to test the effects of NPK fertilizer rates applied as a starter fertilizer in the fall at planting time in addition to spring-applied fertilizers in fallow-planted cane. The starter fall rates were 0-0-0, 15-45-45, 45-0-45 (one test), 45-45-0 (one test), 45-45-45, and 30-90-90. Spring rates consisting of 160-0-0 and 160-40-80 were applied over each fall rate. Fall treatments were applied in the planting furrow. The spring treatments were applied in the off-bar furrow .

Sugar yield of second stubble CP 70-321 was increased by the highest amount of plant cane-applied starter fertilizer (30-90-90) coupled with spring-applied complete fertilizer (Table 1). Starter fertilizers with a higher proportion of P had more long-term effects, especially when supplemented with complete fertilizer in the spring. Alternatively, the use of plant cane-applied starter fertilizer had no residual effect on sugar yield of first stubble HoCP 85-845 (Table 2).

RATES OF SPRING-APPLIED N FERTILIZER

The effect of N fertilizer rate on yield of LCP 85-384 was tested at eight large outfield locations and at the St. Gabriel station. Sugar yield of fourth stubble cane at St. Gabriel was 22% lower at a N application rate of 160 lb/ac than at 120 lb N /ac. The reason for the decline was a drop in CRS at the higher N rate (Table 3). Cane yield response to N rate varied with location (Fig. 1, Table 3). Stubble crops tended to have more response to N input than plant cane. Lower yield at some locations indicated other factors may have been limiting and therefore lowered the response to N. 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. The response of CRS varied with location. Where there was a response, CRS declined with increased N application rate (Fig.2, Table 3). Sugar yield response reflected that of tonnage, but itwas modulated by declines in CRS. Therefore, fewer differences occurred for sugar yield among N fertilizer rates (Fig. 3).

Table 1. Effect of fall and spring applied fertilizer on the yield of second stubble cane CP 70-321 planted after a fallow year on Commerce soil on the St. Gabriel Research Station, 2001.

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	20.9	26.3	1.73	15.7	13.3	3923
	160-0-0	34.1	33.9	2.19	15.8	12.5	5913
	160-40-80	37.9	36.4	2.57	15.2	11.9	6207
15-45-45	0-0-0	20.9	25.7	1.55	15.4	12.8	3761
	160-0-0	35.2	33.3	2.29	14.9	11.3	5421
	160-40-80	43.6	34.6	2.02	15.2	11.9	7115
45-0-45	0-0-0	18.5	25.4	1.54	15.6	13.1	3416
	160-0-0	36.1	34.4	2.13	15.3	12.0	6001
	160-40-80	39.3	37.0	2.13	15.6	12.4	6796
45-45-0	0-0-0	23.0	26.5	1.65	15.8	13.5	4364
	160-0-0	38.2	35.4	2.18	16.0	12.9	6907
	160-40-80	40.3	37.1	2.06	15.7	12.7	7170
45-45-45	0-0-0	20.4	25.4	1.83	15.7	13.3	3827
	160-0-0	38.5	35.2	1.94	15.0	11.3	5901
	160-40-80	38.4	35.8	2.30	15.7	12.6	6715
30-90-90	0-0-0	26.3	27.2	1.59	15.8	13.1	4865
	160-0-0	44.9	35.9	2.15	14.8	11.2	6793
	160-40-80	46.0	36.0	2.56	15.6	12.6	8070
LSD .05 Treatments		3.8	3.1	0.37	0.8	1.1	834
		Mean Effect					
0-0-0		31.0	32.2	2.16	15.6	12.6	5348
15-45-45		33.3	31.2	1.96	15.2	12.0	5432
45-0-45		31.3	32.3	1.93	15.5	12.5	5404
45-45-0		33.8	33.0	1.96	15.9	13.0	6147
45-45-45		32.4	32.2	2.02	15.5	12.4	5481
30-90-90		35.1	33.0	2.10	15.4	12.3	6576

Table 1. Continued.

Fertilizer applied N-P_2O_5-K_2O Fall	Spring	Second Stubble Cane - Fallow Planted Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
	0-0-0	21.7	26.1	1.65	15.7	13.2	4026
	160-0-0	37.8	34.6	2.15	15.3	11.9	6156
	160-40-80	40.9	36.2	2.27	15.5	12.3	7012
LSD .05 Fall		2.2	1.8	0.22	0.5	0.6	481
LSD .05 Spring		1.6	1.3	0.15	0.3	0.5	340

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1998 and spring fertilizer was applied in the off-bar furrow in the spring of each year.

Table 2. Effect of fall and spring applied fertilizer on the yield of first stubble cane HoCP 85-845 planted after a fallow year on Commerce soil on the St. Gabriel Research Station, 2001.

Fertilizer applied N-P_2O_5-K_2O Fall	Spring	First Stubble - Fallow Planted Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
0-0-0	0-0-0	21.6	25.5	1.88	15.5	13.2	3997
	160-0-0	33.7	30.8	2.38	15.5	12.9	6103
	160-40-80	33.7	31.5	2.23	15.2	12.8	6012
15-45-45	0-0-0	19.4	26.0	1.63	15.5	13.1	3557
	160-0-0	32.8	31.4	2.11	15.5	13.0	5992
	160-40-80	35.0	33.6	2.15	15.3	12.6	6147
45-45-45	0-0-0	24.7	26.9	2.01	15.1	12.8	4386
	160-0-0	31.8	30.3	2.27	15.4	12.9	5722
	160-40-80	34.9	32.5	2.24	14.6	12.0	5732
30-90-90	0-0-0	20.4	25.0	1.99	15.3	12.8	3619
	160-0-0	31.0	32.5	1.93	16.0	13.6	5965
	160-40-80	33.2	32.7	2.26	15.2	12.8	5920

Table 2. Continued.

Fertilizer applied N-P_2O_5-K_2O Fall	Spring	First Stubble - Fallow Planted Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
LSD .05 Treat.		3.6	2.0	0.34	0.7	0.8	701
				Mean	Effect		
0-0-0		29.7	29.2	2.16	15.4	12.9	5370
15-45-45		29.1	30.1	1.97	15.4	12.9	5232
45-45-45		30.5	29.9	2.17	15.0	12.5	5280
30-90-90		28.2	30.1	2.06	15.5	13.0	5168
	0-0-0	21.5	25.7	1.88	15.4	12.9	3890
	160-0-0	32.3	31.2	2.17	15.6	13.1	5945
	160-40-80	34.2	32.6	2.22	15.1	12.5	5953
LSD .05 Fall		2.1	NS	0.20	0.4	0.5	NS
LSD .05 Spring		1.8	1.0	0.17	0.4	0.4	351

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

Table 3. Effect of nitrogen fertilizer rates on the fourth stubble yield of LCP 85-384 on the St. Gabriel Research Station, 2001.

Nitrogen Fertilizer	Fourth Stubble Cane - 2001 Cane Yield	Stalk Wt.	Normal Juice Sucrose	Normal Juice CRS	Sugar Yield
lbs/A	T/A	lbs.	%	lbs/T	lbs/A
40	38.0	1.97	12.9	180.4	6860
80	38.1	1.75	13.1	184.1	7004
120	42.3	1.82	13.6	193.2	8183
160	38.2	1.72	12.1	166.8	6367
LSD .05	NS	NS	1.5	23.9	1596

The nitrogen fertilizer rates were applied to plots in the spring of each crop year.

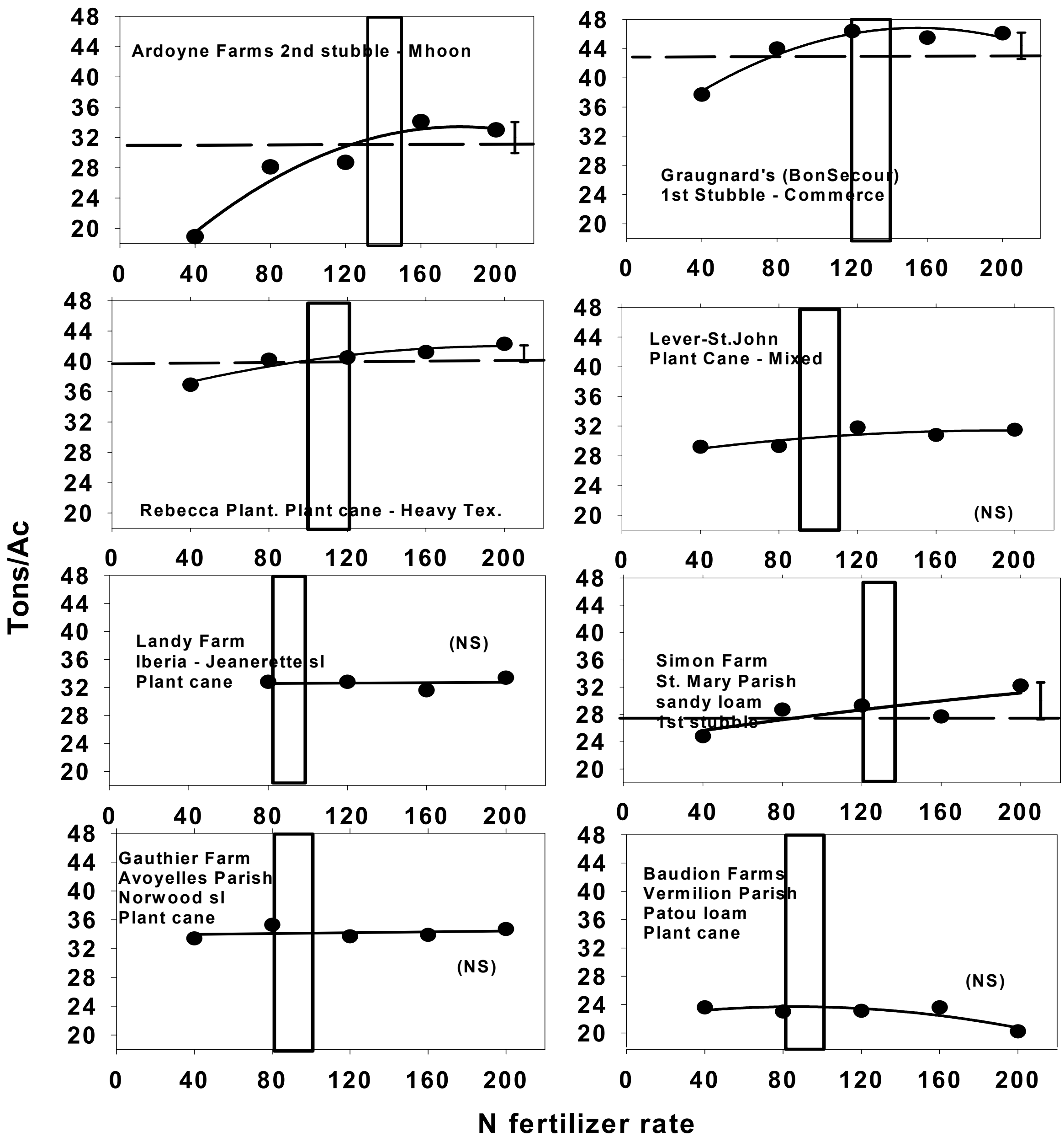


Fig. 1. The effect of N fertilizer rate on cane yield of variety LCP 85-384. Rectangles represent current recommended N fertilizer range. Error bars are LSD 0.05. Dashed line= ≥ 90% of max.

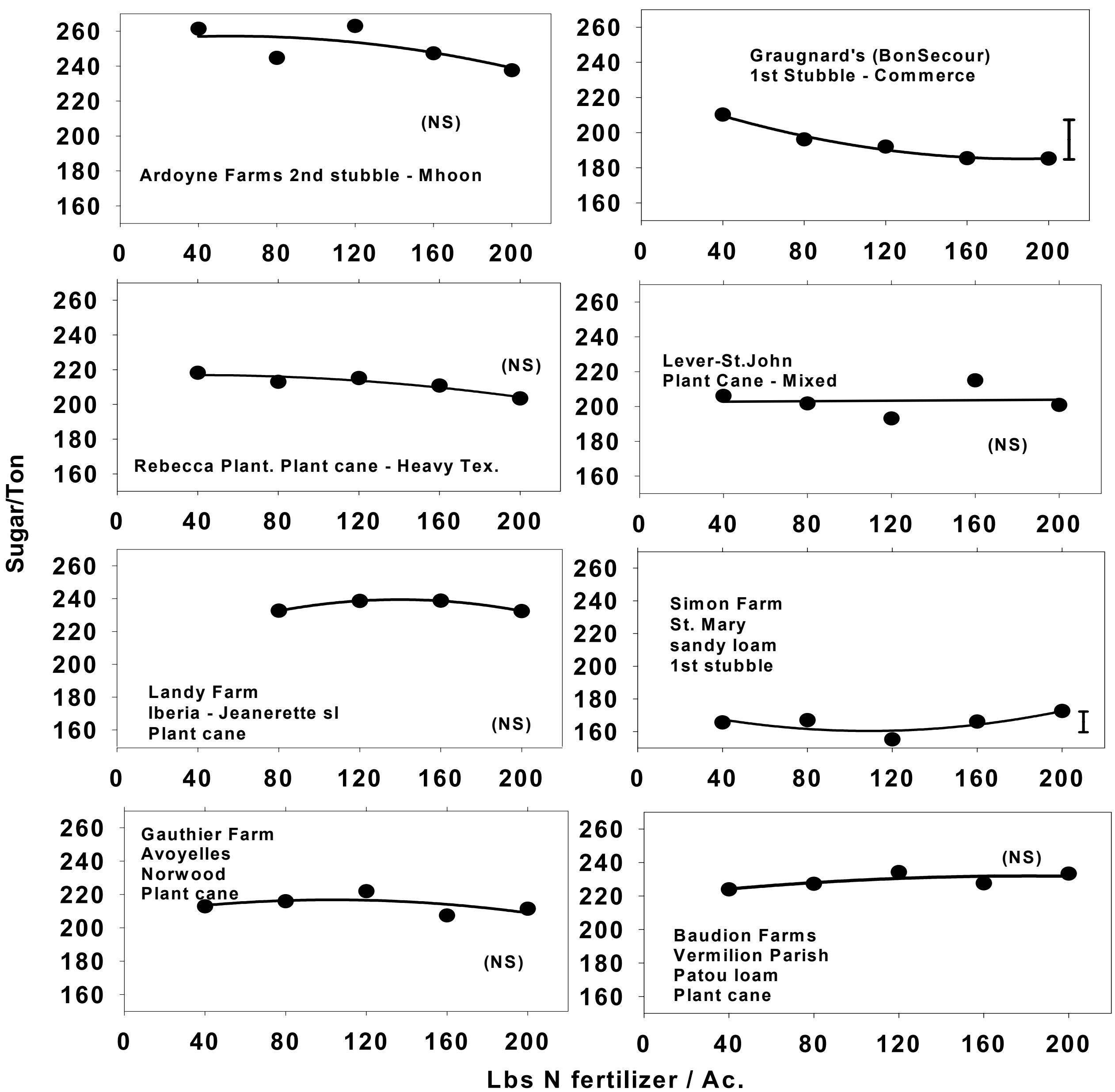


Fig. 2. The effect of N fertilizer rate on CRS of variety LCP 85-384. Error bar = LSD0.05; NS= not significantly different at P ≤ 0.05.

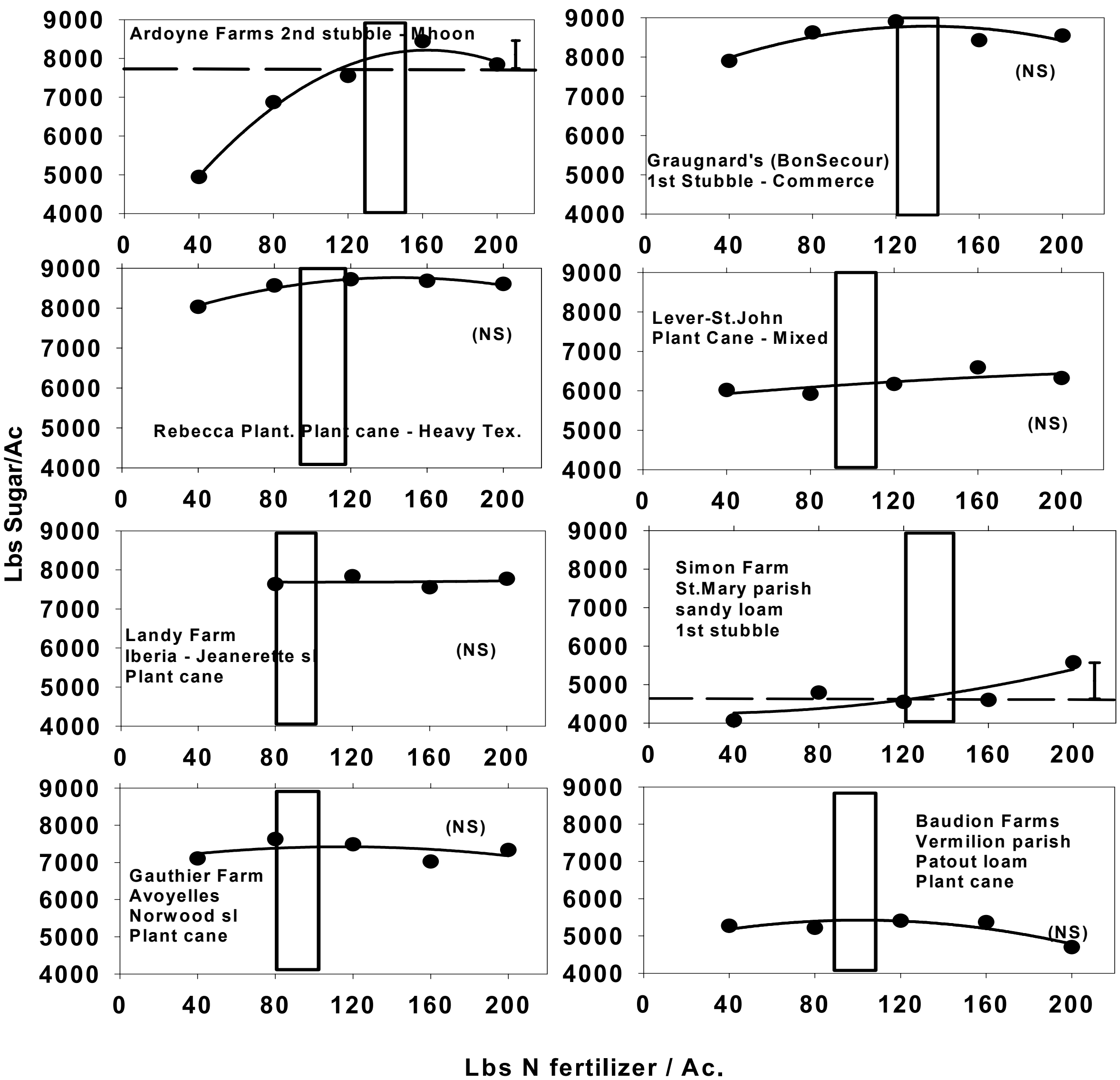


Fig. 3. The effect of N fertilizer rate on sugar yield of variety LCP 85-384. Rectangles represent current recommended N fertilizer range. Error bars are LSD 0.05. Dashed line= ≥ 90% of max. yield.

EFFECT OF POTASSIUM SULFATE VS. POTASSIUM CHLORIDE ON SUGARCANE YIELDS ACROSS TWO YEARS

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Jesse Breaux
St. Mary Parish Sugarcane Producer

SUMMARY

Results in 2000 and 2001 for plant and first-stubble cane showed that applying potassium sulfate vs. potassium chloride at three different rates of K_2O (70, 140, and 210 lb/A) on a K deficient soil did not result in statistical ($P>0.10$) differences for stalk weights, plant population, CRS, cane yield, or sugar yield for sugarcane variety HoCP 85-845. Potassium application rates did not affect the measured cane yield parameters in 2000 or 2001 using either potassium source. Sulfur application also had no effect on sugarcane yields across the two years. Our results indicate that K fertilizer recommendations for sugarcane in Louisiana may be too liberal. The results also fail to support the assertion by some that potassium chloride is harmful to crop yields compared to potassium sulfate. Chloride addition in our study was associated with increased uptake of S.

INTRODUCTION

In recent years, certain advocates have convinced some sugarcane producers in Louisiana that potassium chloride is harmful to soil health and crop yields. These advocates have persuaded sugarcane producers to use potassium sulfate in the place of potassium chloride. Since potassium sulfate is more expensive (per pound of K) than potassium chloride, the sustainable ag advocates have advised producers to compensate for this by reducing their K application rates. They have further argued that this is justified because "K from potassium sulfate is more available than K from potassium chloride." No research in Louisiana has been done that supports or refutes the contentions about K put forward by sustainable-ag advocates. Consequently, this research was initiated.

OBJECTIVES

To compare potassium sulfate and potassium chloride fertilizer rates in their effects on sugarcane yield parameters, available soil K, and nutrient concentration and content of sugarcane at harvest.

MATERIALS AND METHODS

A Baldwin silty clay loam soil very low in K was selected for this study. Soil analysis showed that pH, organic matter, and exchangeable bases were 5.9, 0.67%, and 13.1 meg/100g; and P, Na, K, Mg, and Ca ppm levels were 83 (medium), 42 (very low), 113 (very low), and 406 (very high), and 1865 (low), respectively.

In September of 1999, sugarcane variety HoCP 85-845 (first progeny Kleentek) was planted at three stalks and a lap of two joints on 5-foot10-inch wide rows. The experimental treatments in Table 2 were imposed on the experimental site in May of 2000 and 2001. All treatments were replicated eight times in a Latin square experimental design. Plots consisted of three 5-foot10-inch by 30-foot rows with a 10-foot alley separating the ends of all plots. A blanket application of 120 lb N and 40 lb P_2O_5 /A was added along with the potassium fertilizer. Treatments 2, 4, and 6 used ammonium sulfate as a sulfur source so that S rate would not differ in comparisons between the two K sources. Ammonium nitrate was used as the primary N source. After fertilization, the sugarcane rows were hipped up and the cane was grown to maturity using standard cultural practices.

In September of 2000 and 2001, the number of millable stalks in each sugarcane plot were counted. In December of 2000 and November of 2001, the experimental plots were harvested with a two-row soldier harvester and weighed with a weigh rig. Ten stalks were randomly selected from each plot to measure average stalk weight and commercially recoverable sugar (CRS). Three additional stalks were also taken from each plot for nutrient analysis (after the plants were topped and stripped of leaves) to determine the effect of the treatments on nutrient uptake.

RESULTS AND DISCUSSION

Table 1 shows that potassium sources and potassium rates did not affect ($P>0.10$) any of the sugarcane yield variables measured across the two years. The % CVs for stalk weight, plant population, and CRS were good (below 10%), while those for cane tonnage and sugar yield were a little higher. The treatment x year interaction was not significant ($P>0.25$) for any of the measured variables.

Table 2 shows how the N, K, S, and Cl rates in the eight treatments (Table 3) were derived. Since K rates from potassium sulfate also included S, this difference was screened out by using ammonium sulfate as part of the nitrogen source (the remaining N was composed of ammonium nitrate) for the potassium chloride treatments. Consequently, each K rate, using both K sources, had the same amount of S (T2 vs. T3, T4 vs. T5, and T6 vs. T7). This resulted in the K sources differing only in Cl rates. Since some individuals claim that Cl is harmful to the soil and, thereby, decreases crop yields, this provided a means to test this claim. Comparison of T1 vs. T3, T5, and T7 (Table 2) are used to determine the effect of potassium sulfate rates on sugarcane yield variables (Table 3); and comparison of T1 vs. T2, T4, and T6 (Table 2) determined the effect of potassium chloride rates on sugarcane yields (Table 3). Comparison of T2 vs. T3, T4 vs. T5, and T6 vs. T7 (Table 2) shows the effect of Cl application on sugarcane yields (Table 3), and comparing T8 vs. T4 (Table 2) shows the effect of S application on sugarcane yields (Table 3).

Table 3 indicates that the yields obtained with HoCP 85-845 were respectable given the severe drought experienced in the summer of 2000 and the excess rainfall in June of 2001. The average stalk weights for this variety were very good. Across the two years, yield variables were not affected (P$0.10) by K rates or K sources. However, in each comparison of K source (T2 vs. T3, T4 vs. T5, and T6 vs. T7), the sugar and cane yields for potassium chloride were numerically higher than for potassium sulfate. The failure to obtain yield responses to potassium application rates in our study (on a soil testing very low in K) indicates that potassium fertilizer recommendations for sugarcane in Louisiana may be too liberal. This is confirmed by discussions held with Dr. Jim Wang, head of the LSU AgCenter's soil testing lab. We will continue the test in 2002 to see if this continues for second-stubble cane.

Table 4 shows that stalk weights, cane yield, and sugar yield decreased significantly (P#0.10) for first-stubble compared to plant cane, but the opposite was true for CRS and plant population. The decrease in cane and sugar yields with first-stubble cane may have been caused by the excessive rainfall received in the 2002 season.

Table 5 shows that the fertilizer treatments did not significantly (P$0.10) affect any of the stripped whole-plant nutrient concentrations, except for S. Table 6 shows that T #6 (86.1, 210, and 190.5 lb/A of S, K_2O, and Cl, respectively) had significantly higher (P#0.10) whole-plant S concentrations than T #'s 1 and 8.

Table 7 shows that the fertilizer treatments did not affect (P$0.10) whole-plant nutrient uptake for any of the nutrients, except for S. Table 8 shows that T #6 had higher (P#0.10) whole-plant S uptake than T #'s 1, 3, 5, 7, and 8. The only difference between T #6 and T #7 is that T #6 had 190.5 lb Cl/A added as fertilizer and T #7 did not receive Cl. Apparently, the Cl was responsible for the difference in S uptake between the two treatments.

Table 1. F-values and statistical parameters for effect of treatments and harvest years on sugarcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main-plots</u>						
Treatments (T)	7	1.57	1.52	1.10	1.04	0.75
HREP	7	1.76	2.97*	0.37	1.60	1.35
VREP	7	1.27	2.88*	1.48	0.87	0.21
<u>sub-plots</u>						
Year (Y)	1	74.12****	3.35$^{\sim}$	148.82****	125.63****	38.10****
TxY	7	0.62	0.30	0.37	0.38	0.48
RMSE for main-plots		0.2542	2082	8.941	3.771	847.4
% CV for main-plots		8.97	6.00	4.24	10.24	10.97
RMSE for sub-plots		0.2674	1941	8.249	3.666	798.9
% CV for sub-plots		9.43	5.59	3.91	9.955	10.34
Mean		2.835	34,700	210.7	36.82	7725

, $^{\sim}$, *, and **** denotes statistical significance at the P#0.25, 0.10, 0.05, and 0.0001 levels, respectively.

Table 2. Fertilizer treatments used in study.

T#	NH_4NO_3	$(NH_4)_2SO_4$	$(NH_4)_2SO_4$	$K_2(SO_4)$	KCl	Cl	$K_2(SO_4)$	P
	------------lb N/A---------		------------lb S/A----------		K_2O/A	lb Cl/A	lb K_2O/A	lb P_2O_5/A
1	120	0	0	0	0	0	0	40
2	94.9	25.1	28.7	0	70	63.5	0	40
3	120	0	0	28.7	0	0	70	40
4	69.8	50.2	57.4	0	140	127.0	0	40
5	120	0	0	57.4	0	0	140	40
6	44.7	75.3	86.1	0	210	190.5	0	40
7	120	0	0	86.1	0	0	210	40
8	120	0	0	0	140	127.0	0	40

Table 3. Effect of fertilizer on sugarcane yield variables averaged across two years.

T#	S	K_2O	Cl	Stalk wt.	Plant pop.	CRS	Cane yield	Sugar yield
	-----------------lb/A---------------			lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	0	0	3.06	34.5	206	39.5	8090
2	28.7	70	63.5	2.91	34.8	201	40.3	8110
3	28.7	70	0	2.93	34.1	206	38.9	7990
4	57.4	140	127.0	3.14	34.8	199	41.6	8270
5	57.4	140	0	2.97	34.4	202	39.9	8040
6	86.1	210	190.5	3.19	34.2	201	42.4	8510
7	86.1	210	0	3.02	33.1	198	39.0	7710
8	0	140	127.0	3.08	35.3	204	42.1	8570
LSD 0.10				NS	NS	NS	NS	NS
LSD 0.25				0.10	0.9	NS	NS	NS

NS denotes statistical non significance at the indicated probability level.

Table 4. Effect of harvest years on sugarcane yield variables averaged across treatments.

Harvest year	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
	lb/stalk	1000/A	lb/T	T/A	lb/A
Plant cane	3.04	34.4	202	40.4	8160
First-stubble	2.63	35.0	220	33.2	7290
LSD 0.10	0.08	0.6	2	1.1	240
LSD 0.25	0.06	0.4	2	0.8	160

Table 5. F-values and statistical parameters for effect of fertilizer treatments on nutrient concentrations of whole stalk sugarcane at harvest.

Source[a]	df	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
Treatments	7	0.65	1.09	1.11	0.78	0.66	0.70	1.52	1.07	0.93	2.40*
HREP	7	1.29	3.56**	3.68**	1.34	2.05~	1.70	7.86****	0.74	2.06~	3.57**
VREP	7	0.84	0.52	0.52	0.67	1.11	1.00	1.59	3.22**	1.71	1.74
RMSE		0.04931	0.03386	0.1935	0.01308	0.01456	0.8005	2.953	54.24	4.184	0.02227
% CV		22.49	27.83	31.53	20.96	19.42	26.66	34.743	51.07	22.78	29.38
Mean		0.2193	0.1217	0.6136	0.06239	0.07497	3.003	8.501	106.2	18.37	0.07580

, ~, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

[a] The whole stalks were topped and stripped of their leaves.

Table 6. Effect of fertilizer treatments and sources on whole-plant nutrient concentrations at harvest.

T#	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	---------------------------		%----	-------------------------		------------------------	ppm----	--------------------		%
1	0.234	0.118	0.529	0.058	0.071	3.43	7.36	126	18.0	0.0534
2	0.220	0.142	0.760	0.070	0.082	3.25	9.87	97	20.6	0.0840
3	0.210	0.119	0.581	0.060	0.073	2.82	8.77	107	18.9	0.0751
4	0.240	0.107	0.551	0.068	0.081	2.73	7.85	90	16.4	0.0816
5	0.231	0.105	0.621	0.062	0.074	3.08	10.87	144	19.8	0.0770
6	0.203	0.123	0.655	0.061	0.072	2.79	7.18	102	17.4	0.0929
7	0.211	0.127	0.624	0.061	0.074	2.99	7.74	90	18.8	0.0783
8	0.206	0.133	0.588	0.060	0.073	2.90	8.37	96	17.1	0.0641
LSD 0.10	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0187
LSD 0.25	NS	NS	NS	NS	NS	NS	1.72	NS	NS	0.0130

Table 7. F-values and statistical parameters for effect of fertilizer treatments on nutrient uptake of stripped plant cane at harvest.

Source	df	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
Treatments	7	0.53	1.09	1.09	0.68	0.67	0.41	1.50	1.23	0.55	2.83^{*}
HREP	7	1.23	3.07^{*}	3.21^{**}	0.76	1.22	1.28	9.23^{****}	0.92	2.46^{*}	3.19^{**}
VREP	7	1.28	0.86	0.95	0.97	1.37	1.40	2.33^{*}	3.77^{**}	2.66^{*}	$2.18^{\sim}$
RMSE		13.95	8.907	49.76	3.767	4.190	0.02019	0.0732	1.384	0.1122	5.407
% CV		26.09	30.17	33.35	24.87	23.04	26.66	35.24	52.74	25.09	29.52
Mean		53.49	29.52	149.2	15.15	18.18	0.07260	0.2079	2.623	0.4470	18.32

, $^{\sim}$, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 8. Effect of fertilizer treatments on nutrient uptake of stripped plant cane at harvest.

T#	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	---lb/A---									
1	56.6	27.7	127	13.8	16.9	0.0809	0.174	3.11	0.424	12.7
2	52.6	34.3	183	16.5	19.4	0.0770	0.238	2.31	0.495	20.0
3	49.4	27.7	135	14.0	16.9	0.0654	0.210	2.56	0.443	17.2
4	59.7	26.7	137	16.8	20.3	0.0681	0.195	2.24	0.408	20.3
5	55.7	25.2	150	14.9	17.6	0.0739	0.268	3.71	0.484	18.0
6	52.1	31.2	167	15.6	18.2	0.0708	0.184	2.63	0.447	23.6
7	49.5	29.8	147	14.4	17.4	0.0703	0.183	2.12	0.441	18.4
8	52.2	33.6	148	15.3	18.8	0.0736	0.210	2.38	0.434	16.3
LSD 0.10	NS	NS	NS	NS	NS	NS	NS	NS	NS	4.5
LSD 0.25	NS	NS	NS	NS	NS	NS	0.043	NS	NS	3.2

EFFECT OF COPPER AND POTASSIUM FERTILIZATION ON YIELD AND PLANT NUTRIENT STATUS OF SUGARCANE

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Danny Hebert
Chastant Brothers Feed and Fertilizer

Richard Latiolais
Latiolais Farm, Incorporated

SUMMARY

Four rates of potassium chloride (0, 80, 160, and 240 lb K_2O/A) were applied to plant cane and first-stubble variety LCP 85-384 on a Jeanerette silt loam soil low in K near Parks, La. Potassium application rates did not affect (P>0.10) sugarcane stalk weights, commercially recoverable sugar, cane yield, or sugar yield across the two years. Communication with Dr. Jim Wang, head of the LSU AgCenter soil testing lab, indicates that potassium fertilizer recommendations for sugarcane in Louisiana may be too liberal. Our research results support this.

Because of excess rainfall in the spring of 2001, we were not able to apply the Cu treatments as planned. Our results also showed that increasing K fertilizer rates increased (P#0.10) leaf Mn concentrations.

JUSTIFICATION

Preliminary research (private communication with Therian LaFleur, Chastant Brothers, Inc.) shows that spraying sugarcane foliage with copper sulfate may increase plant potassium levels and result in higher cane yields.

It is generally assumed that sugarcane yields in Louisiana will not respond positively to micronutrient application. However, little research has been done to support this assumption. Also, no formal research in Louisiana has shown whether copper and potassium fertilizer applications interact positively to increase sugarcane yields. Continued research is needed to determine how the newer cane varieties respond to potassium fertilization of soils in Louisiana.

OBJECTIVES

Our project will test whether sugarcane yields in Louisiana respond to copper fertilization. The specific objective is to determine the effect of soil-applied potassium chloride and foliar-applied copper sulfate on plant nutrient status and sugarcane yield parameters across a cane production cycle.

MATERIALS AND METHODS

Sugarcane variety LCP 85-384 was planted in September 1999 at three stalks and a lap of two joints using first-progeny Kleentek seed cane. The experimental design was a Latin square split-plot with four potassium chloride rates as main-plots and three copper sulfate rates as sub-plots. All experimental plots consisted of three 6-foot by 50-foot rows, with 10-foot alleys separating the ends of the plots. The sides of each plot were buffered by three border rows. All treatments were replicated four times.

The soil used in the study was a Jeanerette silt loam with an initial analysis of 5.1, 14.8, and 0.66 for pH, sum of bases (meg/100g), and % organic matter available; P, Na, Mg, K, and Ca concentrations were 81 (medium), 47 (very low), 500 (very high), 144 (low) and 2027 ppm (low), respectively.

Potassium fertilizer rates (0, 80, 160, and 240 lb K_2O/A) were applied in May of 2000 and 2001 along with a blanket application of N, P_2O_5, and S at 120, 60, and 24 lb/A as ammonium nitrate, polyphosphate, and calcium sulfate, respectively. The cooperating producer (Richard Latiolais) did not wish to foliar apply the copper sulfate treatments in 2000 as planned because of the severe drought. We were unable to apply copper sulfate in the spring of 2001 because of excess rainfall that kept us out of the field until the sugarcane plants were too high to apply the copper safely with the equipment available.

Plant leaf tissue (the first leaf with a visible dewlap) was taken from all plots (for nutrient analyses) in August 2000 and 2001. Plant populations were not determined in September each year as originally planned, because of severe lodging. All plots were harvested with a two-row soldier harvester in early January 2001 and December of 2001 and weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar.

RESULTS AND DISCUSSION

F-values and statistical parameters for the test are given in Table 1. The results (Tables 1 and 2) show that potassium chloride fertilizer rates did not affect (P>0.10) stalk weights, CRS, cane yield, or sugar yield of sugarcane across the two harvest years. Vertical reps did a good job of removing variability from the test for CRS, cane yield, and sugar yield (Table 1). Harvest year effects were highly significant (P#0.01) for all the measured yield variables (Table 1), and the treatment by harvest year interaction was nonsignificant (P$0.10) for all the variables.

Table 2 shows that potassium application rates did not affect (P>0.25) sugarcane yield variables across the two harvest years. This is surprising since initial soil analysis indicated that soil potassium was low. Private communication with the head of the LSU soil testing lab (Dr. Jim Wang) indicates that our present soil testing recommendations for potassium may be too liberal in their diagnosis of potassium deficiency.

Table 3 shows that stalk weights, CRS, cane yield, and sugar yield were all significantly (P#0.10) lower for first-stubble compared to plant cane. This may have been partially caused by

the excess rainfall received in the spring of 2001 and by the severe lodging in the summer and fall of 2001.

Table 4 shows that potassium fertilizer application rates affected ($P<0.10$) Mn leaf concentrations of plant cane, but did not affect the other nutrient concentrations. There was, however, a trend (P#0.25) toward significance for K, Mg, and Cu.

Table 5 shows that the 160 and 240 K fertilizer rates increased plant Mn leaf concentrations compared to the O and 80 K rates. There was also a trend (P#0.25) toward lower Mg and Cu leaf concentrations as K fertilizer rates increased.

Table 1. F-values and statistical parameters for effect of potassium chloride and harvest years on sugarcane yield variables.

Source	df	Stalk weight	CRS	Cane yield	Sugar Yield
<u>main-plots</u>					
Treatments (T)	3	0.03	1.75	1.60	0.78
HREP	3	4.62$^{\sim}$	0.99	0.26	0.15
VREP	3	0.83	7.16*	31.84***	17.58**
<u>sub-plots</u>					
Year (Y)	1	51.98****	7.10**	308.36****	296.52****
TxY	3	0.83	1.74	0.64	1.36
RMSE for main-plots		0.1966	7.907	1.999	511.6
% CV for main-plots		11.06	3.29	7.20	7.66
RMSE for sub-plots		0.2022	8.944	2.802	724.8
% CV for sub-plots		11.37	3.726	10.09	10.86
Mean		1.778	240.1	27.78	6675

, $^{\sim}$, *, **, *** and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 2. Effect of potassium chloride on sugarcane yield variables across two harvest years.

T #'s	K rates	Stalk weight	CRS	Cane yield	Sugar yield
	lb K_2O/A	lb/stalk	lb/T	T/A	lb/A
1	0	1.77	240	27.8	6690
2	80	1.78	239	27.3	6550
3	160	1.78	243	27.5	6690
4	240	1.78	238	28.5	6770
LSD 0.10		NS[%]	NS	NS	NS
LSD 0.25		NS	NS	NS	NS

[%]NS denotes that the LSD was not significantly different at the indicated probability level.

Table 3. Effect of harvest year on sugarcane yield variables averaged across potassium fertilizer rates.

Harvest year	Stalk weight	CRS	Cane yield	Sugar Yield
	lb/stalk	lb/T	T/A	lb/A
Plant cane	1.93	243	32.8	7950
First-stubble	1.63	238	22.8	5400
LSD 0.10	0.07	3	1.0	250
LSD 0.25	0.05	2	0.7	170

Table 4. F-values and statistical parameters for effect of potassium chloride on sugarcane leaf nutrient concentrations of plant cane.

Source	df	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
Potassium	3	0.87	0.48	1.59	1.20	1.72	1.74	9.16****	0.85	0.68	0.35
HREP	3	0.30	2.46~	3.62*	0.89	0.42	1.10	2.11	1.12	1.39	0.75
VREP	3	1.09	2.07	2.93*	1.15	1.91	4.54****	4.26*	2.97*	0.66	1.71
RMSE		0.09278	0.02903	0.1379	0.04099	0.01584	0.6429	3.683	8.590	2.322	0.01559
% CV		6.92	13.56	9.44	17.75	14.08	15.32	23.95	23.65	10.28	10.01
Mean		1.341	0.2141	1.461	0.2310	0.1125	1.196	15.37	36.31	22.60	0.1556

, ~, *, and **** denote statistical significance at the P#0.25, 0.10, 0.05, and 0.0001 levels, respectively.

Table 5. Effect of potassium fertilizer rates on leaf nutrient concentrations of plant cane.

K-rate	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
lb K_2O/A	----------------	----------------	---------------- %	----------------	----------------	----------------	---------------- ppm	----------------	----------------	%
0	1.38	0.222	1.49	0.234	0.118	4.29	13.3	39.6	22.6	0.159
80	1.34	0.211	1.42	0.240	0.116	4.44	12.2	34.7	21.8	0.154
160	1.32	0.215	1.41	0.238	0.112	4.19	16.8	34.7	23.1	0.154
240	1.33	0.208	1.52	0.212	0.104	3.84	19.2	36.3	22.9	0.156
LSD 0.10	NS	NS	NS	NS	NS	NS	2.5	NS	NS	NS
LSD 0.25	NS	NS	0.07	NS	0.008	0.31	1.8	NS	NS	NS

EFFECT OF GIBBERELLIC ACID[1] ON SUGARCANE YIELDS

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Mike Landry
Iberia Parish Sugarcane Producer

SUMMARY

Application of gibberellic acid (0.5, 1.0 and 2.0 qt/A three times during the growing season) to sugarcane variety LCP 85-384 did not significantly ($P > 0.10$) affect sugar yields or the other measured yield variables across four years. Cane tonnage was appreciably lower in 2001 with third-stubble compared with second-stubble in 2000. This may have been caused by excess rainfall received in June of 2001.

INTRODUCTION

Anecdotal data from Florida indicates that gibberellic acid may increase sugarcane yields by increasing stalk elongation. Some cane producers in Louisiana have expressed interest in using gibberellic acid. Our research was initiated to determine whether gibberellic acid can be used to increase sugarcane yields in Louisiana.

PROCEDURES

A gibberellic acid (SUL-15) study was initiated in the spring of 1998 using second progeny Kleentek variety LCP 85-384 plant cane. The six treatments used in the study are given in Table 2. The gibberellic acid rates used were 0.5 qt/A (0.5x), 1.0 qt/A (1.0x), and 2.0 qt/A (2.0x). The SUL-15 treatments were applied in 10 gallon/A of water along with a surfactant (1.5 pt of 820 surfactant per 100 gallons of water) using a high-clearance sprayer. The first application of SUL-15 was sprayed directly over the top of the cane, while the second and third applications were sprayed over the top and to the sides of the cane. In 1999 the study was continued on the 1998 research plots with first-stubble cane using the application dates shown in Table 2. Because of lodged cane, treatments 4 and 6 did not receive gibberellic acid in 1999 at the third application date (August 24).

The soil used in the study was a Baldwin silty clay loam with a pH of 4.5 and a soil analysis of 248, 30, 202, 2233, and 505 ppm, respectively, for P, Na, K, Ca, and Mg. The study used a 6x6 Latin square design with six replications. Experimental plots consisted of three 5-foot 10-inch by 50-foot rows with a 10-foot alley at the ends of the plots. All plots were separated on both sides by three 5-foot 10-inch by 50-foot border rows.

[1]Research was partially supported by PRO-CHEM Chemical Company.

The cane was grown to maturity each year using recommended fertilizer rates and standard cultural practices. All plots were harvested in 1998, 1999, and 2000 with a two-row soldier harvester and weighed with a weigh rig. The test was harvested in 2001 (the center row of the three-row plots) with a combine harvester and a portable weigh wagon. A 10-stalk sample was randomly taken at harvest from each plot each year to determine stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane. Plant height was also determined for this 10-stalk sample in 1998, 1999, and 2001. Plant populations were determined before harvest each year.

RESULTS AND DISCUSSION

Tables 1 and 3 show that the gibberellic acid treatments used in the study (Table 2) did not significantly ($P>0.10$) affect the measured yield variables. Harvest year affected all of the measured variables (Tables 1 and 4) in the study, and the year x treatment interaction was not significant ($P>0.10$) for any of the variables (Table 1).

Stalk weights, plant height, CRS, and sugar yield were highest (Table 4) for first-stubble cane (1999). Plant populations were larger with second-stubble cane (2000). Plant populations and cane tonnage were appreciably lower in 2001 with third-stubble compared to second-stubble in 2000. The decrease in tonnage may have been caused by the excess rainfall received in June of 2001.

Table 1. F-values and statistical parameters for effect of gibberellic acid treatments and harvest years on sugarcane yield variables.

Source	df	Plant pop.	Stalk weight	Plant§ height	CRS	Cane yield	Sugar yield
<u>main-plots</u>							
Treatments (T)	5	0.59	0.94	0.51	1.54	0.46	1.01
HREP	5	1.63	0.07	2.77*	4.95**	2.38~	4.28**
VREP	5	4.01*	1.80	2.15	0.22	5.85**	5.84**
<u>sub-plots</u>							
Years (Y)	3	204.80****	119.55****	163.29****	141.93****	74.10****	83.47****
TxY	5	0.84	0.52	1.32	0.68	0.68	0.42
RMSE for main-plots		4174	0.2498	0.4248	12.23	3.809	926.3
% CV " " "		8.03	13.32	4.98	5.52	9.73	10.72
RMSE for sub-plots		4791	0.2122	0.3722	14.84	3.724	968.4
% CV " " "		9.21	11.32	4.36	6.69	9.51	11.20
Mean		52,000	1.875	8.536	221.7	39.16	8643

§Plant height was not measured for the 2000 crop.

, ~, *, **, and **** denotes statistical significance at the P# 0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Gibberellic acid rates and timing for three years.

T#	For 1998[§]	For 1999	For 2000	For 2001
1	SUL-15 not applied			
2	1.0x SUL-15 applied on: 4/9	5/7	4/6	5/16
3	1.0x SUL-15 applied on: 4/9, 5/22	5/7, 6/24	4/6, 5/31	5/16, 7/16, 8/21
4	1.0x SUL-15 applied on: 4/9, 5/22, 7/6	5/7, 6/24, 7/24[~]	4/6, 5/31, 7/21	5/16, 7/16, 8/21
5	0.5x SUL-15 applied on: 4/9, 5/22, 7/6	5/7, 6/24, 7/24	4/6, 5/31, 7/21	5/16, 7/16, 8/21
6	2.0x SUL-15 applied on: 4/9,5/22, 7/6	5/7, 6/24, 7/24[~]	4/6, 5/31, 7/21	5/16, 7/16, 8/21

[§]The 0.5x, 1.0x, and 2.0x rates denote gibberellic acid rates of 0.5, 1.0, and 2.0 qt/A, respectively, for each of the indicated dates.
[~] The August 24 application was not applied on these two treatments because the cane was lodged.

Table 3. Effect of gibberellic acid treatments on sugarcane yield variables averaged across harvest years.

T#	Stalk weight	Plant pop.	Plant[%] height	CRS	Cane yield	Sugar yield
	lb/stalk	1000/A	ft.	lb/T	T/A	lb/A
1	1.84	52.1	8.58	217	38.9	8440
2	1.90	52.4	8.54	221	39.5	8650
3	1.92	51.4	8.52	222	39.5	8720
4	1.93	51.5	8.58	223	38.5	8520
5	1.82	51.6	8.40	221	38.8	8560
6	1.83	53.1	8.59	227	39.9	8980
LSD 0.10	NS	NS	NS	NS	NS	NS
LSD 0.25	NS	NS	NS	4	NS	NS

[%] Plant height are based on 1998, 1999, and 2001; treatments were not measured for plant height in 2000.
NS denotes that the treatments did not affect the indicated yield variables at the designated significance levels.

Table 4. Effect of harvest year on sugarcane yield parameters averaged across gibberellic acid treatments.

Year	Stalk weight	Plant pop.	Plant[%] height	CRS	Cane yield	Sugar yield
	lb/stalk	1000/A	ft.	lb/T	T/A	lb/A
1998	1.94	50.7	8.61	227	38.1	8,660
1999	2.39	36.8	9.28	245	43.9	10,720
2000	1.53	63.8	-	179	42.6	7,630
2001	1.63	56.7	7.67	236	32.0	7,560
LSD 0.10	0.08	1.9	0.15	6	1.5	380
LSD 0.25	0.06	1.3	0.10	4	1.0	260

[%] Plant heights at harvest were not made in 2000.

EFFECT OF NITROGEN FERTILIZER RATES AND LIME-STABILIZED SEWAGE SLUDGE ON LCP 85-384 SUGARCANE YIELDS

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Lynn Minvielle
Iberia Parish Sugarcane Producer

SUMMARY

Applying 10 and 20 T/A (dry weight basis) of lime-treated sewage sludge under cane at planting reduced (P< 0.10) LCP 85-384 cane and sugar yields across two years. However, mixing 10 T/A of sludge into the row before planting had no effect (P$0.10) on cane or sugar yield when averaged across the two years.

INTRODUCTION

Research has shown that composted municipal waste can be safely and effectively used to grow sugarcane. However, municipalities in the Sugar Belt of Louisiana do not produce composted municipal waste. Consequently, if municipal waste is to be used, it will necessarily occur in the form of sewage sludge. At present, lime-stabilized (class B) sewage sludge can be used in sugarcane production only with a special permit. Such a permit was obtained by the Iberia Research Station and the City of New Iberia for a sewage sludge x nitrogen fertilizer study in Iberia Parish.

OBJECTIVE

To determine the effect of nitrogen fertilizer rates and lime-stabilized sewage sludge rates and placement on sugarcane yields.

MATERIALS AND METHODS

A Baldwin silty clay soil near Olivier was selected as the test site. The experimental design was a Latin square, split-plot with four replications. Experimental plots consisted of three 5-foot 10-inch by 30-foot rows with a 10-foot alley at the ends of each plot. All experimental plots were separated by three border rows that were fertilized according to recommended rates for plant cane and first- stubble. Main-plot treatments consisted of four different class B lime-stabilized sewage sludge rates (dry weight basis) and application methods (Table 2). One main-plot did not receive sludge; a second had 10 T/A of sludge broadcast over rows and incorporated into the soil; and the third and fourth main-plots received 10 and 20 T/A, respectively, of sewage sludge applied to opened rows immediately before planting first progeny Kleentek variety LCP 85-384 at three stalks and a lap of two joints in September of 1999.

Nitrogen fertilizer rates (0, 50, 100, and 150 lb N/A as ammonium nitrate) served as the split-plots. All experimental plots received a blanket application of P_2O_5, K_2O, and S at 40, 120, and 24 lb/A as polyphosphate, potassium chloride, and gypsum, respectively, in 2000. Fertilizer was applied to the plots in May of 2000. All the plots were inadvertently fertilized by the cooperating producer in 2001, so residual nitrogen fertilizer rate was the variable in 2001.

Plant cane was grown untill mid-November using standard cultural practices, and plant populations were taken in September from all plots. The experiment was harvested with a two-row soldier harvester and all plots were weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane. The same methods were used for first-stubble cane in 2001, and the cane was harvested on September 27.

RESULTS AND DISCUSSION

Table 1 shows that sewage treatments had a significant (P<0.10) effect on stalk weights, cane yield, and sugar yield. Nitrogen fertilizer and residual rates affected only cane yield. There was also a significant sludge x nitrogen interaction for stalk weight, CRS, and cane yield.

The relatively low CV's (below 10%) for CRS, cane yield, and sugar yield indicate that the experimental design did a good job of removing variability from the study.

Table 2 shows that the 10-under and 20-under sludge treatments significantly (P< 0.10) decreased stalk weight, and cane and sugar yield across the two years compared to the check. However, the 10-mixed sludge treatment did not affect (P$0.10) the yield variables relative to the check. The reason for the decrease in yield with sludge application may be related to the sensitivity of LCP 85-384 to over-fertilization with nitrogen in the sludge. Previous research with starter fertilizer on fallow-planted cane shows that applying more that 15 lb N/A in the furrow with cane at planting can reduce sugar yields.

Table 3 shows that increasing nitrogen fertilizer to 50 lb N/A and beyond increased (P< 0.10) cane tonnage, but it did not significantly affect the other yield variables.

Table 4 shows that plant populations and CRS were higher (P#0.10) for first-stubble cane (2001) compared to plant cane (2000). The reverse was true for stalk weights, cane yield, and sugar yield.

Table 5 shows the significant (P<0.10) interactive effect of sewage, N rates, and harvest year (Table 1) on sugar yields. In the year 2000 (plant cane), the 10-under sludge treatment decreased sugar yields compared to the check at 0 lb N/A, and at 50 lb N/A the 10-mixed and 20-under sludge treatments decreased sugar yields. In year 2001 (first-stubble) the sludge treatments did not affect (P$0.10) sugar yields compared to the check at any of the N fertilizer rates. However, at the 100 lb N rate, the 10-mixed sewage treatment produced higher sugar yields than the 10-under or 20-under sludge treatments.

Table 1. F-values and statistical parameters for effect of sewage sludge, nitrogen application rates and harvest year on LCP 85-384 yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main-plots</u>						
Sewage (S)	3	$3.51^{\sim}$	1.56	0.95	6.22^{*}	4.80^{*}
HREP	3	$3.60^{\sim}$	0.23	0.64	9.22^{*}	6.57^{*}
VREP	3	$3.33^{\sim}$	4.83^{*}	5.88^{*}	$4.57^{\sim}$	$3.66^{\sim}$
<u>sub-plots</u>						
Nitrogen (N)	3	1.98	0.53	0.55	$2.27^{\sim}$	0.88
SxN	9	2.33^{*}	1.19	2.17^{*}	$1.97^{\sim}$	0.85
<u>sub-sub-plots</u>						
Year (Y)	1	74.63^{****}	57.23^{****}	$3.07^{\sim}$	55.07^{****}	20.87^{****}
SxY	3	1.20	0.78	1.64	0.94	0.76
NxY	3	5.99^{**}	0.79	0.93	1.94	0.76
SxNxY	3	0.74	0.33	0.93	1.36	$2.07^{\sim}$
RMSE for main-plots		0.1485	6191	12.11	2.305	578.6
% CV for main-plots		10.32	11.89	5.26	7.04	7.68
RMSE for sub-plots		0.1359	4490	8.366	1.901	571.1
% CV for main-plots		9.44	8.62	3.63	5.81	7.58
RMSE for sub-sub-plots		0.1600	5152	11.11	1.640	484.9
% CV for sub-sub-plots		11.12	9.89	4.82	5.01	6.43
Mean		1.439	52,060	230.3	32.74	7537

, $^{\sim}$, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Effect of sewage sludge rates and placement on sugarcane yield variables averaged across N rates and harvest years.

Sewage sludge	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.50	50.5	232	33.8	7820
10 - mixed	1.45	53.2	227	33.4	7590
10 - under	1.38	53.3	230	32.3	7430
20 - under	1.43	51.3	232	31.6	7300
LSD 0.10	0.07	NS	NS	1.1	280
LSD 0.25	0.05	NS	NS	0.7	180

NS denotes statistical non significance at the indicated P level.

Table 3. Effect of nitrogen fertilizer rates on sugarcane yield variables averaged across sewage treatments and harvest year

N-rate[3]	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
lb N/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.42	51.5	231	32.0	7400
50	1.49	52.1	230	32.9	7550
100	1.42	52.8	231	32.8	7580
150	1.43	51.8	229	33.2	7620
LSD 0.10	NS	NS	NS	0.8	NS
LSD 0.25	0.04	NS	NS	0.6	NS

NS denotes statistical non significance at the indicated P level.

[3] Fertilizer rates were applicable only for plant cane in 2000. All plots were inadvertently fertilized with a blanket application of fertilizer in 2001, so that only residual N was a variable.

Table 4. Effect of harvest years on sugarcane yield variables averaged across sewage treatments and nitrogen fertilizer rates.

Harvest year	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
	lb/stalk	1000/A	lb/T	T/A	lb/A
2000	1.56	48.6	229	33.8	7730
2001	1.32	55.5	232	31.7	7340
LSD 0.10	0.05	1.5	3	0.5	140
LSD 0.25	0.03	1.1	2	0.3	100

Table 5. Effect of sewage sludge treatments, nitrogen fertilizer rates, and harvest years on sugar yields.

Harvest year	N-rate[3]	Sewage Treatment			
		Check	10-mixed	10-under	20-under
	lb N/A	-------------------------lb/A---------------------------			
2000	0	7870	7930	7040	7250
2000	50	8470	7480	7880	7570
2000	100	8150	7530	7500	7830
2000	150	7930	8050	7770	7480
2001	0	7540	7260	7130	7180
2001	50	7350	7340	7360	6950
2001	100	7440	8090	7030	7090
2001	150	7820	7080	7710	7080
LSD 0.10 for effect of sewage treatments within year and N-rate.					800
LSD 0.25 for effect of sewage treatments within year and N-rate.					520

[3] The N rates indicated for 2001 are not applicable (only in a residual sense) since all research plots were inadvertently fertilized with a complete fertilizer in 2001.

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

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

SUMMARY

Applying up to 20 T/A of by-product gypsum to an Alligator clay soil did not significantly affect HoCP 91-555 sugar yields across two years. However, applying gypsum did result in lower ($P<0.10$) commercially recoverable sugar. Conversely, applying 5 T/A or more of gypsum each year increased cane tonnage across the two years.

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 in 2000 and 2001 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, first-stubble cane was harvested on October 22 with a combine harvester and a weigh wagon. 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 did not affect ($P>0.10$) stalk weight, plant population, or sugar yield. The treatments did, however, affect CRS (Table 1) as is shown by the lower ($P<0.10$) CRS values for all treatments receiving gypsum (Table 2).

Also, T #'s 2, 4, and 5, which received 5, 15, and 20 T/A of gypsum, respectively, all had higher cane yields than T #1 and T #6, which received 0 and 1.5 T/A of gypsum, respectively. Treatment #3 (10 T/A of gypsum) also had higher cane tonnage than T #1, which did not receive gypsum. Likewise, T #6 had higher cane tonnage than T #1. The above shows that gypsum was beginning to have an effect on cane 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. We will continue our study with second-stubble cane in 2002 to determine the effects of our treatments on soil moisture and resistance to penetration by a soil penetrometer.

Table 1. Effect of gypsum rates and harvest years on F-values and statistical parameters for sugarcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main-plots</u>						
Treatments (T)	5	0.32	1.90	$2.25^{\sim}$	4.44^{**}	0.35
HREP	5	0.81	1.62	1.37	3.06^{*}	1.80
VREP	5	3.68^{*}	18.50^{****}	9.25^{****}	17.48^{****}	4.55^{**}
<u>sub-plots</u>						
Year (Y)	1	10.77^{**}	$22.61^{**\ **}$	234.45^{****}	1.70	86.05^{****}
TxY	5	0.65	0.05	1.95	0.18	1.00
<u>main-plots</u>						
RMSE		0.1655	2637	10.04	1.716	476.5
% CV		10.29	5.47	5.93	5.39	8.84
<u>sub-plots</u>						
RMSE		0.1792	4485	12.28	4.299	758.9
% CV		11.14	9.31	7.25	13.51	14.08
Mean		1.609	48,170	169.3	31.82	5390

, $^{\sim}$, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Effect of gypsum treatments on sugarcane yield variables averaged across two 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	1.58	47.4	178	29.9	5390
2	5.0	1.59	48.5	168	32.5	5460
3	10.0	1.61	47.3	168	32.1	5360
4	15.0	1.59	47.8	166	32.5	5430
5	20.0	1.62	50.1	168	32.6	5450
6	1.5[+]	1.66	47.8	168	31.2	5240
LSD 0.10		NS	NS	7	1.2	NS
LSD 0.25		NS	1.3	5	0.8	NS

[%]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 INORGANIC FERTILIZER AND FISH[1]
EMULSION ON SUGARCANE YIELDS

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

SUMMARY

Numerically highest (P<0.10) LCP 85-384 sugar yields across three years were obtained where 75 lb N/A and 5 gallon/A of fish emulsion were sidedressed in the spring. Spring-applied fertilizer and fish emulsion treatments, however, did not affect (P>0.10) stalk weights or commercially recoverable sugar. Fall-applied fish emulsion did not significantly (P>0.10) affect the sugarcane yield variables. Two large-plot studies showed that fish emulsion did not affect (P>0.25) sugar yields of first- and second-stubble sugarcane.

INTRODUCTION

Liquid fish emulsion is a by-product of the fish industry. This material is rich in nutrients and, therefore, should have value as a fertilizer in the growing of sugarcane. To date, little research has been conducted to determine whether fish emulsion has economic value in sugarcane culture.

OBJECTIVES

1) Determine the effect of placing various fish emulsion rates under cane at planting on sugarcane yields.

2) Determine the effect of fish emulsion on inorganic fertilizer requirements.

3) Determine if using fish emulsion in sugarcane production can increase the number of ratoon crops obtained from one planting.

MATERIALS AND METHODS

In September 1998 Kleentek variety LCP 85-384 sugarcane was planted at three stalks and a lap of two joints for a fish emulsion by inorganic fertilizer rate study at the Iberia Research Station. The experiment used a Latin square, split-plot design with four replications. Main plots consisted of the four spring-applied inorganic fertilizer and fish emulsion rates shown in Table 2. Split-plots consisted of the four fall-applied fish emulsion rates shown in Table 3. The fall-applied fish emulsion rates were applied to opened rows under cane at planting. The spring applied fertilizer and fish emulsion rates were applied to the inner off bar of each row receiving that particular treatment (Table 2) in April of 1999, 2000, and 2001.

[1]Research was partially supported by Omega Protein, Inc.

Experimental sub-plots consisted of three 5-foot 10-inch by 40-foot rows with a 10-foot alley separating the ends of the plots. The sugarcane plots were grown to maturity using standard cultural practices.

Plant populations for each sub-plot were determined before harvest each year. The study was harvested each year using a two-row soldier harvester and the plots were weighed with a weigh rig. Ten stalks were randomly selected from each sub-plot for determination of commercially recoverable sugar (CRS) and average stalk weight.

In addition to the three-year study at the Iberia Research Station (Tables 1-3), two additional large-plot studies were initiated in the spring of 2001.

The first was at Gralyn Farms with first-stubble cane using the liquid N and liquid fish treatments given in Table 4. A second study was initiated at Rene Simon Farms with second-stubble cane. This study (Table 5) used the same fertilizer and fish rates as the first study.

Both studies used a liquid inorganic fertilizer source with a fertilizer element mix of 15-5-10-1.5 (N-P_2O_5-K_2O-S). In the treatments involving liquid fish emulsion (Tables 4 and 5), the fertilizer and fish emulsion were mixed together before being applied to the experimental plots. All the treatments were applied with a spray coupe that dribbled the liquid fertilizer/fish on both sides of the sugarcane rows. The experimental treatments were applied in mid-May.

Plant populations were taken for both tests before harvest. Ten whole stalks were taken from each plot prior to harvest for determination of commercially recoverable sugar (CRS). All experimental plots were harvested with a combine harvester and a portable weigh wagon. Only the center row of the three-row plots was used for yield determination.

RESULTS AND DISCUSSION

Table 1 shows that the spring-applied fertilizer and fish emulsion rates significantly (P< 0.10) affected plant population and cane and sugar yields of LCP 85-384 across the three years. However, the fall-applied fish emulsion rates did not affect (P$0.10) the five yield parameters measured. The spring by fall interaction was not significant (P<0.10) for four of the five yield variables (Table 1), though it was significant for CRS. The low % CV's (less than10) for CRS, cane yield, and sugar yield show that the statistical design did a good job of removing variability from the study.

Table 2 shows that the 0.75x fertilizer and 5 G/A spring-applied fish emulsion treatment had the highest numerical sugar yield across the three years. Further increasing the fertilizer rate from 0.75x to 1.0x (increasing nitrogen from 75 lb/A to 100 lb/A and not adding fish emulsion) did not affect (P$0.10) sugar yields. However, decreasing the fertilizer rate from 0.75x to 0.5x (reducing nitrogen fertilizer from 75 lb/A to 50 lb/A) resulted in reduced sugar yields.

Table 1 shows that the year x spring, year x fall, and year x spring x fall interactions were not significant (P>0.10) for sugar yield. There was a trend (P<0.25), however, toward significance for the year x spring x fall interaction for sugar yield (Table 3).

Harvest year affected (P#0.0001) all of the measured yield variables (Tables 1 and 3). Sugar yields for first-stubble were appreciably lower than those of plant cane, which is partially attributable to the severe drought in 2000. Also, sugar yields for second-stubble were appreciably lower than for first-stubble, which may have been caused by the extremely wet conditions of June 2001.

Tables 4 and 5 show that inorganic fertilizer and fish emulsion rates had no effect (P>0.25) on the sugarcane yield variables of the two large plot studies.

Table 1. F-values and statistical parameters for effect of inorganic fertilizer and fish emulsion on LCP 85-384 yield variables for two years.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main-plots</u>						
Spring (S)	3	1.69	5.51*	0.29	21.64**	16.76**
HREP	3	1.11	1.94	4.08$^{\sim}$	7.47*	1.61
VREP	3	3.80$^{\sim}$	1.68	4.44$^{\sim}$	10.71**	32.27***
<u>sub-plots</u>						
Fall (F)	3	0.26	1.44	1.90	1.20	0.24
SxF	9	1.13	0.72	2.38*	0.65	1.10
<u>sub-sub-plots</u>						
Years (Y)	2	184.56****	82.36****	1051.63****	208.98****	1294.71****
YxS	6	3.03**	7.14****	0.83	2.08$^{\sim}$	0.99
YxF	6	0.34	0.57	0.69	0.63	0.77
YxSxF	18	0.41	1.06	0.96	1.12	1.39
RMSE for main-plots		0.3113	7971	15.11	2.726	444.1
% CV for main-plots		15.44	15.39	8.98	6.68	6.34
RMSE for sub-plots		0.2055	5033	10.82	3.162	729.0
% CV for sub-plots		10.19	9.71	6.43	7.75	10.41
RMSE for sub-sub-plots		0.2400	4664	12.52	2.963	615.6
% CV for sub-sub-plots		11.90	9.00	7.45	7.27	8.79
Mean		2.016	51,810	168.2	40.78	7000

, $^{\sim}$, *, **, ***, and **** denotes statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 2. Effect of spring fertilizer and fish emulsion rates on sugar yields for three years.

Fertilizer app. in spring[3]	Fish emulsion[P] app. in spring	Plant cane	First stubble	Second stubble	Total
	G/A	------------------------lb/A-----------------------			
0x	0	9,390	6,750	3,790	19,930
0.5x	5	9,700	7,120	4,060	20,880
0.75x	5	10,210	7,310	4,190	21,710
1.0x	0	9,750	7,250	4,460	21,460
LSD 0.10		310	310	310	540
LSD 0.25		200	200	200	350

[3]The 1.0x fertilizer treatment consisted of 120 lb N/A as dry ammonium nitrate.
[P]Fish emulsion was applied as a liquid in the fertilizer off-bar on top of the dry ammonium nitrate.

Table 3. Effect of spring fertilizer and fish emulsion and fall fish emulsion rates on sugar yields for three years.

T#	Spring fert.	Fish emulsion appl. in spring	Fish emulsion appl. in fall	Plant cane	First stubble	Second stubble
		G/A	G/A	----------------lb/A---------------		
1	0.0x	0	0	9,040	6,720	3710
2	0.0x	0	25	9,960	6,650	3780
3	0.0x	0	50	9,320	6,660	3800
4	0.0x	0	100	9,250	6,970	3860
5	0.5x	5	0	10,060	7,220	4090
6	0.5x	5	25	10,200	7,180	4070
7	0.5x	5	50	9,800	6,590	3820
8	0.5x	5	100	8,850	7,370	4210
9	0.75x	5	0	10,390	7,110	4220
10	0.75x	5	25	9,840	6,920	3920
11	0.75x	5	50	10,030	7,580	4470
12	0.75x	5	100	10,590	7,640	4140
13	1.0x	0	0	9,520	7,550	4470
14	1.0x	0	25	9,700	7,690	4570
15	1.0x	0	50	10,000	6,800	3850
16	1.0x	0	100	9,760	6,970	4960
LSD 0.25 for effect of spring fertilizer treatments				410	410	410
LSD 0.25 for effect of fall fish treatments				610	610	610

Table 4. Effect of fertilizer rates and fish emulsion treatments on first-stubble yield variables at Gralyn Farms.

N-rate	Fish	Plant pop.	Cane yield	Stalk weight	CRS	Sugar yield	Lodging[3]
lb N/A	G/A	1000/A	T/A	lb/stalk	lb/T	lb/A	
90	0	55.5	20.3	1.27	245	4980	3.2
90	5	56.3	20.3	1.32	247	5020	3.3
120	0	58.9	21.7	1.27	243	5280	3.5
120	5	56.6	21.6	1.26	235	5050	3.3
LSD 0.10		NS	NS	NS	NS	NS	NS
LSD 0.25		NS	NS	NS	NS	NS	NS

[3]Lodging was based on a 1-5 scale where 1 had all plants erect and 5 had all plants lodged.

Table 5. Effect of fertilizer and fish emulsion treatments on second-stubble sugarcane yield variables at Rene Simon Farms.

N-rate	Fish	Plant pop.	Cane yield	Stalk weight	CRS	Sugar yield
lb N/A	G/A	1000/A	T/A	lb/stalk	lb/T	lb/A
90	0	65.1	25.2	1.17	235	5940
90	5	66.9	25.2	1.12	223	5640
120	0	68.4	24.7	1.13	224	5540
120	5	65.3	25.6	1.17	225	5750
LSD 0.10		NS	NS	NS	NS	NS
LSD 0.25		NS	NS	NS	NS	NS

EFFECT OF HARVEST YEAR, COMBINE RESIDUE MANAGEMENT[1], AND A NITROGEN STABILIZATION PACKAGE ON SUGARCANE YIELDS

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Ronald Hebert, Jr.
Iberia Parish Sugarcane Producer

SUMMARY

Research across a three-year residue management study shows that spraying combine trash with 60 lb N/A as nitrogen stabilized urea (containing a urease and nitrification inhibitor), and applying the remaining urea (30 or 60 lb N/A) in the spring resulted in as good a sugar yield as where the trash was burned or raked off the row tops and all the urea nitrogen (120 lb N/A) was applied in the spring. Also, applying 90 lb N/A as urea treated with a urease inhibitor (Agrotain) in the spring resulted in as high a sugar yield as where 120 lb N/A of untreated urea was applied in the spring.

INTRODUCTION

Approximately 85% of the sugarcane acreage in Louisiana is now harvested with combine harvesters. Much of this cane is harvested green chopped, which results in a residue blanket on the soil surface that can reduce sugar yields (500 to 1250 lb/A) for the following crop if it is not removed or burned. Removing the residue blanket from the row tops and placing it in the furrow can cause cultivation problems the following spring. Many producers burn the residue blanket after harvest, which may result in air quality problems for the public. Burning the residue also results in loss of nitrogen and organic matter that could improve soil fertility and soil manageability if the residue blanket were not destroyed.

At present, the sugarcane combine residue blanket is more of a liability than an asset. The research in this study seeks to determine if there is a way to manage the residue blanket so that it becomes an asset instead of a liability.

OBJECTIVES

1) Compare the effect of burning combine harvest residue vs. spraying it with liquid super urea (which contains a urease and nitrification inhibitor) on sugar yields.

2) Determine if applying super urea to the trash blanket can reduce the nitrogen fertilizer requirements of sugarcane.

3) Determine the effects of nitrogen fertilizer and residue management on nutrient uptake into sugarcane

[1]Research was partially supported by IMC Global Operations, Inc.

MATERIALS AND METHODS

In late January 1999, the six treatments in Table 2 were imposed on a Baldwin silty clay soil where LCP 85-384 plant cane had been harvested with a combine harvester in mid-January. The treatments were replicated six times in a 6x6 Latin square design. Experimental plots consisted of three 6-foot by 50-foot rows with 10-foot alleys at the ends of each plot. Three border rows also separated each plot on both sides of the plot. First-stubble cane was harvested with a combine harvester on Dec. 6, 1999. Treatments 1, 2, and 6 had their plots burned on Dec. 16, 1999, while treatment 4 and 5 plots had 60 lb N/A as super urea (stabilized with both a urease and nitrification inhibitor) sprayed on the residue blanket on January 6, 2000. In April of 1999, 2000, and 2001 treatments 1-5 received spring-applied urea nitrogen (Table 2) sprinkled by hand on the row tops. Treatment 6 urea (which contained Agrotain urease inhibitor) was also sprinkled on the row tops at the same time. All plots received a blanket application of 40 lb/A of P_2O_5 (as polyphosphate) and 120 lb/A of K_2O (as potassium chloride) in 1999, 2000, and 2001 with the spring N application.

Second-stubble cane was harvested with a combine harvester on Sept. 26, 2000. Liquid super-urea was applied to the plots of treatments 4 and 5 on Jan. 10, 2001. Rainfall prevented the burning of cane residue so the residue was raked off the plots on January 22, 2001.

The first-stubble, second-stubble, and third-stubble cane crops were grown to maturity using standard cultural practices. Cane tonnage in each experimental plot was estimated by harvesting 10-feet from the middle row of each plot in 1999 and 2000. Five stalks were randomly selected from the 10-foot section to estimate commercially recoverable sugar (CRS) and average stalk weights. Three stalks were also taken to analyze (after being stripped of leaves and tops) for nutrient uptake. To determine nutrient uptake, stripped cane stalks were considered to be 30% dry matter. Third-stubble cane was harvested with a combine on October 10, 2001, and weighed with a weigh wagon. Ten stalks were selected for determination of CRS.

RESULTS AND DISCUSSION

Table 1 shows that the trash management and fertilizer treatments (Table 2) did not significantly ($P>0.10$) affect CRS or cane and sugar yields across the three crop years. The treatments did affect ($P<0.10$) stalk weights and plant populations. The treatment by year interaction was not significant ($P \geq 0.10$) for any of the yield variables. The effect of harvest year on the yield variables was very significant ($P \leq 0.0001$)

The % CVs for main-plots and sub-plots of stalk weight, cane yield, and sugar yield were large, which indicates that variability was brought into the study by using only a 10-foot section of the center row from each plot to estimate the yield variables in the first two years of the study.

Table 2 shows the effect of the trash and fertilizer treatments on the five measured yield variables. Sugar yields for T #s 4 and 5 (which had nitrogen stabilized liquid urea sprayed on the trash blanket in January each year after harvest) were as good as for T #1 where the trash blanket was burned and urea was applied to row tops in April each year. This indicates that spraying the trash blanket in the winter with N-stabilized urea may be an alternative to burning.

The results also show that applying 90 lb N/A as agrotain-treated urea in April each year to cane rows that had their trash blanket burned the previous January (T #6) yielded as well as T #1 where the trash had been burned and 120 lb N/A as untreated urea was added.

Table 2 shows that the stalk weights for T #4 were significantly (P<0.10) larger than for T #s 1,5, and 6. However, the plant population for the check (T #1) was higher (P#0.10) than for all the other treatments.

Table 3 shows that stalk weights, CRS, cane yield, and sugar yields were substantially higher for first-stubble cane in 1999 compared to second-stubble and third-stubble cane in 2000 and 2001, respectively. This can partially be attributed to the severe drought in 2000 and the excessive rainfall received in 2001.

Table 4 shows that the experimental treatments affected Mn and S concentrations in whole plants at harvest, but had no significant (P$0.10) effect on the other nutrients measured. Harvest year affected (P#0.10) all the whole plant nutrient concentrations, except Cu. The treatment by year interaction was significant (P#0.10) for Cu, but not for any of the other nutrients.

Table 5 shows that treatment #3 (not burning the combine residue and applying all the urea N dry in the spring) had significantly (P#0.10) higher Mn concentrations than all the other treatments. Treatment #6 (combine residue burned in the winter and 90 lb N/A as dry Agrotain urea applied in the spring) had more plant Mn than treatments 1, 2, and 4. As with Mn, plant S was also highest for T #3, which was larger than for T #4 and 5.

Table 6 shows that all the nutrient concentrations, except for Cu, were significantly (P#0.10) higher in second-stubble than in first-stubble. This may partially be because there was a severe drought in the second-stubble crop year (2000) that reduced the cane tonnage (Table 3) appreciably compared to the first-stubble crop year (1999).

Table 7 shows that the fertilizer and residue management treatments (Table 2) had a significant (P#0.10) effect on N, K, and Mn uptake into mature cane, but they did not affect the other nutrients. Harvest year affected the uptake of all nutrients except for Ca, Cu, and Zn. As with whole- plant nutrient concentrations, the treatment x year interaction for nutrient intake was significant only for Cu.

Table 8 shows that treatment #1 (cane residue burned in winter, 120 lb N/A as urea applied on row tops in the spring) had higher (P#0.10) nitrogen uptake than treatments 2 (residue burned in winter, 90 lb N/A as urea applied to row tops in the spring) and 5 (residue not burned, 60 lb N/A liquid super U sprayed on residue in winter and 30 lb N/A applied in spring).

Table 8 also shows that T #6 had more K uptake than all other treatments except for T #3. Also, T #'s 3 and 6 had more Mn uptake than T #'s 2 and 4.

Table 9 shows that second-stubble cane had higher nutrient uptakes of N, P, K, Fe, and S than first-stubble cane. The reverse was true for Mg and Mn.

Tables 10a and 10b show that the experimental treatments affected (P#0.10) Ca, Fe, and pH of the soil at the end of the experiment. Table 11a shows that T #2 had the numerically highest soil Ca level, which was statistically (P#0.10) higher than T #'s 3 and 4.

Table 11a also shows that T #3 had the highest soil Fe levels, which were higher (P#0.10) than all the other treatments, except T #6.

Table 11b shows that T #1 had the soil pH which was higher (P#0.10) than T #3.

Table 1. F-values and statistical parameters for effect of harvest years and residue and fertilizer management on LCP 85-384 yield variables.

Source	df	Plant[3] pop.	Stalk weight	CRS	Cane yield	Sugar Yield
main-plots						
Treatments (T)	5	2.58$^{\sim}$	2.32$^{\sim}$	1.04	0.75	0.55
HREP	5	2.54$^{\sim}$	1.26	0.67	1.65	2.24$^{\sim}$
VREP	5	9.88****	2.01	2.00	1.44	2.05
sub-plots						
Years (Y)	2	34.14****	52.80****	423.99****	75.31****	221.25****
T x Y	10	0.83	1.56	0.52	0.54	0.51
RMSE for main-plots		3815	0.2141	13.90	6.176	1250
% CV for main-plots		6.89	12.71	8.11	19.03	21.23
RMSE for sub-plots		4718	0.2569	15.65	6.260	1442
% CV for sub-plots		8.52	15.26	9.138	19.28	24.49
Mean		55,390	1.684	171.3	32.46	5888

, $^{\sim}$, and ****, denote statistical significance at the P#0.25, 0.10, and 0.0001 levels, respectively.
[3] The analysis for plant population involved only two years (2000 and 2001).

Table 2 . Effect of urea treatments and residue management on LCP 85-384 yield variables across three years.

T#	Residue blanket	Urea source	Urea applied to rows in	Urea N. rate	Plant[3] pop.	Stalk weight	CRS	Cane yield	Sugar yield
				lb/A	1000/A	lb/stalk	lb/T	T/A	lb/A
1	burned in winter	untreated urea	spring	120	58.6	1.65	165	33.6	5,900
2	burned in winter	untreated urea	spring	90	53.9	1.73	173	31.0	5,640
3	not burned	untreated urea	spring	120	54.7	1.70	172	31.4	5,640
4	not burned	Super U	winter spring	60 60	56.0	1.80	173	32.0	5,910
5	not burned	Super U	winter spring	60 30	53.9	1.57	175	32.4	6,040
6	burned in winter	Agrotain	spring	90	55.3	1.65	170	34.3	6,200
LSD 0.10					2.7	0.12	NS[§]	NS	NS
LSD 0.25					1.9	0.08	NS	NS	NS

[§] NS denotes that the means of the indicated variable was not statistically different at the indicated significance levels.
[3] Plant populations involved 2000 and 2001, but not 1999.

Table 3. Effect of harvest years on LCP85-384 yield variables averaged across fertilizer and residue management treatments.

Harvest year	Plant pop.	Stalk weight	CRS	Cane yield	Sugar Yield
	1000/A	lb/stalk	lb/T	T/A	lb/A
1999	-	2.03	233	42.8	10,000
2000	52.1	1.42	143	28.6	4,090
2001	58.6	1.60	137	26.0	3,570
LSD 0.10	1.9	0.10	6	2.6	570
LSD 0.25	1.3	0.07	4	1.7	390

Table 4. F-values and statistical parameters for effect of harvest years and residue and fertilizer management on whole plant nutrient concentrations of harvested cane for 1999 and 2000.

Source	df	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
main-plots											
Treatments(T)	5	2.15	1.06	1.01	1.43	2.03	0.49	4.99**	0.33	0.73	3.78*
HREP	5	0.62	1.54	1.14	8.66***	8.34****	0.70	7.15***	2.44$^{\sim}$	1.40	3.75*
VREP	5	3.41*	7.17***	1.47	0.52	1.73	0.24	11.55****	1.03	1.61	3.23*
sub-plots											
Years (Y)	1	233.66****	173.04****	6.54*	103.80****	78.24****	2.60	28.42****	29.05****	14.74***	183.49****
TxY	5	1.09	0.34	0.61	0.77	0.73	2.33$^{\sim}$	1.36	0.76	0.23	1.58
RMSE for main-plots		0.04935	0.01590	0.2809	0.01076	0.01066	0.9962	1.960	27.10	6.915	0.006017
% CV for main-plots		30.52	19.74	68.70	11.47	12.35	34.81	24.27	46.62	49.43	14.01
RMSE for sub-plots		0.03138	0.02064	0.2627	0.01222	0.01201	0.9580	1.697	31.81	7.366	0.009507
% CV for sub-plots		19.40	25.62	64.23	13.12	13.91	33.47	21.02	54.73	52.67	22.14
Mean		0.1617	0.08056	0.4089	.09383	0.08632	2.862	8.076	58.13	13.99	0.04294

, $^{\sim}$, *, **, ***, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001 and 0.0001 levels, respectively.

Table 5. Effect of urea treatments and residue management on whole-plant nutrient concentrations averaged across 1999 and 2000.

T#	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	------------------------------%------------------------------					------------------------ppm--------------------------				%
1	0.188	0.0722	0.325	0.0992	0.0923	3.03	7.3	52.0	15.5	0.0435
2	0.147	0.0865	0.559	0.0930	0.0846	2.48	7.1	57.7	12.2	0.0431
3	0.181	0.0813	0.422	0.0942	0.0885	2.92	10.1	57.7	14.3	0.0473
4	0.158	0.0827	0.354	0.0938	0.0828	2.83	6.8	55.6	16.4	0.0359
5	0.132	0.0808	0.382	0.0877	0.0806	2.99	8.4	67.1	12.3	0.0416
6	0.165	0.0799	0.413	0.0952	0.0892	2.95	8.9	58.2	13.3	0.0458
LSD 0.10	NS	NS	NS	NS	NS	NS	1.4	NS	NS	0.0043
LSD 0.25	0.024	NS	NS	NS	0.0052	NS	0.9	NS	NS	0.0029

Table 6. Effect of harvest year on whole plant nutrient concentrations averaged across treatments.

Harvest years	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	---------------------------%----------------------------					-----------------------ppm------------------------------				%
First-stubble	0.105	0.049	0.330	0.079	0.0738	2.63	7.01	37.9	10.7	0.0276
Second-stubble	0.218	0.113	0.488	0.109	0.0988	3.05	9.14	79.6	17.3	0.0587
LSD 0.10	0.013	0.008	0.105	0.005	0.0048	NS	0.68	12.9	2.9	0.0038
LSD 0.25	0.009	0.006	0.073	0.003	0.0033	0.28	0.47	8.9	2.0	0.0026

Table 7. F-values and statistical parameters for effect of harvest years and residue and fertilizer management on plant nutrient uptake of harvested cane for 1999 and 2000.

Source	df	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
main-plots											
Treatments(T)	5	2.26$^{\sim}$	0.47	5.28**	1.43	1.84	0.63	2.63$^{\sim}$	0.20	0.62	2.00
HREP	5	1.38	0.62	6.95***	4.14**	4.63**	0.50	5.48**	3.37*	1.43	0.71
VREP	5	2.41$^{\sim}$	4.06*	3.56*	0.43	0.56	0.07	5.36**	0.89	1.16	1.13
sub-plots											
Years (Y)	1	19.41****	54.22****	6.93*	2.67	3.36$^{\sim}$	2.88	3.03$^{\sim}$	7.28*	1.00	26.91****
TxY	5	0.73	0.99	0.80	0.89	0.86	2.61$^{\sim}$	1.68	0.54	0.45	1.08
RMSE for main-plots		12.14	3.805	14.42	4.203	3.994	0.03165	0.06312	0.5719	0.1706	2.264
% CV for main-plots		37.62	24.17	18.83	21.53	22.15	53.42	37.15	48.96	60.01	26.54
RMSE for sub-plots		10.62	3.764	22.53	4.196	4.292	0.02510	0.05410	0.6264	0.1408	2.271
% CV for sub-plots		32.90	23.91	29.43	21.49	23.80	42.37	31.84	53.64	49.53	26.61
Mean		32.27	15.74	76.56	19.52	18.03	0.05925	0.1699	1.168	0.2843	8.532

, $^{\sim}$, *, **, ***, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 8. Effect of urea treatments and residue management on total nutrient uptake averaged across 1999 and 2000.

T#	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	--lb/A---									
1	38.1	15.0	67.6	21.6	20.0	0.0653	0.162	1.12	0.332	9.15
2	26.7	15.7	68.5	18.1	16.5	0.0468	0.137	1.09	0.237	7.87
3	35.9	16.1	85.3	19.2	18.0	0.0600	0.202	1.16	0.287	9.26
4	31.2	16.1	71.9	19.1	16.9	0.0564	0.137	1.11	0.320	7.36
5	25.6	14.7	74.3	18.1	17.0	0.0656	0.180	1.28	0.243	7.76
6	36.0	16.7	91.1	20.9	19.9	0.0625	0.201	1.24	0.287	9.71
LSD 0.10	8.5	NS	10.2	NS	NS	NS	0.044	NS	NS	NS
LSD 0.25	5.9	NS	7.0	NS	1.9	NS	0.031	NS	NS	1.10

Table 9. Effect of harvest year on total nutrient uptake averaged across treatments.

Harvest years	N	P	K	Ca	Mg	Cu	Mn	Fe	Zn	S
	---lb/A---									
First-stubble	26.8	12.5	69.5	20.3	19.0	0.0669	0.181	0.98	0.268	7.12
Second-stubble	37.8	19.0	83.4	18.7	17.1	0.0529	0.159	1.37	0.301	9.98
LSD 0.10	4.2	1.5	9.1	NS	1.7	NS	0.022	0.25	NS	0.92
LSD 0.25	2.9	1.0	6.3	1.2	1.2	0.0074	0.015	0.18	NS	0.63

Table 10 a. F-values and statistical parameters for effect of residue and fertilizer management on soil nutrient variables.

Source	df	O.M.	Ca	Cu	Fe	Mg	Mn
Treatments(T)	5	0.25	2.38~	0.47	3.82*	1.11	1.98
HREP	5	32.64****	29.15****	9.33****	0.59	16.90****	0.82
VREP	5	2.19~	17.73****	1.95	14.00****	1.82	4.51**
RMSE		0.1096	167.8	0.07951	4.368	15.63	0.9256
% CV		8.03	7.26	13.17	17.39	5.38	12.34
Mean		1.359	2312	0.6036	25.12	290.5	7.498

Table 10 b. F-values and statistical parameters for effect of residue and fertilizer management on soil nutrient variables.........Continued

Source	pH	P	K	Na	S	Zn
Treatments(T)	2.70~	1.38	2.13	0.97	1.52	0.78
HREP	3.81*	1.85	4.50**	2.98*	5.13**	2.82
VREP	11.06****	5.03**	5.33**	0.40	1.66	2.16
RMSE	0.2781	33.93	12.17	2.565	4.775	0.05237
% CV	3.832	25.49	10.60	12.01	23.19	17.67
Mean	7.256	133.1	114.8	21.35	20.60	0.2964

, ~, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 11 a. Effect of urea and residue management treatments on soil nutrient variables.

T#	OM[3]	Ca	Cu	Fe	Mg	Mn
	%	-----------------------------------	ppm	-----------------------------------		
1	1.35	2320	0.585	21.9	288	6.87
2	1.36	2470	0.572	22.5	285	7.01
3	1.35	2140	0.615	31.2	285	8.32
4	1.39	2280	0.630	24.0	287	7.67
5	1.33	2350	0.600	24.0	296	7.37
6	1.38	2310	0.620	27.1	301	7.76
LSD 0.10	NS	170	NS	4.3	NS	NS
LSD 0.25	NS	110	NS	3.0	NS	0.63

[3]Soil samples were taken on February 14, 2002 down to 6-inches.

Table 11 b. Effect of urea and residue management treatments on soil nutrient variables.........Continued

T#	pH	P	K	Na	S	Zn
		-----------------------------------	ppm	-----------------------------------		
1	7.45	150	120	20.9	18.5	0.290
2	7.37	132	115	21.6	22.9	0.293
3	6.93	139	114	21.1	17.4	0.280
4	7.36	130	105	20.2	23.6	0.323
5	7.24	104	109	21.0	20.6	0.277
6	7.19	144	125	23.3	20.5	0.315
LSD 0.10	0.28	NS	NS	NS	NS	NS
LSD 0.25	0.19	NS	8	NS	3.3	NS

NS denotes statistical nonsignificance at the indicated P level.

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

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Ronald Hebert, Jr.
Iberia Parish Sugarcane Producer

SUMMARY

Our results show that applying up to 20 G/A of Power Perk across sugarcane rows after planting had no effect on sugar yields, but applying 30 G/A of Power Perk across the rows reduced both cane and sugar yields, indicating that this treatment was too hot. Power Perk treatments did not affect ($P>0.25$) soil moisture or soil penetrometer resistance in 2001.

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 (Table 2) 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 (1-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 in 2000 and 2001 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 the plots were harvested on October 22 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-inch on August 28 and October 11 in 2001.

RESULTS AND DISCUSSION

Tables 1 and 2 show that the Power Perk treatments (Table 2) significantly (P< 0.10) affected stalk weight, CRS, and sugar yield. Harvest year affected (P#0.10) CRS and cane and sugar yields.

Table 2 shows that the 10 G/A Power Perk treatment (T #2) had a higher (P#0.10) plant population than all treatments except T #6. Likewise, T #2 had larger stalk weights than T #'s 1, 4, 5, and 6. Treatment #1 had the highest CRS, which was larger than that of the T #'s 2, 4, and 5. Cane tonnage was significantly (P#0.10) higher for T #2 than for T #'s 4 and 5. Likewise, T #'s 1, 2, and 3 produced more sugar than T #'s 4 and 5. Apparently, the 30T/A Power Perk treatment and applying Power Perk on the row top were too much for our cane.

Table 3 shows that plant cane had appreciably more CRS, cane tonnage, and sugar yield than did first-stubble cane. Excess rainfall in June of 2001 may have been the cause of the lower cane tonnage.

Tables 4-7 show that the Power Perk treatments did not affect (P$0.25) soil moisture or soil penetrometer resistance at the two sampling dates (August 28 and October 11) in 2001.

Table 1. F-values and statistical parameters for effect of Power Perk and harvest year on sugarcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
main-plots						
Treatments (T)	5	6.85***	1.58	2.58~	1.84	4.02*
HREP	5	9.41****	0.42	4.03*	12.33****	11.05****
VREP	5	4.03*	1.45	6.36**	8.22***	9.31****
sub-plots						
Year (Y)	1	1.53	1.91	334.18****	94.46****	205.23****
TxY	5	0.31	0.90	1.38	0.26	0.36
RMSE for main-plots		0.1034	6061	7.265	2.590	427.1
% CV for main-plots		6.68	12.53	3.94	9.09	7.87
RMSE for sub-plots		0.1850	9507	7.946	3.816	689.3
% CV for sub-plots		11.96	19.65	4.31	13.40	12.69
Mean		1.547	48,370	184.5	28.49	5430

, ~, *, **, ***, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 2. Effect of Power Perk rates and placement on sugarcane yield variables averaged across two years.

T#	Power Perk	Stalk weight	Plant population	CRS	Cane yield	Sugar yield
	G/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0 - furrow to furrow	1.49	47.9	189	28.5	5560
2	10 - " " "	1.65	52.6	183	29.7	5600
3	20 - " " "	1.60	47.1	187	29.2	5650
4	30 - " " "	1.48	46.6	182	27.4	5170
5	5 in furrow +5 over row top	1.58	47.0	179	27.0	5050
6	10 in furrow + 10 over row top	1.48	49.1	186	29.4	5580
LSD 0.10		0.07	4.3	5	1.9	310
LSD 0.25		0.05	3.0	4	1.3	210

NS denotes non significance at the indicated P level.

Table 3. Effect of harvest year on sugarcane yield variables averaged across experimental treatments.

Harvest year	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
	lb/stalk	1000/A	lb/T	T/A	lb/A
Plant cane	1.57	49.8	202	33.1	6670
First-stubble	1.53	46.9	167	24.0	4230
LSD 0.10	NS	NS	3	1.6	280
LSD 0.25	0.05	2.6	2	1.1	190

NS denotes nonsignificance at the indicated P level.

Table 4. F-values and statistical parameters for effect of Power Perk application rates and placement on soil penetrometer resistance for first-stubble cane in 2001.

Source	df	Penetration
main-plots		
Treatments (T)	5	0.40
HREP	5	8.08***
VREP	5	2.95*
sub-plots		
Date (D)	1	307.25****
TxD	5	0.46
RMSE for main-plots		39.35
% CV " " "		10.29
RMSE for sub-plots		46.89
% CV " " "		12.26
Mean		382.5

*, ***, and **** denotes statistical significance at the P# 0.05, 0.001, and 0.0001 levels, respectively.

Table 5. Effect of Power Perk treatments and sampling date on soil penetrometer resistance for first-stubble cane in 2001.

T#	Power Perk	Sampling date	
		August 28	October 11
	G/A	---------lb/in.^{2}----------	
1	0 - furrow to furrow	286	498
2	10 - " " "	276	473
3	20 - " " "	292	483
4	30 - " " "	292	466
5	5 in furrow +5 over row top	280	504
6	10 in furrow + 10 over row top	277	461
LSD 0.10 for treatment within sampling date		NS	NS
LSD 0.25 " " " " "		NS	NS

NS denotes non significance at the indicated P level.

Table 6. F-values and statistical parameters for effect of Power Perk application rates and placement on soil moisture for first-stubble cane in 2001.

Source	df	soil moisture
main-plots		
Treatments (T)	5	0.99
HREP	5	0.73
VREP	5	0.59
sub-plots		
Date (D)	1	351.81****
TxD	5	0.76
RMSE for main-plots		1.525
% CV " " "		7.18
RMSE for main-plots		2.255
% CV " " "		10.61
Mean		21.25

**** denotes statistical significance at the P#0.0001 level.

Table 7. Effect of Power Perk treatments and sampling date on soil moisture in 2001.

T#	Power Perk	Sampling date	
		August 28	October 11
	G/A	------------%-------------	
1	0 - furrow to furrow	25.9	15.7
2	10 - " " "	26.9	15.1
3	20 - " " "	26.3	15.3
4	30 - " " "	26.3	16.9
5	5 in furrow + 5 over row top	26.5	16.7
6	10 in furrow + 10 over row top	26.2	17.7
LSD 0.10 for treatment within sampling date		NS	NS
LSD 0.25 " " " " "		NS	NS

NS denotes non significance at the indicated P level.

EFFECT OF NITROGEN FERTILIZER RATE AND TIMING ON PLANT CANE YIELD VARIABLES

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Ricky Judice
Iberia Parish Sugarcane Producer

SUMMARY

Nitrogen fertilizer rates (60, 120, and 180 lb N/A) were applied to LCP 85-384 plant cane at four different dates (mid-February, mid-March, mid-April, and mid-May) in 2001. Nitrogen fertilizer applied in mid-March produced as much sugar yield as when nitrogen was applied in mid-April. Nitrogen fertilizer rates did not affect (P$0.25) plant cane sugar yields in the first year of our study.

INTRODUCTION

The recommended time for applying nitrogen fertilizer in Louisiana is April to mid-May. However, this recommended date for nitrogen fertilization was derived with sugarcane varieties that are no longer grown in Louisiana. Consequently, research is needed to determine if the optimal time for applying nitrogen is still applicable for the varieties now grown.

Also, recent research indicates that LCP 85-384 may require less than the recommended nitrogen rate for plant cane and first-stubble. We also need to know if there is an interaction between nitrogen application date and nitrogen fertilizer rates.

OBJECTIVES

1) To determine the optimal date for nitrogen application to sugarcane in Louisiana for variety LCP 85-384.

2) To determine the optimum nitrogen rate for LCP 85-384.

3) To determine if split applying nitrogen increases sugar yields of LCP 85-384.

MATERIALS AND METHODS

A nitrogen fertilization date by nitrogen application rate study was initiated with LCP 85-384 plant cane in 2001. The study was planted in August of 2000 using first-progeny Kleentek at three stalks and a lap of two joints.

The experiment used a Latin square, split-plot design with four replications. The main plots were application dates (mid-February, mid-March, mid-April, and mid-May); sub-plots were

nitrogen fertilizer rates (60, 120, 180 lb N/A, plus a 60-60 split where half of the N was applied in mid-June). Experimental plots consisted of three 5-foot 10-inch by 50-foot rows with a 10-foot alley at the ends of the plots. There were also three border rows between each plot fertilized at the recommended fertilizer rate in April.

Sugarcane was grown till maturity (December 10) and harvested with a two-row soldier harvester and the research plots were weighed with a weigh rig. Ten stalks were taken from each plot for sucrose analysis. Plant populations were determined in September of 2001 for each plot.

RESULTS AND DISCUSSION

Table 1 shows that dates of nitrogen application affected (P<0.10) cane yields, but did not affect the other plant cane yield variables. Nitrogen fertilizer rates also did not affect (P$0.10) the yield variables, except for plant population. The application date by nitrogen rate interaction was not significant (P$0.10) for any of the yield variables. The low % CVs for the variables in the test indicate that the experimental design did a good job of removing variability from the study.

Table 2 shows that the mid-March and mid-April fertilizer dates yielded essentially the same cane tonnage and significantly (P#0.10) more tonnage than at the mid-February and mid-May fertilization dates. Likewise, the mid-March date yielded as much sugar as the mid-April fertilization date, indicating that it may be possible to fertilize a little earlier than what is recommended.

Nitrogen fertilizer rates had little effect on the plant cane yield variables (Table 3), except where the 120 and 180 lb N/A rates increased (P#0.10) plant population relative to the other treatments.

Table 1. F-values and statistical parameters for effect of nitrogen application dates and rates on plant cane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main-plots</u>						
Dates (D)	3	0.31	0.80	3.04	4.55~	1.77
HREP	3	0.51	2.58	1.37	0.70	0.37
VREP	3	2.95	5.10*	5.09*	5.33*	2.59
Rates (R)	3	0.48	3.16*	0.69	0.44	1.21
D x R	9	1.22	1.48	0.72	1.08	1.05
RMSE for main-plots		0.1975	3,750	7.171	2.478	623.1
% CV for main-plots		10.41	6.97	3.14	7.86	8.67
RMSE for sub-plots		0.1548	3,176	9.916	2.338	567.9
% CV for sub-plots		8.15	5.90	4.35	7.42	7.91
Mean		1.898	53,810	228.1	31.54	7183

, ~, and *, denote statistical significance at the P#0.25, 0.10, and 0.05 levels, respectively.

Table 2. Effect of nitrogen fertilization date on plant cane yield variables.

Fertilization date	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
	lb/stalk	1000/A	lb/T	T/A	lb/A
mid-Feb.	1.92	54.0	230	30.9	7100
mid-March	1.86	54.5	226	32.6	7360
mid-April	1.92	54.2	225	32.7	7340
mid-May	1.90	52.6	231	30.0	6930
LSD 0.10	NS[%]	NS	NS	1.7	NS
LSD 0.25	NS	NS	3	1.1	NS

[%]NS denotes that the means of the indicated variable was not statistically different at the indicated significance levels.

Table 3. Effect of nitrogen fertilizer rate on plant cane yield variables.

Fertilization rate	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
lb N/A	lb/stalk	1000/A	lb/T	T/A	lb/A
60	1.91	52.5	231	32.0	7380
120	1.89	54.8	226	31.3	7020
180	1.87	55.3	228	31.7	7230
60-60[P]	1.93	52.7	228	31.2	7100
LSD 0.10	NS[3]	1.9	NS	NS	NS
LSD 0.25	NS	1.3	NS	NS	NS

[3] NS denotes that the means of the indicated variable was not statistically different at the indicated significance level.
[P] Half of the total nitrogen rate (60 lb N/A) was applied in mid-June.

EFFECT OF N-HIB CA FERTILIZER AND NITROGEN FERTILIZER RATES ON PLANT CANE YIELD VARIABLES

W.B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

SUMMARY

N-hib Ca and nitrogen fertilizer rates did not affect ($P \geq 0.10$) stalk weights, plant populations, cane yield, sugar yield, or soil moisture in 2001. However, applying 120 lb Ca/A in a narrow one-inch band in the row furrow as aqua-cal did decrease ($P \leq 0.10$) CRS.

INTRODUCTION

Previous research at the Iberia Research Station shows that including liquid calcium-chloride (N-hib Ca) in a liquid urea fertilizer program can result in increased sugar and cane yields. This research follows up that research and also looks at the effect on yields of spraying different rates of liquid urea and liquid N-hib Ca fertilizer rates on sugarcane combine residue.

OBJECTIVES

1) To compare urea sources, combinations, and rates on sugarcane yields.

2) To determine the effect of applying N-hib Ca plus urea to combine harvest residue on sugarcane yields vs. burning the residue and applying urea in the spring.

MATERIALS AND METHODS

LCP 85-384 sugarcane (Kleentek) was planted in September 2000 at three stalks and a lap of two joints in a 7x7 Latin square experimental design using the treatments listed in Table 2. Experimental plots consisted of three 5-foot 10-inch by 60-foot rows with 10-foot alleys at the ends of the plots. All plots were separated by three border rows on each side of the plot.

Half of the nitrogen from T #7 was applied on Feb. 5, 2001 in a narrow 1-inch band in the furrow on both sides of each of the three rows in the plot. The remaining half of the nitrogen was applied on June 14, 2001, along with the other fertilizer treatments (Table 2).

All the plots were grown till maturity using standard cultural practices. Plant populations were determined in September 2001. The plots were harvested on December 3, 2001, with a combine harvester and a portable weight wagon. Ten stalks were taken from the center row of each plot to determine average stalk weight and CRS.

RESULTS AND DISCUSSION

Tables 1 and 2 show that the experimental treatments did not affect (P$0.10) the measured yield variables, except for CRS.

Table 2 shows that applying aqua-cal (calcium hydroxide) in a narrow 1-inch band resulted in decreased CRS compared to T #5. This may have been because of the high pH of the calcium hydroxide.

Table 1. F-values and statistical parameters for effect of nitrogen fertilizer rates and sources on LCP 85-384 plant cane yield variables and soil moisture.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield	Soil moisture
Treatments	6	0.37	1.37	2.52*	0.78	1.46	1.82
HREP	6	1.58	5.57***	2.11~	8.13****	5.33***	4.34*
VREP	6	0.36	2.15~	2.79*	0.88	0.52	0.97
RMSE		0.2259	2,584	8.476	3.467	839.2	0.9204
% CV		11.34	5.65	3.76	11.60	12.46	4.29
Mean		1.992	45,700	225.6	29.89	6,735	21.44

, ~, *, **, ***, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, 0.001 and 0.0001 levels, respectively.

Table 2. Effect of nitrogen fertilizer rates, N-hib Ca, and aqua-cal on plant cane yield variables and soil moisture.

T#	Urea[1]	N-hib Ca[2]	aqua-cal[2]	aqua-cal[2]	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield	Soil moisture
	lb N/A	lb Ca/A	lbN/A	lb Ca/A	lb/stalk	1000/A	lb/T	T/A	lb/A	
1	60	0	0	0	1.94	47.3	224	31.1	6920	21.3
2	120	0	0	0	1.97	44.3	224	29.3	6550	21.8
3	180	0	0	0	1.99	45.7	230	30.3	6940	21.2
4	60	20	0	0	2.07	44.5	225	29.4	6610	20.7
5	120	40	0	0	2.03	45.1	228	30.9	7030	21.8
6	180	60	0	0	2.01	46.2	232	30.5	7090	21.2
7	60	20	60	120	1.93	46.8	217	27.8	6000	22.1
LSD 0.10					NS	NS	8	NS	NS	NS
LSD 0.25					NS	NS	5	NS	530	0.6

[1]Liquid urea and N-hib Ca treatments were applied to the inside of the rows on June 14, 20001.
[2]Aqua-cal was applied to the inside and outside furrows of all three rows in the plot on February 5, 2001.

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

W. B. Hallmark[1], G.J. Williams[1], and G.L. Hawkins[2]
Iberia Research Station[1] and Sugar Research Station[2]

Ronald Gonsoulin
Iberia Parish Sugarcane Producer

SUMMARY

Mixing 1 T/A and 2 T/A of calcium silicate slag into soil before planting or placing 1 T/A of slag under cane at planting resulted in significantly higher (P#0.10) sugar yields compared to the check. However, mixing 1 and 2 T/A of calcitic lime into the soil before planting did not increase (P$0.10) sugar yields relative to the check. The fact that sugar yields were higher where the slag was mixed into the soil vs. where lime was mixed into soil indicates that the yield response obtained from the slag was because of its silica content and not its ability to change soil pH. The increase in yields with application of slag was associated with higher levels of monosilicic acid concentration of soil.

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 (more than 100 lb/A each year) from soil. Monosilicic acid is used rapidly 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 2. 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 analyses 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 on November 27, 2001, 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

Research results from the calcium silicate slag and calcitic lime study on a Jeanerette silty loam soil using LCP 85-384 plant cane showed that mixing 1 T/A of silicate slag into soil before planting resulted in a significant ($P<0.10$) increase (17%) in sugar yields (1080 lb sugar/A) compared to where the slag was not added (Table 2). Furthermore, mixing 1 T/A of calcitic lime into soil did not result in an increase in sugar yields, and the 1 T/A slag treatment produced 690 lb sugar/A more ($P<0.10$) than did the 1 T/A calcitic lime treatment. This clearly indicates that the yield response from the calcium silicate slag was caused by the addition of silica and was not caused by the addition of calcium or a change in soil pH.

In addition to the effect of silica on sugar yields, it also increased (P#0.10) cane tonnage relative to the check (Table 2; T#'s 4,5, and 6 vs. T1) and cane yields for the slag treatments relative to the lime treatments (T4 vs. T2 and T5 vs. T3). Likewise, the slag treatments mixed into the soil produced heavier (P#0.10) stalk weights compared to the check (T4 and T5 vs. T1) and the two lime treatments (T4 vs. T2 and T5 vs. T3). However, placing 1 T/A of slag under the cane at planting (T6) did not increase (P#0.10) stalk weights relative to the check (T1) or the two lime treatments (T#'s 2 and 3).

The experimental treatments did not affect (P$0.25) plant populations or lodging (Tables 1 and 2). However, the 2 T/A slag rate resulted in higher CRS (T5 vs. T1), but placing 1 T/A of slag under cane at planting produced lower CRS compared to T #'s 2, 3, 4, and 5.

Table 3 shows that the experimental treatments had a very significant (P#0.0001) effect on monosilicic acid content of soil (Table 4). All treatments receiving calcium silicate slag (T #'s 4, 5, and 6) had higher monosilicic acid concentrations than treatments (T #'s 1, 2, and 3) not receiving the slag.

While plant silica was not significantly (P$0.10) affected by the experimental treatments (Table 1), there was a trend (P#0.25) toward higher plant silica levels for treatments 5 and 6 (Table 4).

Table 1. F-values and statistical parameters for effect of calcitic lime and calcium silicate slag rates and placement on LCP 85-384 plant cane yield and growth variables on a Jeanerette silt loam soil.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield	Lodging
Treatments	5	5.16^{**}	1.34	3.07^{*}	5.77^{**}	4.15^{*}	0.68
HREP	5	$2.55^{\sim}$	1.16	1.00	0.94	2.18	1.44
VREP	5	2.72^{*}	1.46	0.89	4.77^{**}	4.78^{**}	0.49
RMSE		0.1918	4241	9.791	2.672	554.3	1.025
% CV		9.71	7.38	4.47	8.50	8.07	72.33
Mean		1.976	57,450	218.9	31.45	6864	1.417

, $^{\sim}$, *, and ** denotes statistical significance at the P#0.25, 0.10, 0.05, and 0.01 levels, respectively

Table 2 . Effect of calcitic lime and calcium silicate slag rates and placement on LCP 85-384 plant cane yield and growth variables on a Jeanerette silt loam soil.

T#	Lime	Silica slag	Placement[1]	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield	Lodging[3]
	T/A	T/A		lb/stalk	1000/A	lb/T	T/A	lb/A	
1	0	0	-	1.90	54.9	215	28.9	6,230	2.0
2	1	-	mixed into rows	1.75	57.9	222	29.7	6,620	1.5
3	2	-	mixed into rows	1.97	57.6	224	28.0	6,290	1.0
4	-	1	mixed into rows	2.14	55.1	218	33.5	7,310	1.3
5	-	2	mixed into rows	2.23	57.9	227	31.9	7,220	1.5
6	-	1	placed under cane	1.88	60.6	207	35.5	7,330	1.2
LSD 0.10				0.19	NS	10	2.8	580	NS
LSD 0.25				0.13	NS	7	1.9	390	NS

[1]Soil test indicated that silica was critically (13.5 ppm) deficient. 0-20 ppm = critically deficient; 20-40 ppm = deficient.
[3]Lodging was rated on a 1-5 scale, where 1 had all plants erect and 5 had all plants lodged.

Table 3. F-values and statistical parameters for effect of experimental treatments on monosilicic acid concentration of soil and Si concentration of plant leaf tissue.

Source	df	Monosilicic acid	Plant silica
Treatments	5	9.83****	1.84
HREP	5	5.16**	0.41
VREP	5	2.05	0.23
RMSE		1.434	0.2290
% CV		9.12	15.20
Mean		15.72	1.506

, **, and **** denotes statistical significance at the P#0.25, 0.01, 0.0001 levels, respectively.

Table 4 . Effect of experimental treatments on monosilicic acid concentration of soil and silica concentration of sugarcane leaves.

T#	Lime	Silica slag	Placement[1]	Monosilicic acid	Plant silica
	T/A	T/A		ppm	%
1	0	0	-	13.4	1.39
2	1	-	mixed into rows	14.2	1.42
3	2	-	mixed into rows	14.8	1.38
4	-	1	mixed into rows	16.8	1.53
5	-	2	mixed into rows	17.9	1.64
6	-	1	placed under cane	17.3	1.67
LSD 0.10				1.4	NS
LSD 0.25				1.0	0.16

IMPACTS OF PAPER MILL PRIMARY CLARIFIER SLUDGE ON SUGAR CANE PRODUCTION AND YIELDS

R. Hendrick[1], B. L. Legendre[2], K. P. Bischoff[3], and K. A. Gravois[3]
Agronomy Department[1], St. Gabriel Research Station[2], and Sugar Research Station[3]

Most Louisiana agricultural soils are low in organic matter content. Increasing organic matter content will increase water and nutrient-holding capacity, improve water percolation through the soil, improve tilth, and reduce erosion. These factors can cause improved plant survival and growth. The result can be increased yields with lowered fertilizer requirements and less soil, pesticide and nutrient loss in runoff.

Paper mills collect large volumes of short fiber (sludge) from the paper-making process in their waste water 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 they produce. It appears to be a good candidate as an amendment to increase soil organic matter contents in the production of sugar cane.

A study was initiated at the St. Gabriel Research Station in the fall of 2000 using paper mill sludge applied in the open furrow, planting the seed cane, and closing the furrow. The sludge was applied at 0, 10, and 20 tons per acre using a Ty-Crop® Spreader. Fall fertilizer was applied at 0 and the recommended rate of 15-45-45 after planting to each sludge application rate creating the first of the two split-plot levels. The second split occurred with the spring fertilizer applications where each of the six previous treatments was subdivided into three plots for the application of 0, 80, and 160 pounds per acre of N in the form of ammonium nitrate. Each of the 18 treatments was replicated four times. Normal agronomic and pest control practices were followed.

The plots were harvested with a sugarcane combine harvester on December 3, 2001. Plots weights were recorded using a 3.5-ton weigh wagon, which had load cells to record the weights. A 10-stalk sample was taken for sucrose analysis. Tons of cane per acre were estimated from plot weights, and pounds of recoverable sucrose per ton of cane were estimated from Brix and pol readings. Sugar per acre was calculated as the product of cane yield and recoverable sucrose per ton of cane. The data were analyzed with the PROC MIXED procedure of SAS (v. 8.2).

There were no significant differences between treatments or combination of treatments for tons of cane per acre, sugar per ton, or sugar per acre. Average yields of cane ranged from 43.2 to 44.1 tons per acre. Sugar per ton averages ranged from 190 to 197 pounds per ton. Sugar per acre ranged from 8,210 to 8,684 pounds per acre.

Since there were no decreases in yield from the un-stabilized organic amendment the responses are considered to be positive and the study will be continued. Research with compost applications on other crops normally does not show significant yield increases until the second year.

This study was carried out with funds derived from a grant from Integrated Technical Services of Baton Rouge.

Table 1. Mixed model analysis of fixed effect terms for the Paper Mill Sludge test conducted at the St. Gabriel Research Station during 2001.

Source	Num df	Den df	Sugar per acre	Tons per acre	Sugar per ton
				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 2. Treatment means for the paper mill sludge experiment conducted at the St.Gabriel Research Station during 2001.

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

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

Nitrogen Rate	Sugar per acre lbs/ac	Tons per acre Tons/ac	Sugar per ton lbs/ton
0-0-0	8549	44.1	194
80-0-0	8358	44.1	190
160-0-0	8445	43.2	196
Significance (P=0.05)	NS	NS	NS

EFFECT OF MULCH RESIDUE ON THE USE OF ALTERNATIVE HERBICIDES AND SUGARCANE YIELD[1]

H. M. Selim, R. L. Bengtson, J.L. Griffin, L. Zhou, and H. Zhu
Agronomy Department

INTRODUCTION

The effect of surface crop residues on interception, subsequent wash-off, and movement of herbicide in the soil profile is the primary focus associated with conservation measures in today's agriculture. Various forms of soil conservation are highly recommended in an effort to reduce soil losses and runoff of applied agricultural chemicals. Conservation production systems are characterized by the presence of mulch residue left on the soil surface to protect it from water and soil erosion.

Over the last five years, the sugarcane industry has shifted toward an alternative harvesting system. The traditional harvest system involves the use of soldier harvesters where the whole stalks of sugarcane plants are cut, piled, burned, picked up, and transported to the mill. The new system involves the use of a combine harvester that cuts the cane stalks into billets, which are directly loaded into wagons for transport to the mill. Extractor fans in the combine separate leaf-material from billets and deposit the plant residue on the soil surface. However, the mulch produced from the leaf material and plant residue is believed to promote disease and low yields in the next crop. As a result, burning the leaves off the whole stalks prior to harvest or burning of the residue on the soil surface following harvest are measures to reduce their impact on disease and/or possible yield reduction.

Burning of the residue prior to or following harvest is a major environmental air-pollution concern. Therefore, there is considerable interest in the impact of plant residue or mulch cover on weed controls, diseases, and insects. Numerous studies on several crops have shown that crop residue or surface mulch can enhance control of weeds and in reducing herbicide losses. This information is essential for the implementation of control measures or corrective actions needed to reduce herbicide leaching and sediment losses from crop lands and thus reducing watershed's total maximum daily loads (TMDLs).

OBJECTIVES

Generation of a viable, effective management practice that prevents atrazine movement to groundwater and surface water is necessary. The combination of a management practice that protects water quality, avoids the burning of the combine harvester trash, and maintains the use of atrazine would be optimal. The specific objectives are:

- Compare the concentration of atrazine in surface water runoff from sugarcane grown under conventional sugarcane practices and best management practices (BMPs).

---

[1] This study was supported in part by a grant from Louisiana Department of Environmental Quality Non-Point Source Program (section 319), Jan Boydstun, project officer.

- Obtain quantifiable surface water data on the concentrations of atrazine and metribuzin present in surface runoff and the amounts remaining in the soil when the best management practices are used. This information will lead to understanding and implementation of corrective actions needed to reduce herbicide off-target movement from sugarcane fields.

- Make a recommendation on a BMP that is effective on significantly reducing atrazine runoff.

EXPERIMENTAL METHODS

The experimental site is located at the St. Gabriel Research Station of the Louisiana State University Agricultural Center. The experimental site was approximately 3.5 acres (1.5 ha), and the soil was classified as a Commerce silt loam (Aeric Fluvaquent, fine-silty, mixed, nonacid, thermic). In 1997, the land was rowed and prepared for 6-foot rows (1.8-m spacing) where six plots (two replications x three treatments) running east to west were outlined with levees on each side of each treatment (see Figure 5). Recent planting of sugarcane variety CP70-321, a major variety for Southern Louisiana, was chosen, and planting was completed in September 1997.

At the lowest part (north-east corner) of each plot, we installed sumps (corrugated, galvanized culverts, 36 inches in diameter and 6 1/2 feet in depth, approximately 0.92 m I.D., and 2 m in length. A plate (sheet metal 1/16-inch thick) was welded at the bottom of each sump. A hole was dug and subsequently backfilled following installation of the sumps, and the remaining soil was used to close the levees surrounding each plot. Additional earth moving was carried out to ensure that each plot was completely leveed and that runoff water was collected into each sump through a V-type opening. In each sump, a water-pump connected to a flow meter was also installed. As a result, the only outlet for surface runoff water was through the pump and flow meter and exiting into the levees between plots. Adjacent to each sump, we placed an ISCO water sampler and connected the sampler tubing and sensors to each sump by placing the sampler cup and a sensor at the bottom of each sump. Sample collection was triggered when the sensor placed in the sump detected runoff water.

For the preceding growing season, the sugarcane at the St Gabriel site was harvested on December 7, 1999. We harvested plots 1, 3, 5, and 6. Then we burned plots 2 and 4 with the sugarcane standing. Then we harvested plots 2 and 4. We measured the amount of mulch residue on the soil surface for all plots. No herbicides were applied or cultural operations carried out during the winter following harvest . In early spring (February 25, 2000), all plots were cultivated. Cultivation included row middles that were off-barred and the top of the rows remained undisturbed.

Herbicide Applications:

On April 7, 2000, all plots were sprayed according to the map below with metribuzin at the rate of 0.9 lb/acre of active ingredient on plots 3 and 5. All other plots received atrazine at the rate of 1 lb/acre of active ingredient. All herbicides were applied on a 36-inch band on top of the rows as described earlier. In addition, all plots received 2,4-D at the rate 1 quart/acre (active ingredient). Layby application was carried out on June 5 for all plots. This layby application consisted of broadcast atrazine application of 2 lb/acre (active ingredient) throughout the entire field.

RESULTS AND DISCUSSION

Runoff and Rainfall:

During 2000 at the St. Gabriel site as well as south Louisiana, rainfall was considerably below of normal. This resulted in no runoff being collected during the 2000-growing season. The total rainfall (in inches) for 2000 was 40.48, which represents 71% of normal and third driest year in history

Surface Mulch versus Time:

To assess the impact of the presence of a surface mulch residue on the retention of herbicides, the amount of mulch was measured. First, we measured the amount of mulch residue left on the field for each plot following harvest (December 7, 1999) using the combine harvester. Four plots were harvested, and the mulch was not removed. The other two plots were burned with the sugarcane standing prior to harvest. Four additional measurements were made during January, April and May, and August. Because of the disappearance/decay of the residue, no additional sampling was made thereafter. The average amount of mulch on the surface of the no-burn plots decreased continuously from a high of 8.04$\pm$2.12 tons/acre on December 7, 1999 to a low of 1.66$\pm$0.32 on August 18, 2000 (see Table 1). The mulch results are given in Figure 51 along with one standard deviation. It is of interest to point out that the measured amount of mulch during 1999, at another site south of Baton Rouge was well within that measured during 2000 as shown in Figure 1.

Weed Assessment:

Weed assessment for all plots were carried out several times during the growing season prior to spring application of herbicides and following layby application. The following are notes from Dr. Griffin's visits.

Visual assessment of the experimental plots was made on the following dates: March 29, April 24, June 12, August 1, and August 30, 2000. At each of these dates, notes were made with regard to amount of mulch remaining on the row tops, weed control, and crop response.

March 29, 2000: In the burn plot treatments (plots # 2 and 4), there was very little mulch residue on the soil surface. Annual ryegrass, sow thistle, rescue grass, timothy grass, and Virginia pepper weed were present in significant quantity. This was in direct contrast with the other no-burn plot treatments (plots # 1, 3, 5, and 6), where mulch did an excellent job of suppressing weed growth. Cane plants were emerging in all plots at this rating. On April 7, plots were off-barred and sprayed according to the designated treatment. Additionally, 2,4-D was applied to the entire experimental area.

April 24,2000: Winter broadleaf weeds, of which the predominate species was sow thistle, were controlled at least 95% by the 2,4-D application. Grass weeds were unaffected by the herbicide treatments. Timothy grass and rescue grass were naturally maturing, with most plants dead. In contrast, annual ryegrass was headed and just at the flowering stage, but plants were still green. Cane was actively growing and not negatively affected by the herbicide treatments. Cane mulch residue was visible on the surface of row tops and was continuing to suppress weed emergence.

June 12, 2000: Weed control in all plots was considered very good. Annual ryegrass had matured, and dead plants were present. Cane had been worked (layby), was actively growing, and not negatively affected by the herbicide treatments. Cane shoot population did not seem to vary among the herbicide treatments.

August 1, 2000: It was difficult to denote much difference in regard to specific treatments. In all plots, weed control was considered very good. Annual ryegrass that had already died and dried up was still present in some plots. Very few weeds had emerged on the row tops or row middles since the cane had been cultivated at layby and treated with atrazine. There was some evidence of triazine injury on emerging morningglories. Based on visual observations alone, it is estimated that stalk populations in late August as well as cane yields were equivalent for all treatments (see separate section on yields and stock counts) section.

Overall Weed Evaluation:

Weed control and sugarcane growth were not negatively affected by mulch present on the soil surface. Weeds were controlled with atrazine whether or not mulch was present. Avoidance of the off-barring tillage operation in the spring did not negatively affect the efficiency of cultivation or herbicide application at layby. As would be expected, sugarcane yields did not appear to be affected by either mulch management, tillage program, or herbicide application.

Previous LSU AgCenter research has shown that mulch distributed on the field during the combine harvesting operation can delay sugarcane emergence and growth in the spring, but also can be positive in delaying weed emergence. A standard practice among growers is to remove the mulch from the row tops during the winter or early spring by burning or by mechanical removal. Another common practice is not to allow mulch to be deposited on the soil surface by burning the standing cane prior to harvest to remove extraneous leaf material. All of these methods accomplish the same goals of preventing mulch from interfering with cane growth in the following crop year and of preventing mulch from delaying the drying of fields and subsequent tillage operations in spring. Mulch cover during the winter months, however, can be positive in helping to prevent freeze damage of sugarcane during severe winters and in reducing soil runoff losses.

From a practical viewpoint, unless there is a ban on burning, growers who harvest cane with combines will either burn the cane standing prior to harvest or come in after harvest during December or January and burn the mulch after it has dried. Burning standing cane also can enhance sugar recovery by the mill. The possibility of the mulch cover delaying cane growth in spring is a major concern to growers. The benefits of the mulch in helping to minimize soil erosion and reduce pesticide movement from fields should be emphasized when considering changes in management programs.

Sugar Yield:

A primary concern prior to recommendation of a new management practice is the effect on yield. In the 2000 growing season, the sugarcane was harvested on November 19 using a combine harvester. This was carried out in a similar manner as during the previous growing season. In addition, two weeks prior to harvest, the number of stocks per 100 feet of sugarcane rows (in triplicates) was made for all six plots (see Table 2). Moreover, subsamples of sugarcane stalks were taken to the laboratory for complete sugar analysis. The table below provides the results for all three treatments: no-burn metribuzin, no-burn atrazine, and burn atrazine. Bases on our analysis, no significant differences of sugar yields (tons per acre) were observed among all three treatments (see Table 3). In fact no single parameter indicated significant differences among all treatments. Such a finding is significant and illustrates the success of the use of alternative herbicides as a best management practice (BMP) for sugar. It is important to point out that sugar yields in all plots of the second replication (plots 4, 5, and 6), lower yields were observed. Such observation was perhaps caused by higher weed infestation in this part of the southern section of field at the St. Gabriel site.

CONCLUSIONS

Under conditions where mulch was not removed, it was concluded that there was no significant difference in sugar yield among the various treatments. Specifically, the use of band application of metribuzin for spring application provided equally well weed control in comparison to atrazine and is thus recommended as an alternative pre-emergent herbicide for sugarcane in south Louisiana. Moreover, no significant differences of sugar yields (tons per acre) were observed among all three treatments. Such a finding is significant and illustrates the success of the use of surface mulch as well as metribuzin as an alternative herbicide as a best management practice (BMP) for sugarcane.

Table 1. Weight of sugarcane mulch residue in the various experimental plots (tons/acre), St. Gabriel, La., during the 2000 growing season.

Plot*	Date of measurement				
	12/17/1999	1/21/200	4/6/200	5/23/200	8/18/2000
1	9.68	8.13	6.76	6.27	1.76
2	3.63**				
3	8.47	5.84	4.97	5.47	1.74
4	1.21**				
5	7.26	5.96	7.34	5.31	1.27
6	9.08	5.50	5.20	3.84	1.88
Overall Avera	8.04	6.60	5.97	5.22	1.66
Standard Err	2.12	1.01	0.96	0.96	0.32

* Plots 1 & 6: No-burn, atrazine
Plots 2 & 4: Burn, atrazine
Plots 3 & 5: No-burn, metribuzin
** Not included in the overall average

Table 2. Stalk count (in triplicates) along a 100-feet-long segment at St. Gabriel experimental site:

Number	Average	Replicate		
Plot Label	Stalk number	1	2	3
Plot 1	464	487	444	460
Plot 2	420	420	411	430
Plot 3	417	400	450	400
Plot 4	396	437	380	370
Plot 5	447	430	410	500
Plot 6	360	330	380	370

Table 3. Sugarcane yields for the different treatments during 2000.

TREATMENT	Rep. Number	Plot Number	Number of Stalk per acre	Cane Yield tons/acre	Total solids (BRIX) %	Sucrose %	Sugar Yield lbs/ acre
No Burn Metribuzin	1	3	30,300	31.0	15.5	12.7	5483
	2	5	32500	24.4	16.1	13.5	4654
Average			31400	27.7	15.8	13.1	5069
No Burn Atrazine	1	1	33,700	34.7	15.2	12.4	5959
	2	6	26,100	17.3	15.7	13.2	3194
Average			29,900	26.0	15.5	12.8	4577
Burn Atrazine	1	2	30,500	37.0	15.8	13.2	6840
	2	4	28,700	25.9	15.6	12.9	4655
Average			29,600	31.5	15.7	13.1	5748
LSD 0.05			NS	NS	NS	NS	NS

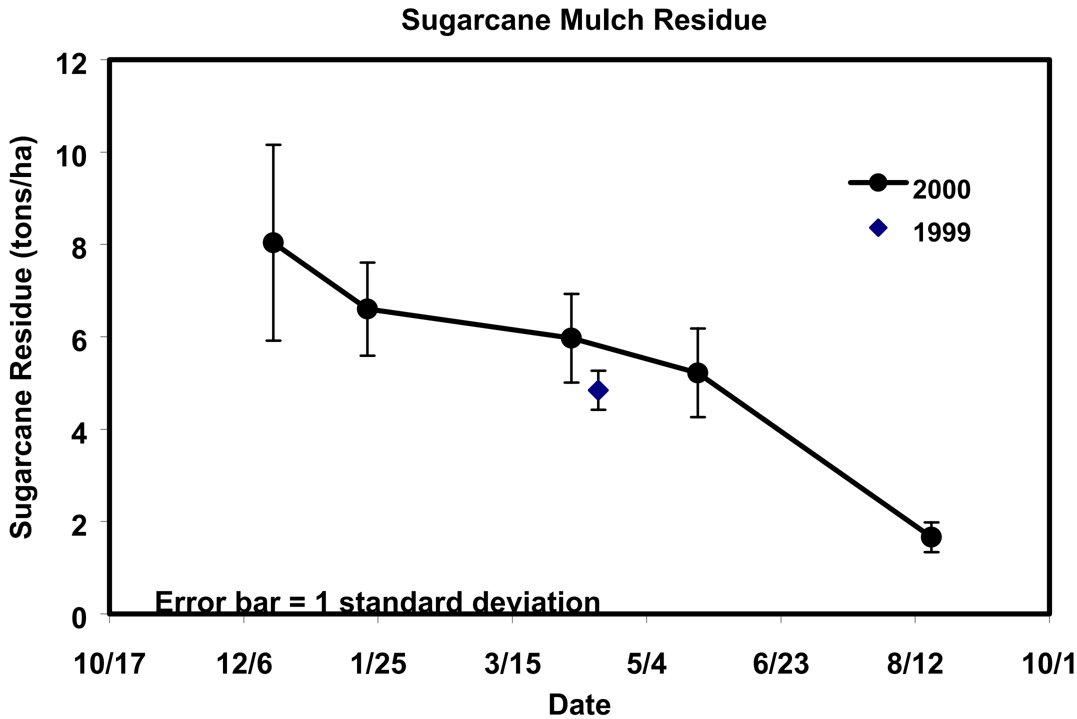


Figure 1. Amount of mulch residue remaining on the soil surface versus time during the growing season.

ATRAZINE ADSORPTION-DESORPTION BY SUGARCANE MULCH RESIDUE[2]

H. Zhu and H. M. Selim
Agronomy Department

INTRODUCTION

Various forms of soil conservation are highly recommended in continuing efforts to reduce soil losses and runoff of applied agricultural chemicals. Several conservation production systems are characterized by the presence of mulch residue left on the soil surface to protect it from water and soil erosion. In fact, numerous studies on best management practices have shown distinct advantages of minimum or no-till systems (Dao, 1991;1995, Banks and Robinson, 1982). However, we are not aware of published research that has been carried out on correlating the effectiveness of plant or mulch residue remaining on the soil surface, following sugarcane harvest, on the retention of applied herbicides, leaching losses in the runoff, and their downward movement in soil profile. We are also not aware of research efforts on the adsorption-desorption kinetics of herbicides such as atrazine or their fate during the crop's growing season as influenced by mulch residue over time following harvest. Such information is a prerequisite in quantifying the role of mulch residue in minimizing the leaching losses of applied agricultural chemicals.

MATERIAL AND METHODS

Bulk sample of sugarcane residue was collected from a private farm south of Baton Rouge on April 16, 1999, prior to application of herbicides. The residue was collected to quantify the adsorption-desorption behavior of sugarcane mulch for atrazine. The site was chosen to evaluate several BMPs, including mulch management practices, to determine their effect on herbicide retention and runoff losses. The soil was a Commerce silt loam soil (Aeric Fluvaquent, fine-silty, mixed, nonacid, thermic), and the sugarcane variety was LCP85-384. The mulch residue was dried at 55^0C for 24 hours and then cut into 1-cm sections (in length) and stored in a closed container prior to the experiments.

Atrazine adsorption-desorption by mulch residue was carried out using batch equilibration technique (Zhu and Selim, 2000). Radioactive atrazine was used as a tracer to monitor the extent of retention. Six ^{14}C-atrazine spiked having initial concentrations (C_i) of 3.37, 6.36, 12.34, 18.22, 24.30, and 30.16 μg mL^{-1} in distilled water were used. Adsorption was initiated by mixing 1 g of dried and cut sugarcane residue with 30 mL of the various atrazine concentration solutions in a 40-mL Teflon centrifuge tube. The mixtures were kept shaking and centrifuged at 500 × g for 10 minutes for each specific reaction time before sampling. A 0.5-mL aliquot was sampled from the supernatant at reaction times of 2, 8, 24, 48, 96, 192, 288, and 504 hours. 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 (504 hour). Each desorption step was conducted by replacing the supernatant with atrazine-free 0.005 M $CaCl_2$ solution and shaking for 24 hours. Six desorption

[2] This study was supported in part by a grant from Louisiana Department of Environmental Quality Non-Point Source Program (section 319), Jan Boydstun, project officer.

steps were carried out with a total desorption time of six days. After the sixth step, one further extraction using a 4:1 methonal:water 0.005 M $CaCl_2$ solution was carried out.

RESULTS AND DISCUSSION

The amount of atrazine in soil solution versus that retained by the mulch residue is presented in Figure 1. These results are for the various reaction times used and are often referred to as adsorption or sorption isotherms. In most studies, isotherms are based on 24-hour equilibration time is commonly accepted. Retention results for atrazine by the mulch residue were well described using a linear model. Specifically, for all reaction times of adsorption, the isotherms appear to be linear within the concentration range used. As a result, we obtained best-fit parameters values for the slope of the relationships shown in Figure 1 for each adsorption time. This slope is referred to as the distribution coefficient (K_d), which represents the partitioning between the amount of atrazine in the solution phase and that retained by the solid phase (see Ma and Selim, 1997).

The K_d values, which represent the affinity or strength of adsorption by the mulch residue, exhibited a gradual increase with the time for reaction, from 16.4 to 23.40 cm^3/g after 24 and 504 h, respectively (see Table 1). These results are indicative of strong kinetic behavior of atrazine adsorption by the mulch residue. The change of K_d values for the mulch residue versus time is shown in Figure 2. Such kinetic behavior is also manifested by the change in concentration versus time during adsorption by the mulch residue for the wide range of concentrations used shown in Figure 3. It is clear following the initial decrease in concentration, a gradual decrease with time was observed for the entire range. These data, when expressed in terms of the amount adsorbed versus time, clearly illustrate the kinetic of the retention mechanisms by the mulch residue (see Figure 4). The continued but slow increase of the amount sorbed is indicative of a kinetic reversible as well as irreversible reactions. Such kinetic retention is also depicted by the adsorption isotherms for the different retention times.

Values for mulch residue K_d were an order of magnitude higher than that found for the soil matrix of Commerce soil. This was expected since organic matter is the principal soil component affecting the adsorption of many herbicides in the soil environment. These results are clearly illustrated when we compare our adsorption isotherms for the soil matrix given in Figure 5 with that for the mulch residue of Figure1 to compare the extent of retention by the soil matrix. Specifically, the K_d values for the soil matrix were obtained (see Table 2). These values ranged from 2.095 to 2.352 cm^3/g after 24 and 384 h of reaction time, respectively. Moreover, the K_d values for the soil matrix exhibited limited kinetic behavior of atrazine as shown in Figure 6. In contrast extensive kinetics were observed for the mulch residue (Figure 2). Therefore, we conclude that results from our laboratory study of the retention kinetics of the mulch residue were consistent with field measurements. A distribution coefficient (K_d) for mulch residue (23.40 cm^3/g) was an order of magnitude higher than for the Commerce soil (2.352 cm^3/g).

REFERENCES

Banks, P.A., and E.L. Robinson. 1982. The influence of straw mulch on the soil reception and persistence of metribuzin. Weed Sci. 30:164-168.

Dao, T.H. 1991. Field decay of wheat straw and its effects on metribuzin and S-ethyl metribuzin sorption and elution from crop residues. J. Environ. Qual. 20:203-208.

Dao, T.H. 1995. Subsurface mobility of metribuzin as affected by crop residue placement and tillage method. J. Environ. Qual. 24:1193-1198.

Zhu, H. and H. M. Selim. 2000 Hysteretic Behavior of Metolachlor Adsorption-Desorption in Soils. Soil Sci. 165:632-645.

Table 1. Goodness of fit of the linear model for the different retention time for atrazine adsorption and desorption by the sugarcane mulch residue.

	Time (hours)	Kd (mL/g)	r^2
Adsorption	2	10.40±0.1619	0.996
	8	14.27±0.1399	0.998
	24	16.40±0.1597	0.998
	48	17.22±0.1596	0.997
	96	17.58±0.1540	0.998
	192	19.43±0.1949	0.998
	288	20.37±0.1836	0.998
	504	23.40±0.2398	0.998
Desorption	528	40.47±0.4960	0.998
	552	72.54±1.0380	0.996
	576	124.67±2.4870	0.993
	600	215.20±4.6560	0.992
	624	345.20±8.5260	0.989
	648	505.30±4.6160	0.986

Table 2. Goodness of fit of the linear model for the different retention time for atrazine adsorption and desorption by the Commerce soil.

	Time (hrs)	Kd, (mL/g)	Standard error (mg/L)	r^2
Adsorption				
	2	1.843	0.04325	0.9973
	6	1.972	0.05716	0.9958
	12	2.073	0.04707	0.9974
	24	2.095	0.0492	0.9973
	48	2.055	0.05692	0.9962
	96	2.328	0.07493	0.9948
Desorption	192	2.248	0.08431	0.993
	384	2.352	0.09246	0.9923
	408	4.856	0.2145	0.9903
	432	10.004	0.4585	0.9896
	456	19.768	0.8398	0.9911
	480	34.506	1.3956	0.9919
	504	57.807	2.6203	0.9898
	528	91.756	2.9795	0.9948

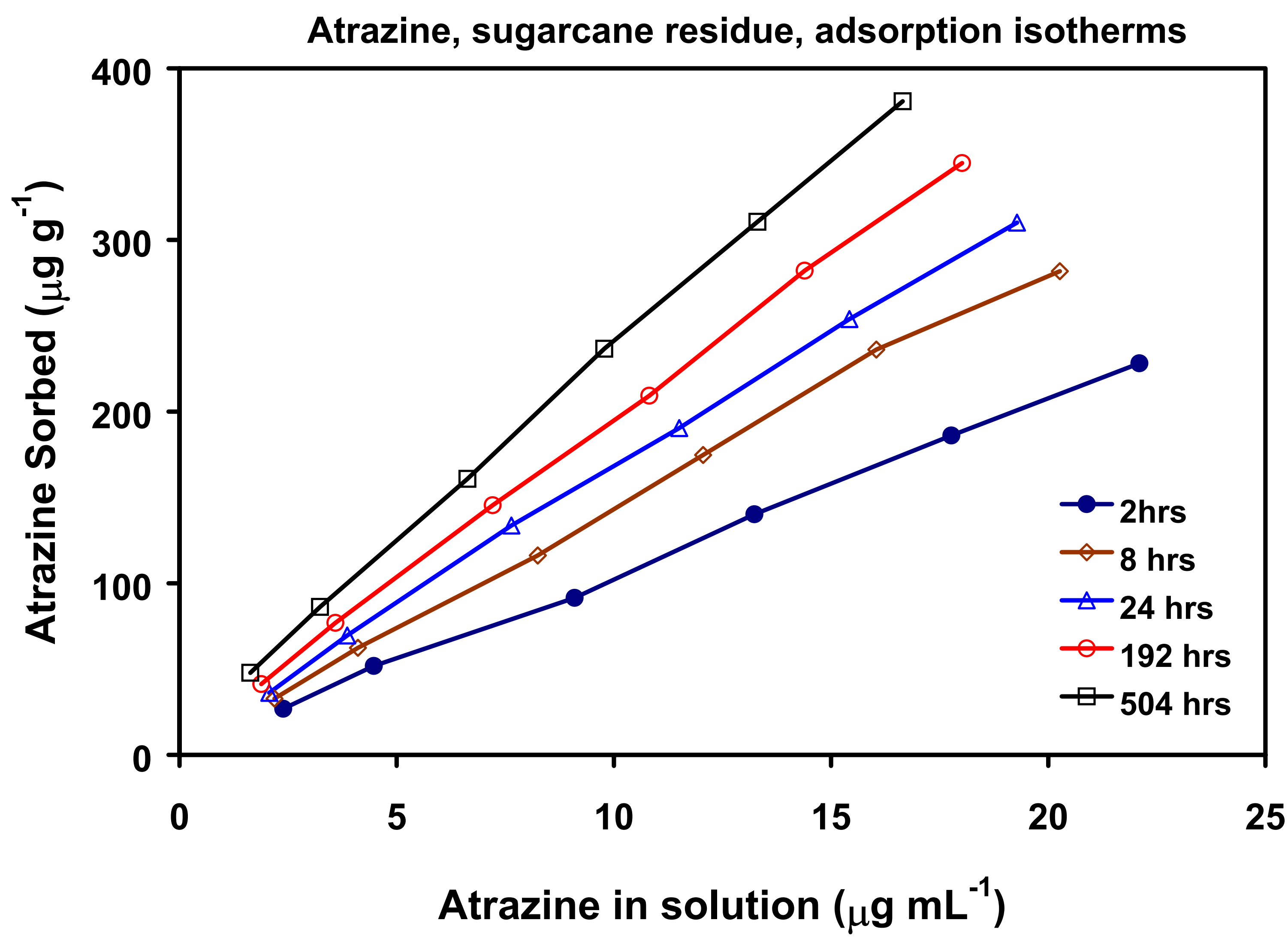


Figure 1. Atrazine adsorption isotherms for sugarcane mulch residue as a function of retention time.

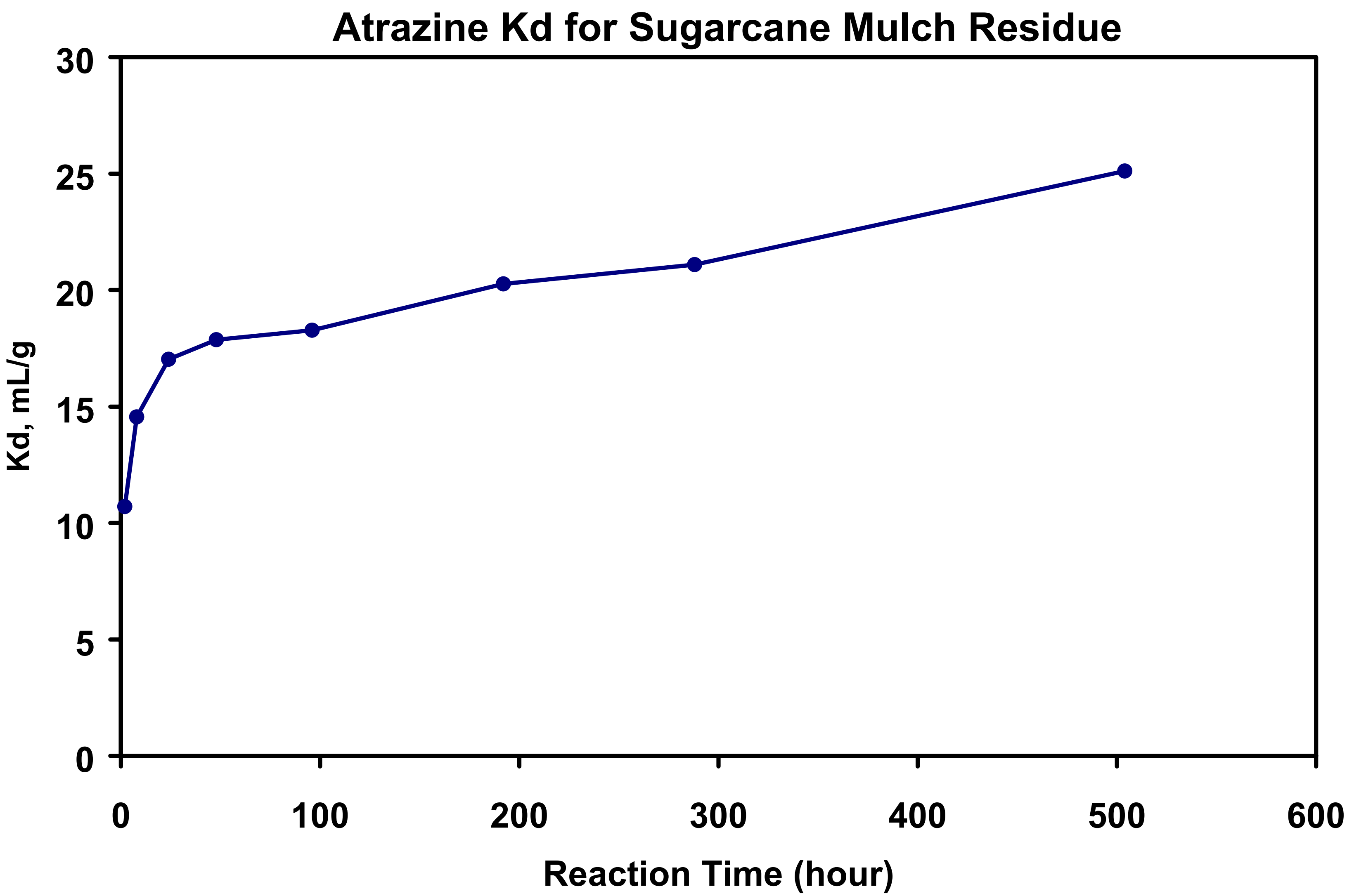


Figure 2. Measured atrazine distribution coefficient (Kd) versus reaction time for sugarcane mulch residue.

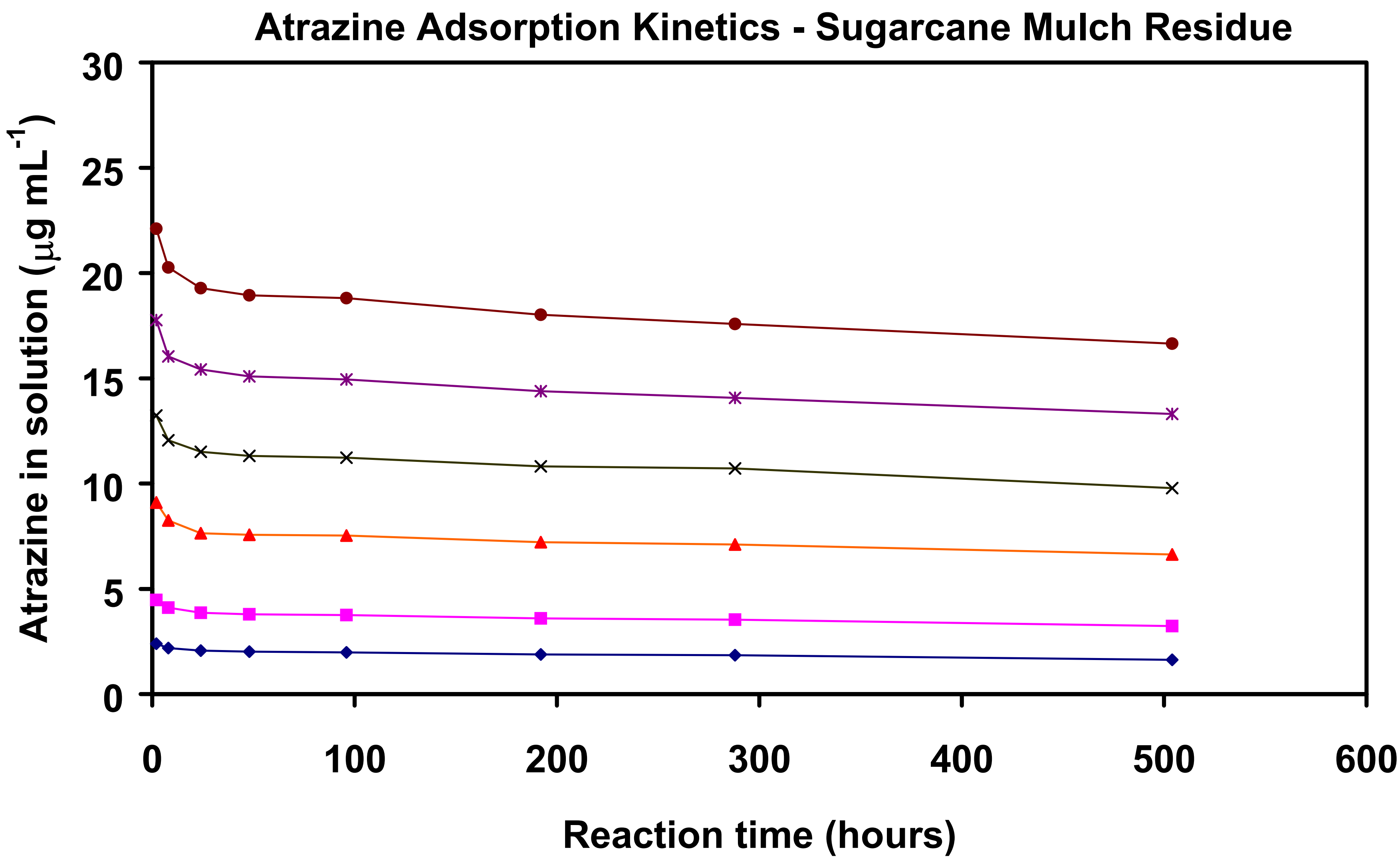


Figure 3. Measured atrazine concentration versus reaction time for different initial concentration (C_I) for sugarcane.

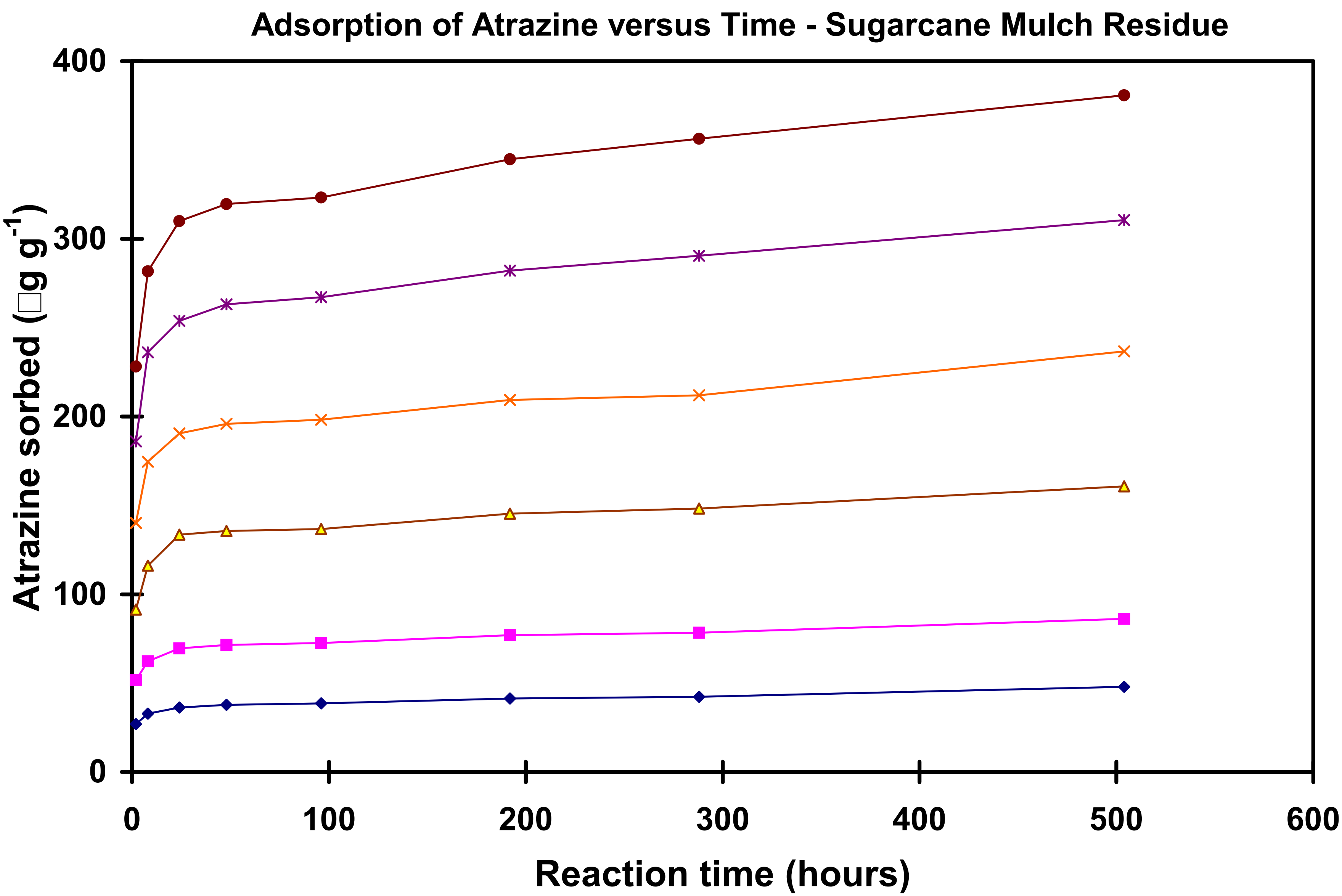


Figure 4. Measured sorbed concentration of atrazine versus reaction time for different initial concentration (C_I) for sugarcane mulch residue.

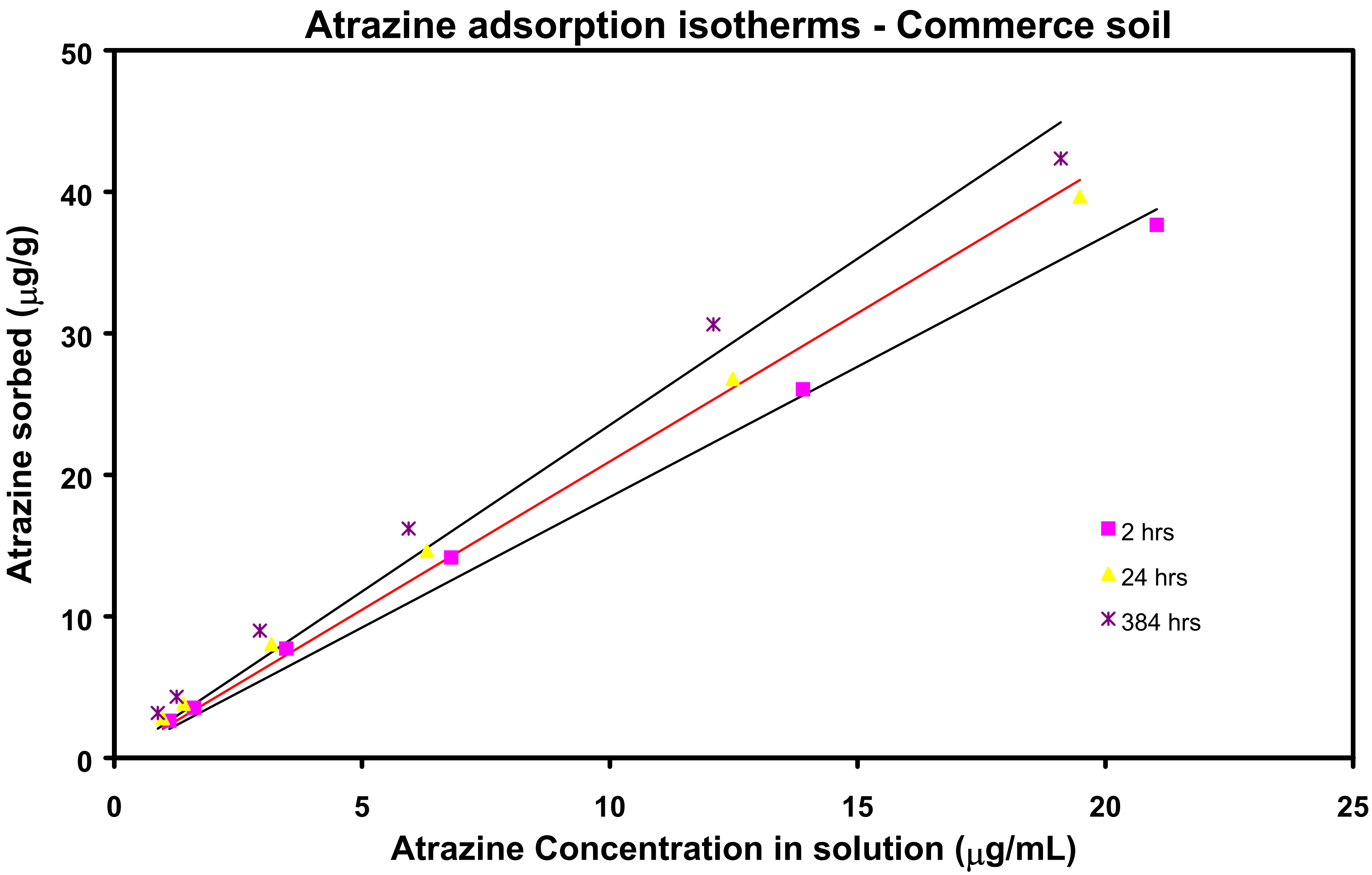


Figure 5. Atrazine adsorption isotherms at different reaction time for Commerce silt loam soil. Solid lines are the predictions using a linear model.

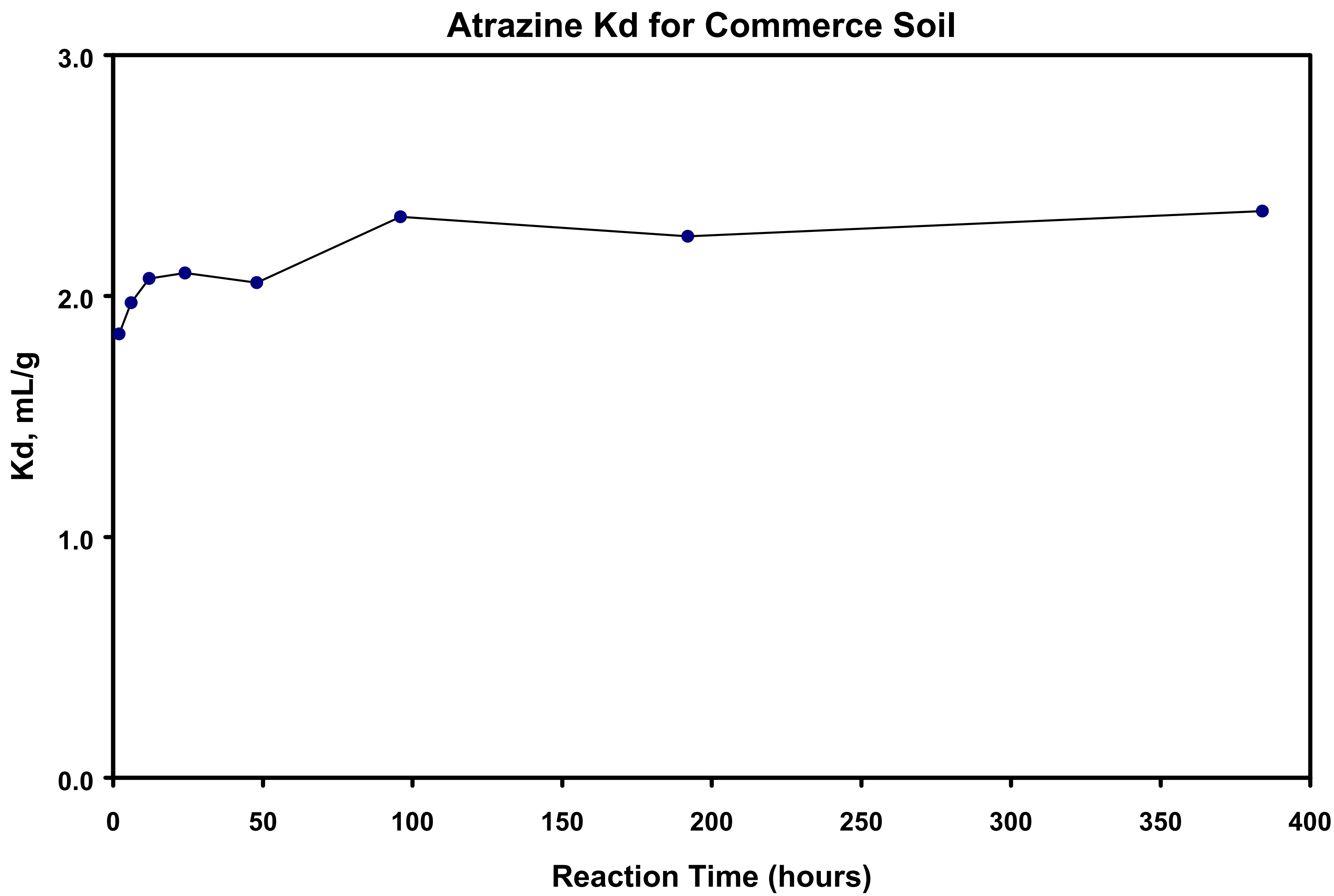


Figure 6. Measured atrazine distribution coefficient (Kd) versus reaction time for Commerce silt loam soil.

ECONOMIC RESEARCH IN SUGARCANE IN 2001

M.E. Salassi and J.B. Breaux
Department of Agricultural Economics and Agribusiness

Projected costs and returns for the various stages of sugarcane production in Louisiana were estimated for the 2002 crop year. Sugarcane producers were surveyed to update information on production and tillage practices. Input suppliers and equipment dealers were surveyed in 2001 for 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 3rd stubble for alternative yield levels are shown in table 1.

Annual ownership costs of sugarcane combine harvesters were estimated to evaluate fixed cost changes because the harvester is used over a range of harvested acreage. Two primary types of annual machinery ownership costs were evaluated, and estimates of these costs were calculated using current combine harvester purchase prices. The effect on annual ownership costs per unit of using a combine harvester over various acreage levels was evaluated with estimates of both annual cost per acre and cost per ton of sugarcane harvested (table 2). The impact of different sugarcane yield levels on annual ownership costs was also estimated (table 3).

Total planting costs per acre for sugarcane planted in 2001 were estimated for both hand-planted and machine-planted sugarcane. Total allocated planting cost includes costs for fallow and seedbed preparation, cultured seedcane, as well as harvest and expansion of seedcane. These costs represent total planting costs which would be allocated to plantcane and stubble crops. Total allocated planting costs for hand-planted cane was estimated at $623 per acre, and total planting costs for machine-planted cane was estimated at $470 per acre (table 4).

Table 1. Breakeven Selling Prices for Raw Sugar for Selected Yield Levels, Arrangements, Harvest Through Third Stubble, Tenant-Operators, Louisiana, 2002

	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	0.157	0.142	0.130	0.121	0.113
Total specified costs	0.204	0.184	0.168	0.156	0.145
Total costs plus overhead	0.240	0.217	0.197	0.182	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	0.150	0.136	0.125	0.116	0.108
Total specified costs	0.196	0.177	0.162	0.149	0.139
Total costs plus overhead	0.231	0.208	0.190	0.175	0.162

[1] Average farm yield across harvested acreage of plantcane, 1st stubble, 2nd stubble, and 3rd stubble (base yield of 40 tons plantcane, 42 tons 1st stubble, 38 tons 2nd stubble, 35 tons 3rd stubble).

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

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

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

Table 2. Estimated sugarcane combine harvester annual ownership costs over range of acreage and tonnage

Total Acres Harvested	Total Tons of Sugarcane Harvested	Annual Combine Harvester Ownership Cost	
		Cost per Acre	Cost per Ton
100	3,500	$323.85	$9.25
200	7,000	161.92	4.63
300	10,500	170.92	3.08
400	14,000	80.96	2.31
500	17,500	64.77	1.85
600	21,000	53.97	1.54
700	24,500	43.26	1.32
800	28,000	40.48	1.16
900	31,500	35.98	1.03
1,000	35,000	32.38	0.93
1,100	38,500	29.44	0.84
1,200	42,000	26.99	0.77
1,300	45,500	24.91	0.71
1,400	49,000	23.13	0.66
1,500	52,500	21.59	0.62

Annual ownership costs were estimated using a total ownership cost of $32,385 (10 year life) and a sugarcane yield of 35 tons per harvested acre.

Table 3. Impact of yield differences on annual combine ownership costs per ton of sugarcane harvested

Total Acres Harvested	Annual Combine Harvester Ownership Cost per Ton of Sugarcane Harvested		
	30 ton/acre yield	35 ton/acre yield	40 ton/acre yield
	($/ton)	*($/ton)*	*($/ton)*
300	3.60	3.08	2.70
600	1.80	1.54	1.35
900	1.20	1.03	0.90
1,200	0.90	0.77	0.67
1,500	0.72	0.62	0.54

Table 4. Sugarcane planting cost allocation for sugarcane planted in 2001.

Plantcane (planted in 2001, 2nd expansion, hand planted 5-1 planting ratio)

Year	Operation	Cost per Acre	Acres Required	Allocated Planting Cost
1999	Fallow and seedbed preparation	\$208.37	0.04	\$8.33
	Cultured seed cane	\$478.53	0.04	\$19.14
	Hand plant	\$216.14	0.04	\$8.65
2000	Fallow and seedbed preparation	\$215.86	0.20	\$43.17
	Harvest propagated seed cane (1st exp.)	\$64.00	0.04	\$2.56
	Hand plant	\$221.36	0.20	\$44.27
2001	Fallow and seedbed preparation	\$231.62	1.00	\$231.62
	Harvest propagated seed cane (2nd exp.)	\$73.91	0.20	\$14.78
	Hand plant	\$250.79	1.00	\$250.79
	Total allocated planting cost per acre of plantcane in 2002			\$623.31

Plantcane (planted in 2001, 2nd expansion, machine planted 8-1 planting ratio)

Year	Operation	Cost per Acre	Acres Required	Allocated Planting Cost
1999	Fallow and seedbed preparation	\$208.37	0.02	\$4.17
	Cultured seed cane	\$478.53	0.02	\$9.57
	Hand plant	\$216.14	0.02	\$4.32
2000	Fallow and seedbed preparation	\$215.86	0.13	\$28.06
	Harvest propagated seed cane (1st exp.)	\$64.00	0.02	\$1.28
	Mechanical plant	\$151.76	0.13	\$19.73
2001	Fallow and seedbed preparation	\$231.62	1.00	\$231.62
	Harvest propagated seed cane (2nd exp.)	\$73.91	0.13	\$9.61
	Mechanical plant	\$162.02	1.00	\$162.02
	Total allocated planting cost per acre of plantcane in 2002			\$470.38

ECONOMIC RESEARCH IN SUGARCANE IN 2001

M.E. Salassi and J.B. Breaux
Department of Agricultural Economics and Agribusiness

Projected costs and returns for the various stages of sugarcane production in Louisiana were estimated for the 2002 crop year. Sugarcane producers were surveyed to update information on production and tillage practices. Input suppliers and equipment dealers were surveyed in 2001 for 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 3rd stubble for alternative yield levels are shown in table 1.

Annual ownership costs of sugarcane combine harvesters were estimated to evaluate fixed cost changes because the harvester is used over a range of harvested acreage. Two primary types of annual machinery ownership costs were evaluated, and estimates of these costs were calculated using current combine harvester purchase prices. The effect on annual ownership costs per unit of using a combine harvester over various acreage levels was evaluated with estimates of both annual cost per acre and cost per ton of sugarcane harvested (table 2). The impact of different sugarcane yield levels on annual ownership costs was also estimated (table 3).

Total planting costs per acre for sugarcane planted in 2001 were estimated for both hand-planted and machine-planted sugarcane. Total allocated planting cost includes costs for fallow and seedbed preparation, cultured seedcane, as well as harvest and expansion of seedcane. These costs represent total planting costs which would be allocated to plantcane and stubble crops. Total allocated planting costs for hand-planted cane was estimated at \$623 per acre, and total planting costs for machine-planted cane was estimated at \$470 per acre (table 4).

Table 1. Breakeven Selling Prices for Raw Sugar for Selected Yield Levels, Arrangements, Harvest Through Third Stubble, Tenant-Operators, Louisiana, 2002

	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	0.157	0.142	0.130	0.121	0.113
Total specified costs	0.204	0.184	0.168	0.156	0.145
Total costs plus overhead	0.240	0.217	0.197	0.182	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	0.150	0.136	0.125	0.116	0.108
Total specified costs	0.196	0.177	0.162	0.149	0.139
Total costs plus overhead	0.231	0.208	0.190	0.175	0.162

[1] Average farm yield across harvested acreage of plantcane, 1st stubble, 2nd stubble, and 3rd stubble (base yield of 40 tons plantcane, 42 tons 1st stubble, 38 tons 2nd stubble, 35 tons 3rd stubble).

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

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

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

Table 2. Estimated sugarcane combine harvester annual ownership costs over range of acreage and tonnage

Total Acres Harvested	Total Tons of Sugarcane Harvested	Annual Combine Harvester Ownership Cost	
		Cost per Acre	Cost per Ton
100	3,500	$323.85	$9.25
200	7,000	161.92	4.63
300	10,500	170.92	3.08
400	14,000	80.96	2.31
500	17,500	64.77	1.85
600	21,000	53.97	1.54
700	24,500	43.26	1.32
800	28,000	40.48	1.16
900	31,500	35.98	1.03
1,000	35,000	32.38	0.93
1,100	38,500	29.44	0.84
1,200	42,000	26.99	0.77
1,300	45,500	24.91	0.71
1,400	49,000	23.13	0.66
1,500	52,500	21.59	0.62

Annual ownership costs were estimated using a total ownership cost of $32,385 (10 year life) and a sugarcane yield of 35 tons per harvested acre.

Table 3. Impact of yield differences on annual combine ownership costs per ton of sugarcane harvested

Total Acres Harvested	Annual Combine Harvester Ownership Cost per Ton of Sugarcane Harvested		
	30 ton/acre yield	35 ton/acre yield	40 ton/acre yield
	($/ton)	*($/ton)*	*($/ton)*
300	3.60	3.08	2.70
600	1.80	1.54	1.35
900	1.20	1.03	0.90
1,200	0.90	0.77	0.67
1,500	0.72	0.62	0.54

Table 4. Sugarcane planting cost allocation for sugarcane planted in 2001.

Plantcane (planted in 2001, 2nd expansion, hand planted 5-1 planting ratio)

Year	Operation	Cost per Acre	Acres Required	Allocated Planting Cost
1999	Fallow and seedbed preparation	$208.37	0.04	$8.33
	Cultured seed cane	$478.53	0.04	$19.14
	Hand plant	$216.14	0.04	$8.65
2000	Fallow and seedbed preparation	$215.86	0.20	$43.17
	Harvest propagated seed cane (1st exp.)	$64.00	0.04	$2.56
	Hand plant	$221.36	0.20	$44.27
2001	Fallow and seedbed preparation	$231.62	1.00	$231.62
	Harvest propagated seed cane (2nd exp.)	$73.91	0.20	$14.78
	Hand plant	$250.79	1.00	$250.79
	Total allocated planting cost per acre of plantcane in 2002			$623.31

Plantcane (planted in 2001, 2nd expansion, machine planted 8-1 planting ratio)

Year	Operation	Cost per Acre	Acres Required	Allocated Planting Cost
1999	Fallow and seedbed preparation	$208.37	0.02	$4.17
	Cultured seed cane	$478.53	0.02	$9.57
	Hand plant	$216.14	0.02	$4.32
2000	Fallow and seedbed preparation	$215.86	0.13	$28.06
	Harvest propagated seed cane (1st exp.)	$64.00	0.02	$1.28
	Mechanical plant	$151.76	0.13	$19.73
2001	Fallow and seedbed preparation	$231.62	1.00	$231.62
	Harvest propagated seed cane (2nd exp.)	$73.91	0.13	$9.61
	Mechanical plant	$162.02	1.00	$162.02
	Total allocated planting cost per acre of plantcane in 2002			$470.38

EFFICACY OF POLADO, ARSENAL AND FUSILADE AS CHEMICAL SUGARCANE RIPENERS FOR LOUISIANA

B. L. Legendre
St. Gabriel Research Station

Kenneth Gravois and Keith Bischoff
Sugar Research Station

J. L. Griffin
Department of Plant Pathology and Crop Physiology

SUMMARY

The chemical ripeners, Polado and Arsenal, at the rates tested, significantly increased the yield of theoretical recoverable sugar per acre (TRS/A) when compared to control at 49 days after treatment (DAT). Polado and Arsenal, as well as Fusilade, increased the yield of theoretical recoverable sugar per ton of cane (TRS/TC) at 35 and 42 DAT. There was a significant increase in TRS/TC for Polado and Arsenal treatments at 49 DAT but not for either rate of Fusilade. Polado had the greatest deleterious effect on the yield of tons cane per acre (TC/A) at 49 DAT although there was no difference in TC/A at 49 DAT amongst the Polado treatment, the high rate of Arsenal, and the two rates of Fusilade. In most cases, there was an improvement in juice purity for all treatments at the three harvest dates when compared to control. There was little or no effect of the three ripeners on mean stalk weight at 35 and 42 DAT; however, there was a significant reduction in stalk weight at 49 DAT for the Polado treatment, the high rate of Arsenal, and the two Fusilade treatments. There was also a deleterious effect of most of the ripener treatments on mean stalk height at all sampling dates. Based on shoot counts taken on December 3, all treatments with the exception of Polado and the high rate of Fusilade had a similar number of shoots per acre when treated with a ripener than when left untreated. Polado-treated plots had a significantly lower shoot count while the high rate of Fusilade had a significantly higher shoot count when compared to control.

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 sugar yield are affected greatly by variety and by the growing season before and during harvest. A combination of high incident light, low night temperatures 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 immediately 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, but major reductions in regrowth, stalk population, and yield have not been reported except at high rates (normally more than 8 oz of the formulated product) and treatment-harvest intervals exceeding 49 days.

Currently, Polado is used on approximately 385,000 acres in Louisiana, netting the state's sugarcane growers, processors, and landlords an estimated $42,000,000 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 a glyphosate-tolerant sugarcane variety will be developed in the near future that would effectively eliminate the use of glyphosate as a ripener. 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 experiment was conducted in the first-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 23, 2001, in water at a broadcast rate of 8 gal/A with a CO_2 sprayer and hand-held boom. A nonionic surfactant (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 48-inch band was sprayed over sugarcane foliage so that most of the leaves were wet by the spray. Plots were one-row by 100-feet long with a 5-foot alley and with buffer rows on either side of treated row, arranged in a randomized complete block design with five replications.

Fifteen-stalk samples, taken at random along the row, were removed from each plot at 35 (September 27), 42 (October 4), and 49 (October 11) days after treatment (DAT). 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 11 (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. To study the possible effect of the chemical ripeners on regrowth potential, stand counts were taken on December 3.

RESULTS AND DISCUSSION

Table 1 show the effect of the three chemical ripeners on mean stalk weight at 35, 42, and 49 days after treatment (DAT). There was little or no effect of the three ripeners on mean stalk weight at 35 and 42 DAT; however, there was a significant reduction in stalk weight at 49 DAT for the Polado treatment, the high rate of Arsenal, and the two Fusilade treatments. Table 2 shows the effect of the three chemical ripeners on mean stalk height at the three harvest dates. There was also a deleterious effect of most of the ripener treatments on mean stalk height at all sampling dates. Table 3 shows the effect of the three chemical ripeners on the yield of theoretical recoverable sugar per ton of cane (TRS/TC) for the three harvest dates. Polado and Arsenal, as well as Fusilade, increased the yield of TRS/TC at 35 and 42 DAT. There was a significant increase in TRS/TC for Polado and Arsenal treatments at 49 DAT but not for either rate of Fusilade. Table 4 shows the effect of the three chemical ripeners on juice purity at the three sampling dates. In most cases, there was an improvement in juice purity for all treatments at the three harvest dates when compared to control. Table 5 shows the effect of the three chemical ripeners on the yield of tons cane per acre (TC/A), TRS/TC, and TRS/A at 49 DAT. The chemical ripeners, Polado and Arsenal, at the rates tested, significantly increased the yield TRS/A when compared to control at 49 days after treatment (DAT). Polado had the greatest deleterious effect on TC/A at 49 DAT although there was no difference in TC/A at 49 DAT amongst the Polado treatment, the high rate of Arsenal, and the two rates of Fusilade. Table 6 shows the effect of the three chemical ripeners on regrowth potential. Based on shoot counts taken on December 3, all treatments with the exception of Polado and the high rate of Fusilade had a similar number of shoots per acre when treated with a ripener than when left untreated. Polado-treated plots had a significantly lower shoot count while the high rate of Fusilade had a significantly higher shoot count when compared to control.

These data show that Polado and 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 stand count data show that Polado can reduce the stand counts taken shortly after harvest while Arsenal has apparently little or no effect at the rates tested.

ACKNOWLEDGMENTS

We acknowledge the assistance of Jonathan Siebert for his assistance in making this study possible.

REFERENCES

Legendre, B.L. 1975. Effects of sunlight, temperature, and rainfall. Crop Sci. 15(3):349-352.

Legendre, B.L. and C.K. Finger. 1987. Response of sugarcane varieties to the chemical ripener glyphosate. Proc. Plant Growth Regulator Soc. 14:479-484.

Nickell, L. G. 1984. Sucrose increases with bioregulators, p.101-112 In R. L. Ory and F. R. Rittig, Ed., Bioregulators: Chemistry and Uses. ACS Symposium Series, No. 257.

Osgood, R.V., P.H. Moore and H.S. Ginoza. 1981. Differential dry matter partitioning in sugarcane cultivars treated with glyphosate. Proc. Plant Growth Regulator Working Group 8:92-93.

Table 1. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on mean talk weight (STK WT) of the sugarcane variety LCP 85-384 in the first-stubble crop when harvested at 35, 42, and 49 days after treatment (DAT)[12].

		STK WT (lb)	
		DAT	
Treatment	35	42	49
Control	1.91 A	1.91 A	1.99 A
Polado (0.2 lb/A)	1.83 A	1.92 A	1.78 BC
Arsenal (0.143 lb/A)	2.00 A	1.94 A	2.20 A
Arsenal (0.214 lb/A)	1.90 A	1.85 AB	1.84 BC
Fusilade (0.0625 lb/A)	1.84 A	1.70 B	1.94 C
Fusilade (0.0875 lb/A)	1.91 A	1.84 AB	1.76 C

[1] Treatment date: August 23, 2001. Harvest dates: September 27 (35 DAT); October 4 (42 DAT); and October 11 (49 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 mean stalk height (STK HT) of the sugarcane variety LCP 85-384 in the first-stubble crop when harvested at 35, 42, and 49 days after treatment (DAT)[12].

		STK HT (in)	
		DAT	
Treatment	35	42	49
Control	95.28 A	94.88 A	95.67 A
Polado (0.2 lb/A)	85.83 C	88.19 BC	89.76 AB
Arsenal (0.143 lb/A)	90.55 ABC	90.55 B	94.88 A
Arsenal (0.214 lb/A)	91.73 AB	87.80 BC	85.83 B
Fusilade (0.0625 lb/A)	87.40 BC	86.22 C	84.65 B
Fusilade (0.0875 lb/A)	86.22 C	86.22 C	86.22 B

[1] Treatment date: August 23, 2001. Harvest dates: September 27 (35 DAT); October 4 (42 DAT); and October 11 (49 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 yield of theoretical recoverable sugar per ton of cane (TRS/TC) of the sugarcane variety LCP 85-384 in the first-stubble crop when harvested at 35, 42, and 49 days after treatment (DAT)[12].

		TRS/TC (lb)	
		DAT	
Treatment	35	42	49
Control	145 C	165 E	176 D
Polado (0.2 lb/A)	208 A	214 A	226 ABC
Arsenal (0.143 lb/A)	185 B	196 BC	209 BC
Arsenal (0.214 lb/A)	185 B	207 AB	220 AB
Fusilade (0.0625 lb/A)	178 B	182 D	197 BCD
Fusilade (0.0875 lb/A)	176 B	191 CD	200 CD

[1] Treatment date: August 23, 2001. Harvest dates: September 27 (35 DAT); October 4 (42 DAT); and October 11 (49 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 the juice purity of the sugarcane variety LCP 85-384 in the first-stubble crop when harvested at 35, 42, and 49 days after treatment (DAT) [12].

		PURITY (%)	
		DAT	
Treatment	35	42	49
Control	74.5 C	77.3 C	78.9 C
Polado (0.2 lb/A)	81.3 A	81.0 A	83.2 A
Arsenal (0.143 lb/A)	78.7 B	79.7 AB	82.3 AB
Arsenal (0.214 lb/A)	79.0 B	81.6 A	83.3 A
Fusilade (0.0625 lb/A)	77.9 B	78.0 BC	82.1 B
Fusilade (0.0875 lb/A)	77.4 B	79.6 AB	81.3 AB

[1] Treatment date: August 23, 2001. Harvest dates: September 27 (35 DAT); October 4 (42 DAT); and October 11 (49 DAT)
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 5. Effect of the chemical ripeners Polado, Arsenal, and Fusilade on yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC) and yield of theoretical recoverable sugar per acre (TRS/A) of the sugarcane variety LCP 85-384 in the first-stubble crop when harvested 49 days after treatment (DAT) [12].

	TC/A	TRS/TC	TRS/A
Treatment	(tons)	(lb)	(lb)
Control	46.0 AB	176 D	8,106 D
Polado (0.2 lb/A)	41.2 C	226 ABC	9,287 ABC
Arsenal (0.143 lb/A)	47.8 A	209 BC	9,964 A
Arsenal (0.214 lb/A)	44.1 ABC	220 AB	9,705 AB
Fusilade (0.0625 lb/A)	44.5 ABC	197 BCD	8,783 BCD
Fusilade (0.0875 lb/A)	43.4 BC	200 CD	8,619 CD

[1] Treatment date, August 23, 2001; Harvest date, October 11, 2001
[2] Means in a column followed by the same letter are non-significant at the 0.05P

Table 6. Fall shoot counts following the application of the chemical ripeners Polado, Arsenal, and Fusilade to the sugarcane variety LCP 85-384 in the first-stubble crop [12].

	FALL SHOOT CT
Treatment	(Number/A)
Control	65,703 BC
Polado (0.2 lb/A)	26,267 D
Arsenal (0.143 lb/A)	64,788 BC
Arsenal (0.214 lb/A)	58,777 C
Fusilade (0.0625 lb/A)	71,801 AB
Fusilade (0.0875 lb/A)	76,608 A

[1] Treatment date, August 23, 2001; fall shoot count, December 3, 2001
[2] Means in a column followed by the same letter are non-significant at the 0.05P

EFFICACY OF GIBBERILLIC ACID IN INCREASING SUGAR YIELD IN LOUISIANA

B. L. Legendre
St. Gabriel Research Station

Calvin Viator
Calvin Viator, Ph.D. and Associates, LLC

Todd Andre
Alma Plantation, Ltd.

SUMMARY

Application of gibberellic acid failed to increase yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC), or yield of theoretical recoverable sugar per acre (TRS/A) when applied as a split application on two occasions at 1.0 qt/A on June 25, 2001, and 2.0 qt/A on July 27, 2001, to the fourth-stubble crop of LCP 85-384 and compared to control fields receiving no gibberellic acid. Glyphosate at 6 oz/A (0.2 lb/A) was applied to all fields, both treated and not treated with gibberellic acid, on October 22, 2001. Cane was harvested on December 10-11, 2001.

INTRODUCTION

Preliminary data from Florida and Louisiana had indicated that gibberellic acid when applied to actively growing sugarcane increased the yield of TC/A, TRS/TC, and/or TRS/A. The manufacturer of PRO-15 PLUS stated that its product activates the enzyme and hormone systems in plants which are essential for normal plant growth and reproduction. PRO-15 PLUS is formulated with 15% sulfur derived from liquid ammonium thiosulfate, which is said to provide nutrients for healthier roots, stronger stems and longer stalks, better fruit, and improved plant performance. This study was initiated to determine if the use of gibberellic acid with sulfur would improve cane and/or sugar yield when used in conjunction with Polado on Louisiana sugarcane.

PROCEDURES

Gibberellic acid (PRO-15 PLUS manufactured by Frit Industries, Ozark, AL) was applied twice to the fourth-stubble crop of the sugarcane variety LCP 85-384 at Alma Plantation, Lakeland, La., at 1 qt/A (0.01 oz. of gibberellic acid per qt) on June 25, 2001, by highboy sprayer in 15 gal spray mixture per acre and 2 qt/A on July 27, 2001, by airplane in 5 gal spray mixture per acre. A surfactant and no-drift product were included with each application to ensure proper coverage.

The experiment was comprised of only two treatments: a split application of the gibberellic acid and an untreated check serving as control. The field was arranged in a randomized complete block design with three replications. Each plot consisted of 30 rows wide

(180 ft) and three blocks deep or approximately 8.0 ac. Sugarcane was cultivated and fertilized according to recommended practices; insecticides were applied as required. Glyphosate (Polado-L) was applied by airplane at 6 oz (0.2 lb/A) on October 22, 2001, to the total area in 5-gal spray mixture per acre. The interior 16–18 rows of each plot or approximately 6.0 ac were harvested by a cane combine (Austoff Model 7700) operating at 3.5 mph and an extractor fan speed of 950 rpm. All cane from each plot was weighed by the Alma Factory's truck scale and the weights recorded. Each of the approximately 10-12 trucks of cane harvested from each plot was sampled by the core/press method of analyses to determine the yield of theoretical recoverable sugar per ton of cane (TRS/TC). From these data, the yield of tons cane per acre (TC/A) and yield of theoretical recoverable sugar per acre (TRS/A) were calculated.

RESULTS AND DISCUSSION

Yield data for the fourth-stubble crop of the sugarcane variety LCP 85-384 treated with gibberellic acid are shown in Table 1. Application of gibberellic acid failed to increase yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC), or yield of theoretical recoverable sugar per acre (TRS/A).

ACKNOWLEDGMENTS

We acknowledge the assistance of Dr. Blaine Viator and Craig DeGravelles of Calvin Viator, Ph.D. and Associates, LLC, Barry and Pat Ande of PRO-CHEM Chemical Company, Herman Waguespack of the American Sugar Cane League of the U.S.A., Inc., and Alma Plantation for their assistance in making this study possible.

Table 1. Effect of gibberellic acid treatment on yield of tons cane per acre (TC/A), yield of theoretical recoverable sugar per ton of cane (TRS/TC) and yield of theoretical recoverable sugar per acre (TRS/A) [1].

Treatment	TC/A	TRS/TC	TRS/A
	(tons)	(lb)	(lb)
Control	40.24	227.7	9,164
Gibberellic acid	39.24	225.0	8,828
LSD (0.05)	NS	NS	NS

[1] 1.0 qt/A gibberellic acid applied June 25, 2001, in 15 gal spray mixture by highboy
2.0 qt/A gibberellic acid applied July 27, 2001, in 5 gal spray mixture by airplane
6.0 oz/A glyphosate (0.2 lb/A) applied to all treatments October 22, 2001
Plots harvested by cane combine on December 10-11, 2001

PUBLICATIONS LIST FOR 2001

Bischoff, K.P., K.A. Gravois, H.P. Schexnayder, Jr., and G.L. Hawkins. 2001. The effect of harvest method and plot size on the estimation of sugarcane yield. Proc. Amer. Soc. Sugar Cane Technol. 21:51-60.

Daugrois, J.H., J.W. Hoy, and J.L. Griffin. 2001. Protox inhibitor herbicide effects on Pythium and root rot of sugarcane. Am. Soc. Sugarcane Technol. Mtg., June 13-15, 2001. New Orleans, La. (J. Am. Soc. Sugarcane Technol. 22:In Press).

Gravois, K.A. and K.P. Bischoff. 2001. New sugarcane varieties pay big dividends. Louisiana Agriculture 44(4):19-23.

Gravois, K.A. 2001. Louisiana's sugarcane industry. Louisiana Agriculture 44(4):4-5.

Griffin, J.L., B.J. Viator, P.A. Clay, J.M. Ellis, D.K. Miller, S.A. Bruff, A.J. Lanie, and R.J. Lencse. 2001. Weed control: Essential to sugarcane production. Louisiana Agriculture 44(4):12-14.

Griffin, J.L., J.M. Ellis, C.A. Jones, B.J. Viator, and J.D. Siebert. 2001. Weed Science 2000 Annual Research Report, 206pp.

Hallmark, W.B., Williams, G.J., Brown, L.P. and Hawkins, G.L. 2001. Fertility research helps optimize sugarcane profits. Louisiana Agriculture 44(4):29-31.

Hallmark, W.B., Williams, G.J. and Hawkins, G.L. 2001. Management of Sugarcane Combine Residue. (Abstr.). Annual Meeting American Society of Agronomy. Charlotte, NC.

Hallmark. W.B., Williams, G.J., Brown, L.P. and Hawkins, G.L. 2001. Effect of urea nitrogen rates, a nitrogen stabilization package, winter vs. spring nitrogen fertilization, and varieties on sugarcane yields. (Abstr.) American Society of Sugar Cane Technologists 21:167.

Hallmark. W.B., Williams, G.J. and Hawkins, G.L. 2001. Management of Sugarcane Combine Residue. (Abstr.). p. 27. Environmental State of the State-VI. Thibodaux, La..

Hallmark, W.B., Williams, G.J. and Hawkins, G.L. 2001 Effect of Fall Fertilizer on Sugarcane Yields. (Abstr.). Louisiana Association of Agronomists Meeting. Baton Rouge, La..

Hoy, J.W. 2001. Controlling disease. Louisiana Agriculture 44(4):10-11.

Hoy, J.W. 2001. Planting sugarcane: Whole stalks versus billets. Louisiana Agriculture 44(4):7-9.

Hoy, J.W., A.E. Arceneaux, C.F. Savario, C.A. Richard, W.R. Jackson, and H.L. Waguespack, Jr. 2001. Billet planting research results from 2000. Sugar Bulletin 79(10):11-15.

Hoy, J.W., and J.L. Flynn. 2001. Control of ratoon stunting disease of sugarcane in Louisiana with seedcane produced through micropropagation and resistant cultivars. Proc. Int. Soc. Sugar Cane Technol. 24:417-421.

Hoy, J.W., L.B. Grelen, and J.Q. Paccamonti. 2001. Don't miss this great opportunity. Sugar Bulletin 79(12):17-19.

Jones, C.A., J.L. Griffin, and J.M. Ellis. 2001. Imazapyr/diuron combinations in fallowed fields and after sugarcane planting. Proc. South. Weed Sci. Soc. 54:18.

LaBorde, C.M., K.A. Gravois, and K.P. Bischoff. 2001. Fertilizer effects of older sugarcane ratoon crops in Louisiana. Proc. Amer. Soc. Sugar Cane Technol. 21:30-42.

Legendre, B.L. and K.A. Gravois. 2001. The 2000 Louisiana Variety Survey. Sugar Bulletin. 79(10):17-21.

Lopes, S., K.E. Damann, J.W. Hoy, and M.P. Grisham. 2001. Infectivity titration for assessing resistance to leaf scald among sugarcane cultivars. Plant Disease 85:592-596.

Martin, F.A., and J.W. Hoy. 2001. Sugarcane: An important industry facing many challenges. Louisiana Agriculture 44(4):6.

Milligan, S.B., M. Balzarini, K.A. Gravois, and K.P. Bischoff. 2001. Efficiency of first clonal trial selection using different plot sizes. Proc. Amer. Soc. Sugar Cane Technol. 21:160-161.

Posey, F. R. and T. E. Reagan. 2001. Small plot assessment of insecticides against the sugarcane borer, 2000. Arthropod Management Tests 26: 107F.

Posey, F. R., M. Ramaswamy, E. A. Ostheimer, and. T. E. Reagan. 2001. Effects of insecticidal wireworm control on non-target arthropods on sugarcane, 2000. Arthropod Management Tests 26: 109F.

Reagan, T. E. 2001. Integrated pest management in sugarcane. Louisiana Agriculture. 44(4): 16-18.

Reagan T. E. 2001. Value of nontarget organisms. Louisiana Agriculture. 44(4): 18.

Reagan T. E. and M. O. Way. 2001. Mexican rice borer threat. Louisiana Agriculture. 44(4): 17.

Reagan, T.E. and F.R. Posey. 2001. Development of an insecticide management program that enhances biological control. J. International Society of Sugarcane Technologists.24: 370-373.

Reagan, T. E. and F. R. Posey. 2001. Small plot assessment of insecticides against the Mexican rice borer in sugarcane, 2000. Arthropod Management Tests 26: 108F.

Reagan, T. E., F. R. Posey, C. Blanco, R. Miller, and J. W. McGee. 2001. Small plot assessment of insecticides against the Mexican Rice Borer in sugarcane, 2000. Arthropod Management Tests 27: 110F.

Rodriguez, L. M., T. E. Reagan, and J. A. Ottea. 2001. Susceptibility of *Diatraea saccharalis* (Lepidoptera: Crambidae) to tebufenozide. J. Economic Entomology 94(6): 1464-4170.

Rodriguez, L. M., J. A. Ottea, and T. E. Reagan. 2001. Selection, egg viability, and fecundity of the Sugarcane Borer, *Diatraea saccharalis* (F.) with tebufenozide. J. Economic Entomology 94(6): 1553-1557.

Schexnayder, Jr., H.P., T. E. Reagan, and D. R. Ring. 2001. Sequential Sampling for the Sc Borer (Lepidoptera: Crambidae) on Sugarcane in Louisiana. J. Economic Entomology 94 (6): 766-771.

Siebert, J.D., J.L. Griffin, E.P. Castner, J.M. Ellis, and C.A. Jones. 2001. Evaluation of hexazinone/diuron combinations in sugarcane. Proc. South. Weed Sci. Soc. 54:17.

Viator, B.J., J.L. Griffin, J.M. Ellis, and C.A. Jones. 2001. New chemistries for weed control in sugarcane. Proc. South. Weed Sci. Soc. 54:190-191.

Viator, B.J. and J.L. Griffin, 2001. Morningglory (tie-vine) management in sugarcane. Louisiana Division, American Society of Sugarcane Technologists Mtg., February 6, 2001. Baton Rouge, La...

Viator, H. P. and J. L. Griffin. 2001. Fallow period cropping to soybeans can provide benefits. Louisiana Agriculture 44(4):15.

Viator, H. P. and Ronald Hebert, Jr. 2001. Sugarcane on clay soil responds to irrigation. Sugar Bull. 79(7):23-25.

Viator, Howard P. 2001. Irrigation of sugarcane on clay in a high rainfall environment. Sugar J. 64(1):32.

Way, M. O., T. E. Reagan, and F. R. Posey. 2001. Mexican rice borer in sugarcane and rice: significance to Louisiana and Texas industries. Sugar Journal 64(1): 27-28.

Way, M.O. and T. E. Reagan. 2001. Borers invade: Mexican rice borers move into Texas ricefields and threaten yields. Rice Journal 104(5): 20-21.

White, W. H., T. E. Reagan, and D. G. Hall. (2001). *Melanaphis sacchari* (Homoptera: Aphididae), a sugarcane pest new to Louisiana. Florida Entomologist 84(3): 435-436.

Woolwine, A.E., and T.E. Reagan. 2001. Potential of winter cover crops to increase abundance of *Solenopsis invicta* and other Arthropods in sugarcane. Environmental Entomology 30(6): 1017-1020.