AN OVERVIEW OF 2020 ACTIVITIES IN THE LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

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An overarching goal of the Louisiana State University Agricultural Center (LSU AgCenter) sugarcane variety development program is to develop genetically improved varieties of sugarcane for the Louisiana sugar industry. The program is made up of several distinct stages (Table 1) each of which is critical to the overall process of creating, selecting, testing, and releasing a new variety for commercial production. For the program to be effective, each of these stages must be accomplished every year.

Sugarcane variety development at the LSU AgCenter is a multidisciplinary and collaborative effort drawing from the expertise of scientists and allied professionals from a diversity of disciplines within (Table 2) as well as outside of the institution. The LSU AgCenter research team also works in collaboration with other institutions such as the United States Department of Agriculture (USDA) and the American Sugar Cane League (ASCL). The best varieties from the LSU AgCenter ('L' varieties) and USDA ('Ho' and 'HoCP') programs are brought together for evaluation at the off-station, infield, and outfield testing stages of the program (Table 1). Outfield testing is conducted by personnel from the LSU AgCenter, the USDA, and the American Sugar Cane League. Upon recommending a variety for commercial release, 'seedcane' increase is carried out by the American Sugar Cane League and generally commences when varieties are introduced to the outfield testing stage (Table 1). This long-standing cooperative effort between the three entities (the LSU AgCenter, the USDA, and the ASCL) which has served the Louisiana sugar industry well is outlined in the "Three-Way Agreement of 2007".

Success in developing new sugarcane varieties is heavily dependent on the availability of novel genetic variability made available for selection via targeted cross hybridization among desirable sugarcane genotypes/parents. Cultivated sugarcane does not flower naturally in Louisiana because of the cool fall temperatures hence, the breeding program must resort to artificial photoperiod treatment to induce and synchronize flowering of sugarcane for crossing. Photoperiod treatment to induce flowering began on June 1 and continued until September 27, 2020. The first crosses were made in the second week of September and crossing lasted till November 13, 2020. The 2020 crossing campaign was faced with significant issues to overcome. COVID-19 restrictions brought about other unforeseen detrimental effects to the parental material. Due to stay-at-home orders, social distancing requirements, and limited staffing, several operations were not performed in a timely manner. Additionally, parental material was severely infected with a fungal disease *Cytospora sacchari* causing Sheath Rot Disease in the stalks. These issues combined resulted in a marked decrease in tassel production with only 87 tassels produced compared with 353 tassels produced in 2019. The 87 tassels from 25 genotypes, or parents, were used to make 47 crosses with a total of 6,356 viable seeds produced. The number of viable seeds per cross was estimated by counting the number of shoots produced per 0.5 g of seed (fuzz). Details about the 2020 crossing campaign can be found in the section titled '**2020 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE**

VARIETY DEVELOPMENT PROGRAM'. Stored seed from past crossing campaigns was available from cold storage. The "Three-Way Agreement of 2007" also allowed access to additional seed from our collaborating partner, the USDA.

A total of 46,969 seedlings from 96 crosses were transplanted to the field in the spring of 2020. In addition, 5000 seedlings from 50 families were planted in a cross-appraisal trial at three locations. Many of these seedlings were progeny of biparental crosses among commercial varieties as well as superior experimental clones. Individual seedling selection will be carried out next year when these seedlings are in the first stubble crop.

In the fall of 2020, individual seedling selection was practiced on 44,689 first stubble single stools. These seedlings were mostly from the 2018 crossing series that were planted to the field in 2019, allowed to overwinter, and were in the first ratoon cane crop in 2020. Family selection, based on accumulated data from family appraisal studies and visual assessment of seedling populations, and advancement rates of clones from these families in previous years was used to discard some families prior to selection. The selection criteria included visual appraisal of individual seedlings for disease and insect damage, lodging, yield (stalk number, stalk diameter and height) and then lastly for the absence of pith. This was followed by evaluation of the visually selected clones for Brix using a handheld refractometer. A total of 1373 clones were selected and planted in 10-foot, first line trial plots.

The first line trial plots established last year (mostly from the 2017 crossing series) were evaluated and superior clones selected and planted into a second line trial. Breeders walked through the plots and dropped clones based on visual appraisal for diseases, insect damage, poor stand including lodging. Clones that were not dropped the first time around were evaluated for pith, and Brix. A total of 409 clones were eventually selected and planted into single row, 16-foot second line trial. From the second line trial established the year before (2016 crossing series) 214 clones were selected and planted into 2-row, unreplicated, 16-foot increase plots. These are tentative selections with the 'seedcane' being increased pending additional data from the first line and second line ratoon crops. By the time clones are assigned a permanent 'L' variety number using both the plant and first ratoon cane crop data there will be enough material to plant replicated trials at three on-station nurseries.

Preliminary visual ratings for cane yield and plant type were done in the fall on the 160 clones from the 2015 crossing series that remained active in the second line trial. Clones with acceptable ratings were further evaluated for lodging and/or broken tops, borer damage, disease symptoms, pith, estimated cane yield, sucrose content and sugar yield. A total of 38 experimental varieties judged to be superior to the checks were assigned permanent variety designations ("L") in the fall of 2020. These newly assigned experimental varieties were entered into replicated on-station nursery trials (2 replicates, 16-foot plots) at two locations (Sugar Research Station, Iberia Research Station) with a third location (USDA-ARS Ardoyne Farm) not planted because of inclement weather conditions. Additional details about selection in the seedling and early clonal stages can be found in the section titled '**SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2020**'.

The section titled **'2020 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS'** describes experiments that were conducted outside of the experiment station in several locations scattered across the Louisiana sugarcane industry. The objective is to identify and select varieties that will perform well across the range of environments a commercial variety is likely to encounter in Louisiana. Some of these tests are planted in grower's farms by the breeding crew but are managed by the growers. Twenty experimental varieties from the 2019 assignment series (2014 Crossing series) that performed well in the plant cane crop on-station nursery trials were replanted into infield and off station nursery tests. The off-station nurseries were planted in single row, 20-foot plots with 4-foot alleys. The infield tests were planted in two-row, 25-foot plots with 5-foot alleys. The experimental design for the off-station nursery and infield tests was a randomized complete block with two replications per location. The infield test is the first-time experimental varieties are harvested and weighed using weigh wagons to estimate cane yield. Up until this point, cane yield was estimated using stalk counts multiplied by the weight of 10 random stalks in a plot. Varieties selected by the LSU AgCenter and USDA are jointly evaluated in the off-station and infield locations.

Two experimental varieties from the 2018 assignment series that performed well in the infield, off-station and on-station nurseries tests were introduced to outfield locations and planted into increase plots. Those that continue to perform well in these tests will subsequently be planted into the outfield testing stage of the program in 2021. In 2020, two experimental varieties from the 2017 Assignment Series were eligible for planting into the outfield trials or introduced on primary increase stations. One experimental variety, L 15-306 continue to be tested in the outfield stage and are being increase in the primary and secondary stations. One experimental variety, L 14-267, was released to the Louisiana sugar industry. The outfield stage of the program is described in detail in the section titled '**2020 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM OUTFIELD VARIETY TRIALS'.**

The section titled **'SUCROSE LABORATORY AT THE SUGAR RESEARCH STATION'** describes activities in the sucrose ('juice lab') laboratory for 2020. Of the 3,092 samples processed through the sucrose lab in 2020, close to 80% were from research programs other than the variety development program. Most of the samples were processed using the Spectracane FT-NIR instrument. A subset of samples was processed using the standard wet chemistry method and the data were used to validate data obtained from the Spectracane FT-NIR instrument.

Promising experimental varieties that made it to the advanced stages of the program were entered into several tests to screen for resistance to prominent diseases (Dr. Jeff Hoy, Plant Pathologist) and insect pests (Dr. Blake Wilson, Entomologist) found in Louisiana. Results gathered from these screening tests will be instructive in determining which varieties to recommend for commercial release and how best to manage these varieties during commercial production. The data will also be useful in the crossing program in determining what parents to pair to avoid making susceptible by susceptible crosses. Also informative were data from the molecular breeding program (Dr. Niranjan Baisakh) in deciding, which crosses to make based on

genetic diversity among parents at the molecular level and, which parents harbor the Bru 1 gene that confers rust resistance.

The decision regarding further testing and seed increase of candidate varieties in the advanced stages of the program was determined at the Variety Advancement Committee meeting attended by members of all three (LSU AgCenter, USDA and ASCL) organizations.

The 2020 Louisiana sugarcane industry had a warm start, with above average temperatures for the first quarter of the year. Spring months were warm, with an optimal amount of rain. In 2020 Louisiana was impacted by seven named tropical storms (Cristobal, Marco, Laura, Sally, Beta, Delta, and Zeta). Starting off Hurricane season was Tropical Storm Cristobal, making landfall in southeast Louisiana on June 7. On August 27 category 4 Hurricane Laura made landfall on the southwestern side of the state, with winds of up to 150 miles per hour and over 9 feet of storm surge in some parishes. October ended with Hurricane Zeta, bringing with it high winds and rain in the southern parts of the state. In 2020 the Louisiana industry received 90.69” of rain, which is over 15” higher than the average. Baton Rouge received 67.9” of rainfall, which is 7.2” over the 30-year average. Harvest season was warmer than average, without any major freezes. The outfield harvest was completed on January 5, 2020. All mills in the Louisiana industry completed grinding by January 28, 2020.

Progress in the LSU AgCenter Sugarcane Variety Development Program would not be possible without the collaboration of many growers on whose farm several of the trials are conducted. Financial support from the state of Louisiana disbursed through the LSU AgCenter and from the Louisiana sugar industry disbursed through the American Sugar Cane League is gratefully acknowledged. So too is the collaboration of personnel from the American Sugarcane League and the USDA-ARS Sugarcane Research Unit.

Table 1. Chronological activities within the LSU AgCenter sugarcane variety ('L' varieties) development program

Year	Stage and activity
1	Crossing
2	Seedlings planted
3	Seedlings selected in 1R to plant first line trial
4	First line trial selected in PC to plant second line trial
5	Second line trial selected in PC to plant increase plots
6	Second line trial selected in 1R to assign permanent 'L' variety numbers On-station nurseries planted (at St. Gabriel, Houma, New Iberia) using 'seedcane' from increase plots
7	On-station nurseries PC harvested Off-station (3) and infield (2) nurseries planted
8	On-station nurseries 1R harvested Off-station and infield nurseries PC harvested Experimental clones introduced to 12 outfield test sites and planted as 'seedcane' increase plots Experimental clones introduced to 3 primary increase stations
9	On-station nurseries 2R harvested Off-station and infield 1R harvested Outfield tests planted at 12 locations Experimental clones increased on 3 primary increase stations
10	On-station nurseries 3R harvested Off-station and infield nurseries 2R harvested Outfield tests PC harvested Continue to increase experimental clones on primary increase stations
11	Off-station and infield nurseries 3R harvested Outfield tests 1R harvested Introduce experimental clones to 44 secondary increase stations
12	Outfield tests 2R harvested Increase experimental clones on 44 secondary increase stations
13	Variety release meeting New variety distributed by ASCL from secondary increase stations

1R, First ratoon cane crop; PC, Plant cane crop; 2R, Second ratoon cane crop; ASCL, American Sugarcane League.

Table 2. Members of the LSU AgCenter Sugarcane Variety Development Team

Team Member	Budgetary Unit	Responsibility
Collins Kimbeng	Sugar Research Station	Program Leader
Michael Pontif	Sugar Research Station	Selection and Variety Testing
Blake Wilson	Sugar Research Station	Insect Resistance
Kenneth Gravois	Sugar Research Station	Extension
Jeffrey Hoy	Plant Pathology and Crop Physiology	Disease Resistance
Niranjan Baisakh	School of Plant, Environmental and Soil Sciences	Molecular Breeding
Albert Orgeron	St. James Parish, Lutcher	Herbicide Tolerance
Carlton Baucum	Sugar Research Station	Infield Variety Testing
Mavis Daigle	Sugar Research Station	Sucrose Laboratory
Brayden Blanchard	Sugar Research Station	Photoperiod & Crossing
Zachary Taylor	Sugar Research Station	Outfield Variety Testing
Alphonse Coco	Sugar Research Station	Farm Manager

2020 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

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The longstanding and continued goal of the LSU AgCenter's Sugarcane Variety Development Program is the development of genetically improved sugarcane varieties which will positively impact the sugar industry. The variety development program begins with the photoperiod and crossing stages. Photoperiod treatments are managed to induce flowering of genotypes that would otherwise not naturally flower in Louisiana's climatic conditions. Crosses are made through hybridization techniques that use sugarcane yield components, borer resistance, and disease resistance characteristics as criteria to select parents and to decide what crosses to make. The breeding program strives to produce crosses that will yield superior progeny.

Eyepiece cuttings of breeding genotypes to be used for the 2020 crossing season were planted on October 20, 2019. The cuttings were planted in Styrofoam cell trays and maintained in the greenhouse. On February 3, 2020, the cuttings were transferred to can culture. The transplants were planted in large cans (38 liters) containing equal parts of field soil, washed sand, and peat moss and maintained in the greenhouse. During their time in these cans, the plants were trimmed weekly to harden the parent stalks and induce tillering. On the week of April 20-24, 2020, the cans were moved from the greenhouse to the photoperiod rail carts. Natural lighting and six light-tight chambers were used for photoperiod treatments. The cans were placed on photoperiod carts and assigned to a specific photoperiod regime based on previous knowledge of their flowering behavior. Genotypes that are difficult to flower were given a longer induction treatment of 41 consecutive days of 12 ½ hours of constant day length with a later start date of decline period which began on July 10, 2020. In comparison, genotypes considered to be easy to flower were given a shorter induction treatment of 37 consecutive days of 12 ½ hours of constant day length and a decline period which began on July 6, 2020. New genotypes for which flowering behavior was not known were placed throughout the photoperiod carts. The new genotypes will be moved to more favorable photoperiod conditions in the following crossing season if they do not flower in a specific photoperiod regime. Fertilization was adjusted to condition plants for floral induction as a high C:N ratio has been shown to promote flowering in sugarcane. However, a small dose of Urea (45% granular Nitrogen) was applied to the cans on the 8th, 16th, and 30th of July 2020 to remedy the stunted growth caused by over trimming.

The first photoperiod treatment began on June 1, 2020. All photoperiod treatments were initiated with a minimum of 37 consecutive days of 12 ½ hours of constant day length (Table 1). After the initial constant photoperiod days, day length was artificially shortened by one minute per day. Tassel (flower) initiation begins when day length begins to decrease. Treatments differed by the number of days with constant day length (photoinductive days) and the date on which the decline in day length was initiated (Table 1). All photoperiod treatments were

discontinued on September 27, 2020, when natural day length was less than 12 ½ hours and decreasing at a rate conducive to sugarcane flowering.

The flowering season began in the second week of September in 2020, similar to the previous two years. The normal time frame for first flowering can be as early as the last week of August or as late as the third week of September. There may be a slight deviation in the appearance of the first flower due to temperature during the photoperiod induction phase, varietal characteristics, and the photoperiod treatments. Stalk numbers decreased in 2020 to 1,362 stalks (Table 2) as compared to 1,427 stalks in 2019. On average, there were 4.2 stalks per can with 47 cans producing tassels (Table 2). There was a significant decrease in tassel production with 87 tassels produced in 2020 (Table 2) as compared to 353 tassels produced in 2019. Typically, flowering percentages are highest in stalks located in cart position "A" (Table 1). This was true for the 2020 season relative to other cart positions, however, large decreases in flowering percentages were observed in all cart positions compared to the 2019 season. The total flowering percentage for the six photoperiod bays decreased from 25% in 2019 to 6% in 2020. Of a total of 1,362 stalks, 87 tassels were produced (Table 2).

Crossing began on September 11, 2020 and ended on November 13, 2020. A total of 87 tassels comprising 25 genotypes (Table 4) were used to produce 47 crosses (Table 3, Table 5). A total of 6,356 viable seed were produced in 2020 (Table 3) with 5,091 seed coming from bi-parental crosses, 151 seed from polycrosses, and 1,114 seed from self-crosses (Table 3). Germination rate was estimated based on the germination of 0.5g of seed under greenhouse conditions in late December of 2020. Germination rates decreased in 2020 with an average of 15 plants per gram of seed compared to 31 plants per gram of seed in 2019 (Table 3).

The 2020 crossing season came with significant issues to overcome. COVID-19 restrictions led to unforeseen detrimental effects on parental material and, ultimately, the crossing campaign. In late March, a Stay-at-Home Order was issued by state government to combat COVID-19 and the Sugar Research Station was reduced to a minimal crew to perform necessary operation tasks. Most of the greenhouse and field staff were sent home, leaving few technicians, research associates, and scientists to bear the workload. For this reason, the parental material remained in the greenhouse until late April, where warm and humid greenhouse conditions contributed to a fungal infection of *Cytospora sacchari* causing Sheath Rot Disease in the stalks. Another reason for the later application of Urea was to combat the disease, as Nitrogen fertilization is the only known control method of Sheath Rot. There is evidence to suggest that this disease is responsible for a reduced number of stalks and poor growth of parental stock during the 2020 crossing season. In addition to the introduction of Sheath Rot, miscommunication regarding trimming of the parental material allowed for the stalks to be trimmed far more and far longer than was necessary. The trimming lasted until late April and together with the fungal infections resulted in stunted growth of the stalks before they were placed on the photoperiod carts. The excessive trimming resulted in stalks that did not have the necessary amount of nodes and were probably not mature enough to be induced into flowering with the 37 or 41 day, 12 ½ hour photoinductive period treatment. By the time the stalks produced enough nodes and were deemed mature, the day length was already too short to induce

flowering. As a result, tassel production was reduced significantly and the crossing campaign was restricted to very few flowers and varieties to make crosses with. This allowed for very few options for ideal crosses when it came to combining parents, further resulting in a large relative portion of these crosses being self-crosses or poly crosses. With the severely detrimental effect these occurrences had on flowering and cross quality, it is hard to tell if other factors had any influence on the crossing program for the 2020 season. Moving forward, special effort will be made to ensure that the care of parental genotypes in can culture will be of top priority to get the necessary maturity for the start of the photoinductive days.

Table 1. Summary of the 2020 photoperiod treatments for the LSU AgCenter's sugarcane variety development program

Bay	Cart	Treatment Start Date	Days of Constant Photoperiod	Date Photoperiod Decline Started	Days of Declining Photoperiod		Mean Flowering Date	Total Stalks	Percent Flowered
					Peak 1	Peak 2			
1	A	14-Jun	44	28-Jul	72	87	293±4	83	16
1	B	14-Jun	44	28-Jul	72	87	300±9	74	7
1	C	14-Jun	44	28-Jul	72	87	282±1	78	8
2	A	14-Jun	44	28-Jul	72	87	304±2	73	22
2	B	14-Jun	44	28-Jul	72	87	304±14	79	3
2	C	14-Jun	44	28-Jul	72	87	285±2	76	4
3	A	1-June	37	6-Jul	87	102	281±7	75	8
3	B	1-June	37	6-Jul	87	102	267±.	70	1
3	C	1-June	37	6-Jul	87	102	.	69	.
4	A	1-June	37	6-Jul	87	102	276±3	67	4
4	B	1-June	37	6-Jul	87	102	286±9	82	6
4	C	1-June	37	6-Jul	87	102	267±6	77	8
5	A	1-June	41	10-Jul	82	97	286±8	78	9
5	B	1-June	41	10-Jul	82	97	290±.	79	1
5	C	1-June	41	10-Jul	82	97	.	70	.
6	A	1-June	41	10-Jul	82	97	281±.	77	1
6	B	1-June	41	10-Jul	82	97	282±6	71	10
6	C	1-June	41	10-Jul	82	97	269±4	84	6

Table 2. Summary of can, variety, and flower information in 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----------								
25	324	47	1362	87	4.20 ± 0.96	1.85 ± 1.04	5.59 ± 1.99	87.33 ± 14.74

† Based upon cans with tassels.
‡ Pollen rating of 1 through 4 indicates male tassel; pollen rating of 5 through 9 indicates female tassel.
§ Days from photoperiod decline start date to flowering.

Table 3. Summary of 2020 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	32	5091	159±243	159±243	16±25
Polycross	8	151	19±39	19±39	2±4
Self	7	1114	159±400	159±400	9±22
Total	47	6356	135±252	135±252	15±25

Table 4. Varietal flowering summary in 2020 in the photoperiod bays

Variety	*Days of Constant Photoperiod*	*First Flower Date*	*Mean Days to Flower*	*Pollen Rating*	*Total Stalk Number*	*Total Flowers*	*Percent Flowering Stalks*
CP83-644	39±1	.	0	.	24	.	.
HO06-563	38±1	311	123	4	13	1	8
HO07-613	35	.	.	.	8	.	.
HO08-717	39	.	.	.	5	.	.
HO08-730	40±1	.	.	.	22	.	.
HO09-827	41±1	.	.	.	6	.	.
HO09-832	39	.	.	.	5	.	.
HO09-840	40±1	286	77±1	7	20	3	15
HO09-9401	40±1	255	73±2	8	13	12	92
HO11-532	39±1	.	.	.	22	.	.
HO11-573	39	.	.	.	3	.	.
HO12-615	44	.	.	.	9	.	.
HO13-705	44	293	91±4	4	5	3	60
HO13-708	35	.	.	.	7	.	.
HO13-720	44	.	.	.	3	.	.
HO14-835	39	.	.	.	5	.	.
HO14-836	39	.	.	.	5	.	.
HO15-960	44	.	.	.	5	.	.
HO15-971	44	.	.	.	6	.	.
HO15-972	39	.	.	.	4	.	.
HO17-400	39	.	.	.	5	.	.
HO17-725	39	.	.	.	5	.	.
HO17-755	41±1	.	.	.	9	.	.
HO95-988	39	.	.	.	5	.	.
HOCP00-950	40±1	.	.	.	24	.	.
HOCP01-517	35	.	.	.	4	.	.
HOCP01-523	39	.	.	.	5	.	.
HOCP02-618	39	.	.	.	4	.	.
HOCP04-838	40±1	.	.	.	26	.	.
HOCP04-847	40±1	311	101	8	14	1	7
HOCP05-902	44	.	.	.	4	.	.
HOCP09-804	44	.	.	.	9	.	.
HOCP09-814	38±1	.	.	.	8	.	.
HOCP13-723	39	.	.	.	6	.	.
HOCP14-802	38±1	.	.	.	11	.	.
HOCP14-826	38±1	.	.	.	8	.	.
HOCP14-830	39	.	.	.	3	.	.
HOCP14-867	41±1	.	.	.	8	.	.
HOCP14-876	35	.	.	.	5	.	.
HOCP14-885	35	.	.	.	11	.	.
HOCP15-509	39	.	.	.	4	.	.
HOCP15-510	44	.	.	.	5	.	.
HOCP15-987	39	.	.	.	4	.	.
HOCP17-702	44	.	.	.	6	.	.
HOCP17-710	44	.	.	.	4	.	.
HOCP17-714	39	.	.	.	5	.	.
HOCP17-716	39	.	.	.	4	.	.
HOCP85-845	39±1	.	.	.	21	.	.

Table 4. Continued

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
HOCP91-552	40±1	269	76±3	4	18	7	39
HOCP92-618	40	.	.	.	22	.	.
HOCP92-624	42±1	311	119	7	19	1	5
HOCP95-951	40±1	.	.	.	16	.	.
HOCP96-540	40±1	311	101	4	40	2	5
HOCP96-561	41±1	316	106	5	11	1	9
HOCP97-609	39±1	.	.	.	26	.	.
HOL14-841	42±1	.	.	.	10	.	.
HOL15-508	39±2	.	.	.	9	.	.
HOL15-511	44	.	.	.	4	.	.
HOL15-993	39	.	.	.	5	.	.
Ho13-739	35	.	.	.	10	.	.
L01-283	39±1	.	.	.	21	.	.
L01-299	38±1	303	97±2	4	37	3	8
L01-315	42±1	.	.	.	9	.	.
L03-371	39	.	.	.	4	.	.
L05-448	42±1	272	80±2	4	11	5	45
L05-457	39±1	272	80±0	8±1	27	2	7
L06-001	40±1	311	101	4	27	1	4
L06-038	40±1	.	.	.	10	.	.
L06-040	38±1	.	.	.	12	.	.
L07-057	40±1	318	130	7	11	1	9
L08-088	39	.	.	.	8	.	.
L08-090	40±1	.	.	.	17	.	.
L09-099	39±1	.	.	.	21	.	.
L09-112	35	.	.	.	5	.	.
L09-123	39±1	260	88±3	8	18	11	61
L09-131	39	.	.	.	3	.	.
L10-146	39	.	.	.	6	.	.
L10-147	39	.	.	.	9	.	.
L11-183	40±1	311	105±4	7	19	2	11
L11-187	39±1	293	109±4	6	21	4	19
L12-201	38±1	.	.	.	19	.	.
L12-202	39±1	279	99±8	4	20	5	25
L12-218	38±1	.	.	.	13	.	.
L12-227	38±1	.	.	.	23	.	.
L13-243	38±2	.	.	.	6	.	.
L13-251	35	281	93	4	7	1	14
L13-257	35	.	.	.	3	.	.
L14-264	35	.	.	.	4	.	.
L14-265	40±2	.	.	.	10	.	.
L14-266	44	.	.	.	4	.	.
L14-267	37±1	.	.	.	9	.	.
L14-269	40±1	.	.	.	12	.	.
L14-273	44	290	83±3	7	4	2	50
L14-275	44	.	.	.	3	.	.
L14-276	39±2	303	97±2	8	9	3	33

Table 4. Continued

Variety	Days of Constant Photoperiod	First Flower Date	Mean Days to Flower	Pollen Rating	Total Stalk Number	Total Flowers	Percent Flowering Stalks
L14-282	37±1	.	.	.	7	.	.
L15-298	44	.	.	.	4	.	.
L15-300	44	.	.	.	5	.	.
L15-301	35	.	.	.	4	.	.
L15-302	35	.	.	.	2	.	.
L15-303	44	.	.	.	4	.	.
L15-304	39	.	.	.	5	.	.
L15-305	39	.	.	.	4	.	.
L15-306	40±2	.	.	.	9	.	.
L15-311	39	.	.	.	5	.	.
L15-312	39	.	.	.	8	.	.
L15-317	41±1	.	.	.	8	.	.
L15-319	44	.	.	.	5	.	.
L15-320	40±2	272	65±1	4	8	3	38
L15-328	39	.	.	.	5	.	.
L15-337	39	272	84±3	2	4	3	75
L17-398	44	.	.	.	4	.	.
L17-424	39	.	.	.	5	.	.
L17-426	39	.	.	.	4	.	.
L94-426	38±1	.	.	.	11	.	.
L94-433	40±1	.	.	.	12	.	.
L97-128	40±1	.	.	.	24	.	.
L98-207	39±1	.	.	.	17	.	.
L98-209	41±2	.	.	.	8	.	.
L99-226	39±1	.	.	.	42	.	.
L99-233	39±1	267	84±2	3	38	7	18
LCP81-010	40±1	290	91±8	7	12	2	17
LCP81-030	35	.	.	.	4	.	.
LCP85-384	40±1	286	76	4	29	1	3
LCP86-454	35	.	.	.	3	.	.
N27	35	.	.	.	4	.	.
US01-040	40±1	.	.	.	9	.	.

Table 5. Crosses and seed made in 2020

Cross	Female	Male	Seed
XL20-001	HO09-9401	HO09-9401	0
XL20-002	HO09-9401	HO09-9401	0
XL20-003	HO09-9401	HO09-9401	0
XL20-004	HO09-9401	20P1	0
XL20-005	HO09-9401	20P2	0
XL20-006	L09-123	20P3	0
XL20-007	L09-123	L99-233	482.24
XL20-008	HOCP91-552	HOCP91-552	0
XL20-009	HOCP91-552	HOCP91-552	1065.54
XL20-010	L09-123	L15-337	22.88
XL20-011	L05-457	L15-320	268.8
XL20-012	L05-448	20P4	42.6
XL20-013	L99-233	20P5	109.12
XL20-014	HO09-9401	HOCP91-552	121.8
XL20-015	HO09-9401	L15-320	228.62
XL20-016	L09-123	L15-337	1114.88
XL20-017	L09-123	HOCP91-552	73.2
XL20-018	L05-448	L05-448	48.6
XL20-019	HO09-9401	HOCP91-552	84.96
XL20-020	HO09-9401	L12-202	47.7
XL20-021	HO09-9401	HOCP91-552	0
XL20-022	HO09-9401	L99-233	725.4
XL20-023	L09-123	L15-337	226
XL20-024	HO09-9401	L13-251	157.42
XL20-025	HO09-840	L05-448	0
XL20-026	L09-123	L12-202	0
XL20-027	HO08-840	L05-448	0
XL20-028	L14-273	20P6	0
L20-029	L05-457	20P7	0
XL20-030	LCP81-010	20P8	0
XL20-031	L11-187	L99-233	0
XL20-032	LCP81-010	L12-202	0
XL20-033	HO13-705	HO13-705	0
XL20-034	L14-273	L99-233	203.52
XL20-035	L09-123	HO13-705	15.04
XL20-036	L14-276	L01-299	0
XL20-037	L14-276	HO13-705	8.78
XL20-038	L09-123	L01-299	0
XL20-039	L11-183	L12-202	0
XL20-040	L11-187	L01-299	11.26
XL20-041	HOCP04-847	HOCP96-540	204.88
XL20-042	L14-276	HOCP96-540	110.58
XL20-043	HOCP92-624	HO06-563	400
XL20-044	L11-187	HOCP96-561	0
XL20-045	L11-187	L12-202	293.3
XL20-046	L11-183	L12-202	254.5
XL20-047	L07-057	L12-202	36.08

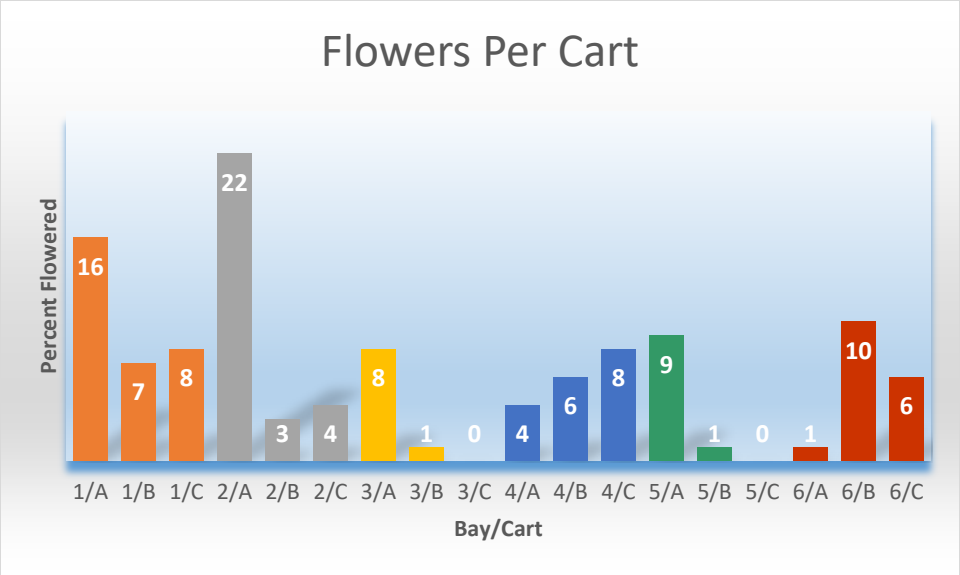

Figure 1. Percent of flowered stalks in each of the carts by the end of the Crossing Season. Bay 1 and Bay 2 are the delayed treatment of 37 consecutive photoinductive days (days with 12 ½ hours of sunlight) that do not start decreasing daylength until July 28, 2020. The significantly larger percentage of flowers in the first two bays testifies to the theory that the parental genotypes were not yet mature enough to be triggered into flowering by the photoinductive days. This is because they were given more time to grow before the treatment started. In this way, more of them would be mature enough when the time came to be triggered into flowering.

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2020

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In the selection phase of the LSU AgCenter's Sugarcane Variety Development Program, superior clones are advanced through the seedling (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 46,969 seedlings from 96 crosses were planted in the field in the spring of 2020. The majority of these seedlings are progeny of bi-parental crosses among commercial and elite experimental varieties. In the fall of 2020, family selection was practiced on the 44,689 stubble seedlings, planted in 2019, surviving the winter. This selection resulted in the planting of 1373 first-line trial plots. At the same time, superior clones were selected and advanced through subsequent stages (409 to second line trials, 214 to the increase stage). Assignments of permanent "L20" numbers were given to the 38 best clones of the 2015 crossing series.

Procedures

In the selection stage of the LSU AgCenter's Sugarcane Variety Development Program, single stools are established from seed generated in the crossing stage. After evaluating and selecting the families for cane yield potential in the cross-appraisal studies, clones with desirable phenotypes are selected and advanced through 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 46,969 seedlings from 96 crosses of the 2018 crossing series were planted to the field in the spring of 2020 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2020, individual selection was practiced on the 44,689 stubble single stools of the 2018 crossing series, planted in 2019, that survived the winter. The 1373 clones selected and advanced from the single stools were planted in 10-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.

The 1076 first-line trial plots of the 2017 crossing series were visually appraised for cane yield potential in August of 2020 (Table 3). After screening for cane yield potential, acceptable clones were further evaluated for pest resistance (diseases and borer injury), stalk quality, and Brix (Table 3). This second stage of advancement concluded with the planting of 409 clones in single row, 16-foot, second line trials plots.

The 338 plant-cane, second line trial plots of the 2016 crossing series were visually appraised for yield potential August 2020. Based on the field evaluation, comments and sucrose lab data collected in 2019, 214 clones were planted in one single row, 25-foot plots representing the increase stage of the program (Table 4). These clones will be candidates for assignment in 2021. Of the 381 candidates from the first stubble crop of the second line trial plots, the best 38

clones from the 2015 crossing series were assigned permanent "L20" numbers (Table 5). These newly assigned "L20" varieties were then planted in replicated nursery trials at three on station locations (Sugar Research Station, Iberia Research Station, and USDA-ARS Ardoyne Farm)

The advancement summary of clones from crosses made in 2015 through 2019 is shown in Table 6. Crosses are sorted by female parent in ascending order, with the percentile ranking given for each cross in each stage of the program.

Table 1. Summary of selections, advancements and assignments made during 2020 by the Louisiana, "L" Sugarcane Variety Development Program's personnel

	Crosses				Advanced to			
Crossing series	Progeny test	Selection program	Plants transplanted	Over-wintered plants	1st line	2nd line	Increase	On-station Nurseries (L20 Assignments)
			---------- number of clones ----------					
X15	20	157	81,783	49,088	1,395	381	160	38
X16	20	333	83,214	34,599	776	338	214	
X17	20	230	71,116	67,041	1,076	409		
X18	--	70	72,661	44,689	1,373			
X19	50	96	46,969					

Table 2. Dates of seedling and line trials planted or harvested in 2020

Crossing Series	Test	Crop	Date Planted	Date Harvested
X19	Seedlings	Planted	04/14-04/16/20	
X18	Seedlings	First Stubble	04/16-04/30/19	10/12-10/14/20
X18	First Line Trails	Planted	10/08/20	
X17	First Line Trials	Plant-cane	10/04/19	09/15/20
X16	First Line Trials	First Stubble	10/05/18	11/19/20
X17	Second Line Trials	Planted	19/16/20	
X16	Second Line Trials	Plant-cane	19/24/19	12/08/20
X15	Second Line Trials	First Stubble	10/15/18	10/20/20
X14	Second Line Trials	Second Stubble	19/27/17	11/09/20
X16	Light Soil Increase	Planted	19/29/20	
X15	Light Soil Increase	Plant-cane	11/06/19	11/24/20
X14	Light Soil Increase	First Stubble	10/31/18	11/17/20
X13	Light Soil Increase	Second Stubble	10/19/17	11/09/20
X15	Heavy Soil Increase	Planted	09/30/20	
X13	Heavy Soil Increase	Second Stubble	10/19/17	11/09/20

Table 3. Numbers of experimental clones dropped for identified faults in the 2017 crossing series first-line trials

	Fault	
Trait	Frequency	Percent
---------- 1076 clones enter first round of evaluation ----------		
Rating	350	32.53
Pith	69	6.41
Tube	78	7.25
---------- 726 clones enter second round of evaluation ----------		
Pith	0	0
Smut	0	0
Lodge / Broken	10	0.93
Tube	0	0
Rating	326	30.30
Other	4	0.37
---------- 340 clones dropped ----------		
Clones advanced	409	38.01

Table 4. Number of experimental clones dropped for identified faults in the 2016 crossing series of the plant-cane second line trial prior to advancement to the increase stage

	Fault	
Trait	Frequency	Percent
---------- 353 clones enter first round of evaluation ----------		
Lodged	6	1.70
Rating	2	0.57
Pith	22	6.23
Tube	18	5.10
Smut	0	0
Leaf Scald	2	0.57
Other	15	4.25
---------- 57 clones dropped ----------		
Clones advanced to Increase stage	296	83.85

Table 5. First stubble second line trial yield data for the 2020 “L” assignments. Assignments were made at the first stubble stage and included data accumulated from preceding stages. The mean, minimum and maximum values reported are for the assigned clones only

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
HoCP 96-540	6155	29.8	206	1.73	76	11.5
L 01-299	7682	35.3	218	1.9	82	12.9
HoCP 04-838	5826	26.8	217	1.55	76	13.3
HoCP 09-804	7226	31.1	232	1.33	103	13.8
L 20-026	5831	26.8	218	1.91	62	13
L 20-027	5285	22.5	235	1.71	58	13.2
L 20-028	5990	28.6	210	2	63	13.6
L 20-029	4697	21.9	214	1.86	52	14.2
L 20-030	7215	31.8	227	1.9	74	12.5
L 20-031	7013	30.7	228	1.76	77	11.5
L 20-032	8506	33.6	253	1.31	113	12.8
L 20-033	5957	29.5	202	1.53	85	12.9
L 20-034	5733	24.7	232	1.45	75	11.6
L 20-035	6258	25	250	1.19	93	14.3
L 20-037	6195	25.7	241	1.6	71	11.6
L 20-039	5881	29.1	202	1.74	74	12
L 20-040	8465	37.3	227	2.22	74	11.9
L 20-042	6644	28.2	236	1.15	108	12.3
L 20-044	6027	26.5	227	1.03	113	14
L 20-045	5800	24.5	237	1.69	64	11.1
L 20-046	5754	25.4	227	1.49	75	10.8
L 20-047	8372	41.4	202	1.66	110	14.1
L 20-049	6148	25.6	240	1.17	97	12.4
L 20-050	6807	31	220	1.33	103	11.5
L 20-051	7951	37.2	214	1.59	103	13.4
L 20-052	6396	28.7	223	1.71	74	12.3
L 20-053	6693	32.2	208	2.12	67	10.9
L 20-055	6840	29.7	230	1.18	111	13.9
L 20-057	7122	28.8	247	1.4	91	12.8
L 20-059	8974	38.1	235	1.96	86	12.9
L 20-060	6089	27.1	225	1.68	71	11.2
L 20-061	8366	36.8	227	2.01	81	12.4
L 20-062	7993	35.7	224	2.22	71	10.2
L 20-063	5826	26.2	222	1.84	63	13.1
L 20-064	10088	46.8	215	1.78	116	11.7
L 20-065	8844	33.1	267	1.7	86	12
L 20-066	6027	28.5	212	1.82	69	12.8
L 20-067	8785	41.5	211	2.18	84	10.4
L 20-068	7739	35.1	220	1.78	87	13.5
L 20-070	6882	33.5	206	1.8	82	13.5

Table 5. Continued

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
L 20-071	5609	25.6	219	1.57	72	13.3
L 20-072	7110	32.5	219	1.48	97	11.9
MEAN	6876	31	224	2	83	13
MIN	4697	22	202	1	52	10
MAX	10088	47	267	2	116	14
STD DEV	1198	5	15	0	17	1

Table 6. Advancement summary of the crosses in 2015 through 2018 series

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
2018 Crossing Series										
HO15-964	HOCP14-885	118	0	7	.	.	.	.	.	.
HO13-739	HOL15-501	131	3	65	.	.	.	.	.	.
HOCP14-885	HO11-573	136	2	47	.	.	.	.	.	.
HOL15-508	HO11-573	142	0	7	.	.	.	.	.	.
HO11-573	HOCP14-826	115	3	73	.	.	.	.	.	.
L12-201	HO12-630	227	6	74	.	.	.	.	.	.
L09-112	L12-201	329	2	22	.	.	.	.	.	.
HO09-840	L12-201	107	4	84	.	.	.	.	.	.
L14-282	L12-201	138	0	7	.	.	.	.	.	.
L14-282	HO12-630	499	0	7	.	.	.	.	.	.
HO11-532	HO12-630	117	0	7	.	.	.	.	.	.
L01-299	HO11-532	112	2	51	.	.	.	.	.	.
L14-282	HOL15-508	464	0	7	.	.	.	.	.	.
HO13-739	HOL15-993	132	2	48	.	.	.	.	.	.
HO13-739	HO15-930	80	0	7	.	.	.	.	.	.
HOCP14-885	HOL15-501	137	5	83	.	.	.	.	.	.
HO13-708	HO12-630	446	0	7	.	.	.	.	.	.
HO13-739	HOCP14-826	135	0	7	.	.	.	.	.	.
L99-233	18P1	299	7	69	.	.	.	.	.	.
L99-233	18P1	1798	3	14	.	.	.	.	.	.
L09-123	18P1	396	4	35	.	.	.	.	.	.
L07-057	18P1	236	15	98	.	.	.	.	.	.
L99-233	18P2	934	0	7	.	.	.	.	.	.
L09-123	18P2	314	2	23	.	.	.	.	.	.
L05-457	18P2	248	7	77	.	.	.	.	.	.
HO09-9401	18P2	240	5	61	.	.	.	.	.	.
L99-233	18P3	365	0	7	.	.	.	.	.	.
L07-057	18P3	576	2	19	.	.	.	.	.	.
HO09-840	HOCP04-838	252	9	81	.	.	.	.	.	.
L09-123	HOCP04-838	1714	11	24	.	.	.	.	.	.
HO09-840	L99-233	736	5	26	.	.	.	.	.	.
L09-123	18P4	332	13	86	.	.	.	.	.	.
L11-168	HOCP04-838	160	8	94	.	.	.	.	.	.
L12-227	18P6	2540	8	18	.	.	.	.	.	.
L12-202	18P6	215	13	96	.	.	.	.	.	.
L12-202	18P6	344	8	68	.	.	.	.	.	.
HOCP92-624	HOCP15-510	410	4	34	.	.	.	.	.	.
HOCP92-624	HO06-563	239	15	97	.	.	.	.	.	.
L11-187	HOCP97-609	393	19	93	.	.	.	.	.	.
L05-457	L99-233	2402	33	43	.	.	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
L11-183	HOCP91-552	374	9	70	.	.	.	.	.	.
HO09-827	HOCP04-838	1518	21	44	.	.	.	.	.	.
L05-457	HOCP04-838	3728	31	30	.	.	.	.	.	.
US01-040	HO14-835	463	18	85	.	.	.	.	.	.
L07-057	HO14-835	119	0	7	.	.	.	.	.	.
L11-187	HO14-835	200	5	71	.	.	.	.	.	.
L05-457	HOCP14-802	659	24	82	.	.	.	.	.	.
HOCP92-624	L99-233	1626	27	50	.	.	.	.	.	.
US01-040	18P7	390	23	95	.	.	.	.	.	.
HO11-9406	18P8	884	4	21	.	.	.	.	.	.
L05-457	HOCP04-838	413	16	85	.	.	.	.	.	.
HOCP95-951	HOCP96-540	246	5	58	.	.	.	.	.	.
L05-457	L99-233	239	3	37	.	.	.	.	.	.
LCP81-010	L06-038	2386	23	33	.	.	.	.	.	.
HO09-827	L06-001	2844	58	59	.	.	.	.	.	.
HOL15-993	18P9	1310	10	29	.	.	.	.	.	.
L14-275	18P9	243	0	7	.	.	.	.	.	.
L15-337	18P9	234	5	64	.	.	.	.	.	.
L14-275	18P9	295	4	42	.	.	.	.	.	.
L12-218	L09-099	353	15	90	.	.	.	.	.	.
L05-457	L12-227	192	4	61	.	.	.	.	.	.
LCP81-010	18P10	1296	4	17	.	.	.	.	.	.
HOCP04-838	18P10	351	3	31	.	.	.	.	.	.
L12-218	HO13-705	479	14	80	.	.	.	.	.	.
HOCP96-561	L99-233	2160	28	39	.	.	.	.	.	.
L13-251	18P11	2510	19	28	.	.	.	.	.	.
L11-168	L09-099	154	2	40	.	.	.	.	.	.
HOCP14-867	HO13-705	2558	18	27	.	.	.	.	.	.
L14-282	L01-299	596	12	57	.	.	.	.	.	.
L14-275	L12-202	69	1	46	.	.	.	.	.	.
LCP81-010	HOCP91-552	2578	35	42	.	.	.	.	.	.
HO08-730	HO11-532	1261	29	66	.	.	.	.	.	.
HO09-827	HO11-532	1464	64	91	.	.	.	.	.	.
L09-123	L09-099	322	6	53	.	.	.	.	.	.
L11-168	L09-099	638	26	89	.	.	.	.	.	.
L15-337	L09-099	453	13	79	.	.	.	.	.	.
LCP81-010	HO11-9406	1510	28	52	.	.	.	.	.	.
HOCP92-624	HO11-9406	617	10	49	.	.	.	.	.	.
HOCP92-624	L99-226	684	19	75	.	.	.	.	.	.
HOCP14-867	HO11-532	2250	28	36	.	.	.	.	.	.
L13-243	18P12	1099	24	64	.	.	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HOCP91-552	18P12	369	5	41	.	.	.	.	.	.
L14-273	L99-226	436	11	72	.	.	.	.	.	.
HOCP00-950	HO11-532	191	0	7	.	.	.	.	.	.
L13-243	HO11-532	499	23	92	.	.	.	.	.	.
L14-273	HO11-532	235	11	92	.	.	.	.	.	.
LCP81-010	HO11-532	1996	7	20	.	.	.	.	.	.
HOCP92-618	18P13	1610	17	35	.	.	.	.	.	.
L99-233	18P13	767	7	32	.	.	.	.	.	.
HOCP95-951	L01-299	475	10	63	.	.	.	.	.	.
HO09-827	L01-299	702	12	50	.	.	.	.	.	.
L11-187	L01-299	211	0	7	.	.	.	.	.	.
L CP81-010	L06-001	352	14	88	.	.	.	.	.	.
HO09-827	L09-099	331	13	87	.	.	.	.	.	.
HO09-827	HO11-532	1171	33	76	.	.	.	.	.	.
HOCP96-561	HO11-532	1102	22	57	.	.	.	.	.	.
HOCP96-561	HO13-705	1544	6	21	.	.	.	.	.	.
L98-209	L99-226	371	1	16	.	.	.	.	.	.
HOL15-993	L99-226	523	10	55	.	.	.	.	.	.
L14-282	L99-226	809	0	7	.	.	.	.	.	.
HOCP04-838	18P14	935	13	45	.	.	.	.	.	.
HO11-9406	18P14	421	12	78	.	.	.	.	.	.
L10-147	18P14	1238	24	56	.	.	.	.	.	.
HOCP97-609	18P14	448	1	15	.	.	.	.	.	.
L14-273	L01-299	492	40	99	.	.	.	.	.	.
HOCP92-624	L99-226	1047	20	54	.	.	.	.	.	.
LCP81-010	L99-226	3092	22	28	.	.	.	.	.	.
L11-183	HOCP04-838	293	6	60	.	.	.	.	.	.
L94-433	18P15	1017	29	78	.	.	.	.	.	.
L11-183	L06-001	1740	22	38	.	.	.	.	.	.
HO09-827	L99-226	1954	13	25	.	.	.	.	.	.
L14-276	L99-226	367	9	71	.	.	.	.	.	.
HO08-730	18P16	604	14	67	.	.	.	.	.	.
2017 Crossing Series										
HO11-512	HO11-532	211	2	34	1	53	.	.	.	.
HOCP14-897	L01-299	382	14	86	12	96	.	.	.	.
HOCP14-897	HO12-630	203	0	6	0	16	.	.	.	.
HOCP09-857	HO09-832	135	5	89	2	86	.	.	.	.
HOCP09-804	HOCP14-885	328	14	92	6	90	.	.	.	.
HO12-630	L01-299	595	23	90	5	70	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HOCP96-540	HO11-532	428	17	90	5	82	.	.	.	.
L14-282	HO12-630	232	1	17	0	16	.	.	.	.
HOCP16-685	HO12-630	440	0	6	0	16	.	.	.	.
HO11-532	HO12-630	224	9	91	0	16	.	.	.	.
HO11-512	HOCP14-867	190	23	99	10	98	.	.	.	.
HOCP15-506	HOCP14-867	226	4	63	4	88	.	.	.	.
HO15-959	HOCP14-867	421	0	6	0	16	.	.	.	.
HO11-512	HO11-532	415	4	36	1	39	.	.	.	.
L09-112	HO11-532	240	4	61	0	16	.	.	.	.
HO11-515	HO11-532	206	3	56	2	76	.	.	.	.
HO15-959	L12-201	196	0	6	0	16	.	.	.	.
HOCP16-685	L12-201	389	3	26	2	56	.	.	.	.
HOCP16-685	HOL15-993	353	0	6	0	16	.	.	.	.
HO15-964	HOCP14-885	412	11	80	9	92	.	.	.	.
L14-285	HO15-930	373	0	6	0	16	.	.	.	.
HO09-832	HOCP14-885	171	0	6	0	16	.	.	.	.
HOCP13-737	HOCP14-885	200	3	59	3	86	.	.	.	.
HOCP14-901	HOCP14-885	858	26	81	9	79	.	.	.	.
HOCP04-838	09P1	204	7	86	2	77	.	.	.	.
HOCP00-930	11P24	185	0	6	0	16	.	.	.	.
L09-131	12P12	208	1	19	0	16	.	.	.	.
HO09-840	L99-226	94	0	6	0	16	.	.	.	.
HO09-827	HO06-563	177	3	62	0	16	.	.	.	.
HO11-9406	L99-233	189	4	71	4	91	.	.	.	.
L99-233	HO11-9406	264	8	81	3	80	.	.	.	.
L05-457	L99-226	233	5	73	0	16	.	.	.	.
L05-457	L01-299	229	3	50	3	83	.	.	.	.
HO09-832	L06-001	425	12	80	4	75	.	.	.	.
HOCP85-845	L06-001	224	2	30	1	50	.	.	.	.
HOCP92-618	CP83-644	236	1	16	0	16	.	.	.	.
L14-275	HOCP96-540	168	2	46	0	16	.	.	.	.
HOCP92-624	HOCP09-804	194	1	20	0	16	.	.	.	.
L94-433	HOCP09-804	403	5	48	1	40	.	.	.	.
L07-057	HOCP04-838	358	0	6	0	16	.	.	.	.
L09-123	HOCP04-838	380	1	13	0	16	.	.	.	.
HO09-840	L99-233	465	10	73	0	16	.	.	.	.
HOCP92-624	L99-233	1240	26	70	7	60	.	.	.	.
L05-457	L99-233	766	7	32	1	33	.	.	.	.
L09-123	HO06-563	391	3	25	1	41	.	.	.	.
L05-457	HOCP04-838	333	6	64	3	73	.	.	.	.
L05-457	L12-202	139	2	54	2	85	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HO09-827	L99-233	1370	26	66	12	72	.	.	.	.
L15-324	17P5	942	13	51	3	46	.	.	.	.
L05-448	17P5	179	4	74	1	58	.	.	.	.
L07-057	HOCP97-609	901	9	37	7	68	.	.	.	.
HO09-827	L01-299	381	9	77	3	69	.	.	.	.
L05-457	HOCP91-552	462	4	29	0	16	.	.	.	.
L09-123	HOCP91-552	412	2	20	0	16	.	.	.	.
L98-207	L08-090	355	1	14	0	16	.	.	.	.
L09-123	L09-099	209	3	53	0	16	.	.	.	.
L05-457	L99-233	964	11	43	3	45	.	.	.	.
HO11-9406	L99-233	894	18	70	9	78	.	.	.	.
L05-457	L99-233	1035	22	72	3	44	.	.	.	.
HO11-9406	L99-233	613	9	57	5	70	.	.	.	.
L01-315	HOCP96-540	549	6	41	1	36	.	.	.	.
L14-289	L06-001	107	0	6	0	16	.	.	.	.
L14-275	HO09-804	764	9	45	1	33	.	.	.	.
US01-040	HO09-804	143	16	98	5	96	.	.	.	.
HO08-730	L12-202	346	5	55	2	62	.	.	.	.
L98-207	L12-202	175	0	6	0	16	.	.	.	.
L11-183	HOCP91-552	155	4	79	4	93	.	.	.	.
HOCP92-624	L01-299	202	19	97	4	90	.	.	.	.
L01-315	L99-233	232	0	6	0	16	.	.	.	.
L14-276	HOCP04-838	179	2	42	0	16	.	.	.	.
L10-146	HOCP04-838	130	7	95	4	95	.	.	.	.
L05-448	HO11-532	209	5	78	0	16	.	.	.	.
HO09-827	L01-299	313	4	49	0	16	.	.	.	.
US01-040	L01-299	381	14	87	2	56	.	.	.	.
HOCP92-624	L01-299	988	0	6	0	16	.	.	.	.
HO06-530	L11-187	106	1	33	0	16	.	.	.	.
L14-275	HOCP09-804	488	2	15	1	37	.	.	.	.
L13-251	HOCP09-804	1458	33	75	20	84	.	.	.	.
L13-723	L09-099	559	5	31	3	57	.	.	.	.
US01-040	L99-233	1198	5	16	0	16	.	.	.	.
HOCP92-624	HOCP96-540	1786	17	35	11	63	.	.	.	.
HOCP01-523	L13-251	508	12	77	9	89	.	.	.	.
HOCP92-624	HO06-563	1245	15	46	6	55	.	.	.	.
HOCP96-561	L99-226	360	3	26	1	43	.	.	.	.
L14-275	L06-001	849	17	69	6	66	.	.	.	.
L14-296	L01-299	211	3	53	1	53	.	.	.	.
L14-282	HOCP04-838	1262	11	30	6	54	.	.	.	.
HOCP13-723	HOCP04-838	789	6	24	1	32	.	.	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
L01-315	L09-099	472	7	58	3	63	.	.	.	.
L15-304	L09-099	452	7	60	1	38	.	.	.	.
L14-282	L09-099	902	17	66	8	73	.	.	.	.
HOCP13-723	L09-099	278	2	23	1	47	.	.	.	.
HO09-840	L09-099	169	3	63	0	16	.	.	.	.
L14-265	L12-227	146	7	93	4	94	.	.	.	.
HO09-840	L12-227	596	6	38	1	36	.	.	.	.
HO09-827	L12-227	104	0	6	0	16	.	.	.	.
CP83-644	LCP85-384	1237	13	40	2	35	.	.	.	.
LCP81-010	LCP85-384	1445	15	39	2	34	.	.	.	.
HO09-840	HOCP97-609	51	1	68	0	16	.	.	.	.
LCP81-010	L99-226	1490	64	93	17	81	.	.	.	.
HOCP92-624	L99-226	536	5	33	3	59	.	.	.	.
LCP81-010	HOCP04-838	703	6	28	0	16	.	.	.	.
HOCP92-624	L99-226	1464	10	23	4	42	.	.	.	.
L05-457	L99-226	867	9	39	6	64	.	.	.	.
L14-282	HOCP04-838	694	8	44	4	61	.	.	.	.
L14-275	L11-187	205	18	96	12	99	.	.	.	.
L14-276	L06-001	696	4	21	2	43	.	.	.	.
L11-183	L99-226	239	16	96	1	49	.	.	.	.
L14-265	HOCP97-609	1151	11	36	5	50	.	.	.	.
L14-265	L12-202	1289	30	76	16	83	.	.	.	.
HOCP92-624	L99-226	709	8	43	5	65	.	.	.	.
L01-283	HOCP13-723	361	7	67	4	80	.	.	.	.
L14-276	HO13-705	124	6	94	5	97	.	.	.	.
HOCP92-624	HO13-705	422	14	84	4	76	.	.	.	.
L14-269	L06-001	245	0	6	0	16	.	.	.	.
HO09-827	L09-099	120	4	85	2	87	.	.	.	.
L14-296	L09-099	522	16	83	2	48	.	.	.	.
HOCP95-951	L99-226	236	2	27	2	71	.	.	.	.
CP83-644	HO11-532	1217	15	47	4	46	.	.	.	.
HO09-827	L06-001	1548	21	50	11	66	.	.	.	.
L14-273	L99-226	414	6	56	0	16	.	.	.	.
HOCP13-726	L01-299	652	24	88	15	93	.	.	.	.
L11-183	L01-299	215	0	6	0	16	.	.	.	.
L98-209	L06-001	881	16	65	5	60	.	.	.	.
HOCP13-726	HOCP96-540	820	5	22	2	40	.	.	.	.
L14-295	HOCP96-540	445	2	18	2	51	.	.	.	.
LCP81-010	HO13-705	868	14	60	4	52	.	.	.	.
L05-457	L09-099	214	3	52	2	74	.	.	.	.
HOCP00-950	L09-099	130	4	83	1	67	.	.	.	.

Table 6. Continued

Female	Male	Survive	1st Line No.	1st Line Rank Percentile	2nd Line No.	2nd Line Rank Percentile	Increases No.	Increases Rank Percentile	Assignments No.	Assignments Rank Percentile
2016 Crossing Series										
HO06-530	L99-233	225	0	7	0	18	0	23	.	.
N27	L06-001	248	0	7	0	18	0	23	.	.
L07-057	L99-233	369	1	22	0	18	0	23	.	.
HO09-840	HOCP04-838	314	1	23	0	18	0	23	.	.
HO09-840	L99-233	824	6	51	4	72	3	72	.	.
L05-457	L99-233	637	11	84	9	94	6	94	.	.
L13-242	HOCP91-552	558	4	50	4	82	4	88	.	.
L05-457	L99-233	937	6	45	4	62	2	56	.	.
L09-123	L01-299	220	3	76	2	86	1	79	.	.
HO09-840	L01-299	167	2	70	0	18	0	23	.	.
L05-457	HOCP91-552	197	1	37	0	18	0	23	.	.
HO09-840	L01-299	395	18	98	2	74	1	61	.	.
L05-457	L01-299	380	5	72	4	89	3	92	.	.
HOCP92-624	L01-299	612	6	64	1	41	0	23	.	.
L05-457	L01-299	240	3	71	1	61	1	76	.	.
L98-209	L05-448	182	1	42	0	18	0	23	.	.
L09-123	HOCP91-552	921	3	24	1	37	0	23	.	.
HOCP91-552	16P1	831	4	31	1	38	1	49	.	.
L06-038	16P1	212	0	7	0	18	0	23	.	.
HO06-563	16P1	232	6	91	2	84	0	23	.	.
HO06-563	16P1	438	5	68	3	80	3	87	.	.
HOCP13-726	HOCP12-647	601	3	36	0	18	0	23	.	.
HOCP91-552	HOCP12-647	284	6	86	0	18	0	23	.	.
L13-243	HOCP12-647	410	0	7	0	18	0	23	.	.
HOCP12-647	HOCP12-647	.	0	.	0	18	0	.	.	.
L12-227	L01-299	209	3	79	5	91	0	23	.	.
L05-457	L01-299	417	9	87	29	90	2	82	.	.
N27	L99-226	2426	59	89	20	88	15	87	.	.
N27	LCP85-384	2110	58	92	1	46	9	77	.	.
L07-057	LCP85-384	420	1	20	6	95	1	59	.	.
L05-457	L08-090	406	12	95	1	57	3	91	.	.
HO09-827	L08-090	280	1	27	0	18	1	71	.	.
L98-209	HOCP11-532	452	0	7	7	97	0	23	.	.
HOCP04-838	16P2	405	9	87	5	55	5	95	.	.
HOCP91-552	16P2	1495	9	44	4	79	3	55	.	.
HOCP91-552	16P2	596	8	74	1	64	2	69	.	.
HOCP97-609	16P2	227	2	56	0	18	0	23	.	.
HOCP97-609	16P2	619	0	7	0	18	0	23	.	.
L07-057	HOCP91-552	382	2	39	0	18	0	23	.	.
							0	23		

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HO06-563	HOCP91-552	188	3	82	7	87	0	23	.	.
HOCP97-609	HOCP91-552	764	14	85	0	18	3	73	.	.
L94-428	HOCP91-552	594	5	54	3	74	2	69	.	.
HOCP95-951	L08-090	1169	8	48	5	63	3	62	.	.
L98-209	L08-090	785	12	81	2	48	2	61	.	.
L07-057	L08-090	179	2	67	0	18	0	23	.	.
L98-207	L12-202	376	0	7	0	18	0	23	.	.
L13-260	LCP85-384	289	1	25	1	56	1	70	.	.
HOCP91-552	LCP85-384	376	2	40	1	51	0	23	.	.
HO09-827	LCP81-010	203	0	7	0	18	0	23	.	.
HOCP91-552	LCP81-010	441	1	18	0	18	0	23	.	.
HOCP92-618	HOCP13-726	569	1	16	0	18	0	23	.	.
L05-457	HOCP13-726	340	2	43	1	53	1	67	.	.
L13-260	L08-090	179	2	67	0	18	0	23	.	.
L98-207	L08-090	301	4	73	1	54	0	23	.	.
HOCP92-624	L09-099	591	8	74	0	18	0	23	.	.
L13-260	L99-233	207	2	62	1	71	1	83	.	.
HO09-840	L99-233	550	6	66	1	42	1	53	.	.
HOCP91-552	16P3	179	0	7	0	18	0	23	.	.
HOCP91-552	16P3	229	0	7	0	18	0	23	.	.
L94-428	16P3	219	14	99	8	99	5	99	.	.
HOCP95-951	16P3	411	3	52	1	48	0	23	.	.
HO09-840	L99-226	476	4	53	3	77	1	56	.	.
L14-273	L99-226	251	1	28	0	18	0	23	.	.
L11-183	L99-226	137	2	80	1	82	1	89	.	.
L98-209	L99-226	637	1	15	0	18	0	23	.	.
L05-457	L99-226	1326	12	58	6	66	2	51	.	.
L11-183	L12-202	218	0	7	0	18	0	23	.	.
HOCP92-618	L12-202	461	4	56	1	43	1	57	.	.
LCP81-010	L12-202	2683	15	43	10	58	7	64	.	.
HO09-840	HO06-563	1047	7	47	3	52	1	47	.	.
HOCP92-618	HO06-563	1198	19	82	8	78	7	86	.	.
HO09-827	HO06-563	1248	17	76	5	60	5	74	.	.
HOCP92-618	HOCP96-540	1122	8	49	5	65	3	66	.	.
HOCP09-840	LCP85-384	387	1	21	0	18	0	23	.	.
HOCP00-950	HOCP91-552	333	1	23	0	18	0	23	.	.
HO11-532	HOCP12-647	501	2	29	0	18	0	23	.	.
L06-001	HOCP12-647	213	2	61	1	68	0	23	.	.
L01-299	HOCP12-647	223	0	7	0	18	0	23	.	.
HO11-9406	L99-233	547	1	17	1	43	1	54	.	.
L05-457	L99-233	617	10	83	3	73	2	68	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HOCP02-618	L99-233	369	5	75	0	18	0	23	.	.
HOCP92-618	HOCP04-838	136	0	7	0	18	0	23	.	.
L05-457	L99-226	1128	13	69	7	76	3	65	.	.
LCP85-384	L99-226	418	3	51	0	18	0	23	.	.
L99-233	HO11-9406	386	2	38	1	50	1	64	.	.
HOCP92-624	L99-226	232	2	55	2	84	2	93	.	.
L05-457	L99-226	228	3	72	1	64	1	78	.	.
L05-457	L06-001	453	13	94	11	98	7	97	.	.
L14-295	L06-001	1111	25	88	10	85	8	89	.	.
L05-457	HOCP96-540	364	3	53	1	51	0	.	.	.
L14-275	HOCP96-540	782	7	58	3	58	1	66	.	.
L05-457	L12-202	614	3	35	1	40	0	23	.	.
L05-457	L99-226	387	4	65	4	89	1	51	.	.
US01-040	L99-226	207	1	33	1	71	2	84	.	.
HOCP92-618	HOCP96-540	216	1	30	1	66	0	23	.	.
HOCP92-624	LCP85-384	607	2	25	0	18	0	23	.	.
L01-283	HO06-563	419	6	79	2	69	0	23	.	.
L14-265	L99-226	586	6	64	3	75	2	82	.	.
L12-218	L99-226	213	2	61	1	68	3	84	.	.
HOCP85-845	L01-299	365	2	41	0	18	1	80	.	.
L05-457	HOCP09-804	222	0	7	0	18	0	23	.	.
LCP85-384	16P6	404	1	20	0	18	0	23	.	.
L05-457	L01-299	723	5	48	3	61	0	23	.	.
L97-128	L01-299	214	8	97	3	94	3	76	.	.
L14-265	L99-226	657	17	92	8	92	1	79	.	.
L98-209	L99-226	413	4	63	1	47	5	92	.	.
L14-265	L08-090	587	14	89	8	92	0	23	.	.
HO09-832	L06-001	570	18	97	9	96	8	97	.	.
HOCP92-618	L06-001	1478	17	69	10	79	9	98	.	.
L01-283	HOCP01-517	218	2	60	0	18	6	75	.	.
HOCP96-561	HOCP01-517	207	1	33	0	18	0	23	.	.
HOCP97-609	HOCP09-804	213	1	30	1	68	0	23	.	.
L05-457	HO11-532	438	6	77	3	80	1	80	.	.
HOCP00-950	HO13-705	388	0	7	0	18	1	58	.	.
N27	HOCP96-540	458	3	46	1	44	0	23	.	.
HO09-840	L12-227	983	9	59	3	53	1	58	.	.
HOCP92-618	L12-227	892	0	7	0	18	1	48	.	.
HOCP00-950	L13-251	589	0	7	0	18	0	23	.	.
HOCP92-618	L13-251	755	5	46	4	76	0	23	.	.
HOCP92-624	L99-226	565	5	57	2	56	4	85	.	.
L94-433	L99-226	180	0	7	0	18	1	53	.	.

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HOCP92-624	HOCP91-552	530	1	17	0	18	0	23	.	.
L01-283	L09-099	414	2	33	1	46	1	60	.	.
L11-183	L99-226	136	4	94	1	83	1	90	.	.
HOCP85-845	L06-001	184	1	41	0	18	0	23	.	.
HOCP01-523	CP83-644	239	6	90	4	97	3	96	.	.
HOCP04-847	HOCP97-609	218	0	7	0	18	0	23	.	.
L14-269	HOCP97-609	850	3	26	1	38	1	48	.	.
HOCP85-845	L09-099	212	0	7	0	18	0	23	.	.
N27	L09-099	866	26	96	12	93	9	94	.	.
HOCP92-618	CP83-644	611	3	35	1	41	1	52	.	.
L14-282	CP83-644	214	3	78	2	87	0	23	.	.
HO09-9402	L15-301	254	7	93	1	59	1	74	.	.
HOCP01-517	HOCP96-540	830	14	84	4	70	3	71	.	.
L14-275	HOCP96-540	388	2	38	1	49	1	63	.	.
L05-457	LCP85-384	178	0	7	0	18	0	23	.	.
HOCP92-624	HOCP09-804	824	4	34	1	39	1	50	.	.
L94-433	HOCP09-804	263	1	28	0	18	0	23	.	.
HOCP92-624	CP83-644	435	1	19	1	45	0	23	.	.
2015 Crossing Series										
HO06-530	L99-226	671	2	22	0	21	0	31	0	41
HO06-530	L99-233	222	4	64	0	21	0	31	0	41
HO07-613	L06-001	998	25	77	8	80	6	90	2	88
HO07-613	L99-226	910	6	31	3	62	1	64	0	41
HO08-709	HO06-563	594	5	38	3	73	0	31	0	41
HO08-709	L08-090	521	5	44	1	52	1	71	0	41
HO08-709	L99-226	1147	24	70	18	93	7	91	3	91
HO08-717	L99-226	132	1	34	0	21	0	31	0	41
HO09-840	HOCP96-561	229	3	51	1	68	0	31	0	41
HO09-9401	L09-099	189	11	96	0	21	0	31	0	41
HO10-937	HOCP05-918	266	2	33	2	80	2	93	1	93
HO11-508	HOCP13-749	735	19	79	1	47	0	31	0	41
HO11-508	L99-233	478	2	23	0	21	0	31	0	41
HO11-515	L99-226	178	3	60	1	73	1	88	1	97
HO11-517	HO13-705	165	0	9	0	21	0	31	0	41
HO11-517	HOCP04-838	219	4	65	1	70	0	31	0	41
HO11-536	L99-233	428	4	42	1	55	1	76	0	41
HO11-556	15P3	594	26	93	4	78	1	68	1	87
HO11-556	HOCP14-865	434	0	9	0	21	0	31	0	41

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HO12-626	HO13-704	372	3	37	0	21	0	31	0	41
HO12-628	HO13-705	425	1	20	0	21	0	31	0	41
HO12-628	HO14-852	699	15	73	7	87	4	89	3	95
HO12-629	HOCP12-676	195	2	45	0	21	0	31	0	41
HO12-633	HOCP14-865	204	6	84	0	21	0	31	0	41
HO12-641	L14-268	167	3	63	0	21	0	31	0	41
HO12-9401	HOCP91-552	158	0	9	0	21	0	31	0	41
HO12-9410	HOCP96-540	286	8	82	5	95	2	93	0	41
HO12-9410	L08-090	190	0	9	0	21	0	31	0	41
HO12-9410	L09-099	162	0	9	0	21	0	31	0	41
HO13-718	HO13-704	715	15	71	6	81	0	31	0	41
HO13-731	L99-233	199	0	9	0	21	0	31	0	41
HO14-805	L99-233	328	9	81	1	58	0	31	0	41
HO14-811	HO11-508	475	16	87	0	21	0	31	0	41
HO14-913	L99-233	472	2	24	0	21	0	31	0	41
HO14-9243	HO14-824	177	0	9	0	21	0	31	0	41
HOCP00-950	HOCP04-838	469	5	47	0	21	0	31	0	41
HOCP00-950	HOCP11-536	273	3	48	1	63	1	82	1	93
HOCP00-950	L01-283	212	4	67	0	21	0	31	0	41
HOCP00-950	L06-001	413	1	21	0	21	0	31	0	41
HOCP01-517	L99-226	938	37	92	9	86	4	84	1	84
HOCP04-814	HO07-613	688	17	75	5	79	2	79	0	41
HOCP05-918	HOCP96-540	710	28	91	3	66	2	77	0	41
HOCP11-516	L01-283	437	11	77	2	71	0	31	0	41
HOCP11-541	HO13-702	514	6	50	0	21	0	31	0	41
HOCP11-541	HOCP04-838	680	6	39	0	21	0	31	0	41
HOCP11-541	HOCP12-674	848	5	29	0	21	0	31	0	41
HOCP11-544	L99-233	637	11	61	2	60	1	66	0	41
HOCP11-545	HOCP05-918	549	9	59	1	51	1	70	1	88
HOCP11-565	HO13-702	431	0	9	0	21	0	31	0	41
HOCP12-643	HOCP13-767	709	4	28	1	48	0	31	0	41
HOCP12-654	HOCP13-767	478	3	31	1	53	0	31	0	41
HOCP12-654	HOCP14-865	501	8	58	5	86	1	71	0	41
HOCP12-676	HOCP14-892	388	0	9	0	21	0	31	0	41
HOCP13-726	HO14-807	497	4	36	1	53	1	72	0	41
HOCP13-749	HO13-705	277	2	32	0	21	0	31	0	41
HOCP13-751	HOCP13-726	261	2	35	0	21	0	31	0	41
HOCP13-764	HOCP10-900	706	27	91	14	97	7	97	2	92
HOCP14-815	HOCP13-726	135	2	57	0	21	0	31	0	41
HOCP14-892	HO14-9219	198	1	27	0	21	0	31	0	41

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
HOCP85-845	15P6	631	9	55	2	60	2	80	1	86
HOCP85-845	HOCP04-838	223	0	9	0	21	0	31	0	41
HOCP92-624	L01-283	1163	6	28	1	43	1	62	0	41
HOCP92-624	L01-299	605	9	57	4	76	1	67	0	41
HOCP92-624	L99-226	926	16	62	1	44	1	64	1	84
HOCP95-951	15P6	230	5	73	0	21	0	31	0	41
HOCP95-951	LCP85-384	158	0	9	0	21	0	31	0	41
HOCP96-540	15P6	958	1	19	1	44	1	63	0	41
HOCP96-561	L99-226	955	9	43	2	54	0	31	0	41
HOCP97-609	L99-226	140	0	9	0	21	0	31	0	41
L01-283	L08-090	238	5	71	1	65	1	84	0	41
L01-283	L99-226	550	5	41	1	51	0	31	0	41
L01-283	L99-233	1117	13	49	2	50	1	62	0	41
L01-299	L99-233	169	5	84	0	21	0	31	0	41
L01-315	LCP85-384	191	0	9	0	21	0	31	0	41
L05-457	15P6	1830	11	30	2	45	0	31	0	41
L05-457	HO11-556	902	12	53	1	46	0	31	0	41
L05-457	HOCP91-552	615	31	94	3	71	0	31	0	41
L05-457	L99-226	2830	51	64	12	67	6	73	0	41
L05-457	L99-233	189	2	46	0	21	0	31	0	41
L06-040	L06-001	1371	43	85	14	88	5	81	0	41
L06-040	L99-226	184	0	9	0	21	0	31	0	41
L07-057	15P1	426	4	42	4	85	4	96	2	97
L07-057	15P2	121	0	9	0	21	0	31	0	41
L07-057	L01-299	365	4	48	0	21	0	31	0	41
L09-099	15P1	1552	4	22	0	21	0	31	0	41
L09-099	15P3	108	0	9	0	21	0	31	0	41
L09-123	L99-233	381	0	9	0	21	0	31	0	41
L11-168	L09-099	490	27	95	12	97	4	95	1	90
L11-168	L99-226	226	1	24	1	69	0	31	0	41
L11-172	15P4	571	7	51	2	62	0	31	0	41
L11-178	15P2	216	1	26	0	21	0	31	0	41
L11-178	HOCP91-552	175	0	9	0	21	0	31	0	41
L11-178	L09-099	352	5	54	1	56	0	31	0	41
L11-178	L14-291	119	1	37	0	21	0	31	0	41
L11-183	L99-226	175	0	9	0	21	0	31	0	41
L11-187	15P4	197	5	78	2	88	1	86	0	41
L12-202	L08-090	127	0	9	0	21	0	31	0	41
L12-218	L06-001	1939	63	86	35	96	13	92	4	91
L13-234	15P5	281	17	97	4	93	1	80	0	41

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
L13-234	HOCP04-838	357	5	53	3	82	0	31	0	41
L13-241	L11-172	330	3	41	1	57	0	31	0	41
L13-243	15P3	158	0	9	0	21	0	31	0	41
L13-246	L06-038	992	21	72	6	75	4	83	2	89
L13-246	L99-226	235	8	88	2	83	0	31	0	41
L13-251	L09-099	703	10	55	8	91	6	95	1	85
L13-251	L13-234	157	0	9	0	21	0	31	0	41
L14-265	HOCP91-552	1949	38	68	13	77	3	65	1	83
L14-268	15P3	137	2	56	0	21	0	31	0	41
L14-269	HOCP04-838	383	10	80	4	89	2	87	0	41
L14-269	HOCP96-540	235	20	98	2	83	0	31	0	41
L14-269	L09-099	692	39	95	18	98	10	97	0	41
L14-272	L09-099	217	1	25	0	21	0	31	0	41
L14-272	L99-233	203	4	69	1	72	0	31	0	41
L14-275	HOCP04-838	293	0	9	0	21	0	31	0	41
L14-275	HOCP91-552	191	0	9	0	21	0	31	0	41
L14-275	L06-038	142	0	9	0	21	0	31	0	41
L14-275	L07-057	748	6	35	5	77	3	82	0	41
L14-276	HOCP97-609	153	3	68	2	92	1	91	1	98
L14-282	HO11-532	249	9	89	4	95	4	98	1	95
L14-282	HOCP97-609	223	10	93	9	99	4	99	2	99
L14-282	L06-038	222	8	88	2	84	1	86	0	41
L14-282	LCP85-384	134	0	9	0	21	0	31	0	41
L14-285	HO11-532	226	5	74	1	69	1	85	1	96
L14-286	HOCP96-540	1184	22	66	5	66	2	68	0	41
L14-286	HOCP97-609	431	1	20	0	21	0	31	0	41
L14-286	L99-233	773	7	40	0	21	0	31	0	41
L15-298	L99-226	878	32	90	2	55	0	31	0	41
L15-298	L99-233	619	17	82	2	61	1	66	0	41
L15-302	HOCP04-838	250	22	99	4	94	2	94	1	94
L15-302	HOCP96-540	429	0	9	0	21	0	31	0	41
L15-302	LCP81-010	686	16	75	2	57	0	31	0	41
L94-433	L01-283	180	15	97	2	91	1	88	0	41
L94-433	L99-226	568	6	46	1	49	1	69	0	41
L94-433	L99-233	1400	41	83	15	90	3	74	0	41
L98-207	HOCP04-838	241	4	60	0	21	0	31	0	41
L98-209	L14-294	807	4	26	1	46	0	31	0	41
L98-209	L99-226	1904	25	52	12	75	4	73	0	41
L99-233	15P1	396	3	34	0	21	0	31	0	41
L99-233	HOCP96-540	1405	26	66	12	84	4	77	2	86

Table 6. Continued

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
L99-233	L01-299	696	18	80	4	74	2	78	0	41
LCP81-010	HOCP96-540	704	7	44	1	48	0	31	0	41
N27	L01-299	248	8	86	1	64	0	31	0	41
N27	L06-001	3221	80	76	10	59	7	75	1	82
N27	L99-226	1787	32	62	7	64	4	75	0	41

2020 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS

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

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

The on-station nursery trials were planted in single row (6-foot centers), 16-foot-long plots with 4-foot alleys. The off-station nurseries were planted in single row, 20-foot plots with 4-foot alleys. The infield tests were planted in two-row, 25-foot-long plots with 5-foot alleys. The experimental design for both nursery and infield tests was a randomized complete block with two replications per location. Commercial check varieties, HoCP96-540, L01-299, HoCP04-838, HoCP09-804, L11-183, L12-201and Ho 12-615 were planted in all nursery and infield tests for comparison.

Millable stalk counts for both nursery and infield tests were made in late July and August. A combine harvester and weigh wagon system was used to cut and weigh plots, respectively, for the infield tests. At harvest, 10-stalk samples were harvested by hand and stripped of leaves. A bundle weight was recorded to obtain a stalk weight (lb) estimate. Samples were then analyzed for sucrose content and fiber content. At the USDA-ARS laboratory, the pre-breaker press method was used to estimate fiber content. A juice sample was sent to the laboratory to obtain Brix and pol readings, which were used to estimate theoretical recoverable sugar per ton as estimated by the Winter-Carp formula as reported by Gravois and Milligan (1992). Samples sent to the Sugar Research Station sucrose laboratory were analyzed with a NIR Spectra Cane system to estimate sucrose and fiber content. Cane yield for the nursery tests was estimated as the product of stalk weight and stalk number. Cane yield for the infield tests was determined from the plot weights and reduced 14 percent to account for extraneous trash. Sugar per acre was calculated as the product of sugar per ton and cane yield.

In 2020, Louisiana was impacted by seven named tropical storms (Cristobal, Marco, Laura, Sally, Beta, Delta, and Zeta). Tropical Storm Cristobal began the Louisiana hurricane season by making landfall in southeast Louisiana on June 7. On August 27, Hurricane Laura made landfall as a category 4 hurricane in southwestern Louisiana, with winds of up to 150 miles per hour and over 9 feet of storm surge in some parishes. October ended with Hurricane Zeta making landfall in southeastern Louisiana and bringing with it high winds and rain. The Louisiana industry received 90.69" of rain in 2020, which is over 15" higher than the average. Baton Rouge received 67.9" of rainfall, which is 7.2" over the 30-year average. All mills in the Louisiana industry completed grinding by January 28, 2020. Recommended cultural practices were followed at all test locations. The most widely grown varieties in Louisiana in 2020 were L01-299 and HoCP96-540, occupying 59% and 12% of the state's acreage, respectively. L01-299 was used as a standard for comparison and is highlighted in the tables. Nursery trials located at Iberia Research Station were not harvested in 2020 due to severe damage to plots from wild boar populations. To adjust for missing data, the statistical analysis calculated least square means (SAS 9 Proc Mixed). Mean separation used least square means probability differences where P=0.05. Varieties that are significantly higher or lower than L01-299 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. 2020 Location, soil texture, and planting and harvest dates for the nursery and infield tests

					Harvest Date	Varieties	
Series	Location†	Stage	Soil Texture	Planting Date	2020	No. Planted	No. Harvested
2015	Blackberry Farms	Infield	Commerce silt loam	09/21/16	10/26/20	37	2
2015	Sugar Research Station	Infield	Commerce Silty Clay loam	09/30/16	12/5/19	37	2
2015	Newton Cane, Inc.	Nursery	Norwood silt loam	09/12/16	11/13/20	75	2
2015	Michael Melancon	Nursery	Loreauville silt loam	09/23/16	11/10/20	75	2
2015	Landry Farms	Nursery	Sharkey silty clay loam	08/25/16	10/07/20	75	2
2016	Sugar Research Station	Nursery	Commerce silt loam	11/07/16	Not Harvested	34	0
2016	Ardoyne Farm – U.S.D.A.	Nursery	Commerce silt loam	11/14/16	Not Harvested	34	0
2016	Iberia Research Station	Nursery	Baldwin silty clay	11/09/16	Not Harvested	33	0
2016	Blackberry Farms	Infield	Commerce silt loam	09/06/17	10/26/20	47	1
2016	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/24/17	11/05/20	47	1
2016	Newton Cane, Inc.	Nursery	Norwood silt loam	08/16/17	11/13/20	64	2
2016	Michael Melancon	Nursery	Loreauville silt loam	08/18/17	11/10/20	64	2
2016	Landry Farms	Nursery	Sharkey silty clay loam	09/08/17	10/07/20	64	2
2017	Sugar Research Station	Nursery	Commerce silt loam	11/18/17	11/12/20	42	2
2017	Ardoyne Farm – U.S.D.A	Nursery	Commerce silt loam	11/13/17	11/06/20	42	2
2017	Iberia Research Station	Nursery	Baldwin silty clay	11/7/17	Not Harvested	42	0
2017	Blackberry Farms	Infield	Commerce silt loam	09/17/18	10/26/20	39	4
2017	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/15/18	11/05/20	39	4
2017	Newton Cane, Inc	Nursery	Norwood silt loam	08/16/18	11/13/20	60	8
2017	Michael Melancon	Nursery	Loreauville silt loam	09/18/18	11/10/20	60	8
2017	Landry Farms	Nursery	Sharkey silty clay loam	09/19/18	10/07/20	60	8
2018	Sugar Research Station	Nursery	Commerce silt loam	11/16/18	11/12/20	28	2
2018	Iberia Research Station	Nursery	Baldwin silty clay	11/19/18	Not Harvested	28	0
2018	Blackberry Farms	Infield	Commerce silt loam	09/12/19	12/11/20	31	8
2018	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/14/19	12/01/20	31	8
2018	Newton Cane, Inc	Nursery	Norwood silt loam	08/13/19	12/11/20	54	17
2018	Michael Melancon	Nursery	Loreauville silt loam	09/05/19	11/13/20	54	17
2018	Landry Farms	Nursery	Sharkey silty clay loam	09/14/19	12/08/20	54	17
2019	Sugar Research Station	Nursery	Commerce silt loam	11/11/19	11/23/20	42	20
2019	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/20/19	11/06/20	42	20
2019	Iberia Research Station	Nursery	Baldwin silty clay	11/07/19	Not Harvested	42	0
2019	Blackberry Farms	Infield	Commerce silt loam	09/09/20		36	
2019	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/13/20		36	
2019	Newton Cane, Inc	Nursery	Norwood silt loam	08/19/20		54	
2019	Michael Melancon	Nursery	Loreauville silt loam	08/18/20		54	
2019	Landry Farms	Nursery	Sharkey silty clay loam	08/11/20		54	
2020	Sugar Research Station	Nursery	Commerce silt loam	11/02/20		27	
2020	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/04/20		33	
2020	Iberia Research Station	Nursery	Baldwin silty clay	11/05/20		38	

† Ardoyne-U.S.D.A. Ardoyne Farm (Chacahoula), Blackberry Farms (Vacherie), Iberia Research Station (Jeanerette), Newton Cane, Inc. (Bunkie), Sugar Research Station (St. Gabriel), Michael Melancon (Cecilia), Landry Farms (Paincourtville), and Circle A Farm (Maurice).

Table 2. Off-station nursery third-stubble means of the 2015 “L” and “HoL” assignment series on a Commerce silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	12110	40.5	298	2.23	36300 -	10.3 -
L 01-283	11117	38.0	293	1.59	47916	12.0
L 01-299	14193	47.6	297	1.83	51365	12.4
HoCP 04-838	12214	44.0	277	1.82	48461	14.3 +
HoCP 09-804	14402	47.4	305	1.65	57173	13.8 +
L 15-306	13511	44.6	304	2.11	43016	10.6 -
HoL 15-508	12692	42.2	301	1.76	47735	9.9 -

Table 3. Off-station nursery third-stubble means of the 2015 “L” and “HoL” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	10226 -	38.8 -	263	2.17	36119 -	12.1 -
L 01-283	13446	48.1	280 +	1.59	60803	12.7
L 01-299	12913	51.4	251	1.66	62073	13.5
HoCP 04-838	11796	44.7	264	1.66	54269	13.7
HoCP 09-804	11558	44.6	259	1.36	65522	12.7
L 15-306	15054 +	56.1	269 +	2.00	56265	11.5 -
HoL 15-508	13997	49.5	283 +	1.69	59169	10.2 -

Table 4. Off-station nursery third-stubble means of the 2015 “L”and “HoL” assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	5577 -	18.6 -	298	1.55	23686 -	12.0 -
L 01-283	11062	37.4	296	1.55	48188	13.4
L 01-299	11188	35.6	314	1.31	54269	13.1
HoCP 04-838	11849	40.2	294	1.40	57808	14.8
HoCP 09-804	9626	30.9	311	1.13	54722	15.3
L 15-306	13412	41.8	321	1.81	46373 -	11.3 -
HoL 15-508	12804	40.9	313	1.61	51002	10.0 -

Table 5. Off-station nursery third-stubble means of the 2015 “L” and “HoL assignment series across 3 locations (Melancon, Newton and Landry) in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	9305 -	32.7 -	286	1.98 +	32035 -	11.5 -
L 01-283	11875	41.2	290	1.57	52302	12.7
L 01-299	12765	44.9	287	1.60	55902	13.0
HoCP 04-838	11953	43.0	278	1.63	53512	14.2 +
HoCP 09-804	11862	41.0	292	1.38	59139	13.9
L 15-306	13992	47.5	298	1.97 +	48551 -	11.1 -
HoL 15-508	13164	44.2	299	1.68	52635	10.0 -

Table 6. Off-station nursery second-stubble means of the 2016 “Ho”assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	4712	17.0 -	279	1.40	23958 -	11.5 -
L 01-283	10080	33.7	299 +	1.29	51637	11.6 -
L 01-299	10914	39.9	274	1.67	47825	13.4
HoCP 04-838	5657	19.8 -	286	1.06	37752	13.6
HoCP 09-804	9450	33.6	281	1.27	53270	14.5
Ho16-600	8566	25.4 -	335 +	1.49	33941 -	9.7 -
Ho16-608	8173	28.1	292	1.39	40202	13.0

Table 7. Off-station nursery second-stubble means of the 2016 “Ho” assignment series on a Commerce silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	8533 -	29.8 -	287	2.07	28859 -	11.3
L 01-283	10303 -	37.1 -	277	1.44 -	51728	11.4
L 01-299	14354	49.5	290	1.97	50457	12.4
HoCP 04-838	12125	43.2	281	1.98	43742 -	13.1
HoCP 09-804	13791	48.6	284	1.54 -	63162 +	12.7
Ho16-600	13930	43.5	322	2.37 +	36845 -	9.1 -
Ho16-608	11511	41.7	276	1.83	45557	12.3

Table 8. Off-station nursery second-stubble means of the 2016 “Ho” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2020

Variety	Sugar per Acre		Cane Yield		Sugar Per Ton		Stalk Weight		Stalk Number		Fiber	
	(lbs./A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)		(%)	
HoCP 96-540	8916	-	38.3	-	233	-	2.12		36482	-	9.9	-
L 01-283	15132	-	57.7	-	263		1.82		63344		12.3	-
L 01-299	19816		78.2		253		2.27		68789		14.1	
HoCP 04-838	12442	-	51.7	-	241		1.74		59714	-	14.2	
HoCP 09-804	14092	-	55.2	-	256		1.71	-	64070		12.6	-
Ho16-600	16840		58.7	-	287	+	2.62	+	44831	-	9.4	-
Ho16-608	11695	-	49.4	-	237	-	2.02		49005	-	11.5	-

Table 9. Off-station nursery second-stubble means of the 2016 “Ho” assignment series across 3 locations (Melancon, Newton and Landry) in 2020

Variety	Sugar per Acre		Cane Yield		Sugar Per Ton		Stalk Weight		Stalk Number		Fiber	
	(lbs./A)		(tons/A)		(lbs/ton)		(lbs)		(stalks/A)		(%)	
HoCP 96-540	7387	-	28.4	-	266		1.86		29766	-	10.9	-
L 01-283	11838	-	42.8	-	280		1.52	-	55569		11.8	-
L 01-299	15028		55.8		272		1.97		55690		13.3	
HoCP 04-838	10075	-	38.2	-	269		1.59	-	47069	-	13.6	
HoCP 09-804	12444		45.8	-	273		1.51	-	60167		13.3	
Ho16-600	13112		42.5	-	315	+	2.16		38539	-	9.4	-
Ho16-608	10460	-	39.7	-	268		1.75		44921	-	12.3	

Table 10. Off-station nursery first-stubble means of the 2017 “L”, “Ho”and “HoCP” assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	7051	26.9	264	1.92	27860 -	12.0
L 01-299	8649	30.2	287	1.68	36119	13.3
HoCP 04-838	6180	22.5	276	1.56	28586 -	13.5
HoCP 09-804	11066	38.1	291	1.53	49822 +	14.2
L 11-183	7320	25.8	286	1.71	29948	12.4
L 17-410	7017	23.8	296	1.69	28496 -	11.1 -
L 17-428	8736	32.7	261	2.10	31400	10.2 -
HoCP 17-701	9348	28.8	326 +	1.77	32579	11.4 -
HoCP 17-702	7153	22.6	316	1.35	33305	10.7 -
HoCP 17-710	8293	28.2	294	1.78	31853	11.9
Ho 17-724	9797	39.1	251 -	2.11	37026	10.4 -
Ho 17-738	10854	37.2	294	1.93	38478	11.4 -

Table 11. Off-station nursery first-stubble means of the 2017 “L”,”Ho”and “HoCP” assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	11323	43.0	263	2.17	39749 -	11.0
L 01-299	13491	47.8	283	1.97	48461	12.3
HoCP 04-838	12847	45.5	287	1.94	46283	13.1
HoCP 09-804	13734	46.6	295	1.69	54995 +	14.2 +
L 11-183	12262	42.8	287	2.07	41382 -	11.4
L 17-410	11330	37.2	304	2.16	34485 -	10.1 -
L 17-428	12949	45.4	286	2.63	34667 -	9.0 -
HoCP 17-701	13806	41.9	330 +	2.04	41201 -	10.6 -
HoCP 17-702	16822	55.9	301	2.26	49187	9.8 -
HoCP 17-710	13322	43.7	304	2.48	35211 -	11.0
Ho 17-724	12544	52.6	241 -	2.17	48642	9.5 -
Ho 17-738	14889	50.8	296	2.06	49005	11.0
Ho 17-776	14247	44.9	317	2.36	38115 -	10.9 -

Table 12. Off-station nursery first-stubble means of the 2017 “L”,”Ho”and “HoCP” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	8916	36.4	245	2.01	36482 -	11.5
L 01-299	11826	49.4	238	1.90	51909	13.0
HoCP 04-838	11024	46.2	240	1.95	46464	13.3
HoCP 09-804	10405	43.1	242	1.73	49731	12.4
L 11-183	9358	42.2	222	2.05	41382 -	9.9 -
L 17-410	9838	40.5	246	2.05	39567 -	9.5 -
L 17-428	13661	57.9	236	2.73	42471 -	9.7 -
HoCP 17-701	11472	41.3	279 +	2.12	39023 -	11.1 -
HoCP 17-702	12225	45.3	270	2.07	43742 -	9.7 -
HoCP 17-710	9013	41.8	212	2.11	39386 -	11.2 -
Ho 17-724	5674	23.2	211	2.28	40656 -	10.1 -
Ho 17-738	15112	54.9	275	2.25	48823	11.7

Table 13. Off-station nursery first-stubble means of the 2017 “L”,”Ho”and “HoCP” assignment series across 3 locations (Newton, Melancon and Westfield) in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	9096	35.4	257	2.03	34697 -	11.5 -
L 01-299	11322	42.5	270	1.85	45496	12.9
HoCP 04-838	10017	38.1	268	1.82	40444	13.3
HoCP 09-804	11735	42.6	276	1.65	51516 +	13.6
L 11-183	9647	36.9	265	1.94	37571 -	11.2 -
L 17-410	9395	33.8	282	1.96	34183 -	10.2 -
L 17-428	11782	45.3	261	2.48 +	36179 -	9.6 -
HoCP 17-701	11542	37.3	311 +	1.97	37601 -	11.0 -
HoCP 17-702	12067	41.3	296 +	1.89	42078	10.0 -
HoCP 17-710	10209	37.9	270	2.12	35483 -	11.4 -
Ho 17-724	9338	38.3	234 -	2.18 +	42567	10.0 -
Ho 17-738	13619	47.6	288	2.08	45436	11.4 -
Ho 17-776	11876	38.9	301 +	2.23	34877 -	11.1 -

Table 14. Off-station nursery plantcane means of the 2018 “L”and “HoCP”, assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2020

Variety	Sugar per Acre		Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number		Fiber	
	(lbs./A)		(tons/A)	(lbs/ton)	(lbs)	(stalks/A)		(%)	
HoCP 96-540	10148	-	33.7	304	2.39	27951	-	11.0	-
L 01-299	14140		45.5	312	2.19	41564		12.6	
HoCP 09-804	10255	-	33.7	304	1.84	36845		11.5	
L 12-201	11138		38.0	294	2.26	33759	-	9.7	-
Ho 12-615	15626		52.0	300	2.10	49550	+	12.3	
L 18 -438	13888		44.9	310	2.62	34304		10.1	-
L 18-441	11700		40.4	288	2.11	37752		10.2	-
HoCP 18-801	10823		36.9	293	2.49	29403	-	10.2	-
HoCP 18-803	13005		44.0	296	2.28	38660		10.5	-
HoCP 18-810	8010	-	25.8	311	1.70	30492	-	11.2	-
HoCP 18-815	13716		42.1	326	2.15	39386		10.0	-
HoCP 18-822	10811		34.6	312	2.13	32126	-	10.9	-
HoCP 18-824	8240	-	28.8	284	1.80	31944	-	8.7	-
HoCP 18-829	13053		42.0	311	2.46	34304		10.7	-
HoCP 18-835	10084	-	34.7	287	2.09	33215	-	11.5	
HoCP 18-839	9858	-	30.4	324	2.03	29948	-	11.5	
HoCP 18-846	11441		41.3	278	2.34	35211		11.7	
HoCP 18-859	11802		38.6	307	2.19	35030		9.8	-
HoCP 18-862	10645		36.7	291	1.94	37934		10.1	-
HoCP 18-878	9994	-	33.7	300	1.85	36119		10.8	-

Table 15. Off-station nursery plantcane means of the 2018 “L” and “HoCP”, assignment series on a Moreland silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	9539	34.4	279	2.28	29948	11.5
L 01-299	9811	33.4	294	2.11	31763	11.8
HoCP 09-804	8359	30.2	277	1.58	38297	13.3
L 12-201	9876	33.5	295	2.34	28677	11.2
Ho 12-615	11942	46.2	259 -	2.18	43379	12.3
L 18 -438	10860	35.9	304	1.85	37752	11.1
L 18-441	9262	32.1	289	1.87	34304	10.7
HoCP 18-801	13343	43.4	306	2.36	36300	11.8
HoCP 18-803	14428	52.6 +	274	2.17	48461 +	13.3
HoCP 18-810	14614	51.9 +	281	2.54	40838	12.4
HoCP 18-815	16047 +	51.7 +	309	2.24	47009 +	10.7
HoCP 18-822	7942	28.8	277	1.84	31218	12.8
HoCP 18-824	9634	33.2	286	2.04	32307	11.1
HoCP 18-829	14138	56.5 +	251 -	2.42	46646 +	11.9
HoCP 18-835	10049	35.1	283	2.07	33941	11.2
HoCP 18-839	10967	36.7	299	1.78	40838	11.6
HoCP 18-846	15465	52.8 +	294	2.38	44105 +	12.9
HoCP 18-859	12290	46.0	266	2.48	37026	11.9
HoCP 18-862	6702	25.2	266	1.88	26862	12.0
HoCP 18-878	11680	37.5	312	1.66	45194 +	12.3

Table 16. Off-station nursery plantcane means of the 2018 “L”and “HoCP”, assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	15358	54.7	280	2.51	43560 -	11.9
L 01-299	16575	60.4	274	2.43	49731	12.7
HoCP 09-804	10355 -	34.2 -	303 +	1.69 -	40475 -	13.7
L 12-201	14580	48.2	302 +	2.61	37026 -	10.6
Ho 12-615	14645	53.9	271	2.01	53906	12.4
L 18 -438	12390	40.4 -	308 +	1.86	43197 -	11.1
L 18-441	13189	46.3	285	2.17	42653 -	11.2
HoCP 18-801	17791	56.0	318 +	2.71	41382 -	11.1
HoCP 18-803	18708	65.4	285	2.69	47916	12.2
HoCP 18-810	16938	60.6	280	2.64	45920	10.0
HoCP 18-815	17173	57.8	295	1.95	59351 +	11.4
HoCP 18-822	17773	62.2	285	2.53	49368	10.8
HoCP 18-824	11813	42.5	277	2.03	41745 -	10.0
HoCP 18-829	20008	68.4	294	2.72	50457	12.3
HoCP 18-835	12287	41.6 -	296 +	2.39	34848 -	12.1
HoCP 18-839	12526	41.3 -	305 +	1.96	42290 -	12.1
HoCP 18-846	21633 +	73.8	293	2.75	53724	12.1
HoCP 18-859	13908	47.1	296 +	2.14	43923 -	11.0
HoCP 18-862	8867 -	31.4 -	283	1.81	34667 -	11.0
HoCP 18-878	20885	69.3	301 +	2.16	64070 +	11.5

Table 17. Off-station nursery plantcane means of the 2018 “L”and “HoCP”, assignment series across 3 locations (Newton, Melancon and Landry) in 2020

Variety	Sugar per Acre		Cane Yield		Sugar Per Ton	Stalk Weight		Stalk Number		Fiber	
	(lbs./A)		(tons/A)		(lbs/ton)	(lbs)		(stalks/A)		(%)	
HoCP 96-540	1900		40.9		288	2.39		33820		11.4	
L 01-299	13509		46.4		293	2.24		41019		12.4	
HoCP 09-804	9656	-	32.7	-	295	1.70	-	38539		12.8	
L 12-201	11864		39.9		297	2.40		33154	-	10.5	-
Ho 12-615	14071		50.7		277	2.10		48945	+	12.4	
L 18 -438	12379		40.4		307	2.11		38418		10.7	-
L 18-441	11384		39.6		287	2.05		38236		10.7	-
HoCP 18-801	13986		45.5		306	2.52		35695		11.0	-
HoCP 18-803	15380		54.0		285	2.38		45012		12.0	
HoCP 18-810	13188		46.1		291	2.29		39083		11.2	-
HoCP 18-815	15645		50.6		310	2.11		48582		10.7	-
HoCP 18-822	12175		41.8		291	2.17		37571		11.5	
HoCP 18-824	9896		34.8		282	1.96		35332		10.0	-
HoCP 18-829	15733		55.6		285	2.53		43802		11.6	
HoCP 18-835	10807		37.1		289	2.18		34001		11.6	
HoCP 18-839	11117		36.1		309	1.92		37692		11.7	
HoCP 18-846	16180		56.0		288	2.49		44347		12.2	
HoCP 18-859	12667		43.9		290	2.27		38660		10.9	-
HoCP 18-862	8856	-	31.5	-	281	1.87		33717		11.0	-
HoCP 18-878	14186		46.8		304	1.89		48461		11.5	-

Table 18. On-station nursery second-stubble means of the 2017 “L” assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number		Fiber	
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)		(%)	
HoCP96-540	7754	29.6	263	2.51	23595	-	11.3	-
L 01-283	7721	26.8	288	1.58	34031	-	12.7	-
L 01-299	14230	52.7	271	2.07	50820		14.5	
HoCP 04-838	12212	43.4	281	2.08	41972		14.3	
HoCP 09-804	10711	36.0	297	1.66	42653		13.4	
L 17-410	12787	43.8	293	2.68	32216	-	10.9	-
L 17-428	12971	45.6	285	2.75	33124	-	10.9	-

Table 19. On-station nursery second-stubble means of the 2017 “L” assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP96-540	8158	29.2	278	1.88	32216	13.3 -
L 01-283	9617	32.0	301	1.58	40838	12.9 -
L 01-299	10401	38.4	270	1.77	43106	14.8
HoCP 04-838	10713	38.8	277	2.00	38569	14.6
HoCP 09-804	11029	38.4	287	1.48	51954	14.4
L 17-410	11210	36.7	306	1.94	37208	10.9 -
L 17-428	12067	42.0	287	2.46 +	34258	11.1 -

Table 20. On-station nursery second-stubble means of the 2017 “L” assignment series across two locations (St. Gabriel and U.S.D.A- Ardoyne Farms) in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP96-540	7956 -	29.4 -	270	2.19	27906 -	12.3 -
L 01-283	8669 -	29.4 -	295 +	1.58	37434	12.8 -
L 01-299	12315	45.6	270	1.92	46963	14.6
HoCP 04-838	11462	41.1	279	2.04	40270	14.4
HoCP 09-804	10930	37.8	290 +	1.59	48631	14.0
L 17-410	11999	40.2	300 +	2.31	34712 -	10.9 -
L 17-428	12519	43.8	286 +	2.60 +	33691 -	11.0 -

Table 21. On-station nursery first-stubble means of the 2018 “L” assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP96-540	13127	45.4	289	2.25	40384	13.1
L 01-299	12637	44.0	287	2.05	42879	14.2
HoCP 04-838	11309	39.7	286	1.67	47190	14.3
HoCP 09-804	10464	35.9	292	1.77	41064	13.8
L 11-183	12348	42.5	290	1.98	42879	12.8
L 18-438	11118	35.7	311 +	1.67	42653	12.1 -
L 18-441	11018	37.6	293	2.14	35393	12.7 -

Table 22. On-station nursery plantcane means of the 2019 “L” assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 09-804	2963	10.1	267	2.24	8769	12.8
L 12-201	5636	20.4	264	2.63	15121	12.1
L 19-001	6951	26.8	263	3.46	15654	10.7
L 19-004	6636	25.9	257	3.32	15654	11.4
L 19-006	11126	38.8	287	2.93	25637	12.8
L 19-007	2350	12.4	206	2.08	12104	12.6
L 19-011	3708	21.0	174	2.38	17696	11.5
L 19-012	6470	24.7	253	3.07	15575	12.0
L 19-013	4606	19.9	234	3.87	10209	10.8
L 19-014	7677	31.9	238	2.03	30855	10.9
L 19-015	7059	27.9	261	3.03	18910	12.9
L 19-020	3794	14.4	265	2.56	11117	12.7
L 19-021	8185	28.8	285	2.67	21326	11.5
L 19-483	6688	29.3	228	2.40	24729	12.6
L 19-486	5282	20.5	258	2.57	15881	11.9
L 19-495	6699	24.7	269	3.02	15654	12.6
L 19-497	2810	12.2	251	2.89	8927	11.5
L 19-498	9825	34.1	295	2.97	23447	11.8

Table 23. On-station nursery plantcane means of the 2019 “L” assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	8662	31.5	275	2.49	25410	10.8 -
L 01-299	11078	38.3	289	2.44	31536	13.1
HoCP 09-804	7844	28.4	277	1.84	30855	12.9
L 12-201	10235	34.4	297	2.39	28133	11.3 -
Ho 12-615	12709	47.5	268	2.28	41518	13.2
L 19-001	12147	38.5	314 +	2.74	27452	10.4 -
L 19-004	9322	33.9	275	3.02	22461	11.6 -
L 19-006	12011	40.3	299	2.73	29721	11.8 -
L 19-007	9262	35.7	261 -	1.52 -	46509 +	12.3
L 19-011	5905	24.7	239 -	1.74 -	29948	11.2 -
L 19-012	9727	32.4	301	2.82	23595	12.0
L 19-013	10168	35.6	286	2.35	30401	11.5 -
L 19-014	10625	37.0	287	2.05	36300	11.4 -
L 19-015	11231	38.4	291	2.41	31763	13.8
L 19-017	10629	37.8	282	2.16	34939	12.1
L 19-020	9944	33.3	297	1.89	36073	12.1
L 19-021	11057	37.3	298	1.90	39249	11.8 -
L 19-023	12456	44.5	283	3.32 +	26318	12.9
L 19-483	10157	39.2	260 -	1.77 -	46056 +	12.1
L 19-486	13536	47.5	285	2.40 -	39476	12.4
L 19-487	9883	32.1	305	1.66	38342	11.7 -
L 19-492	7745	25.5	304	2.38	21553	11.6 -
L 19-495	7070	24.9	285	2.09	24049	12.2
L 19-497	13198	46.2	286	2.31	41291	10.9 -
L 19-498	8408	26.5	317 +	2.41	22461	11.5 -

Table 24. On-station nursery plantcane means of the 2019 “L” assignment series across two locations (St. Gabriel and U.S.D.A. - Ardoyne Farms) in 2020

Variety	Sugar per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
HoCP 96-540	6733	26.1	259	2.76	17889	10.8 -
L 01-299	9149	32.9	273	2.70	24014	13.1
HoCP 09-804	5383	20.0	269	2.05	20854	12.9
L 12-201	7868	27.4	281	2.54	21805	11.6 -
Ho 12-615	10779	42.1	252	2.55	33997	13.2 -
L 19-001	9549	32.7	289	3.10	21553	10.5 -
L 19-004	7979	29.9	266	3.17	19058	11.5
L 19-006	11569	39.6	293	2.83	27679	12.3
L 19-007	6506	26.6	236 -	1.80 -	30778	12.4
L 19-011	4806	22.9	207 -	2.06	23822	11.4 -
L 19-012	7807	27.5	279	2.97	19288	12.0 -
L 19-013	7387	27.8	260	3.11	20305	11.1 -
L 19-014	9151	34.4	263	2.04	33578	11.2 -
L 19-015	9388	33.6	276	2.71	24756	13.5
L 19-017	8700	32.4	265	2.43	27417	12.1
L 19-020	6869	23.9	281	2.23	23595	12.4
L 19-021	9621	33.1	291	2.29	30288	11.6 -
L 19-023	10526	39.1	267	3.59 +	18796	13.0
L 19-483	8423	34.3	244 -	2.09	35393	12.3
L 19-486	9409	34.0	271	2.48	27679	12.1
L 19-487	7954	26.7	289	1.93 -	30821	11.7 -
L 19-492	5816	20.1	287	2.65	14032	11.6 -
L 19-495	6885	24.8	277	2.55	19852	12.4
L 19-497	9283	33.5	268	2.60	26386	11.1 -
L 19-498	8429	27.8	305 +	2.69	21057	11.6 -

2020 LOUISIANA "Ho" NURSERY VARIETY TRIALS

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In the USDA Sugarcane Research Unit's sugarcane variety program, promising experimental varieties are assigned permanent numbers three years after selection in the seedling stage. These varieties are planted in replicated yield trials (randomized complete block design with two replications) in the same year permanent variety numbers are assigned. Trials are normally established at USDA's Ardoyne Farm in Schriever and at the LSU AgCenter's Iberia Research Station in Jeanerette and Sugar Research Station in St. Gabriel. Because of travel restrictions due to COVID-19 in 2020, two nursery trials were planted at Ardoyne Farm (one on heavy soil and one on light soil) and one trial was planted at St. Gabriel Research Station. These trials are established. Plots are 16 feet long by six feet (one row) wide with a four-foot alley between plots. A minimum of three commercial varieties are planted in each test for comparison purposes. The following year, experimental varieties advanced for further testing are combined with varieties from the LSU AgCenter program ("L" series) and planted in replicated nursery yield trials on commercial farms that represent the different regions of the sugarcane belt.

In the spring and summer, team members rate nursery test plots for yield traits such as population, stalk height, stalk diameter, erectness, etc. During the rating process, notes are taken on the presence of any diseases in varieties as well as any damage present from insects or other pests. Mature, millable stalks are counted in each plot in late July or early August. A 10-stalk sample is hand-cut from plots of active varieties during the harvest season. Because of severe hog damage, no "Ho" nursery tests were sampled at Iberia Research Station in 2020. Samples from USDA nurseries are analyzed at the Juice and Milling Quality Laboratory at the USDA Ardoyne Farm, where they are weighed to determine stalk weight and processed for sucrose analysis. Estimates of theoretical recoverable sugar (TRS) per ton of cane are calculated based on Brix (% w/w) and pol reading (Z°) values, while estimated yields of cane per acre, sugar per acre, and number of stalks per acre are calculated based on results from juice analyses, mature millable stalk counts, and mean stalk weight. Varieties with yields equal or higher than the control varieties and not susceptible to diseases are advanced for further testing.

Table 1 lists planting and harvest dates of USDA nursery evaluations. Results of these trials are presented in Tables 2 to 11. Varieties where both the cross and selection were performed in Houma were assigned a prefix of "Ho". Varieties where a cross was made at the USDA facility in Canal Point, FL and selection was performed in Houma have a "HoCP" prefix. Varieties having a "HoL" prefix are derived from a cross made at the LSU Sugar Research Station in St. Gabriel and selected from the USDA farm. Statistical analyses were run for each test and for each crop combined across locations using PROC MIXED procedures in SAS (version 9.4). Because L 01-299 occupies more acreage than any other variety in the industry, it is highlighted in each table and all other varieties are compared to it. Yield values that are significantly higher or lower (P=0.05) than values for L 01-299 are noted with a '+' or '-', respectively.

Table 1. Planting and harvest dates of "Ho" nursery tests in 2020

Series	Location[1]	Soil Series [2]	Planting	Harvest Dates 2017	2018	2019	2020
2016	AFH	ShA	10/20/16	11/20	10/24	10/15	11/13
2016	IRS	Bsc	10/26/16	11/16	10/19	10/17	
2016	STG	Csl	10/27/16	11/28	11/15	11/25	11/19
2017	AFH	ShA	10/20/17		12/12	10/24	11/13
2017	IRS	Bsc	11/02/17		12/11	10/17	
2017	STG	Csl	10/27/17		12/17	11/25	11/19
2018	AFL	CbA	11/21/18			12/16	12/17
2018	IRS	Bsc	10/19/18			11/4	
2019	AFL	CbA	11/07/19				12/21
2019	IRS	Bsc	11/19/19				
2019	STG	Csl	11/21/19				12/15
2020	AFH	ShA	11/17/20				
2020	AFL	CbA	11/04/20				
2020	STG	Csl	11/19/20				

[1]AFH = Ardoyne Farm heavy soil in Schriever, AFL = Ardoyne Farm light soil in Schriever, IRS = Iberia Research Station in Jeanerette, STG = Sugar Research Station in St. Gabriel
[2]Bsc = Baldwin silty clay loam, CbA = Cancienne silt loam, Csl = Commerce silt loam, Sc = Sharkey clay, ShA = Schriever clay

Table 2. Nursery third-stubble means of the 2016 "Ho" assignment series on a Schriever clay soil at the Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)
L 01-299	10714	36.9	291	1.44	50820
HoCP 96-540	7213	28.7	251 -	1.88 +	30401
L 01-283	11921	41.5	286	1.59	51954
HoCP 04-838	8924	31.1	288	1.63	41745
HoCP 09-804	10324	36.1	286	1.39	54450
Ho 16-600	14164	47.7	297	2.37 +	40384
Ho 16-608	15432	53.5	289	2.19 +	48551
Means	11420	40.0	284	1.78	45759

Table 3. Nursery third-stubble means of the 2016 "Ho" assignment series on a Baldwin silty clay loam soil at the Sugar Research Station in St. Gabriel, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	8538	27.3	312	1.49	36527
HoCP 96-540	10034	32.8	305	1.73	37208
L 01-283	8630	27.7	312	1.44	38342
HoCP 04-838	9586	30.6	312	1.71	35846
HoCP 09-804	10793	34.4	313	1.37	50366
Ho 16-600	11085	34.2	325 +	2.16	31536
Ho 16-608	12055	40.1	301 -	2.00	39703
Means	10103	32.5	311	1.70	38504

Table 4. Nursery third-stubble means of the 2016 "Ho" assignment series across locations (Ardoyne Farm & Sugar Research Station) in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	9626	32.1	301	1.47	43673
HoCP 96-540	8624	30.8	278	1.80 +	33804
L 01-283	10275	34.6	299	1.51	45148
HoCP 04-838	9366	30.8	300	1.67	37813
HoCP 09-804	10559	35.2	300	1.38	52408
Ho 16-600	12624	41.0	311	2.26 +	35960
Ho 16-608	13743	46.8	295	2.10 +	44127
Means	10737	36.1	298	1.74	41997

Table 5. Nursery second-stubble means of the 2017 “Ho” and “HoCP” assignment series on a Schriever clay soil at the Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	
L 01-299	13971	49.2	284	1.77	55584	
HoCP 96-540	10373	36.9	281	1.92	38569	-
L 01-283	11520	40.1	287	1.43	56265	
HoCP 04-838	9957	37.2	278	1.71	43106	-
HoCP 09-804	10460	36.0	287	1.24	58534	
HoCP 17-701	15680	52.4	299	2.15	48551	
HoCP 17-702	12694	41.7	304	1.81	46283	
HoCP 17-710	13551	47.0	290	2.10	44694	
Ho 17-724	13861	52.1	267	2.01	51954	
Ho 17-738	11509	43.3	265	1.88	46963	
Means	12596	44.4	284	1.84	49050	

Table 6. Nursery second-stubble means of the 2017 “Ho” and “HoCP” assignment series on a Commerce silt loam soil at the Sugar Research Station in St. Gabriel, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	10612	35.2	301	1.96	36073
HoCP 96-540	8385	28.5	294	1.97	29721
L 01-283	11557	37.9	305	1.75	42879
HoCP 04-838	13218	41.9	316 +	1.84	45602
HoCP 09-804	11800	38.7	305	1.59	48778
HoCP 17-701	17056	52.4	325 +	2.27	45375
HoCP 17-702	13723	43.0	317 +	1.83	46283
HoCP 17-710	13685	42.9	319 +	2.24	38796
Ho 17-724	9722	33.3	292	1.78	37661
Ho 17-738	9758	31.2	314 +	1.78	34485
Means	11952	38.5	309	1.90	40565

Table 7. Nursery second-stubble means of the 2017 “Ho” and “HoCP” assignment series across locations (Ardoyne Farm & Sugar Research Station) in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	12292	42.2	293	1.87	45829
HoCP 96-540	9379	32.7	288	1.94	34145
L 01-283	11539	39.0	296	1.59	49572
HoCP 04-838	12131	40.3	297	1.79	44354
HoCP 09-804	11353	37.8	296	1.47 -	53656
HoCP 17-701	16368	52.4	312 +	2.21 +	46963
HoCP 17-702	13208	42.3	311	1.82	46283
HoCP 17-710	13618	44.9	304	2.17	41745
Ho 17-724	11792	42.7	279	1.89	44808
Ho 17-738	10633	37.3	290	1.83	40724
Means	12257	41.3	297	1.87	44808

Table 8. Nursery first-stubble means of the 2018 “Ho” and “HoCP” assignment series on a Sharkey clay soil at the Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	17887	61.5	291	2.20	56492
HoCP 96-540	12470	45.8	271 -	2.59	35393 -
HoCP 04-838	15764	53.0	298	2.45	43560 -
HoCP 09-804	15466	53.1	291	2.09	51047
L 11-183	16671	57.7	289	2.86	40384 -
HoCP 18-801	15021	52.6	285	2.49	42426 -
HoCP 18-803	18635	62.0	301	2.33	52862
HoCP 18-810	15038	51.1	294	2.39	42879 -
HoCP 18-815	17743	60.3	294	2.62	46056 -
HoCP 18-822	16073	54.9	293	2.47	44468 -
HoCP 18-824	17590	62.9	282	2.76	45148 -
HoCP 18-829	18870	68.3	277 -	2.80	48778
HoCP 18-835	12746	44.5	287	2.17	41745 -
HoCP 18-839	15201	50.6	300	2.11	48098
HoCP 18-846	14187	50.9	278 -	2.22	45829 -
HoCP 18-859	17476	60.0	292	2.65	45148 -
HoCP 18-862	13530	47.2	287	2.05	46056 -
Ho 18-878	16135	54.2	299	1.86	58307
Means	15917	55.0	289	2.39	46371

Table 9. Nursery plant cane means of the 2019 "HoCP" assignment series on a Cancienne silt loam soil at the Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)	
L 01-299	13122		49.4		266		2.48		39930	
HoCP 96-540	13234		48.3		274		2.89		33578	
HoCP 09-804	9775		34.2	-	286		1.97		34712	
L 12-201	16491		62.2		265		3.39	+	36754	
Ho 12-615	18056	+	66.7	+	271		2.31		57853	+
HoCP 19-900	17396	+	63.6		276		3.32	+	37888	
HoCP 19-901	13230		51.6		256		2.57		40157	
HoCP 19-903	15729		55.5		283		2.61		42653	
HoCP 19-905	17916	+	69.4	+	257		2.77		50139	+
HoCP 19-907	15341		60.4		254		2.59		46736	
HoCP 19-908	15568		58.9		265		2.42		48324	
HoCP 19-909	13821		49.9		277		2.31		43106	
HoCP 19-910	12278		51.7		243	-	2.77		36754	
HoCP 19-915	13713		51.3		268		2.40		43106	
HoCP 19-916	13685		49.8		275		2.15		46509	
HoCP 19-919	17932	+	69.3	+	258		3.43	+	40384	
HoCP 19-921	17190	+	65.7	+	262		3.34	+	39930	
HoCP 19-924	14415		58.5		246		2.60		45375	
HoCP 19-925	16386		61.2		268		3.00	+	40838	
HoCP 19-927	13811		52.3		264		2.42		43333	
HoCP 19-929	15953		63.8		250		3.16	+	40611	
HoCP 19-932	12282		46.3		266		2.29		40384	
HoCP 19-933	13406		47.1		285		2.03		46509	
HoCP 19-936	12995		48.8		266		2.79		35166	
HoCP 19-938	14419		51.7		281		2.54		40838	
HoCP 19-943	16476		63.2		261		2.84		44694	
HoCP 19-947	15297		57.1		270		2.89		39023	
HoCP 19-949	13513		49.1		275		2.71		36527	
HoCP 19-951	12046		51.9		232	-	2.45		42426	
HoCP 19-952	13786		55.1		249		2.61		42199	
HoCP 19-954	13631		49.5		276		1.88	-	52862	+
HoCP 19-955	18099	+	63.7	+	286		2.55		49686	+
HoCP 19-956	17420	+	60.2		289	+	3.00	+	40157	
HoCP 19-957	17857	+	67.5		264		3.16	+	42653	
HoCP 19-959	13466		49.4		273		1.81	-	54677	+
HoCP 19-960	16845		62.4		270		3.22	+	38796	
HoCP 19-962	13360		49.1		272		2.45		40384	
HoCP 19-963	20074	+	75.5	+	266		2.97		50820	+
HoCP 19-964	16507		64.4		256		2.72		47417	
Means	15135		56.5		269		2.66		42920	

Table 10. Nursery plant-cane means of the 2019 "HoCP" assignment series on a Commerce silt loam soil at the Sugar Research Station in St. Gabriel, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	1902	7.4	281	2.56	4899
HoCP 96-540	11694	40.6	288	2.60	31309 +
HoCP 09-804	10462	34.9	300	2.12	33124 +
L 12-201	6910	24.1	286	3.03	15881
Ho 12-615	11908	42.7	276	2.43	35846 +
HoCP 19-900	13767	48.8	282	3.02	32216 +
HoCP 19-901	9091	32.2	281	2.64	24503 +
HoCP 19-903	11169	37.8	296	2.45	30855 +
HoCP 19-905	11601	43.9	264	2.58	34031 +
HoCP 19-907	15585	53.8	289	2.62	41064 +
HoCP 19-908	4997	18.7	262	2.40	15201
HoCP 19-909	8711	31.6	275	2.59	24503 +
HoCP 19-910	9501	36.6	256 -	2.65	27679 +
HoCP 19-915	11793	41.6	284	2.31	36300 +
HoCP 19-916	10749	37.7	285	2.08	36527 +
HoCP 19-919	9611	37.2	259	3.49 +	21326
HoCP 19-921	8634	30.9	279	3.13	19738
HoCP 19-924	11395	41.2	278	2.54	32216 +
HoCP 19-925	8333	29.4	283	2.53	24049 +
HoCP 19-927	11249	40.5	279	2.45	33124 +
HoCP 19-929	12942	44.8	288	3.04	29494 +
HoCP 19-932	10120	35.8	283	1.95	36754 +
HoCP 19-933	5793	20.4	283	2.06	19965
HoCP 19-936	12020	42.6	278	2.79	30401 +
HoCP 19-943	4997	17.9	278	2.27	15881
HoCP 19-947	9763	34.3	284	2.59	26318 +
HoCP 19-949	10581	36.4	290	2.67	27679 +
HoCP 19-951	10775	38.7	277	2.64	29040 +
HoCP 19-952	8898	32.4	275	2.53	26091 +
HoCP 19-954	7795	27.6	283	2.48	22914 +
HoCP 19-955	10527	36.5	288	2.42	30174 +
HoCP 19-956	12397	41.7	297	2.45	34258 +
HoCP 19-957	9580	35.2	277	3.10	23141 +
HoCP 19-959	10468	35.4	296	1.96	35846 +
HoCP 19-960	14496	51.8	280	2.91	36527 +
HoCP 19-962	10534	37.9	280	2.44	31082 +
HoCP 19-963	8759	31.6	278	2.54	24956 +
HoCP 19-964	12587	44.2	286	2.45	35846 +
Means	10169	36.1	281	2.56	28508

Table 11. Nursery plant cane means of the 2019 “Ho” and “HoCP” assignment series across locations (Ardoyne Farm & Sugar Research Station) in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	8236	30.8	273	2.49	24369
HoCP 96-540	12464	44.5	281	2.75	32443
HoCP 09-804	10119	34.5	293 +	2.04 -	33918
L 12-201	11701	43.2	275	3.21 +	26318
Ho 12-615	14982	54.7	273	2.37	46850
HoCP 19-900	15581	56.2	279	3.17 +	35052
HoCP 19-901	11161	41.9	269	2.60	32330
HoCP 19-903	13449	46.7	289	2.53	36754
HoCP 19-905	14759	56.7	261	2.67	42085
HoCP 19-907	15463	57.1	272	2.60	43900
HoCP 19-908	10282	38.8	264	2.41	31763
HoCP 19-909	11266	40.8	276	2.45	33804
HoCP 19-910	10890	44.2	250 -	2.71	32216
HoCP 19-915	12753	46.4	276	2.36	39703
HoCP 19-916	12217	43.8	280	2.11	41518
HoCP 19-919	13772	53.3	258	3.46 +	30855
HoCP 19-921	12912	48.3	270	3.23 +	29834
HoCP 19-924	12905	49.8	262	2.57	38796
HoCP 19-925	12359	45.3	276	2.76	32443
HoCP 19-927	12530	46.4	272	2.43	38228
HoCP 19-929	14447	54.3	269	3.10 +	35052
HoCP 19-932	11201	41.1	275	2.12	38569
HoCP 19-933	9599	33.7	284	2.04 -	33237
HoCP 19-936	12507	45.7	272	2.79	32783
HoCP 19-938	11967	41.4	289	2.50	33556
HoCP 19-943	10736	40.6	270	2.55	30288
HoCP 19-947	12500	45.3	277	2.70	32670
HoCP 19-949	12047	42.8	283	2.69	32103
HoCP 19-951	11411	45.3	254 -	2.54	35733
HoCP 19-952	11342	43.8	262	2.57	34145
HoCP 19-954	10713	38.5	280	2.18	37888
HoCP 19-955	14313	50.1	287	2.48	39930
HoCP 19-956	14908	51.0	293 +	2.73	37208
HoCP 19-957	13719	51.4	270	3.13 +	32897
HoCP 19-959	11967	42.4	284	1.88 -	45262
HoCP 19-960	15671	57.1	275	3.06 +	37661
HoCP 19-962	11947	43.5	276	2.44	35733
HoCP 19-963	14417	53.5	272	2.75	37888
HoCP 19-964	14547	54.3	271	2.58	41632
Means	12685	46.5	275	2.61	35855

2020 LOUISIANA VARIETY DEVELOPMENT PROGRAM INFIELD TRIALS

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The infield stage of the variety development program is the first stage in which yield estimates are based on plot weights instead of estimated yields derived from stalk population and stalk weight. Varieties from the LSU AgCenter program (L' s) are planted in infield tests the year after assignment while varieties from the USDA program (Ho's) are included two years after assignment. Infield trials are generally planted at three locations. In 2020, tests were planted at USDA's Ardoyne Farm in Schriever (Ho varieties only) and commercial farms located in Vacherie, LA and Maurice, LA representing three distinct regions and soil types of the Louisiana sugarcane industry.

Infield evaluations on commercial farms are conducted cooperatively with LSU AgCenter sugarcane variety development program personnel. Infield tests are planted in a randomized complete block design with two replications and at least three commercial varieties as controls. The plot size in infield tests are two rows wide by 24 feet long with a four-foot alley between plots. A 10-stalk sample is hand-cut from each plot just prior to combine harvesting and sent to the lab at the Ardoyne Farm, where it is weighed to determine stalk weight and processed through the pre-breaker/press for a determination of sucrose content and fiber content. Brix (% w/w) and pol reading (Z°) values are then used to calculate the yield of theoretical recoverable sugar (TRS) per ton of cane. Plots are weighed with a tractor-pulled weigh-wagon fitted with electronic load cells mounted in the axle and hitch. The weight of harvested cane in each plot, stalk weight, and TRS are used to estimate sugar per acre, tons of cane per acre, sugar per ton of cane, and number of stalks per acre.

Table 1 lists planting and harvest dates of infield evaluations. Results of infield trials are presented in Tables 2 to 18. Statistical analyses were done for each test and for each series across locations using PROC MIXED procedures in SAS (version 9.4). Because the commercial variety L 01-299 occupies the largest percentage of the acreage in the Louisiana industry, it is highlighted in each table and all other varieties are compared to it. Yield values that are significantly higher or lower (P=0.05) than values for L 01-299 are noted with a '+' or '- ', respectively.

Table 1. Planting and harvest dates of infield tests in 2020

'Ho' Series	'L' Series	Location[1]	Soil Series [2]	Planting Date	Harvest Dates			
					2017	2018	2019	2020
2014		AFH	ShA	10/06/16	11/22	10/24	10/24	10/21
2014	2015	BLK	CmA	9/21/16	12/04	10/03	10/11	10/26
2015		AFH	ShA	8/23/17		12/14	10/24	10/21
2015	2016	BLK	CmA	9/06/17		12/05	10/11	10/26
2015	2016	CAF	Co	8/24/17		11/28	12/10	11/05
2016		AFH	ShA	8/23/18			12/05	12/04
2016	2017	BLK	CmA	9/17/18			12/04	10/26
2016	2017	CAF	Co	8/15/18			12/10	11/05
2017		AFH	ShA	9/26/19				12/11
2017	2018	BLK	CmA	9/12/19				12/11
2017	2018	CAF	Co	8/14/19				12/01
2018		AFH	ShA	9/17/20				
2018	2019	BLK	CmA	9/09/20				
2018	2019	CAF	Co	8/13/20				

[1]AFH = Ardoyne Farm heavy soil in Schriever, BLK = Blackberry Farm in Vacherie, CA = Circle A Farm in Maurice.

[2]Co = Coteau-Patoutville-Frost silt loam, CmA = Cancienne silt loam, Sc = Sharkey clay, ShA = Schriever clay.

Table 2. Infield third-stubble means of the 2014 "Ho" assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)	
L 01-299	7205	28.9	246	1.62	35707	13.8	
HoCP 96-540	4708	23.6	199	1.84	26049	12.4	-
L 01-283	7382	30.7	240	1.66	37055	13.4	
HoCP 04-838	6610	28.3	234	1.19	49713	14.2	
HoCP 09-804	5820	24.4	236	1.58	32106	14.5	
HoCP 14-885	6545	26.1	256	2.14 +	24613	10.4	-
Means	6378	27.0	235	1.67	34207	13.1	

Table 3. Infield third-stubble means of the 2014 “Ho” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	11951	41.7	286	1.68	49930	13.3
HoCP 96-540	11210	41.6	270	1.90	44046	14.1
L 01-283	10177	35.4	288	1.36	52659	14.2
HoCP 04-838	8828	33.3	264 -	1.49	44574	14.9
HoCP 09-804	9721	37.6	258 -	1.18 -	63440	15.0
HoCP 14-885	14008	44.2	317 +	1.95	45434	10.8
L 15-306	12141	43.2	280	1.84	46713	12.2
Means	11148	39.6	280	1.63	49542	13.5

Table 4. Infield third-stubble means of the 2014 “Ho” assignment series across two locations (Ardoyne Farm and Blackberry Farm) in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	9578	35.3	266	1.65	42819	13.5
HoCP 96-540	7959	32.6	234	1.87	35048	13.3
L 01-283	8780	33.0	264	1.51	44857	13.8
HoCP 04-838	7719	30.8	249	1.34	47144	14.5
HoCP 09-804	7771	31.0	247	1.38	47773	14.7
HoCP 14-885	10276	35.1	286	2.04	35023	10.6 -
Means	8680	33.0	258	1.63	42111	13.4

Table 5. Infield second-stubble means of the 2015 “Ho” assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	8972	37.8	238	2.05	37212	14.2
HoCP 96-540	6723	33.4	197	2.12	32403	12.9
L 01-283	9914	39.9	248	1.69	47371	12.8
HoCP 04-838	6938	30.4	227	1.56	39807	13.7
HoCP 09-804	8768	34.7	252	1.54	44980	13.6
HoL 15-508	7862	27.9	280	1.71	33058	9.8 -
Means	8196	34.0	241	1.78	39139	12.8

Table 6. Infield second-stubble means of the 2015 “Ho” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	13494	54.7	246	1.63	67319	14.1
HoCP 96-540	8734 -	37.8 -	229	2.17 +	34870 -	13.8
L 01-283	8594 -	34.7 -	247	1.62	42852 -	12.5 -
HoCP 04-838	9799	40.3 -	242	1.66	48404 -	14.4
HoCP 09-804	9247 -	36.3 -	254	1.64	44536 -	14.6
HoL 15-508	14168	50.8	278	1.68	60669	10.4 -
Means	10673	42.5	250	1.73	49775	13.3

Table 7. Infield second-stubble yields of the 2015 “Ho” assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	9528	34.9	275	1.35	51669	11.1
HoCP 96-540	8680	31.0	280	2.14 +	29347	11.4
L 01-283	10117	35.4	285 +	1.65	42656	11.9
HoCP 04-838	9638	34.2	281	1.34	51146	12.9
HoCP 09-804	9853	34.2	287 +	1.33	52132	12.1
HoL 15-508	9083	35.1	259 -	1.70 +	41262	9.6 -
Means	9483	34.1	278	1.58	44702	11.5

Table 8. Infield second-stubble means of the 2015 “Ho” assignment series across three locations (Ardoyne Farm, Blackberry Farm and Circle A Farm) in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)
L 01-299	10665	42.4	253	1.67	52066	13.1
HoCP 96-540	8046	34.1	235	2.14 +	32207	12.7
L 01-283	9541	36.7	260	1.65	44293	12.4
HoCP 04-838	8792	35.0	250	1.52	46452	13.7
HoCP 09-804	9289	35.1	265	1.50	47216	13.5
HoL 15-508	10371	38.0	272	1.69	44997	10.0 -
Means	9451	36.9	256	1.70	44539	12.5

Table 9. Infield first-stubble means of the 2016 “Ho” assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)
L 01-299	9672	37.2	260	1.67	45431	12.4
HoCP 96-540	6953	26.2	268	2.48	21988	12.4
HoCP 04-838	9079	34.7	261	1.68	41401	14.2 +
HoCP 09-804	7632	28.4	269	1.67	34253	13.2
L 11-183	11296	39.7	285	2.22	35995	11.6
Ho 16-600	10253	36.4	282	2.99	25589	11.0 -
Ho 16-608	9192	35.0	263	2.34	30180	12.6
Means	9154	33.9	270	2.15	33548	12.5

Table 10. Infield first-stubble means of the 2016 “Ho” and 2017 “L” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	11411	44.4	257	1.96	45260	12.9
HoCP 96-540	10452	39.3	266	2.16	36447	11.6
HoCP 04-838	11289	44.9	251	1.74	51716	14.0
HoCP 09-804	10845	41.3	263	1.46 -	56473	13.3
L 11-183	11555	44.3	260	2.13	43089	11.5
Ho 16-600	13199	44.1	299 +	2.31	38281	10.7 -
Ho 16-608	10926	44.0	248	1.69	52959	12.3
L 17-410	10479	38.9	270	2.33	33568	10.3 -
L 17-428	13097	49.0	267	2.72 +	36270	10.9 -
Means	11473	43.4	265	2.05	43785	11.9

Table 11. Infield first-stubble means of the 2016 “Ho” and 2017 “L” assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	13412	48.3	278	1.46	66278	13.3
HoCP 96-540	12507	47.5	263	2.58 +	36901 -	11.5 -
HoCP 04-838	14398	55.8	258	1.86	58601	14.0
HoCP 09-804	10581	39.7	267	1.76	45319	13.1
L 11-183	9473	32.9	288	2.32 +	29345 -	11.7 -
Ho 16-600	13959	47.3	296	2.46 +	38452 -	11.0 -
Ho 16-608	11619	44.2	264	2.14 +	41188 -	12.4
L 17-410	7320	26.3	274	2.02 +	26341 -	9.9 -
L 17-428	11145	40.8	273	2.23 +	37072 -	9.7 -
Means	11602	42.5	273	2.09	42166	11.8

Table 12. Infield first-stubble means of the 2016 “Ho” assignment series across three locations (Ardoyne Farm, Blackberry Farm and Circle A Farm) in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)
L 01-299	11498	43.3	265	1.70	52323	12.8
HoCP 96-540	9971	37.7	266	2.40 +	31779 -	11.8 -
HoCP 04-838	11589	45.2	257	1.76	50573	14.1 +
HoCP 09-804	9686	36.4	266	1.63	45348	13.2
L 11-183	10775	38.9	277	2.22 +	36143 -	11.6 -
Ho 16-600	12470	42.6	293 +	2.58 +	34107 -	10.9 -
Ho 16-608	10579	41.1	258	2.06	41442	12.4
Means	10938	40.7	269	2.05	41674	12.4

Table 13. Infield first-stubble means of the 2016 “Ho” and 2017 “L” assignment series across two locations (Circle A Farm & Blackberry Farm) in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)
L 01-299	12411	46.3	268	1.71	55769	13.1
HoCP 96-540	11480	43.4	265	2.37	36674	11.5 -
HoCP 04-838	12844	50.4	255	1.80	55159	14.0 +
HoCP 09-804	10713	40.5	265	1.61	50896	13.2
L 11-183	10514	38.6	274	2.22	36217	11.6 -
Ho 16-600	13579	45.7	298 +	2.38	38366	10.8 -
Ho 16-608	11273	44.1	256	1.92	47073	12.4
L 17-410	8899	32.6	272	2.17	29955	10.1 -
L 17-428	12121	44.9	270	2.47	36671	10.3 -
Means	11537	42.9	269	2.07	42976	11.9

Table 14. Infield plant-cane means of the 2017 “Ho” assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	9693	38.2	254	2.54	30099	13.0
HoCP 96-540	9938	39.3	253	3.19 +	24633	12.3
HoCP 09-804	8668	32.5	267	2.41	27116	13.6
L 12-201	8450	30.3	279 +	3.34 +	18445	10.1 -
Ho 12-615	10550	40.0	263	2.27	35207	12.9
HoCP 17-701	11277	38.2	295 +	2.74	28578	11.8 -
HoCP 17-702	7687	26.7	288 +	2.33	23071	11.5 -
HoCP 17-710	9948	35.6	279 +	2.73	26044	11.4 -
Ho 17-724	9471	37.4	253	2.69	28642	10.9 -
Ho 17-738	11088	41.4	267	2.65	31184	12.8
Ho 17-776	11581	39.3	292 +	3.19 +	25633	10.8 -
Means	9850	36.3	272	2.73	27150	11.9

Table 15. Infield plant-cane means of the 2017 “Ho” and 2018 “L” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	14588	49.4	296	2.40	41233	12.4
HoCP 96-540	12923	45.1	286	2.34	38724	12.7
HoCP 09-804	13342	48.0	278 -	2.07	47307	14.1 +
L 12-201	14374	47.3	304	3.01 +	31485 -	10.5 -
Ho 12-615	14565	51.6	282 -	2.39	43159	12.9
HoCP 17-701	12797	41.8	306	2.23	37532	11.7
HoCP 17-702	12463	40.1	311 +	2.23	37236	10.9 -
HoCP 17-710	13910	47.1	295	2.89 +	32758	11.4
Ho 17-724	12762	45.1	282 -	2.74	32935	10.6 -
Ho 17-738	13957	49.1	284 -	2.53	39343	12.4
Ho 17-776	15049	48.7	308 +	2.67	36646	10.6 -
L 18-438	11999	40.3	297	2.27	35532	11.6
L 18-441	10876	37.3	291	2.37	31712 -	12.5
Means	13354	45.5	294	2.47	37354	11.9

Table 16. Infield plant-cane means of the 2017 “Ho” and 2018 “L” assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	10710	40.7	265	2.01	42013	12.0
HoCP 96-540	9571	38.3	250	2.68	28619	11.5
HoCP 09-804	9380	34.9	270	1.65	42137	12.8
L 12-201	10068	36.6	275	2.57	28694	10.6 -
Ho 12-615	11168	44.5	251	2.13	41848	12.7
HoCP 17-701	10579	36.7	288 +	1.90	38957	11.7
HoCP 17-702	9261	31.9	291 +	2.06	30873	10.3 -
HoCP 17-710	10866	38.6	281	2.41	32686	11.5
Ho 17-724	10021	38.0	264	2.18	35678	10.6 -
Ho 17-738	13669	50.4	272	1.97	51240	11.1
Ho 17-776	10814	36.2	299 +	2.40	30602	10.7
L 18-438	9938	36.1	275	2.08	35331	11.1
L 18-441	7832	28.4	275	1.94	29620	11.1
Means	10298	37.8	273	2.15	36023	11.4

Table 17. Infield plant-cane means of the 2017 “Ho” assignment series across three locations (Ardoyne Farm, Blackberry Farm & Circle A Farm) in 2020

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	11664	42.8	271	2.32	37781	12.5
HoCP 96-540	10811	40.9	263	2.74 +	30659 -	12.2
HoCP 09-804	10463	38.5	272	2.04	38854	13.5 +
L 12-201	10964	38.1	286 +	2.97 +	26208 -	10.4 -
Ho 12-615	12094	45.4	265	2.26	40071	12.8
HoCP 17-701	11551	38.9	297 +	2.29	35022	11.7 -
HoCP 17-702	9804 -	32.9 -	296 +	2.21	30393 -	10.9 -
HoCP 17-710	11575	40.4	285 +	2.67 +	30496 -	11.4 -
Ho 17-724	10751	40.2	266	2.54	32418	10.7 -
Ho 17-738	12905	47.0	274	2.38	40589	12.1
Ho 17-776	12481	41.4	300 +	2.75 +	30961 -	10.7 -
Means	11369	40.6	280	2.47	33950	11.7

Table 18. Infield plant-cane means of the 2017 “Ho” and 2018 “L” assignment series across two locations (Circle A Farm & Blackberry Farm) in 2020

Variety	Sugar/ acre (lbs.)	Tons/ acre (tons)	Sugar/ ton (lbs.)	Weight/ stalk (lbs.)	Stalks/ acre (no.)	Fiber (%)
L 01-299	12649	45.0	280	2.21	41623	12.2
HoCP 96-540	11247	41.7	268	2.51	33672 -	12.1
HoCP 09-804	11361	41.5	274	1.86	44722	13.4 +
L 12-201	12221	42.0	289	2.79 +	30090 -	10.5 -
Ho 12-615	12867	48.1	266 -	2.26	42504	12.8
HoCP 17-701	11688	39.2	297 +	2.06	38245	11.7
HoCP 17-702	10862 -	36.0 -	301 +	2.14	34054	10.6 -
HoCP 17-710	12388	42.9	288	2.65 +	32722 -	11.4
Ho 17-724	11392	41.6	273	2.46	34307	10.6 -
Ho 17-738	13813	49.8	278	2.25	45292	11.7
Ho 17-776	12931	42.5	304 +	2.53	33624 -	10.7 -
L 18-438	10968 -	38.2 -	286	2.18	35432	11.4
L 18-441	9354 -	32.9 -	283	2.15	30666 -	11.8
Means	11826	41.6	284	2.31	36689	11.6

2020 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM OUTFIELD VARIETY TRIALS

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The outfield variety trials are the final stage of testing experimental varieties for their potential commercial production in Louisiana. Results from these trials are used in both variety advancement and crossing decisions. The outfield variety trials are conducted cooperatively by the LSU AgCenter, the USDA-ARS, and the American Sugar Cane League at 12 locations throughout the Louisiana sugarcane belt.

To be considered for release, an experimental variety must equal or exceed the performance of commercial varieties with regards 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 2020 outfield tests. 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. Test plots were two rows wide and 50 feet long with a 5-foot alley between plots. All locations were harvested with a combine harvester and each plot was weighed with a weigh wagon fitted with load cells mounted on each axle and hitch. A 10-stalk, whole-stalk sample, topped but not stripped of leaves, was taken from each plot, and sent to the USDA-ARS sucrose laboratory for analysis. 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 was estimated and reported.

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

Interpreting one year of yield data can be misleading because varieties may differ in relative performance from year to year. Across location means can likewise be misleading since a variety, experimental or commercial, may not perform consistently at all locations. Multi-year and multi–location testing mitigate these problems by averaging the inconsistent performances.

The most widely grown varieties in Louisiana in 2020 were HoCP96-540, L01-283, and L01-299 occupying 12%, 10%, and 59% of the state's acreage, respectively. For comparison, L01-299 was used as the check variety and is highlighted in the tables. To adjust for missing data, the SAS analysis calculated least square means (v 9.2, Proc Mixed). Mean separation was done with the Student's t test by using PDIFF option (P=0.05). Varieties that are significantly

higher or lower than L01-299 are denoted by a plus (+) or minus (-), respectively, next to the value for each trait.

Sixteen varieties representing the 2018 assignment series were introduced to outfield locations for seed increase in 2020 (Table 1). Thirteen experimental and nine commercial varieties were planted at 10 outfield locations. Thirty-nine tests were harvested in 2020 including twelve plantcane, nine first-stubble, eleven second-stubble, and seven third-stubble crops (Table 2).

Variety yield traits are reported by crop and trait with overall means and individual location data in the same table and in summary tables by crop. A combined analysis of plantcane, first-stubble, second-stubble, and third-stubble crops averaged over several years is also provided.

The 2020 Louisiana sugarcane industry had a warm start, with above average temperatures for the first quarter of the year. Spring months were warm, with an optimal amount of rain. In 2020 Louisiana was impacted by seven named tropical storms (Cristobal, Marco, Laura, Sally, Beta, Delta, and Zeta). Starting off Hurricane season was Tropical Storm Cristobal, making landfall in southeast Louisiana on June 7. On August 27 category 4 Hurricane Laura made landfall on the southwestern side of the state, with winds of up to 150 miles per hour and over 9 feet of storm surge in some parishes. October ended with Hurricane Zeta, bringing with it high winds and rain on the southern parts of the state. The Louisiana industry received 90.69” of rain in 2020, which is over 15” higher than the average. Baton Rouge received 67.9” of rainfall, which is 7.2” over the 30-year average. Harvest season was warmer than average, without any major freezes. The outfield harvest was completed on January 5, 2021. All mills in the Louisiana industry completed grinding by January 28, 2021.

Varieties HoL 15-508 and L 15-306 (both eligible for commercial release in 2022) were harvested in the plant cane and first-stubble, while L 14-267 and HoCP 14-855 were recommended for commercial production. .

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The continued advancement of the Louisiana sugarcane industry depends on the dedication and commitment of many individuals throughout the industry. The assistance of Lawrence “Junior” Lovell from the USDA-ARS Sugarcane Research Unit, as well as Gregory Williams and Darrekus “Shorty” Braxton from LSU AgCenter is greatly appreciated. Sincere appreciation is expressed to the growers who participate in the many different stages of the Louisiana sugarcane variety improvement program.

Data were obtained through a cooperative effort of personnel from the LSU AgCenter, USDA-ARS, Sugarcane Research Laboratory, and the American Sugar Cane League in accordance to the provisions of the “Three-way Agreement of 2007.”

Table 1. Commercial and experimental varieties planted in the outfield in 2020

Commercial Varieties		Experimental Varieties		Experimental Varieties Introduced to the Outfield			
HoCP96-540	Ho13-739	L14-267	L 17-428	L 18-438	HoCP 18-824	Ho 18-878	
L01-299	CP 01-1372	HoCP14-885	HoCP 17-701	L 18-441	HoCP 18-829	Ho 17-776	
Ho 05-961		L15-306	HoCP 17-702	HoCP 18-801	HoCP 18-835		
HoCP09-804		HoL15-508	HoCP 17-710	HoCP 18-803	HoCP 18-839		
Ho12-615		Ho 16-600	Ho 17-724	HoCP 18-810	HoCP 18-846		
L12-201		Ho 16-608	Ho 17-738	HoCP 18-815	HoCP 18-859		
HoCP04-838		L 17-410		HoCP 18-822	HoCP 18-862		

Table 2. Harvest and planting dates for all outfield locations harvested in 2020

Location	Parish	Plantcane			First-stubble		Second-stubble		Third-stubble	
		2020 Planting Date	2020 Harvest Date	2019 Planting Date	2020 Harvest Date	2018 Planting Date	2020 Harvest Date	2017 Planting Date	2020 Harvest Date	2016 Planting Date
Al Landry	Iberville	8/17	12/17	09/11	10/22	08/28	10/22	09/13	**	09/28
Allains	St. Mary	9/10	11/23	09/18	**	*	11/23	09/21	11/23	10/11
Alma	Pointe Coupee	8/12	10/7	09/03	10/7	09/21	10/7	09/20	**	10/04
Brunswick	Pointe Coupee	9/9	12/11	09/12	12/11	09/24	9/30	09/22	9/30	09/19
Domingue	Vermilion	*	12/21	09/13	12/21	10/12	**	*	**	*
Glenwood	Assumption	8/19	12/15	09/20	**	*	12/15	08/24	10/29	09/21
Harper Farms	Rapides	9/14	12/8	09/16	12/8	09/14	10/27	09/18	10/27	09/21
Lanaux	St. John	9/4	12/16	08/23	11/25	08/15	12/16	09/07	11/25	08/31
Levert-St. John	St. Martin	8/18	12/4	08/30	11/9	09/18	11/9	09/08	**	09/20
Magnolia	Terrebonne	*	11/24	09/23	11/24	10/15	10/01	09/11	**	10/01
Mary	Lafourche	9/11	12/28	09/23	**	*	10/15	09/28	10/15	10/10
Ronald Hebert	Iberia	9/3	1/05/21	09/18	1/05/21	09/19	11/10	09/14	11/10	08/25

*No test planted at this location. **No test harvested at this location.

Table 3. Plantcane sugar per acre for nine commercial and six experimental varieties at twelve outfield locations in 2020

	HEAVY						LIGHT						
Variety	Allains	Alma	Domingue	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(tons/A)							
HoCP96-540	9250	7620	7201	11024	9284	10481	9196	11185	9164	8809	7847 -	10001 +	9255
L01-299	9068	7766	8243	12627	9030	10187	8497	12572	10598	10726	9463	7794	9714
HoCP04-838												11821 +	11790 +
Ho05-961		7328	6737	12389	10499		8021		10561	11336	8837		9799
HoCP09-804	9788	6705	9061	11843	9428	8870	8926	10839 -	10155	11328	9585	9388 +	9660
L11-183	8773	5907	7784	10669	9900	10967	8560	11730	10361	10721	10255	9882 +	9626
L12-201	8978	7916	8540	12168	10515	10718	8610	11713	9822	9071	9874	9702 +	9802
Ho12-615	10711	6408	8533	12171	10709 +	12074	9679	11861	11603	11375	9900	10456 +	10459 +
Ho13-739	8104	6509	9060	11936	8687	11184	8335	11618	10888	9626	9132	8913	9499
L14-267	8657	8254	8726	12528	10885 +	11755	8681	12099	10124	9181	9351	9238	9967
HoCP14-885	11917 +	7968	10560 +	13879	11171 +	13310 +	11057 +	15552 +	12280	12409	12161 +	13150 +	12118 +
L15-306	10034	7000	9019	11350	9924	11901	8153	12227	10588	9501	10736 +	11511 +	10162
HoL15-508	11531 +	9014	8899	11722	9408	10779	8463	10767 -	11555	9053	9740	9795 +	10060
Ho16-600		10010 +	9801	13076	9647		7778		12752	14066 +	11751 +	10995 +	11370 +
Ho16-608		7430	8196	11779	10177		10584 +		11803	12023	11511 +	12201 +	10929 +

Table 4. Plantcane cane yield for nine commercial and six experimental varieties at twelve outfield locations in 2020

	HEAVY						LIGHT						
Variety	Allains	Alma	Domingue	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(tons/A)							
HoCP96-540	34.5	36.8	27.0	34.8	38.6 +	36.6	33.8	38.7	36.3	31.5	30.2 -	39.0 +	34.8
L01-299	32.8	36.7	28.9	40.8	32.6	35.1	29.1	42.3	41.6	36.1	35.0	31.8	35.2
HoCP04-838												43.6 +	41.8 +
Ho05-961		34.4	25.2	39.4	36.2		26.8		39.0	38.2	34.0		34.9
HoCP09-804	33.0	32.8	32.0	37.6	32.5	29.5	30.5	36.4 -	38.3	38.0	34.5	34.3	34.1
L11-183	31.4	31.4	28.3	33.9	34.3	37.6	30.1	41.7	41.8	37.2	39.2 +	38.1 +	35.4
L12-201	33.6	38.8	30.1	39.6	37.2	35.0	28.5	39.3	37.1	31.9	35.4	36.3	35.2
Ho12-615	37.0	34.3	32.2	40.5	40.1 +	42.4 +	32.3	43.3	44.9	38.5	38.8 +	41.5 +	38.8 +
Ho13-739	26.9	29.8 -	33.0	39.0	30.7	38.9	28.8	40.3	40.6	32.4	33.9	33.4	34.0
L14-267	29.7	37.0	32.0	40.2	38.9 +	40.6	28.8	41.3	37.2	30.9	33.9	34.9	35.5
HoCP14-885	39.2	35.8	36.0 +	44.0	39.8 +	43.4 +	35.8 +	50.3 +	47.2	39.4	40.8 +	46.4 +	41.5 +
L15-306	34.3	34.1	32.8	35.9	36.0	40.3	27.2	41.7	38.8	31.4	39.2 +	42.0 +	36.1
HoL15-508	36.5	40.8	30.7	36.0	32.9	34.2	26.6	35.9 -	41.7	28.2 -	35.3	35.9	34.6
Ho16-600		39.5	31.8	39.1	30.6		23.8		43.1	42.6 +	38.4 +	37.2 +	36.7
Ho16-608		39.1	29.6	39.0	39.8 +		36.8 +		47.0	40.3	41.7 +	45.2 +	40.3 +

Table 5. Plantcane sugar per ton for nine commercial and six experimental varieties at twelve outfield locations in 2020

	HEAVY						LIGHT						
Variety	Allains	Alma	Domingue	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(tons/A)							
HoCP96-540	268	206	268 -	318	241 -	286	272 -	289	253	280 -	260	256	266 -
L01-299	276	212	284	311	279	291	293	297	254	296	271	245	276
HoCP04-838												271 +	284
Ho05-961		213	266 -	315	291		299		270 +	297	260		280
HoCP09-804	296 +	204	283	315	289	300	292	298	265	298	277 +	274 +	283 +
L11-183	279	192	274	315	290	290	285	281	247	288	262	259	272
L12-201	267	203	284	307	282	305	303	298	265	284	279	267 +	279
Ho12-615	290 +	187	265 -	306	268	285	300	273 -	258	296	255 -	252	270
Ho13-739	301 +	218	273	306	283	287	290	288	268	296	270	268 +	279
L14-267	292 +	222	274	312	280	290	302	293	272 +	297	276	265 +	281
HoCP14-885	304 +	222	295	316	280	307	310 +	309	260	315 +	298 +	283 +	292 +
L15-306	293 +	205	275	317	276	295	299	293	273 +	303	274	274 +	281
HoL15-508	316 +	221	288	327	290	316 +	317 +	299	277 +	320 +	275	271 +	293 +
Ho16-600		252 +	309 +	334 +	315 +		327 +		294 +	330 +	306 +	296 +	311 +
Ho16-608		190	278	303	257		288		249	299	276	269 +	272

Table 6. Plantcane stalk weight for nine commercial and six experimental varieties at twelve outfield locations in 2020

	HEAVY						LIGHT						
Variety	Allains	Alma	Domingue	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(tons/A)							
HoCP96-540	2.91	2.80 +	2.98 +	2.63	3.15 +	2.64 +	3.09 +	3.08 +	2.64	2.66 +	2.76	2.93	2.86 +
L01-299	2.40	2.21	2.17	2.75	2.28	2.07	2.18	2.52	2.52	2.16	2.59	2.50	2.36
HoCP04-838												2.70	2.55
Ho05-961		2.54	2.28	2.78	2.58	2.10	2.55		2.76	2.78 +	2.83		2.69 +
HoCP09-804	2.02	1.68 -	1.89	1.86 -	2.23	3.15 +	1.80	2.04 -	1.92 -	2.01	2.01 -	2.11	1.97 -
L11-183	2.33	2.04	2.20	2.51	2.79 +	2.85 +	2.40	2.82	2.30	3.09 +	3.35 +	3.02 +	2.67 +
L12-201	2.72	2.46	2.35	3.03	3.04 +	2.09	2.42	3.51 +	2.83	3.02 +	2.85	3.00 +	2.84 +
Ho12-615	2.14	1.82	1.69	1.98 -	2.53	3.01 +	2.09	2.24	2.16	2.24	2.51	2.31	2.15 -
Ho13-739	2.79	2.44	2.54	2.91	3.09 +	3.26 +	2.44	3.01 +	2.52	2.25	2.98	2.49	2.70 +
L14-267	2.72	2.53	2.66 +	2.95	2.82 +	2.59 +	2.50	2.59	2.76	2.80 +	3.06 +	2.83	2.79 +
HoCP14-885	2.76	2.11	2.44	2.39	2.91 +	2.52 +	2.41	3.03 +	2.90	2.69 +	2.99	3.06 +	2.69 +
L15-306	2.29	2.71 +	2.46	2.54	2.91 +	2.29	2.45	2.58	2.63	2.52	2.68	2.84	2.59 +
HoL15-508	2.59	2.27	2.12	2.34	2.81 +		2.35	2.64	2.40	2.22	2.56	2.59	2.43
Ho16-600		3.47 +	2.89 +	3.35 +	3.59 +		3.01 +		3.24 +	3.76 +	3.67 +	3.59 +	3.42 +
Ho16-608		2.26	2.32	2.58	2.75 +		2.62 +		2.67	3.04 +	2.92	3.23 +	2.73 +

Table 7. Plantcane stalk number for nine commercial and six experimental varieties at twelve outfield locations in 2020

	HEAVY						LIGHT						
Variety	Allains	Alma	Domingue	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(tons/A)							
HoCP96-540	23758	26329	18092 -	26313	24514	28272	22446	25171 -	27471	23699 -	22015 -	26791	24573 -
L01-299	27329	33011	26708	29678	29281	34747	26821	33980	33124	34367	27206	25434	30140
HoCP04-838												32748 +	33393
Ho05-961		27133	22163	28379	28483	28285	21027 -	35861	28341	27483	24036		25760 -
HoCP09-804	33149	38992	33864	40462 +	29212	24514 -	34049 +	29623	39937	39851	34355 +	32853 +	35072 +
L11-183	28567	32272	25425	27021	24581	24988 -	25109	22517 -	36834	24212 -	23450	25699	27276 -
L12-201	25093	32078	25522	26153	24666	40641	23380	38904	26192	21176 -	24839	24193	25066 -
Ho12-615	34686	38476	40194 +	41420 +	31723	25904 -	31004	26831 -	42488 +	34364	31001	36081 +	36671 +
Ho13-739	19302	24620	26127	26784	19230 -	24915 -	23910	32105	32511	30248	22930 -	27142	25569 -
L14-267	22207	29505	23956	27304	27709	33486	23375	33331	26935	22076 -	22548 -	24666	25680 -
HoCP14-885	28368	33957	29660	37821 +	27543	31915	29926	32550	32782	29495	27471	30393	31186
L15-306	30677	25182	26688	28297	24631	30166	22236	27290 -	29556	24919	29555	29855	28005 -
HoL15-508	28533	36053	29078	30693	23434 -		22747		34992	26063	27855	27939	28737
Ho16-600		23145 -	22318	23426	17037 -		15706 -		26816	22590 -	21028 -	20763	21548 -
Ho16-608		34808	25473	30419	29007		28083		35537	26499	28633	28174	29749

Table 8. First-stubble sugar per acre for five commercial and six experimental varieties at ten outfield locations in 2020

	HEAVY				LIGHT					
Variety	Alma	Dominguez	Landry	Magnolia	Brunswick	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)									
HoCP96-540	6924	8416	5391 -	7027	6603 -	9254 -	6114 -	9049	7992 -	7419 -
L01-299	9106	9403	9134	6202	9162	11421	9681	9821	11106	9448
HoCP04-838	7870	9757	6654 -	6268	6047 -	11408	8184	9089	10679	8440 -
HoCP09-804	7539	9445	8118	5091	7023 -	11838 -	8927	7880 -	10746	8512 -
L11-183	7036	8940	7380 -	6583	7842	9942	7588 -	9822	9893	8336 -
L12-201	8917	9004	6270 -	7304	7585	10255	8584	8289 -	11205	8584 -
Ho12-615	7976	10762	8252	8274 -	7520	11847	10557	9317	10432	9438
Ho13-739	8531	10253	7981	7287	7100	10155	9560	9749	10642	9029
L14-267	9076	8576	7694	8101 -	8447	10741	9657	9859	10821	9219
HoCP14-885	8220	10653	7722	8136 -	8502	12268	10557	11320 +	12758	10015
L15-306	7861	10194	8427	7891 -	8671	10495	9342	10161	11873	9435
HoL15-508	5648 -	9898	8333	7944 -	9925	12821 +	8834	8610	12418	9381

Table 9. First-stubble cane yield for five commercial and six experimental varieties at ten outfield locations in 2020

	HEAVY				LIGHT					
Variety	Alma	Dominguez	Landry	Magnolia	Brunswick	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)									
HoCP96-540	33.9 -	30.8	27.5 -	23.8	23.4 -	33.6 -	21.6 -	35.0	31.2 -	29.0 -
L01-299	42.7	33.9	39.0	21.1	31.7	40.7	34.0	35.6	39.6	35.4
HoCP04-838	36.9	34.4	33.3	21.9	21.4 -	40.0	28.4	32.6	37.8	31.9 -
HoCP09-804	35.1 -	32.9	34.6	17.2	23.9 -	42.0	30.3	28.9 -	37.7	31.4 -
L11-183	30.9 -	32.0	29.8 -	22.9	26.5	36.8	26.1 -	36.3	36.7	30.9 -
L12-201	38.5	32.6	27.6 -	25.7	25.6	35.5	29.7	29.5 -	39.4	31.5 -
Ho12-615	37.5	39.8 +	37.9	28.8 +	26.2	45.1	36.9	36.7	39.1	36.5
Ho13-739	33.2 -	36.2	31.5 -	23.7	23.8 -	38.8	33.2	36.8	36.7	32.7 -
L14-267	37.6	32.2	32.0 -	26.3	27.4	38.0	31.7	35.4	38.1	33.2
HoCP14-885	33.8 -	34.3	32.2	26.8 +	28.0	41.6	34.7	39.8	43.3	35.0
L15-306	35.2 -	36.3	35.0	26.0	28.3	37.4	31.4	38.3	42.4	34.5
HoL15-508	25.5 -	33.6	33.1	25.5	31.8	44.0	27.2 -	30.8	40.6	32.4 -

Table 10. First-stubble sugar per ton for five commercial and six experimental varieties at ten outfield locations in 2020

	HEAVY				LIGHT					
Variety	Alma	Dominguez	Landry	Magnolia	Brunswick	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)									
HoCP96-540	199.8	272.8	194.9 -	297.7	281.0	275.2	282.6	259.1 -	255.6 -	257.6 -
L01-299	212.7	278.0	233.7	295.6	291.2	280.1	285.6	275.8	280.2	270.3
HoCP04-838	213.7	283.6	202.6 -	287.1	285.8	286.0	288.2	278.8	282.0	267.5
HoCP09-804	216.4	286.9	235.0	296.0	293.6	281.7	295.2	272.6	284.6	273.6
L11-183	226.4	279.8	249.4	288.5	296.5	270.4	290.9	271.7	269.4	271.4
L12-201	231.2	276.2	225.4	284.4	296.0	289.1	289.5	281.3	284.2	272.9
Ho12-615	211.5	270.5	217.9	286.5	286.8	262.7	286.9	254.2 -	267.0	260.4 -
Ho13-739	258.1 +	283.2	252.7	308.4	297.2	262.8	287.9	265.2	289.5	278.3
L14-267	242.3	266.9	240.9	307.6	308.9 +	283.0	304.6 +	277.7	283.9	279.5 +
HoCP14-885	243.4	309.7 +	239.4	303.7	304.8	294.8	304.9 +	284.6	294.2 +	286.6 +
L15-306	224.3	280.6	242.3	304.1	306.9	280.5	298.6	265.9	280.2	276.0
HoL15-508	217.6	294.1 +	253.2	313.1 +	310.6 +	295.3	324.5 +	280.4	305.8 +	288.3 +

Table 11. First-stubble stalk weight for five commercial and six experimental varieties at ten outfield locations in 2020

	HEAVY				LIGHT					
Variety	Alma	Dominguez	Landry	Magnolia	Brunswick	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
					(lbs./A)					
HoCP96-540	2.11	2.49	2.00	1.85	2.57	2.68 +	2.43	2.87 +	2.77 +	2.42 +
L01-299	1.79	2.00	2.07	1.51	2.28	2.08	2.10	2.15	2.08	2.00
HoCP04-838	1.75	1.99	1.91	1.60	1.98	2.19	1.89	2.36	2.12	1.98
HoCP09-804	1.56	1.90	1.83	1.78	1.48 -	1.75	1.72	1.73	1.74	1.72 -
L11-183	1.89	2.51	1.86	1.82	1.88	2.32	2.30	2.62 +	2.39	2.18
L12-201	2.41	2.70 +	2.54	2.95 +	2.36	2.85 +	2.97 +	2.69 +	2.42	2.66 +
Ho12-615	1.58	2.03	2.08	1.46	1.60 -	2.05	1.91	2.11	1.85	1.85
Ho13-739	1.87	2.18	2.55	2.02 +	2.03	2.65 +	2.35	2.87 +	2.47	2.33 +
L14-267	2.51 +	2.62 +	2.68 +	2.64 +	2.40	2.24	2.64 +	2.52	2.41	2.52 +
HoCP14-885	2.21	2.33	2.43	2.24 +	2.10	2.24	2.67 +	3.19 +	2.41	2.42 +
L15-306	1.99	2.18	2.26	1.95	2.13	2.57 +	2.15	2.47	2.40	2.23 +
HoL15-508	2.35	2.22	2.05	2.05 +	2.19	2.09	1.93	1.95	2.04	2.10

Table 12. First-stubble stalk number for five commercial and six experimental varieties at ten outfield locations in 2020

	HEAVY				LIGHT					
Variety	Alma	Dominguez	Landry	Magnolia	Brunswick	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)									
HoCP96-540	32569 -	25274	27639 -	25634	18164 -	25264 -	17869 -	24416 -	22862 -	24410 -
L01-299	47970	34003	37942	27716	27991	39213	33430	33443	38344	35561
HoCP04-838	42440	35188	34659	28130	21653	36665	31112	27708	36250	32616
HoCP09-804	45334	35065	38209	19300 -	32143	48016 +	35238	33391	44684	36820
L11-183	32718 -	25419	31816	24501	28201	31830	23283 -	28333	31114	28529 -
L12-201	32361 -	24413 -	21765 -	17548 -	22446	25087 -	20023 -	22262 -	32711	24156 -
Ho12-615	48643	39292	38910	39531 +	33140	44197	37519	36284	42339	39993 +
Ho13-739	35745	33265	25022 -	23324	23877	29549 -	28232	25821	29925	28306 -
L14-267	32024 -	25165	24829 -	20252 -	22846	34191	24014 -	28113	31978	27046 -
HoCP14-885	32929 -	30654	27123 -	24099	26795	37620	26974	25060 -	36030	29698 -
L15-306	36215	33473	31307	26716	26675	29401 -	29223	30938	35838	31087 -
HoL15-508	22572 -	33601	33157	24868	29005	43161	28185	31896	39866	31812 -

Table 13. Second-stubble sugar per acre for seven commercial and three experimental varieties at eight outfield locations in 2020

	HEAVY					LIGHT						
Variety	Allains	Alma	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)											
HoCP96-540	9060	3639 -	5843 -	3159	7814	2160	9208 -	6179 -	6867 -	7347 -	4346 -	5966 -
L01-283	8529	5958	8325	4741	8515	4142	10157 -	8319	7755	9584 -	8535	7687 -
L01-299	9886	6841	8832	4202	8480	3401	13274	8658	9738	11914	8868	8554
HoCP04-838	7488 -	6051	7074 -	3340	5960 -	3575	10556 -	7440	8400	9110 -	7861	6987 -
HoCP09-804	9607	5435 -	7503 -	3506	6720 -	3979	12509	7774	10520	10167	7617	7758 -
L11-183	8063	4418 -	7198 -	3652	9440	2976	10274 -	7230 -	8350	9919 -	6898 -	7129 -
L12-201	8738	5431 -	8063	5004	7667	4048	10239 -	8659	7067 -	10206	7914	7549 -
Ho12-615	11350	6192	7554 -	4000	7535	2757	9646 -	8510	9338	11071	7237 -	7745 -
Ho13-739	7666 -	4737 -	7986	4025	7255	4433	11118 -	7595	10908	10988	9072	7845
L14-267	8914	6725	8505	3908	8238	3461	10551 -	7972	9565	10115 -	7986	7813 -
HoCP14-885	11067	6898	9600	3895	8520	4758	14513	9049	10572	12392	10974 +	9302 +

Table 14. Second-stubble cane yield for seven commercial and three experimental varieties at eight outfield locations in 2020

	HEAVY					LIGHT						
Variety	Allains	Alma	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
					(lbs./A)							
HoCP96-540	30.5	18.6 -	26.3 -	12.9	29.9	14.3	31.8	26.0 -	23.5 -	29.7 -	14.8 -	23.5 -
L01-283	28.5	28.5 -	37.1	18.5	32.9	21.3	32.9	35.0	24.7 -	34.8 -	27.9	29.3 -
L01-299	33.3	33.3	37.6	16.3	32.7	18.6	41.9	39.2	32.2	43.1	31.1	32.7
HoCP04-838	27.0	28.5 -	32.9	13.3	24.3 -	19.9	33.7 -	33.3 -	28.2	32.3 -	26.6	27.3 -
HoCP09-804	32.3	26.9 -	34.4	14.2	26.9 -	20.7	41.4	33.9 -	34.5	37.7	25.3 -	29.8 -
L11-183	27.6	22.1 -	28.8 -	13.6	34.1	18.5	33.2 -	31.8 -	28.8	39.2	25.1 -	27.5 -
L12-201	30.4	24.4 -	34.1	18.6	28.4	21.2	35.3 -	33.7 -	23.8 -	39.2	27.4	28.8 -
Ho12-615	38.2	29.5 -	33.9	16.1	28.3	16.3	32.8 -	38.8	30.4	41.8	26.4	30.2
Ho13-739	25.6 -	22.3 -	33.3	15.3	27.5 -	23.6	37.4	32.2 -	35.5	39.8	31.2	29.6 -
L14-267	30.4	29.0 -	35.2	15.4	31.6	17.4	34.7 -	33.3 -	30.7	37.6	28.5 -	29.4 -
HoCP14-885	36.1	29.8 -	41.5	15.1	33.0	27.0	45.3	36.2	34.7	44.1	35.5	34.4

Table 15. Second-stubble sugar per ton for seven commercial and three experimental varieties at eight outfield locations in 2020

	HEAVY					LIGHT						
Variety	Allains	Alma	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
						(lbs./A)						
HoCP96-540	297.7	195.3	223.4	244.3	261.5	150.3	289.7	236.6	291.2	248.5	299.7	248.9
L01-283	299.4	209.3	224.9	256.8	259.3	196.4	308.5	237.6	314.4	275.7	306.8	262.6
L01-299	297.0	205.3	234.3	258.3	258.7	185.4	317.0	220.7	302.3	276.9	285.7	258.3
HoCP04-838	278.4	212.6	215.8	249.1	245.8	174.0	313.8	223.8	298.5	282.3	297.5	253.8
HoCP09-804	297.6	201.9	217.6	246.0	250.1	192.0	302.1	229.5	305.2	270.1	300.8	255.7
L11-183	291.7	199.6	250.6	268.4	277.4	161.9	309.0	228.1	289.7	253.0	275.2	255.0
L12-201	287.3	222.4	236.8	269.4	269.8	184.5	290.8	256.8	296.8	260.5	287.8	260.3
Ho12-615	297.2	210.2	222.6	247.9	263.0	170.2	293.7	219.9	307.5	264.8	274.6	252.0
Ho13-739	300.2	212.4	239.7	262.9	264.4	186.3	296.6	235.8	306.4	276.0	291.3	261.1
L14-267	292.8	231.2	242.0	254.2	260.5	198.5	303.8	239.6	311.8	267.4	280.7	262.1
HoCP14-885	308.7	231.8	231.5	257.6	256.9	179.0	319.2	250.0	304.8	282.2	309.3	266.5

Table 16. Second-stubble stalk weight seven commercial and three experimental varieties at eight outfield locations in 2020

	HEAVY					LIGHT						
Variety	Allains	Alma	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)											
HoCP96-540	2.13	1.83	2.04	1.44	2.22	1.60	2.42 +	2.46 +	2.43 +	2.32	1.61	2.05 +
L01-283	1.62	1.59	1.77	1.41	1.65	1.39	1.83	1.58	1.85	1.90	1.63	1.66
L01-299	1.83 B	1.86	1.80	1.32	1.73	1.44	2.00	1.80	1.75	2.03	1.83	1.76
HoCP04-838	1.69	2.08	1.77	1.33	1.64	1.25	2.30	1.80	1.92	1.79	1.86	1.77
HoCP09-804	1.72	1.37	1.60	1.54	1.34	1.25	1.82	1.54	1.84	1.62	1.49	1.56 -
L11-183	1.94	1.73	1.79	1.47	2.11	1.32	2.27	1.86	2.42 +	2.10	2.01	1.91
L12-201	2.71 +	2.60 +	2.54 +	2.09 +	2.01	1.75	2.85 +	2.41 +	3.08 +	2.93 +	2.36 +	2.48 +
Ho12-615	1.64	1.64	1.76	1.31	1.35	1.07	2.07	1.79	1.70	1.95	1.38 -	1.61 -
Ho13-739	1.91	1.45	2.28 +	1.73 +	1.64	1.45	2.25	2.12	2.03	2.37	1.90	1.92 +
L14-267	2.10	2.17	2.27 +	1.72 +	1.80	1.28	2.54 +	2.20	2.33 +	2.47 +	1.81	2.06 +
HoCP14-885	2.04	1.49	1.57	1.34	1.77	1.44	2.60 +	2.23 +	2.36 +	2.47 +	2.14	1.95 +

Table 17. Second-stubble stalk number for seven commercial and three experimental varieties at eight outfield locations in 2020

	HEAVY					LIGHT						
Variety	Allains	Alma	Landry	Magnolia	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	St. John	Overall Mean
	(lbs./A)											
HoCP96-540	28806	20618 -	25892 -	18287	26808	18290	26504 -	21258 -	19807 -	25831 -	18425 -	22775 -
L01-283	35612	36530	42069	27096	40790	30909	36089	44290	26846 -	36815	34121	35561
L01-299	36989	36342	42336	24714	37978	26168	42268	45363	37494	43605	34582	37076
HoCP04-838	32258	28395	37283	20135	30681	31298	29495 -	38256	29389	36266	28985	31131 -
HoCP09-804	37811	39243	43717	18389	40071	33173	46046	44407	37892	46722	34547	38365
L11-183	30054	25665 -	32176 -	18864	32695	27926	29396 -	34237 -	23957 -	37602	26168 -	28977 -
L12-201	22749 -	18878 -	26917 -	18200	29877	23899	24761 -	27952 -	15579 -	26792 -	23541 -	23559 -
Ho12-615	46565	36468	38793	25543	41723	31629	31698 -	43625	35918	43951	38603	37683
Ho13-739	28832	30236	29214 -	18376	34481	32667	33409 -	30581 -	35503	33619 -	32687	30852 -
L14-267	31284	28570	31515 -	17879	36210	27572	27357 -	30544 -	26871 -	30545 -	31512	29078 -
HoCP14-885	35572	42912	53329 +	23007	38058	38869 +	35429	32494 -	29888	35667	33816	36121

Table 18. Third-stubble sugar per acre for nine commercial varieties at seven outfield locations in 2020

	HEAVY		LIGHT					
Variety	Allains	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	Overall Mean
				(stalks/A)				
HoCP96-540	8735	7149	2393 -	7544 -	3701 -	6752 -	8219 -	6356 -
L01-283	8688	6700	4089	8314 -	6489	7978	8050 -	7187 -
L01-299	10403	7701	5085	10944	6942	9659	11823	8937
HoCP04-838	7869 -	6091 -	3558 -	9746	5946	7903	8884 -	7143 -
HoCP09-804	8348 -	7263	5055	7595 -	6530	7452 -	8985 -	7366 -
L11-183	7818 -	7927	3364 -	10754	5151	8306	8651 -	7424 -
L12-201	9402	7742	4336	9346	5381	7922	9014 -	7592 -
Ho12-615	10405	7562	4487	8221 -	6811	7696 -	10450 -	7947 -
Ho13-739	9426	6307 -	4933	9909	6097	8926	9031 -	7804 -

Table 19. Third-stubble cane yield for nine commercial varieties at seven outfield locations in 2020

	HEAVY		LIGHT					
Variety	Allains	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	Overall Mean
				(stalks/A)				
HoCP96-540	30.2	28.2	14.4 -	27.1 -	17.7 -	24.7 -	32.7 -	25.0 -
L01-283	29.6	24.9	20.5 -	30.5 -	28.7	25.9 -	29.9 -	27.2 -
L01-299	34.4	29.5	29.4	40.3	32.4	33.2	42.8	34.6
HoCP04-838	27.7 -	24.7	21.1 -	36.4	29.7	27.1	32.8 -	28.5 -
HoCP09-804	26.9 -	27.0	26.1	30.2 -	31.4	24.5 -	33.5 -	28.5 -
L11-183	26.7 -	28.5	20.7 -	37.7	29.5	29.8	33.2 -	29.4 -
L12-201	32.1	27.9	24.2	32.2 -	25.7	28.4	34.3 -	29.3 -
Ho12-615	34.6	28.8	24.3	30.7 -	31.3	27.5	40.6	31.1 -
Ho13-739	32.2	24.3 -	23.8	34.3 -	28.3	30.1	31.9 -	29.3 -

Table 20. Third-stubble sugar per ton for nine commercial varieties at seven outfield locations in 2020

	HEAVY				LIGHT			
Variety	Allains	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	Overall Mean
				(stalks/A)				
HoCP96-540	289	254	162 -	278	205	276	251 -	245
L01-283	293	269	200	272	224	308	270	262
L01-299	302	262	172	272	216	292	276	256
HoCP04-838	285 -	247	168	269	199	292	271	247
HoCP09-804	310	269	193	251	208	304	269	258
L11-183	293	278	162	285	177 -	279	260 -	248
L12-201	294	277	179	290	209	279	263	256
Ho12-615	301	263	185	267	218	281	257 -	253
Ho13-739	294	258	207 +	289	218	296	284	264

Table 21. Third-stubble stalk weight for nine commercial varieties at seven outfield locations in 2020

	HEAVY				LIGHT			
Variety	Allains	Mary	Brunswick	Glenwood	Harper	Lanaux	Ronald Hebert	Overall Mean
				(stalks/A)				
HoCP96-540	2.15 +	1.60	1.94 +	1.95	2.00	2.41	2.08 +	2.02 +
L01-283	1.64	1.24 -	1.00	1.58	1.91	1.76	1.76	1.55
L01-299	1.66	1.71	1.36	1.84	1.66	1.99	1.71	1.70
HoCP04-838	2.00	1.53	1.21	1.75	1.67	1.93	1.80	1.70
HoCP09-804	1.62	1.23 -	1.17	1.54	1.84	1.46 -	1.58	1.49 -
L11-183	1.77	1.90	1.49	1.87	1.70	1.83	2.33 +	1.84
L12-201	2.50 +	2.40 +	1.78 +	2.83 +	2.17 +	2.31	2.59 +	2.37 +
Ho12-615	1.67	1.31 -	1.17	1.52	1.54	1.62	1.65	1.50 -
Ho13-739	2.04	1.53	1.54	1.83	2.20 +	1.86	1.99	1.86

Table 22. Third-stubble stalk number for nine commercial varieties at seven outfield locations in 2020

	HEAVY			LIGHT											
Variety	Allains		Mary		Brunswick		Glenwood		Harper		Lanaux		Ronald Hebert		Overall Mean	
							(stalks/A)									
HoCP96-540	28295	-	35465		15001	-	28440	-	18151	-	20313	-	31382	-	25292	-
L01-283	37106		40020		41169		39202		30187		30742		33833	-	35989	-
L01-299	41629		34727		43769		44405		38682		33461		50843		41074	
HoCP04-838	27632	-	33217		34369		41595		35972		28139		37094	-	34003	-
HoCP09-804	34921		44439	+	44680		40564		34820		33940		42461		39414	
L11-183	30912	-	30771		27768	-	42181		35098		33277		28508	-	32645	-
L12-201	25599	-	23324	-	27320	-	22796	-	23759	-	24779	-	26447	-	24861	-
Ho12-615	42138		44130	+	42102		41364		40704		34032		50045		42074	
Ho13-739	31960	-	32675		31112	-	37746		26374	-	32946		32232	-	32149	-

Table 23. Plantcane means from twelve outfield locations in 2020: Allains, Alma, Brunswick, Domingue, Glenwood, Harper, Lanaux, Landry, Magnolia, Mary, R. Hebert, and St. John

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	9255	34.8	266.5 -	2.86 +	24573 -
L01-299	9714	35.2	275.7	2.36	30140
HoCP04-838	11790 +	41.8 +	284.3	2.55	33393
Ho05-961	9799	34.9	279.7	2.69 +	25760 -
HoCP09-804	9660	34.1	282.7 +	1.97 -	35072 +
L11-183	9626	35.4	271.8	2.67 +	27276 -
L12-201	9802	35.2	278.7	2.84 +	25066 -
Ho12-615	10459 +	38.8 +	269.5	2.15 -	36671 +
Ho13-739	9499	34.0	279.0	2.70 +	25569 -
L14-267	9967	35.5	281.2	2.79 +	25680 -
HoCP14-885	12118 +	41.5 +	291.7 +	2.69 +	31186
L15-306	10162 +	36.1	281.4	2.59 +	28005 -
HoL15-508	10060 +	34.6	293.2 +	2.43	28737
Ho16-600	11370 +	36.7	311.5 +	3.42 +	21548 -
Ho16-608	10929 +	40.3 +	272.0	2.73 +	29749

Table 24. First-stubble means from nine outfield locations in 2020: Alma, Brunswick, Domingue, Harper, Lanaux, Landry, Magnolia, R. Hebert, and St. John

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	7419 -	29.0 -	257.6 -	2.42 +	24410 -
L01-299	9448	35.4	270.3	2.00	35561
HoCP04-838	8440 -	31.9 -	267.5	1.98	32616
HoCP09-804	8512 -	31.4 -	273.6	1.72 -	36820
L11-183	8336 -	30.9 -	271.4	2.18	28529 -
L12-201	8584 -	31.5 -	272.9	2.66 +	24156 -
Ho12-615	9438	36.5	260.4 -	1.85	39993 +
Ho13-739	9029	32.7 -	278.3	2.33 +	28306 -
L14-267	9219	33.2	279.5 +	2.52 +	27046 -
HoCP14-885	10015	35.0	286.6 +	2.42 +	29698 -
L15-306	9435	34.5	276.0	2.23 +	31087 -
HoL15-508	9381	32.4 -	288.3 +	2.10	31812 -

Table 25. Second-stubble means from nine outfield locations in 2020: Alma, Magnolia, Mary, Brunswick, Glenwood, Harper, Lanaux, Landry, and R. Hebert

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	5966 -	23.5 -	248.9 -	2.05 +	22775 -
L01-283	7687 -	29.3 -	262.6	1.66	35561
L01-299	8554	32.7	258.3	1.76	37076
HoCP04-838	6987 -	27.3 -	253.8	1.77	31131 -
HoCP09-804	7758 -	29.8 -	255.7	1.56 -	38365
L11-183	7129 -	27.5 -	255.0	1.91	28977 -
L12-201	7549 -	28.8 -	260.3	2.48 +	23559 -
Ho12-615	7745 -	30.2	252.0	1.61 -	37683
Ho13-739	7845	29.6 -	261.1	1.92 +	30852 -
L14-267	7813 -	29.4 -	262.1	2.06 +	29078 -
HoCP14-885	9302 +	34.4	266.5	1.95 +	36121

Table 26. Third-stubble means from eight outfield locations in 2020: Allains, Brunswick, Glenwood, Harper, Lanaux, Mary, and R. Hebert

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	6356 -	25.0 -	245.2	2.02 +	25292 -
L01-283	7187 -	27.2 -	262.3	1.55	35989 -
L01-299	8937	34.6	256.0	1.70	41074
HoCP04-838	7143 -	28.5 -	247.2	1.70	34003 -
HoCP09-804	7366 -	28.5 -	258.5	1.49 -	39414
L11-183	7424 -	29.4 -	247.7	1.84	32645 -
L12-201	7592 -	29.3 -	256.0	2.37 +	24861 -
Ho12-615	7947 -	31.1 -	253.1	1.50 -	42074
Ho13-739	7804 -	29.3 -	263.7	1.86	32149 -

Table 27. Combined plantcane means across outfield locations from 2018 to 2020

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	7938 -	31.7 -	248 -	2.83 +	22828 -
L01-283	8955	33.8	265	2.11 -	32029
L01-299	8809	34.0	258	2.31	30057
HoCP04-838	9232	34.6	266 +	2.31	30242
Ho05-961	8909	33.3	266	2.65 +	25109 -
HoCP09-804	9015	32.9	273 +	1.92 -	34569 +
L11-183	8963	34.7	258	2.53 +	28052 -
L12-201	8966	33.7	265 +	2.83 +	23967 -
Ho12-615	9773 +	38.3 +	255	2.13 -	36380 +
Ho12-630	9184	34.2	267 +	2.63 +	26513 -
Ho13-739	8883	32.9	269 +	2.69 +	24783 -
L14-267	9261 +	34.6	268 +	2.78 +	25142 -
HoCP14-885	10637 +	37.9 +	279 +	2.61 +	29692

Table 28. Combined first-stubble means across outfield locations from 2019 to 2020

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
HoCP96-540	5974 -	25.0 -	238 -	2.16 +	23700 -
L01-283	7842	29.3	269 +	1.87	31864 -
L01-299	8062	31.2	259	1.83	34773
HoCP04-838	7266 -	28.5 -	254	1.81	31934 -
HoCP09-804	7564 -	28.5 -	267 +	1.62 -	35422
L11-183	7008 -	27.5 -	254	1.94	28916 -
L12-201	7324 -	27.8 -	261	2.37 +	23828 -
Ho12-615	8153	32.9	248 -	1.68 -	39732 +
Ho13-739	7766	29.0 -	268 +	2.09 +	28170 -
L14-267	8248	30.3	272 +	2.23 +	27970 -
HoCP14-885	8470	31.1	270 +	2.11 +	30239 -

Table 29. Second-stubble means across outfield locations in 2020

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(lbs/A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)
HoCP96-540	5966 -	23.5 -	249 -	2.05 +	22775 -
L01-283	7687 -	29.3 -	263	1.66	35561
L01-299	8554	32.7	258	1.76	37076
HoCP04-838	6987 -	27.3 -	254	1.77	31131 -
HoCP09-804	7758 -	29.8 -	256	1.56 -	38365
L11-183	7129 -	27.5 -	255	1.91 +	28977 -
L12-201	7549 -	28.8 -	260	2.48 +	23559 -
Ho12-615	7745 -	30.2	252	1.61 -	37683
Ho13-739	7845	29.6 -	261	1.92 +	30852 -
L14-267	7813 -	29.4 -	262	2.06 +	29078 -
HoCP14-885	9302 +	34.4	266	1.95 +	36121

SUCROSE LABORATORY AT THE SUGAR RESEARCH STATION

Mavis Daigle[1], Michael Pontif[1], and Collins Kimbeng[1]

[1]Sugar Research Station

The Sugar Research Station Sucrose Laboratory processed 3,092 samples during the 2020 harvest season (Table 1).

A total of 3,092 samples (including 16 energy cane samples) were analyzed using a Spectracane FT-NIR instrument. The samples were shredded using a Dedini shredder then analyzed for Brix, pol, sucrose percent, fiber, moisture, purity, and theoretical recoverable sugar using Near InfaRed (NIR) spectroscopy technoloy.

Standard laboratory (wet chemistry) procedures were used to analyze 16 samples which were also processed using the Spectracane FT-NIR instrument. The samples were shredded using a Dedini shredder and the juice was extracted using a Honiron sugarcane hydraulic press. Octapol® was used for juice clarification. Brix was measured with a refractometer and pol was measured using a saccharimeter (Autopol 880). Sucrose percent and theoretical recoverable sugar (lbs/ton of cane) were calculated based on the Brix and pol values. The sucrose laboratory processed samples from September 2020 to December 2020.

Table 1. Number of sugarcane samples processed at the Sugar Research Station sucrose laboratory during the 2020 harvest season

Unit/Project Area	Leader	Number of Samples
School of Plant, Environmental, and Soil Sciences	Niranjan Baisakh	733
	Brenda Tubana	580
	Blake Wilson	32
Plant Pathology and Crop Physiology	Jeff Hoy	148
LSU AgCenter Southeast Region	Albert Orgeron	253
LCES	Kenneth Gravois	94
Sugar Research Station/Variety Development	Line Trials	629
	Increase	93
	Nursery	418
Contract Services		112
TOTAL		3,092

LAES SUGARCANE TISSUE CULTURE LABORATORY

A. Parco[1], D. P. Fontenot[1], C. Kimbeng[2], M. J. Pontif[2], and J. W. Hoy[2]

[1]Certis USA, LLC and [2]Sugar Research Station

During 2020-2021 production season, more than 22,400 sugarcane plantlets that were propagated in the Louisiana Agricultural Experiment Station Tissue Culture Laboratory were turned over to Certis USA, LLC, Kleentek Division for transplanting in the greenhouse at Houma, LA. The number of plantlets transplanted for each sugarcane cultivar is listed in Table 1.

Table 1. Number of tissue culture-derived plantlets of different sugarcane cultivars transplanted in the greenhouse

Cultivar	Number of Plantlets
Ho 12-615	3,888
Ho 13-739	3,204
HoCP 14-885	4,608
HoL 15-508	1,944
L 01-299	864
L 12-201	263
L 14-267	4,176
L 15-306	3,540
Total	22,487

THE 2020 LOUISIANA SUGARCANE VARIETY SURVEY

Kenneth A. Gravois[1]

[1]Sugar Research Station

Each year a sugarcane variety survey is conducted by county agents in sugarcane-growing parishes of Louisiana to determine variety makeup and distribution. Surveys were obtained from 24 parishes. According to USDA Farm Service Agency (FSA), there were 496,258 acres planted to sugarcane in Louisiana in 2020.

Agents collected acreage according to variety and crop. A total of nine sugarcane varieties, HoCP 96-540, HoCP 00-950, L 01-283, L 01-299, HoCP 04-838, HoCP 09-804, L 11-183, L 12-201, and Ho 12-615 were listed along with "Others" in the survey. The category of "Others" included, but was not limited to, small acreages of HoCP 85-845, L 99-226, L 03-371, Ho 05-961, Ho 07-613, and potential new sugarcane varieties on primary and secondary seed cane increase stations. The crop was divided into four categories: plant-cane, first-stubble, second-stubble, and third-stubble and older crops.

Total State Acreage

Total sugarcane acreage for each parish, region and the statewide total is shown in Table 1. Statewide, the area planted to sugarcane in 2020 was 496,258 acres, representing an increase of 2.93% compared to acreage in 2019.

Sugarcane Distribution by Variety

Statewide sugarcane acreage in percent by variety and crop is shown in Table 2. The leading variety for 2020 was L 01-299, which occupied 59% of the Louisiana sugarcane acreage. This percentage was three points higher than the acreage of L 01-299 in 2019 (Gravois, 2020). HoCP 96-540 was next in total acreage, planted on 12% of the state's acreage. The varieties planted in the next largest areas were L 01-283, HoCP 09-804, and HoCP 04-838, occupying 10%, 9%, and 3% of the state's acreage, respectively. All other varieties in the survey had less than 1% or less of the planted area for the 2020 crop.

Sugarcane Distribution by Region and Crop

The total sugarcane acreage was highest for the Teche region (194,224 acres), followed by the River-Bayou Lafourche region (156,031 acres), and the Northern region (146,003 acres) [Table 3]. Total FSA reported sugarcane acreage for Louisiana in 2020 was about 14,000 acres higher than in 2019. The northern area showed the greatest increase in acreage, with Acadia, Avoyelles, Evangeline, Pointe Coupee, Rapides, and St. Landry parishes showing the largest percentage increases compared to 2019.

In 2020, 22.1% of the state's acreage was grown as third and older stubble crops, which was higher than the acreage of the same category for 2019. In 2020, 26.6%, 25.6%, and 25.7% of the state's acreage was in plant-cane, first-stubble, and second-stubble crops, respectively.

For the current survey, plant-cane percentage was highest in the River-Bayou Lafourche region (31.4%). For the third and older stubble crops, the Bayou Teche region had the highest percentage at 27.2%, whereas the River-Bayou Lafourche had the lowest acreage devoted to third and older stubble crops at 18.5%.

Sugarcane Distribution by Variety and Crop for the Three Regions

L 01-299 was the most widely grown variety in all three regions in all crop categories (Tables 4-6). The most notable variety trend in sugarcane acreage was the continued increased planting of L 01-299 and increased older stubble crops devoted to L 01-299. The River-Bayou Lafourche and Northern growing areas had more acres devoted to L 01-283 than the Bayou Teche region. HoCP 96-540 was more widely grown (19.2%) in the Bayou Teche region, followed by the northern region and the River-Bayou Lafourche region at 5.8% and 8.7%, respectively. The survey showed more acres of HoCP 09-804 planted in the Northern region, followed by the Bayou Teche region where mosaic did not affect initial seed cane distribution.

Variety Trends

HoCP 96-540, released for commercial planting in 2003, now occupies 12% of the state's 2020 acreage, which is a decrease of three percentage points from the previous year. The variety continues to perform well for some growers. The main reasons for growers limiting acreage in HoCP 96-540 are weak performance and poor overwintering in older stubble crops HoCP 96-540 is better adapted to sandier soils. Rust infections can be a problem in its plantcane crop. HoCP 96-540 possesses superior cold tolerance.

HoCP 00-950 occupied one percent of the state's acreage in 2020. This variety has high sugar per ton of cane and is early maturing. HoCP 00-950 does not grow as well in poorly drained soils and is better suited to the sandier soils in the sugar belt. The variety has a fit for early harvest on better-drained land.

L 01-283, released for commercial planting in 2008, occupied 10 percent of the Louisiana acreage in 2020. The variety is more popular on the River-Bayou Lafourche and Northern regions. L 01-283 has excellent stubbling ability, good sugar yield, erectness, and cold tolerance. Naturally occurring, environmentally induced off-types have been increasing in L 01-283. The variety has performed best in well-drained sandier soils along with good fertility programs, all of which reduce stress. The variety is especially susceptible to late season brown rust disease, especially after mild winters.

L 01-299 was grown on 59% of the state's acreage in 2020. The variety has outstanding stubbling ability and is well suited for both light and heavy soils. The variety has an erect growth habit and is not the best shading variety. L 01-299 can have difficulty establishing after planting. When cut for harvest, the variety stubbles extremely well. Early spring growth of L 01-299 plantcane and seedcane is susceptible to several stress factors, such as cool weather, wet soils, damage from herbicides, and poor fertility (especially pH) Brown stripe is a disease that takes advantage of these stress factors in L 01-299 and further slows growth. L 01-299 responds well to ripening with glyphosate.

HoCP 04-838 was released in 2011. This variety has good sugar and cane yield potential, with its most notable attribute being cold tolerance. Cane yield in stubble crops can be erratic; the variety does not appear to take the drought well. HoCP 04-838 had the best juice quality for the greatest length of time following the freeze on November 13, 2019.

HoCP 09-804 was released to growers in 2016. This variety has a high population of small diameter stalks with excellent sugar yield potential. Sucrose content and maturity is like L 01-283. HoCP 09-804 performs well in stubble crops. The variety did have some mosaic disease, primarily in the River-Bayou Lafourche region. Growers are encouraged to plant HoCP 09-804 from healthy seed cane sources. This variety was planted on a larger scale in 2020.

L 11-183 was released to growers in 2018. The new variety was derived from the cross HoCP 92-624 and LCP 85-384. Stalks of L 11-183 are larger, and the population is lower than L 01-299. The variety has good sugar yield and is considered a mid- to late-maturing variety. L 11-183 has a good disease package, but it tends to lodge. Sugar yield in L 11-183 has been lower in older stubble crops. Regrowth of L 11-183 was negatively affected by the freezes experienced in mid-February 2021.

L 12-201 was released in 2019. The new variety was derived from the cross HoCP 96-540 x L 97-128. It is characterized as having a moderate population of larger diameter stalks. The yield potential and disease package are very good. In a freeze test conducted in 2019 in Cheneyville, the variety was rated as having poor cold tolerance.

Ho 12-615 was released in 2019. The new variety was derived from the cross HoCP 96-540 x TucCP 77-42. This variety is characterized as having a high population of small diameter stalks. The yield potential and disease package are very good. In a freeze test conducted in 2019 in Cheneyville, the variety was rated as having poor cold tolerance.

New sugarcane variety Ho 13-739 was released in 2020. Growers are encouraged to increase the new variety and determine where it might fit on their farms. Ho 13-739 is noted for a good disease package and early high sucrose content.

Relying on a single variety can lead to changing disease reactions and insect infestations. This was seen with brown rust in LCP 85-384 and HoCP 96-540. With acreage of L 01-299 over 50%, growers are cautioned to diversify their sugarcane variety choices. With the release of many new sugarcane varieties in recent years, growers have good choices to diversify their sugarcane plantings in 2021.

ACKNOWLEDGMENTS

We acknowledge the assistance of the county agents for conducting the sugarcane variety survey in their parishes. We also thank the sugarcane growers and/or their consultants who took the time and effort to respond to the survey. We also acknowledge the assistance of the USDA-FSA offices in the sugarcane parishes for certified acreages.

REFERENCES

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Table 1. Total area planted to sugarcane in Louisiana by region and parish, 2020[1]

Region	Parish	2020 Total Acres	% Change from 2019
Bayou Teche	Acadia	5,807	14.54
River-Bayou Lafourche	Ascension	17,938	-0.39
River-Bayou Lafourche	Assumption	33,069	-1.75
Northern	Avoyelles	18,385	19.47
Bayou Teche	Calcasieu	109	9.78
Bayou Teche	Cameron	33	-0.15
Northern	Concordia	184	5.17
Northern	Evangeline	1,002	32.32
Bayou Teche	Iberia	56,549	-2.04
River-Bayou Lafourche	Iberville	38,795	1.80
Bayou Teche	Jefferson Davis	703	-1.66
Bayou Teche	Lafayette	8,713	-4.25
River-Bayou Lafourche	Lafourche	24,834	-1.48
Northern	Pointe Coupee	66,656	10.43
Northern	Rapides	18,940	18.69
River-Bayou Lafourche	St. Charles	1,280	-7.76
River-Bayou Lafourche	St. James	25,330	-5.27
River-Bayou Lafourche	St. John the Baptist	6,434	-3.93
Northern	St. Landry	25,584	23.41
Bayou Teche	St. Martin	31,811	0.37
Bayou Teche	St. Mary	45,815	-1.84
River-Bayou Lafourche	Terrebonne	8,351	-6.41
Bayou Teche	Vermilion	44,683	2.33
Northern	West Baton Rouge	15,253	0.13
	State Total	496,258	2.93

[1]Acreage based on USDA, FSA estimates obtained by the county agents.

Table 2. Estimated statewide sugarcane percentage by variety and crop, all regions, 2020[1]

Variety	Plant-cane	First-stubble	Second-stubble	Third-stubble and older	Total
	---------- Percentage ----------				
HoCP96-540	10.5	10.6	11.6	16.0	12.1
HoCP00-950	0.5	0.5	0.7	1.2	0.7
L01-283	9.0	10.3	11.4	10.9	10.4
L01-299	61.8	60.3	57.6	56.7	59.2
HoCP04-838	1.9	2.2	3.7	6.5	3.5
HoCP09-804	9.5	10.8	10.1	5.3	9.1
L11-183	2.3	1.9	0.4	0.3	1.2
L 12-201	0.6	0.2	0.1	0.1	0.2
Ho 12-615	1.3	0.3	0.1	0.1	0.5
Others	2.6	2.9	4.2	3.0	3.2
% Crop	26.6	25.6	25.7	22.1	

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

Table 3. Estimated sugarcane distribution by region and crop in Louisiana, 2020[1]

Crop	Bayou Teche	River-Bayou Lafourche	Northern	State Total
Plant-cane Area (acres) Percent (%)	44,423 22.9	49,033 31.4	38,514 26.3	131,852 26.6
First-stubble Area (acres) Percent (%)	43,923 22.6	38,397 24.6	44,711 30.6	127,031 25.6
Second-stubble Area (acres) Percent (%)	53,080 27.3	39,789 25.5	34,669 23.8	127,538 25.7
Third-stubble and older Area (acres) Percent (%)	52,798 27.2	28,812 18.5	28,110 19.3	109,720 22.1
Total area (acres) Percent (%)	194,224 39.1	156,031 31.4	146,003 29.4	496,258

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

Table 4. Estimated area planted to sugarcane in percent by variety and crop for the Bayou Teche region, 2020[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP96-540	19.0	16.8	17.3	23.3	19.2
HoCP00-950	0.9	0.7	0.9	1.0	0.9
L01-283	4.4	5.0	6.0	6.6	5.6
L01-299	56.5	56.0	51.8	53.1	54.2
HoCP04-838	1.7	3.2	5.8	7.0	4.6
HoCP09-804	8.8	10.7	10.8	5.7	8.9
L11-183	2.7	2.6	0.0	0.0	1.2
L 12-201	0.6	0.0	0.0	0.0	0.1
Ho 12-615	1.0	0.1	0.0	0.0	0.2
Others	4.5	5.0	7.4	3.3	5.1

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

Table 5. Estimated area planted to sugarcane in percent by variety and crop for the River/Bayou Lafourche region, 2020[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP96-540	7.8	9.0	8.8	9.6	8.7
HoCP00-950	0.1	0.1	0.3	1.7	0.5
L01-283	7.5	12.6	13.7	14.4	11.6
L01-299	71.3	64.5	66.0	59.2	66.0
HoCP04-838	2.2	2.2	2.6	8.2	3.4
HoCP09-804	4.5	6.9	6.5	3.6	5.4
L11-183	2.8	2.3	0.5	0.3	1.6
L 12-201	0.8	0.4	0.1	0.1	0.4
Ho 12-615	2.0	0.5	0.1	0.1	0.8
Others	1.1	1.7	1.3	2.8	1.6

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

Table 6. Estimated area planted to sugarcane in percent by variety and crop for the Northern region, 2020[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP96-540	4.2	5.3	5.8	8.9	5.8
HoCP00-950	0.2	0.6	0.9	1.1	0.6
L01-283	16.3	13.5	17.3	15.4	15.5
L01-299	56.6	61.4	57.1	61.1	59.0
HoCP04-838	1.8	1.3	1.7	3.6	2.0
HoCP09-804	16.5	14.6	13.2	6.3	13.2
L11-183	1.3	0.9	0.7	0.7	0.9
L 12-201	0.3	0.2	0.2	0.2	0.2
Ho 12-615	0.6	0.3	0.3	0.3	0.4
Others	2.3	2.0	2.7	2.4	2.3

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

Table 7. Louisiana sugarcane variety trends, by variety and years, all regions, 2016-2020[1]

	Area planted to sugarcane by variety and year (%)						
Variety	**2016**	**2016**	**2017**	**2018**	**2019**	**2020**	**1 Year Change**
HoCP96-540	30	30	25	20	15	12	-3
HoCP00-950	4	4	3	2	1	1	0
L01-283	12	12	12	14	14	10	-4
L01-299	36	36	45	51	56	59	+3
HoCP04-838	10	10	8	5	4	3	-1
HoCP09-804	<1	<1	1	3	5	9	+4
L11-183				<1	<1	1	+1
L 12-201					<1	<1	0
Ho 12-615					<1	<1	0

[1] Based on annual variety surveys by county agents, 2016-2020.

PERFORMANCE OF FLORIDA SUGARCANE VARIETIES IN LOUISIANA

Kenneth Gravois[1]

[1]Sugar Research Station

Sugarcane brown rust continues to be a problem for sugarcane growers in Louisiana. The primary means of combatting this disease has been fungicides and breeding resistant varieties. Previous work has identified a QTL (quantitative trait loci) named *Bru1* that is associated with resistance to brown rust disease in sugarcane. The prevalence of *Bru1* is low in the clones used for breeding sugarcane in Louisiana. In fact, the only commercial Louisiana varieties that have *Bru1* are L 01-299 and HoCP 14-885. The prevalence of *Bru1* in Florida sugarcane varieties is much higher. In addition, even Florida varieties without *Bru1* possess higher resistance to brown rust than many Louisiana sugarcane varieties.

Each year a few stalks of each sugarcane variety are obtained from the Kleentek quarantine greenhouse and used to plant a small seed cane increase. Yield trials were planted each subsequent year during August at the Sugar Research Station in St. Gabriel, Louisiana. Each test was planted as a randomized complete block (two replications) design. Plots were paired rows that were 25 feet in length, and a four-foot alley separated plots. The soil type was a Commerce silt loam. In 2020, a new trial was planted on August 14.

Standard cultural practices were followed during each growing season. The first, second, and third stubble trials were harvested on October 7, 2020; the plantcane trial was harvested on December 4, 2020. Plots were combine-harvested and weighed to determine cane yield (tons/acre). A 6-stalk sample was hand-cut out of each plot for a quality analysis via NIR. Each sample was then sent to the laboratory to estimate fiber content (%), and sucrose content (lbs/ton of cane). Sugar yield was estimated as the product of cane yield and sucrose content.

Each year the data are summarized and sent to the sugarcane breeders.

In 2019, seed cane of CP 01-1372 was sent to Alma Plantation. From this increase, a larger field of CP 01-1372 was planted in 2020. The goal is to observed performance in Louisiana and estimate yield potential and observed for diseases.

Table 1. Plantcane Florida variety yield trials harvested on December 4, 2020 at the Sugar Research Station, St. Gabriel, LA

Variety	Sugar Yield	Cane Yield	TRS	Fiber
Plantcane	lbs/acre	tons/acre	lbs/ton of cane	%
CP01-1372	11885	46.5	255	11.3
CP06-2042	10766	45.1	238	14.8
CP07-2137	8844	37.6	235	10.8
CP07-2320	7646	30.1	254	9.3
CP08-1110	10984	46.8	235	14.1
CP08-1968	11752	47.8	246	15.2
CP96-1252	8462	38.6	219	11.5
Ho12-615	12797	50.9	252	14.0
HoCP09-804	11892	46.7	255	14.3
L01-299	9241	40.8	226	13.0

Table 2. First stubble Florida variety yield trials harvested on October 7, 2020 at the Sugar Research Station, St. Gabriel, LA

Variety	Sugar Yield	Cane Yield	TRS	Fiber
First Stubble	lbs/acre	tons/acre	lbs/ton of cane	%
CP01-1372	8743	36.8	237	10.6
CP06-2042	6625	32.7	202	13.6
CP07-2137	7034	30.6	231	11.8
CP07-2320	6469	28.1	230	9.3
CP08-1110	6752	32.3	209	12.0
CP08-1968	6851	35.3	194	14.1
CP96-1252	5916	31.4	188	11.7
HoCP09-804	8272	34.6	240	14.0
HoCP96-540	6693	35.6	188	12.7
L01-299	8354	40.6	205	13.1
L11-183	7665	33.5	229	12.0

Table 3. Second stubble Florida variety yield trials harvested on October 7, 2020 at the Sugar Research Station, St. Gabriel, LA

Variety	Sugar Yield	Cane Yield	TRS	Fiber
Second Stubble	lbs/acre	tons/acre	lbs/ton of cane	%
CP01-1372	3587	34.4	110	12.0
CP04-1935	3406	19.2	178	12.5
CP06-2042	6134	30.2	205	13.6
CP07-2137	5032	25.8	194	11.4
CPCL02-0926	3910	23.4	167	11.2
CPCL05-1102	6708	37.0	179	10.3
CPCL95-2287	4843	22.8	215	11.8
HOCP04-838	6756	32.2	205	12.7
HOCP09-804	6198	28.4	219	13.0
HOCP96-540	6216	30.8	203	12.2
L01-299	7411	35.4	209	13.2

Table 4. Third stubble Florida variety yield trial harvested on October 7, 2020 at the Sugar Research Station, St. Gabriel, LA

Variety	Sugar Yield	Cane Yield	TRS	Fiber
Third Stubble	lbs/acre	tons/acre	lbs/ton of cane	%
CP01-1372	7201	38.6	193	11.4
CP03-1912	4968	32.6	150	11.1
CP04-1844	5967	35.2	169	12.5
CP05-1526	6159	36.2	170	12.1
CP05-1791	2523	16.1	158	11.5
CP06-2400	4713	27.0	175	14.7
CP96-1252	4764	31.1	153	11.3
CPCL02-6848	3953	23.0	175	13.5
CPCL05-1102	4805	29.0	168	10.1
CPCL05-1201	8593	45.8	188	11.7
CPCL95-2287	5613	29.0	193	11.7
HoCP04-838	5089	28.3	180	13.2
HoCP96-540	5128	29.9	171	11.3
L01-299	8490	43.7	194	13.1

A COMPARATIVE EVALUATION OF SOFTWARE AND METHODS FOR MARKER-TRAIT ASSOCIATION ANALYSIS IN SUGARCANE

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Introduction

Genome wide association study (GWAS) has an advantage in sugarcane over traditional biparental techniques for identifying molecular markers associated with trait(s) of interest due to the high amount of linkage disequilibrium (LD). The high LD is attributed to the relatively few generations between modern cultivars and the initial interspecific hybridization consisting of a limited number of clones. A biparental population with a limited number of recombination events could result in a quantitative trait locus (QTL) on a linkage block covering many centiMorgans (cM). Detection of such QTL is possible for a trait that has a very large phenotypic effect. A diversity panel used for GWAS, on the other hand, has comparative advantage with generally more genetic variation and smaller linkage blocks.

Several marker-trait association (MTA) studies have been reported in sugarcane to identify markers associated with resistance to smut, pachymetra root rot, red rot, leaf scald, sugarcane yellow leaf virus, brown rust, cane yield and sugar content through use of mixed linear models accounting for both population structure fixed effects and kinship random effects (Q-K model). The Q-K mixed mdel was incorporated into TASSEL and JMP Genomics software. We undertook a genome-wide association mapping using different models with Q-K matrices in both TASSEL and JMP Genomics. The objective was to compare TASSEL and JMP in conducting Q-K models with a Q-matrix from TASSEL, JMP, and STRUCTURE, and K matrix from TASSEL and JMP for their use in GWAS to identify potential QTLs for Brix, TRS, and percent sucrose in a small population comprising of 48 elite and historic sugarcane clones of Louisiana.

Materials and Methods

Plant material and phenotypic data

The present study consisted of 48 sugarcane clones that included 43 elite breeding lines and released varieties bred at the LSU AgCenter Sugarcane Research Station, St. Gabriel, Louisiana (“L” or “LCP”), the USDA-Agricultural Research Station (ARS), Houma, Louisiana (“Ho” or “HoCP”), or the USDA-ARS, Canal Point, Florida (“CP”). The remaining five clones included the experimental clones US01-040 and US79-010, and the foreign commercial cultivars N27, NCo310, and TucCP77-42 that have been historically used in sugarcane breeding in Louisiana.

The 48 sugarcane clones were planted in 2010 and 2012 in 1.8 m plots in a randomized complete block design with two replications at the Louisiana State University Agricultural Center Sugar Research Station, St. Gabriel, LA. Six stalks from each plot were harvested in 2011

and 2013, respectively. Sucrose data on total soluble solids (Brix), percent sucrose, and theoretical recoverable sugar (TRS) were collected using a Spectracane Near Infrared System (Bruker Corporation, Billerica, MA).

Phenotypic data analysis

Phenotypic data were analyzed using a mixed linear model (MLM) as follows:

$$p_{ijk} = \mu + g_i + s_j + r_{k(j)} + \varepsilon_{ijk},$$

where p_{ijk} is the phenotypic trait, μ is the overall mean, g_i is the i^{th} genotypic effect, s_j is the j^{th} site-year effect, $r_{k(j)}$ is the k^{th} replication in the j^{th} site-year effect, and ε_{ijk} was the residual error for p_{ijk}. For mean estimates, g was considered to be a fixed effect, while s and r were considered as random effects. The analysis was conducted using JMP Pro version 13.0.0. Broad-sense heritability (H^2), as the degree of genetic determination, was estimated using the following equation where the coefficient of genotypic variation g, s, and r were all considered as random effects as genotypes are considered to be a random representation of Louisiana breeding clones, and mean estimates of the genotypes are not of interest for H^2:

$$H^2 = \frac{\sigma_g^2}{\sigma_g^2 + \frac{\sigma_\varepsilon^2}{n_{jk}}},$$

where σ_g^2 is the genetic variance, σ_ε^2 is the residual error variance, n_{jk} is the number of site-years by the number replicates. JMP Genomics version 6.0 was also used to evaluate the correlation between TRS, Brix, and percent sucrose with Pearson's product moment metrics.

DNA purification and genotyping

Leaf tissues were harvested from the 48 clones, placed directly on ice, and stored in -80 □C until DNA extraction. Genomic DNA was isolated from ~100 mg leaf tissues using the CTAB miniprep method. The DNA was checked for quality and quantity using a ND-100 spectrophotometer (Nanodrop Technologies Inc, Wilmington, DE).

In this study, 1,062 alleles were generated using 47 SSR and EST-SSR primer pairs, and 5 AFLP primer pairs (Table 1). Thirty-six SSR primer pairs came from the sugarcane microsatellite consortium, and 11 EST-SSR primer pairs were designed from the sequences of genes differentially expressed in sugarcane under cold stress. The polymerase chain reaction (PCR) was performed in a 10 µL reaction mixture containing 1X reaction buffer, 2.5 mM $MgCl_2$, 0.4 unit GoTaq Flexi DNA Polymerase, 200 µM dNTP mix (all PCR reagents from Promega, Madison, WI), 0.5µM each of forward and reverse primer, and 50 ng of genomic DNA. The thermal cycler program used was: (i) an initial denaturation at 95°C for 5 min; (ii) amplification for 36 cycles at 95°C for 45 s, 58°C for 45 s, 72°C for 1 min; and (iii) a final extension at 72°C for 5 min. Amplification products were electrophoresed in a 6% polyacrylamide gel using a high efficiency gel electrophoresis system (HEGS, Nihon Eido, Tokyo, Japan) according to the manufacturer's instructions. The gel was stained with ethidium bromide, and then visualized and documented in a Kodak Gel Logic 200 documentation system (Kodak Inc, New Brokhaven, CT).

For AFLP marker analysis, 500 ng of DNA were digested with *Eco*RI and *Mse*I enzymes and the digested products were ligated with enzyme-specific adapters. The ligated products were

preamplified with *Eco*RI+ A and *Mse*I+ C primers. Two µl of 50x diluted preamplified products were amplified with primers having selective nucleotides at the 3' end. Four microliters of the AFLP products were heat-denatured and resolved in a 6% denaturing polyacrylamide sequencing gel run with 0.5 TBE electrophoresis buffer in a Li-Cor 4300 DNA analyzer (Li-Cor, Lincoln, NE).

Amplified fragments (alleles) were manually scored as "1" (present, dominant) and "0" (absent). Alleles with a minor allele frequency less than 5% were discarded prior to downstream statistical analysis to reduce false similarity between clones due to shared absence of alleles while still capturing rare alleles.

Population structure

Population structure was determined using DARwin software 6.0.12, STRUCTURE 2.3.4, and JMP Genomics. In DARwin, a present / absent dissimilarity matrix was calculated using Dice dissimilarity scores. Weighted neighbor-joining algorithms were used to construct a phylogenetic tree, which was evaluated for robustness with 1,000 bootstrap repetitions. Polymorphism information content (PIC) value for each SSR marker was calculated by averaging the PIC of each allele. The allele PIC was calculated using the formula:

$$PIC = 1 - \sum f_i^2,$$

where f_i^2 is the frequency of the i^{th} allele presence or absence (Weir 1990).

In STRUCTURE 2.3.4, models were run for the number of populations $K = 2$ through 10, and $K = 3$ was selected as per documentation. The Markov chain Monte Carlo (MCMC) methods were run for 100,000 iterations of burn-in and 100,000 subsequent iterations were used for model parameter estimation. Five model runs were used to check for non-symmetric modes. An average of the five runs was used as the final result.

Principal coordinate analysis (PCoA) was performed using a PCA analysis module in JMP Pro. The calculations used single-value decomposition, i.e., JMP Pro's wide estimation method.

Association mapping

The association between markers and traits was evaluated using a Q-K analysis of the model. 2005). The MLM from the phenotypic analysis using JMP Pro was used to calculate estimates of the phenotypic trait for use as the dependent variable. Both JMP Genomics and TASSEL 5.1 (http://www.maizegenetics.net) platforms were used to conduct the Q-K analyses. An identity by state (IBS) distance matrix (K) from each program was paired with four population STRUCTURE (Q) matrices including one from STRUCTURE, TASSEL using principal component analysis (PCA) of covariances (default), JMP using PCA of correlations (default), and JMP using multidimensional scaling (MDS). The $-log(P)$ from JMP Genomics and the p-value from TASSEL were both converted to $-log_{10}(P)$. R^2 from each software was obtained, and the rank was based on R^2 where the marker with the largest R^2 was given a rank of 1 for each model. Markers were sorted by their rank in the overall average of all 16 models.

Results and Discussion

Phenotypic data analysis

The phenotypic data were analyzed using an MLM to obtain estimates for association mapping (Table 2). TRS, Brix, and percent sucrose were found to be normally distributed and highly correlated, as expected. TRS and Brix were 0.93 correlated, while correlations between Brix and percent sucrose, and between TRS and percent sucrose were 0.96 and 1.00, respectively. TRS ranged from 70.41 to 141.00 Kg/t with a mean of 115.71 Kg/t. Brix ranged from 15.16 to 22.01 % with a mean of 19.57 %. Percent sucrose ranged from 10.95 to 19.30 % with a mean of 16.44 %. For each trait, the genotype effect was significant (p-value < 0.0001). Broad-sense heritability was high ranging from 0.83 to 0.85 for TRS and Brix, respectively. Comparing genotypic variance Brix had the least at 5.2 % followed by percent sucrose at 7.5%, and TRS had the most at 8.7%.

Population structure

Clustering of the 48 clones was evident in the neighbor-joining tree from the dice dissimilarity matrix (Figure 1). The majority of the clones selected in Canal Point, FL grouped together, which was close to the subcluster with those selected in Houma, LA. The most robust subcluster consisted of the historic and experimental clones grouped together in 96 percent of the bootstraps. They were, however, fairly distinct from each other as well as from the rest of the clones. Clones from the LSU AgCenter did not show a single subcluster; rather formed mini-subclusters with one or two clones from either Houma or Canal Point, FL. Expectedly, a few LSU AgCenter clones were close to the subcluster with historic clones.

A clear population structure was observed with sub-populations based on the breeding program where a clone was selected (Figure 2). The STRUCTURE analysis and PCA (Figure 3) both produced the same results. In both, there was a tight clustering of clones from Canal Point, FL and Houma, LA together with the clones L01-281, L01-283, L01-299, L03-371, and L05-466. In the PCA, there were sub-clusters of the Canal Point, FL clones, the Houma, LA clones, and the five LSU AgCenter clones. There was also an independent mini-subgroup of the rest of the Louisiana clones, and historic/experimental clones.

Marker-trait association

Eight models each were run in TASSEL and JMP Genomics with comparisons being made between the two software, the two IBS-derived K-matrices from TASSEL and JMP Genomics, and the four Q-matrices from STRUCTURE, TASSEL-derived PCA (on covariance), JMP Genomics-derived PCA (on correlation), and JMP Genomics MDS. Models were averaged in each case. An average of the eight models run by the given software was used for the comparison between the software (Table 3). The results showed that there was very little difference between the two platforms, although there were minor differences in the rank particularly for the markers with higher order ranking. The $-log_{10}(P)$ were nearly the same, and more importantly, the top nine markers associated with each trait after rounding were the same. However, using TASSEL, the R^2 value was 0.01-0.02 units less than when using JMP Genomics. The markers 1-66, 1-25, and 15-5 showed the most significant associations with the traits. These

markers were the most consistent across models explaining on average 15-20% of the variance for sucrose traits. Marker 1-66 explained the most variance with 19% for TASSEL models, and 20% for JMP Genomics models. All had a $-log_{10}$(P) greater than two (P-value < 0.01).

The IBS K-matrices were very similar between TASSEL and JMP Genomics (Table 4). An average over the eight models with each K-matrix–four Q-matrices for each K-matrix in each software–was used for comparison. There was very little difference between the results obtained with the two matrices. Again, there were some minor differences in the rank of the markers that were particularly of the higher order in the ranking. The $-log_{10}$(P) were nearly the same, but with slightly more variation than in the software comparison. Also, with this comparison the R^2 values were very similar. The markers 1-66, 1-25, and 15-5 were again the highest ranked for marker-trait associations. Marker 1-48 tied third with 15-5 for TRS using the JMP Genomics K-matrix.

On the other hand, significant variation was observed between the four Q-matrices from STRUCTURE, TASSEL PCA (on covariance), JMP Genomics PCA (on correlation), and JMP Genomics MDS (Table 5). Models were averaged over both the K-matrices and the two software with four runs for each Q-matrix. At least two markers out of 1-66, 1-25, and 15-5 were in the top three by ranking for all models. All three of these markers were top-ranked for the JMP Genomics PCA and MDS Q-matrices with the exception of TRS using the MDS matrix where marker 15-5 was ranked 4th. Except for two instances, the markers 1-66, 1-25, and 15-5 had $-log_{10}$(P) values greater than two; marker 1-25 had a $-log_{10}$(P) value of 1.95 using the STRUCTURE Q-matrix and marker 15-5 had a $-log_{10}$(P) value of 1.90 using the TASSEL PCA Q-matrix. With the Q-matrices, markers 1-66, 1-25, and 15-5 had R^2 values ranging from 0.13 in Brix for marker 1-25 to 0.27 also in Brix for marker 1-66. The remaining markers displayed high variation in their ranking and R^2 values. For instance, marker 7-87 in percent sucrose had a $-log_{10}$(P) value of 0.99 and an R^2 value of 0.06 using the STRUCTURE Q-Matrix, while it had a $-log_{10}$(P) value of 2.17 and an R^2 value of 0.16 using the JMP MDS Q-matrix.

Model comparison analysis showed that TASSEL and JMP Genomics yielded very similar results. With care, results from one could be replicated in the other, as the software directed the user's approach differently through default settings. A difference without user option occurs in the handling of the K-matrix. TASSEL uses a relationship matrix with 1's on the diagonal, and JMP uses the square root matrix (0's on the diagonal). In this study, the difference between K-matrix led to some rounding error, which can be attributed to some of the differences between running the JMP Genomics IBS K-matrix in TASSEL (squared square-root matrix) and running the TASSEL IBS K-matrix in JMP Genomics.

The main source of difference in the comparison between software was due to the handling of missing data. TASSEL requires the missing data to be imputed, and JMP allows the imputation of missing data, but will complete the analysis without it. In this study, the most significant difference was the handling of missing data in TASSEL, which had a denominator degree of freedom of 48 for the individual marker analysis, whereas in JMP Genomics the denominator degree of freedom was 43. This resulted in TASSEL having lower R^2 values than

JMP Genomics. Missing data handling also partially contributed to the slight difference in the rank and $-log_{10}$(P) values between the software.

Another difference between TASSEL and JMP Genomics was in the calculation PCA. TASSEL gives a very clear check box allowing the user to choose to conduct the analysis using either covariance or correlation. JMP Genomics does not provide such option. JMP Genomics does not document what method it uses for PCA, although they appear to be based on correlation. JMP Genomics does, however, allow the user to correct for population stratification using the EIGENSTRAT method.

In conclusion, TASSEL and JMP Genomics were compared by running eight different models in each associating an IBS K-matrix from each and four Q matrices from STRUCTURE, TASSEL using PCA of covariances, JMP using PCA of correlations, and JMP using multidimensional scaling (MDS). The software differed mainly in rounding to JMP Genomics using a square root matrix for kinship, handling of missing data, and options for computing PCA. Validation of the marker-trait associations obtained from the present study in a larger population with high density marker coverage with minimal missing data will provide a clear picture of the comparative advantage of one model over the other.

Table 1. Number of alleles and polymorphic information content (PIC) obtained with 41 genomic and 11 EST-SSR markers for 48 sugarcane hybrids

#	Marker Name	no. of alleles	PIC[b]	#	Marker Name	no. of alleles	PIC[b]
	Genomic SSRs				*EST-SSRs*		
1	SMC1808LA	143 (4)[a]	0.139	37	ESSR_So1	66 (1)	0.178
2	SMC222CG	15	0.273	38	ESSR_So2	19	0.270
3	SMC361BS	17 (1)	0.204	39	ESSR_So3	4 (2)	0.133
4	SMC668CS	15 (1)	0.225	40	ESSR_So4	2 (1)	0.059
5	SMC851MS	29 (1)	0.298	41	ESSR_So5	7 (1)	0.196
6	SMC872CG	122 (4)	0.144	42	ESSR_So6	13 (2)	0.186
7	SMC257MS	46	0.126	43	ESSR_So7	6	0.127
8	SMC477CG	10 (2)	0.210	44	ESSR_So9	6 (4)	0.162
9	SMC749BS	29	0.212	45	ESSR_So10	7 (1)	0.262
10	SMC1604SA	82 (1)	0.218	46	ESSR_So11	7 (1)	0.180
11	SMC238MS	24	0.235	47	ESSR_So12	2 (1)	0.020
12	SMC787BS	7 (4)	0.149				
13	SMC1237FL	25	0.317				
14	SMC2024FL	17	0.211		*AFLPs*		
15	SMC432MS	19	0.187	A	mSSCIR38	132	0.173
16	SMC2083FL	24 (3)	0.271	B	mSSCIR65	11 (2)	0.222
17	SMC213MS	27 (1)	0.242	C	mSSCIR72	11 (1)	0.181
18	SMC264CG	3 (1)	0.164	D	mSSCIR60	2	0.170
19	SMC67CS	7	0.279	E	mSSCIR13	8 (2)	0.201
20	SMC1527CL	8 (1)	0.356				
21	SMC1623CL	10 (1)	0.262				
22	SMC17AUQ	16 (2)	0.232				
23	SMC1218LA	15	0.297				
24	SMC1732CL	4	0.361				
25	SMC07CUQ	7 (3)	0.156				
26	SMC1814LA	8	0.273				
27	SMC2042FL	2	0.079				
28	SMC720BS	11 (2)	0.158				
29	SMC1488CL	6	0.355				
30	SMC662CS	5	0.341				
31	SMC1232	15 (1)	0.277				
32	SMC179S	9	0.286				
33	SMC17CC	22	0.302				
34	SMC22DU	6 (1)	0.227				
35	SMC39BU	8 (2)	0.236				
36	SMC805E	4 (3)	0.010				

[a] Numbers in parentheses represent monomorphic alleles.
[b] Average PIC.

Table 2. Descriptive statistics and broad-sense heritability for three phenotypic traits of sugarcane

Trait		Range		Mean ± standard	σ_g^2	H^2	CV_g
		min	max	error			
TRS	Kg/t	70.41	141.00	115.71 ± 1.69	102.15**	0.86	8.7
Brix	%	15.16	22.01	19.57 ± 0.11	1.04**	0.87	5.2
Sucrose	%	10.95	19.30	16.44 ± 0.12	1.52**	0.87	7.5

** Significant at P-value < 0.0001.
σ_g^2, Genotypic variance.
H^2, The degree of genetic determination.
CV_g, % coefficient of genetic variation.
TRS, Total recoverable sugar.

Table 3. Comparison between averages of eight models for TASSEL and JMP Genomics. Markers are shown where at least one of the 16 model runs had a $-log_{10}(P) > 2$ resulting in the top nine markers by overall rank for Brix, percent sucrose, and total recoverable sugar (TRS) in sugarcane

Trait	Marker[a]	Marker effect (+ / -)	TASSEL			JMP		
			Rank (avg.)	$-log_{10}(P)$	R^2	Rank (avg.)	$-log_{10}(P)$	R^2
Brix	15-5	-	1.75	2.31	0.18	1.75	2.31	0.19
Brix	1-66	-	2	2.35	0.19	2	2.35	0.20
Brix	1-25	-	4	2.13	0.16	4	2.13	0.17
Brix	1-142	-	6.125	1.94	0.14	6.125	1.94	0.16
Brix	7-8	+	36	1.55	0.10	36	1.55	0.12
Brix	45-39	+	46.625	1.46	0.10	46.25	1.46	0.12
Brix	1-28	-	48	1.41	0.10	47.75	1.41	0.12
Brix	11-49	-	53.125	1.37	0.10	53.25	1.37	0.11
Brix	7-38	-	75.875	1.23	0.09	77.5	1.23	0.11
Sucrose	1-66	-	1.25	2.42	0.19	1.25	2.42	0.20
Sucrose	1-25	-	2.25	2.26	0.17	2.25	2.26	0.19
Sucrose	15-5	-	3	2.19	0.17	3	2.19	0.18
Sucrose	1-48	-	6.5	1.94	0.15	6.5	1.94	0.16
Sucrose	1-C	+	23	1.66	0.11	22.75	1.66	0.13
Sucrose	1-28	-	33	1.53	0.11	33	1.53	0.13
Sucrose	7-38	-	37.375	1.49	0.11	37.875	1.49	0.12
Sucrose	7-87	-	52.125	1.37	0.10	51.5	1.37	0.12
Sucrose	14-35	+	77.5	1.19	0.08	77.25	1.19	0.09
TRS	1-66	-	1.75	2.39	0.19	1.75	2.39	0.20
TRS	1-25	-	2.125	2.27	0.17	2.125	2.27	0.19
TRS	15-5	-	4	2.08	0.15	4	2.08	0.17
TRS	1-48	-	4.375	2.07	0.16	4.375	2.07	0.17
TRS	7-87	-	40	1.48	0.12	40.125	1.48	0.13
TRS	1-28	-	27.875	1.54	0.11	28.125	1.54	0.13
TRS	1-C	+	26.625	1.62	0.11	26.25	1.62	0.13
TRS	7-38	-	35.875	1.53	0.11	35.75	1.53	0.13
TRS	14-35	+	56.625	1.29	0.09	55.625	1.29	0.10

[a] The marker name refers to the marker number followed by the allele number in Table 1

Table 4. Comparison between averages of models run using the TASSEL K matrix and the JMP Genomics K matrix. Markers are shown where at least one of the 16 model runs had a $-log_{10}(P) > 2$ resulting in the top nine markers by overall rank for BRIX, percent sucrose, and total recoverable sugar (TRS) in sugarcane

Trait	Marker[a]	Marker effect (+ / -)	TASSEL K			JMP K		
			Rank (avg.)	$-log_{10}(P)$	R^2	Rank (avg.)	$-log_{10}(P)$	R^2
Brix	15-5	-	1.75	2.32	0.19	1.75	2.31	0.18
Brix	1-66	-	2	2.35	0.19	2	2.35	0.19
Brix	1-25	-	4	2.13	0.17	4	2.13	0.17
Brix	1-142	-	6	1.95	0.15	6.25	1.94	0.15
Brix	7-8	+	36	1.55	0.11	36	1.56	0.11
Brix	45-39	+	46.75	1.45	0.11	46.125	1.46	0.11
Brix	1-28	-	48.125	1.41	0.11	47.625	1.41	0.11
Brix	11-49	-	51.375	1.38	0.11	55	1.35	0.11
Brix	7-38	-	77	1.23	0.10	76.375	1.23	0.10
Sucrose	1-66	-	1.75	2.42	0.20	1.75	2.42	0.20
Sucrose	1-25	-	2.75	2.26	0.18	2.75	2.27	0.18
Sucrose	15-5	-	3.5	2.20	0.17	3.5	2.18	0.17
Sucrose	1-48	-	7	1.94	0.15	7	1.94	0.15
Sucrose	1-C	+	22.375	1.66	0.12	24.375	1.65	0.12
Sucrose	1-28	-	33.625	1.53	0.12	33.375	1.53	0.12
Sucrose	7-38	-	38.25	1.49	0.12	38	1.49	0.12
Sucrose	7-87	-	53.875	1.36	0.11	50.75	1.37	0.11
Sucrose	14-35	+	76.875	1.20	0.09	78.875	1.19	0.09
TRS	1-66	-	1.75	2.39	0.19	1.75	2.39	0.19
TRS	1-25	-	2.25	2.27	0.18	2	2.27	0.18
TRS	15-5	-	3.75	2.10	0.16	4.25	2.07	0.16
TRS	1-48	-	4.5	2.06	0.16	4.25	2.07	0.16
TRS	7-87	-	42	1.48	0.12	38.125	1.48	0.12
TRS	1-28	-	28	1.54	0.12	28	1.54	0.12
TRS	1-C	+	26.25	1.62	0.12	26.625	1.61	0.12
TRS	7-38	-	36.25	1.53	0.12	35.375	1.53	0.12
TRS	14-35	+	55	1.29	0.10	57.25	1.28	0.09

[a] The marker name refers to the marker number followed by the allele number in Table 1

Table 5. Comparison between averages of models run using the STRUCTURE, TASSEL PCA, JMP PCA, and JMP Genomics MDS Q matrices. Markers are shown where at least one of the 16 model runs had a $-log_{10}(P) > 2$ resulting in the top nine markers by overall rank for BRIX, percent sucrose, and total recoverable sugar (TRS) in sugarcane

Trait	Marker[a]	Marker effect (+ / -)	STRUCTURE Q			TASSEL PCA Q			JMP PCA Q			JMP MDS Q		
			Rank (avg.)	$-log_{10}(P)$	R^2	Rank (avg.)	$-log_{10}(P)$	R^2	Rank (avg.)	$-log_{10}(P)$	R^2	Rank (avg.)	$-log_{10}(P)$	R^2
Brix	15-5	-	3	2.09	0.15	1	2.23	0.19	2	2.72	0.23	1	2.48	0.18
Brix	1-66	-	1	2.32	0.17	3	2.16	0.18	1	3.12	0.27	3	2.26	0.16
Brix	1-25	-	7	1.95	0.13	4	2.01	0.17	3	2.32	0.19	2	2.42	0.17
Brix	1-142	-	2	2.21	0.16	5	1.95	0.16	4	2.15	0.17	13	1.68	0.11
Brix	7-8	+	54	1.40	0.09	48	1.41	0.11	37	1.69	0.13	5	1.86	0.13
Brix	45-39	+	4	2.05	0.14	51	1.38	0.10	42	1.64	0.12	90	1.17	0.07
Brix	1-28	-	94.5	1.16	0.07	33	1.50	0.12	5	2.14	0.17	60	1.32	0.08
Brix	11-49	-	5	2.03	0.14	64	1.26	0.09	132.5	1.04	0.07	4	1.92	0.13
Brix	7-38	-	85	1.17	0.07	2	2.19	0.19	163	0.93	0.06	58	1.34	0.08
Sucrose	1-66	-	1.5	2.34	0.16	1.5	2.28	0.19	1.5	2.96	0.25	2.5	2.37	0.17
Sucrose	1-25	-	3.5	2.04	0.14	2.5	2.24	0.19	3.5	2.42	0.20	1.5	2.50	0.19
Sucrose	15-5	-	2.5	2.11	0.15	5.5	2.02	0.17	2.5	2.48	0.21	3.5	2.36	0.17
Sucrose	1-48	-	12.5	1.61	0.10	4.5	2.18	0.18	5.5	2.23	0.18	5.5	2.03	0.14
Sucrose	1-C	+	4.5	1.94	0.13	32.5	1.49	0.11	41	1.58	0.12	11.5	1.77	0.12
Sucrose	1-28	-	77	1.25	0.08	10.5	1.63	0.13	4.5	2.24	0.18	42.5	1.48	0.10
Sucrose	7-38	-	52.5	1.38	0.09	3.5	2.22	0.19	77.5	1.23	0.09	19.5	1.61	0.11
Sucrose	7-87	-	125.5	0.99	0.06	62	1.33	0.10	23.5	1.75	0.13	4.5	2.17	0.16
Sucrose	14-35	+	5.5	1.88	0.13	131.5	0.99	0.07	74.5	1.25	0.09	96	1.08	0.06
TRS	1-66	-	1	2.29	0.16	3	2.26	0.19	1	2.86	0.24	2	2.36	0.17
TRS	1-25	-	4	2.04	0.14	2	2.27	0.19	2	2.41	0.20	1	2.50	0.19
TRS	15-5	-	3	2.04	0.14	5	1.90	0.15	3	2.35	0.19	4	2.26	0.17
TRS	1-48	-	8	1.75	0.12	1	2.28	0.19	4	2.32	0.19	5	2.16	0.16
TRS	7-87	-	102	1.10	0.06	40	1.46	0.11	23	1.87	0.15	3	2.31	0.17
TRS	1-28	-	73.5	1.26	0.08	9.5	1.64	0.13	5	2.25	0.18	24	1.50	0.10
TRS	1-C	+	5	1.91	0.13	41	1.46	0.11	46.5	1.52	0.11	12.5	1.75	0.12
TRS	7-38	-	52	1.41	0.09	4	2.19	0.18	69	1.30	0.09	20	1.65	0.11
TRS	14-35	+	2	2.04	0.14	90	1.07	0.07	59.5	1.34	0.10	68.5	1.20	0.07

[a] The marker name refers to the marker number followed by the allele number in Table 1

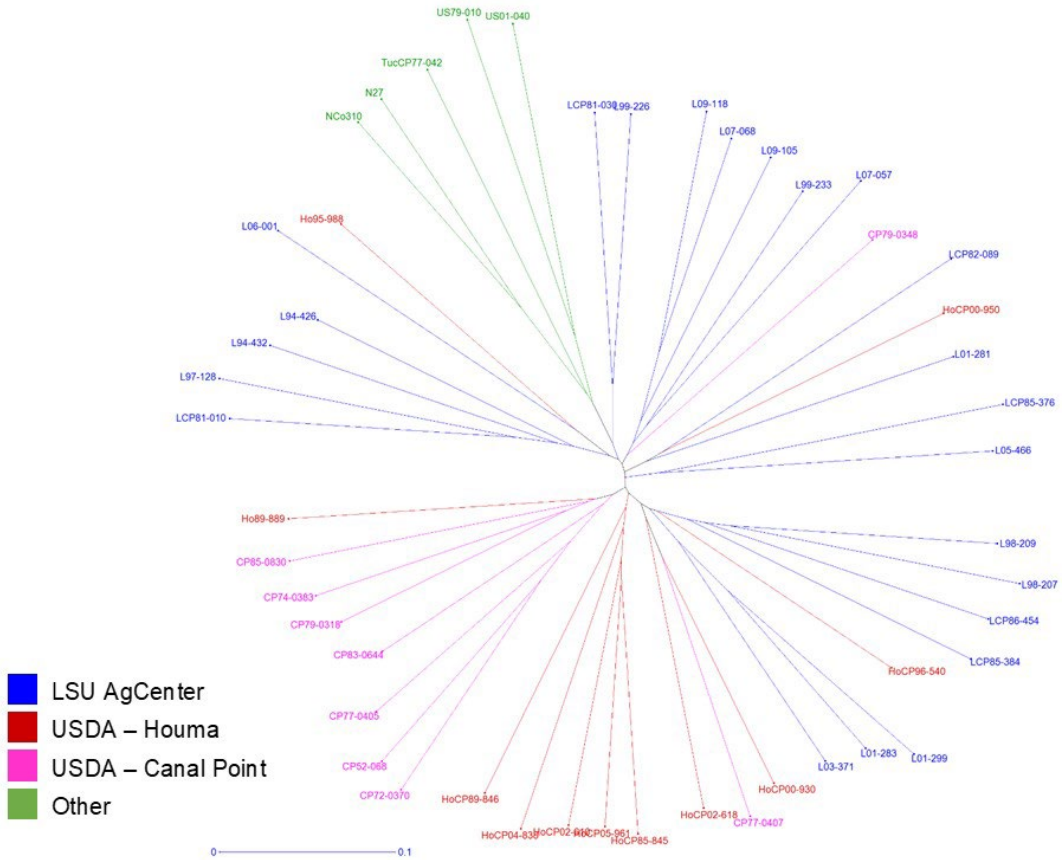

Figure 1. Neighbor-joining tree of a Dice dissimilarity matrix from 48 sugarcane clones using 1,062 SSR and AFLP alleles.

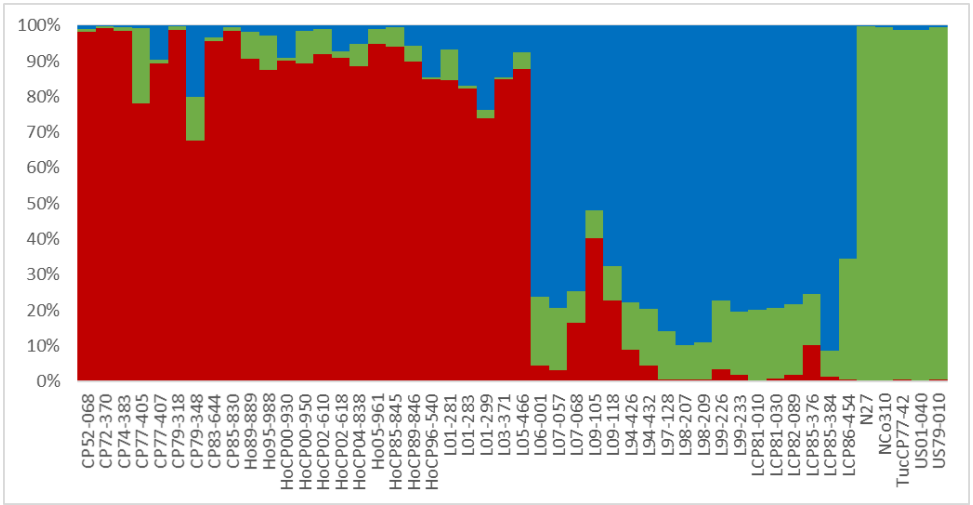

Figure 2. Population structure of 48 sugarcane clones using 1,062 SSR and AFLP alleles for 48 sugarcane clones. The graph represents the likelihood in percent of an individual belonging to one of the three colored subpopulations.

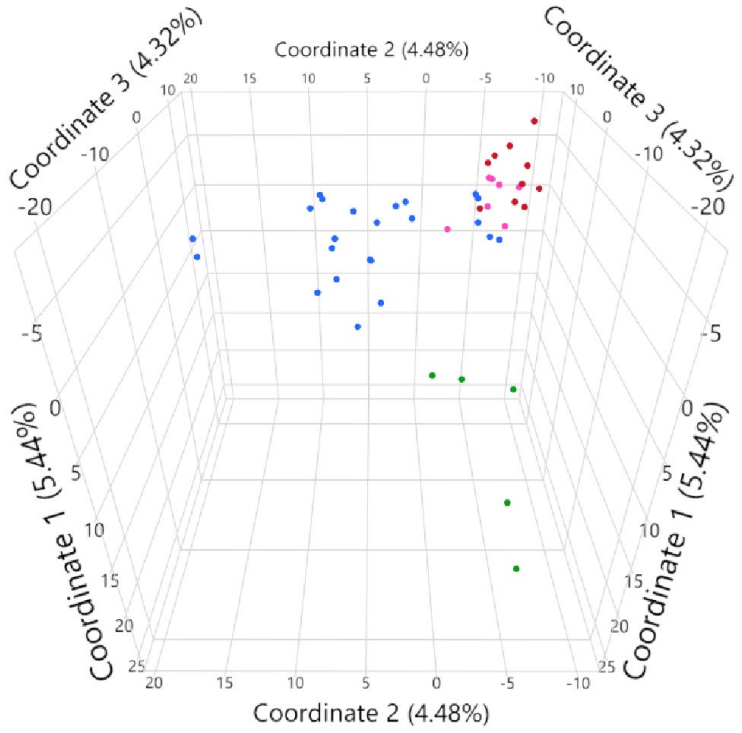

Figure 3. Principal coordinate analysis of 48 sugarcane clones using 1,062 SSR and AFLP alleles.