AN OVERVIEW OF 2022 ACTIVITIES IN THE LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

Collins Kimbeng
Sugar Research Station

A major objective 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 comprised of several distinct stages (Table 1) each of which is critical to the overall objective. The stages as listed in chronological order depict the process of creating, selecting, testing, and releasing of new, genetically improved varieties for commercial production. For the program to be effective, each of these stages must be accomplished every year. This report is a summary of the activities of the LSU AgCenter sugarcane variety development in the 2022 season.

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 any variety development program 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, 2022, after which the day length was less than 12 ½ hours and decreasing at a rate conducive to sugarcane flowering. The first crosses were made on September 12, 2022, and the 2022 crossing campaign lasted till November 7, 2022.

Details about the 2022 crossing campaign can be found in the section titled '**2022 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM**'. Stalk number increased in 2022 to 1647 stalks (Table 2) as compared to 1,077 stalks in 2021. On average, there were 5.1 stalks per can with 237 cans producing tassels (Table 2). There was a slight increase in tassel production with 692 tassels produced in 2022 (Table 2) as compared to 683 tassels produced in 2021. This was the highest

number of tassels produced in the last 7 years. However, the total flowering percentage for the six photoperiod bays decreased from 63.4% in 2021 to 42.0% in 2022. A total of 692 tassels from 97 genotypes (Table 2) were used to make 378 crosses (Table 3, Table 5). A total of 53,529 viable seeds were produced in 2022 (Table 3) with 50,097seeds coming from bi-parental crosses, 3,010 seeds from polycrosses, and 422 seeds from self-crosses (Table 3). The seed set was surprisingly low in 2022 compared with 2021 (122,862 seed). Intensive research is being conductive to understand why seed set was low despite the successful crossing campaign.

In the next stage of the selection program (the seedling stage) a total of 59,049 seedlings from 124 crosses mostly from the of the 2021 crossing series were planted to the field in the spring of 2022. The number of seedlings transplanted dropped from previous years because we increased row spacings from 16 inches to a wider row spacing of 20 inches. Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2022, individual selection was practiced on the 30,967 stubble single stools of the 2020 crossing series, planted in 2021, that survived the winter. The 1471 clones selected and advanced from the single stools were planted in 10-foot, first-line trial plots.

The first line trial plots established last year 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 245 clones were eventually selected and planted into a single-row, 16-foot second line trial. From the second line trial established the year before 194 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 154 clones from the 2017 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 31 experimental varieties judged to be superior to the checks were assigned permanent variety designations ("L") in the fall of 2022. These newly assigned experimental varieties were entered into replicated on-station nursery trials (2 replicates, 16-foot plots) at three locations (Sugar Research Station, Iberia Research Station, and USDA-ARS Ardoyne Farm. 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 2022**'.

The section titled **'2022 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. Fifteen varieties from the 2021 assignment series (2016 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.

Four experimental varieties from the 2022 assignment series that performed well in the infield, off-station and on-station nursery 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 2023. In 2022, one of the experimental varieties from the 2019 Assignment Series was eligible for planting into the outfield trial stage or introduced on primary increase stations. No variety was released to the Louisiana sugar industry in 2022. The outfield stage of the program is described in detail in the section titled '**2022 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 2022. The lab. Processed a total of 3,974 samples 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) of sugarcane 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 2022 Louisiana sugarcane industry had a mild and dry start, with warm average temperatures and below average rainfall. These mild conditions continued into the spring with

above average temperatures and below average rainfall, with Baton Rouge having a 17% decrease in rainfall from the average for this season. These mild and dry conditions can be partially attributed to La Nina weather patterns and a persistent ridge of high pressure over the Gulf of Mexico. The hurricane season was favorable due to these conditions, as Louisiana was not impacted by any hurricanes in 2022. Baton Rouge received 56.6” of rain in 2022 which is 5.4” under the 30-year average. Harvest season was warmer than average and wetter than average. The final outfield trial was harvested on December 21, 2022. L 01-299 was once again the most widely grown varieties in Louisiana in 2022 (55.6%) distantly followed by HoCP 09-804 (10.6%), HoCP 96-540 (8%), L01-283 (7.6%), Ho12-615 (6.3%) and several other newly released varieties. L 01-299 was used as a check in all trials.

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
Warner Simon	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
Colt Landry	Sugar Research Station	Farm Manager

2022 PHOTOPERIOD AND CROSSING IN THE LSU AGCENTER SUGARCANE VARIETY DEVELOPMENT PROGRAM

Brayden Blanchard and Collins Kimbeng
Sugar Research Station

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, disease resistance, and pedigree characteristics as criteria to select parents and to decide what crosses to make. The breeding program strives to perform crosses that will yield superior progeny.

Eyepiece cuttings of breeding genotypes to be used for the 2022 crossing season were planted in October of 2021. The cuttings were planted in Styrofoam cell trays and maintained in the greenhouse. In February 2022, 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 once to harden the parent stalks and induce tillering. In Mid-April, 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, 2022. 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, 2022. 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 the plants for floral induction as a high C:N ratio has been shown to promote flowering in sugarcane.

The cans were moved out of the greenhouse and onto the carts during the second week of April. Great diligence was given to the care of the parental genotypes in greenhouse culture in the 2022 season to promote maturity and general health of the plants.

The first photoperiod treatment began on June 1, 2022. 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 after the 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, 2022, when natural day length was less than 12 ½ hours and decreasing at a rate conducive to sugarcane flowering.

Flowering of the parents began in the second week of September in 2022. 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 were increased in 2022 to 1647 stalks (Table 2) as compared to 1,077 stalks in 2021. On average, there were 5.1 stalks per can with 237 cans producing tassels (Table 2). There was a slight increase in tassel production with 692 tassels produced in 2022 (Table 2) as compared to 683 tassels produced in 2021. This was the highest amount of tassels produced in the last 7 years. The total flowering percentage for the six photoperiod bays decreased from 63.4% in 2021 to 42.0% in 2022. This is likely due to increased trimming relative to the 2021 season while parents were growing in greenhouse culture during the winter. Trimming stimulates tillering of the parents at the cost of stalk vigor and height, and in 2021, no trimming was performed to promote further growth of the parental stalks. Trimming was increasing slightly for the 2022 season in an attempt to find an ideal balance between adequate growth and tillering of parents.

Crossing began on September 12, 2022 and ended on November 7, 2022. A total of 692 tassels comprising 97 genotypes (Table 2) were used to produce 378 crosses (Table 3, Table 5). A total of 53,529 viable seeds were produced in 2022 (Table 3) with 50,097seeds coming from bi-parental crosses, 3,010 seeds from polycrosses, and 422 seeds from self-crosses (Table 3). Germination rate was estimated based on the germination of 0.5 g of seed under greenhouse conditions in late December of 2022 into January 2023. Germination rates decreased in 2022 with an average of 15 plants per gram of seeds compared to 22 plants per gram of seeds in 2021 (Table 3).

After a successful 2021 crossing season, minor adjustments were made to further optimize the process. Substantial benefits were achieved from refraining from trimming in the 2021 season at the cost of total stalks due to less tillering of the parents. This approach was justified by previous research regarding growth and maturation of parental genotypes to flower (Burr et al. 1957; Clements and Awada 1967; Coleman 1969; Julien 1973; LaBorde 2007). Considering the success of the prior season, trimming was once again applied in the 2022 season in very few instances to induce tillering while as not to inhibit the growth of the parents. The goal was to seek an ideal balance between stressing the parents to tiller and avoiding inhibiting the necessary vigor before the photoperiod treatments. This strategy of reduced trimming resulted in some success, as the total number of stalks greatly increased from the 2021 season while the number of tassels increased only slightly. Adequate growth was achieved by a large portion of the genotypes by the start of the photoperiod treatment allowing for a flowering percentage of 42%. Continued hypotheses will suggest helpful measures for the future seasons. One suggested method that will be employed in the 2023 crossing season is the application of LED growth lighting to be applied to the parents in the greenhouse. This should promote substantial growth

in the months that they are contained in greenhouse culture and can counteract the inhibiting effects of tillering to better achieve both a high population and adequate growth of parent stalks.

Germination results are a cause for concern. Proper resource allocation and management is crucial to the crossing campaign, and while recent years' efforts have improved the flowering capabilities of parental genotypes, crossing efforts are wasted by a lack of germination and viable seed. Noticed trends of reduced germination especially in recent years has prompted breeders to thoroughly review protocol and consider multiple inhibiting factors to germination. Among these causes more likely to be the root of the issue are humidity and temperature fluctuations in the crossing house, unsuitable weather conditions during the season, and timing of the crosses and maturation of the seed. These are factors that will be examined closely in the next crossing season. Still, the benefits of new practices were seen in the resulting high-quality crosses made and the potential abundance of genetic variation achieved from the 2022 Crossing Campaign.

Table 1. Summary of the 2021 photoperiod treatments for the LSU AgCenter's sugarcane variety development program

Bay	Cart	Treatment Start Date	Days of Constant Photoperiod	Date Photoperiod Decline Started	Days of Declining Photoperiod Peak 1	Days of Declining Photoperiod Peak 2	Mean Flowering Date	Total Stalks	Percent Flowered
1	A	14-Jun	44	28-Jul	72	87	285±1	105	61
1	B	14-Jun	44	28-Jul	72	87	288±2	98	50
1	C	14-Jun	44	28-Jul	72	87	287±2	96	32
2	A	14-Jun	44	28-Jul	72	87	289±2	98	40
2	B	14-Jun	44	28-Jul	72	87	288±2	97	43
2	C	14-Jun	44	28-Jul	72	87	292±2	92	25
3	A	1-June	37	6-Jul	87	102	273±2	89	64
3	B	1-June	37	6-Jul	87	102	276±5	91	21
3	C	1-June	37	6-Jul	87	102	272±5	93	23
4	A	1-June	37	6-Jul	87	102	273±2	88	50
4	B	1-June	37	6-Jul	87	102	270±1	94	37
4	C	1-June	37	6-Jul	87	102	282±2	89	26
5	A	1-June	41	10-Jul	82	97	279±2	80	55
5	B	1-June	41	10-Jul	82	97	278±4	94	36
5	C	1-June	41	10-Jul	82	97	273±3	79	37
6	A	1-June	41	10-Jul	82	97	280±3	89	56
6	B	1-June	41	10-Jul	82	97	275±2	86	49
6	C	1-June	41	10-Jul	82	97	273±2	89	52

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	-----------	-----------	-----------	-----------
97	324	237	1647	692	5.08±1.24	2.92±1.53	5.52 ± 2.14	83.39 ± 15.43

† 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 2021 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	358	50097	140 ± 313	140 ± 313	15 ± 28
Polycross	12	3010	251 ± 371	251 ± 371	34 ± 57
Self	8	422	53 ± 139	53 ± 139	5 ± 14
Total	378	53529	142 ± 313	142 ± 313	15 ± 29

Table 4. Varietal flowering summary in 2021 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
CP01-1372	44±0	.	.	.	6	.	.
CP83-644	35±0	273	103±6	6	9	6	67
HO06-563	35±0	262	81±3	3	12	7	58
HO07-613	37±1	.	.	.	12	.	.
HO08-717	39±1	.	.	.	18	.	.
HO08-730	39±1	262	82±3	3	24	9	38
HO09-827	39±1	271	91±4	7	20	8	40
HO09-832	44±0	.	.	.	6	.	.
HO09-840	40±1	262	73±2	8	26	12	46
HO09-9401	44±0	271	64±2	8	7	4	57
HO11-532	42±1	276	92±4	3	31	15	48
HO11-573	37±1	.	.	.	8	.	.
HO12-615	42±1	269	81±2	6	25	20	80
HO13-705	44±0	283	79±3	4	5	4	80
HO13-739	37±0	.	.	.	17	.	.
HO15-971	35±0	287	115±7	8	5	5	100
HO16-600	37±1	271	84±2	6	9	3	33
HO16-608	35±0	.	.	.	5	.	.
HO17-738	42±1	.	.	.	12	.	.
HO17-776	39±1	259	80±3	9	20	10	50
HO18-878	39±0	257	67±1	2	5	4	80
HO9-9401	38±0	255	71±1	8	17	14	82
HO95-988	39±0	297	297	9	4	1	25
HOCP00-950	42±1	266	85±2	8	26	10	38
HOCP01-517	39±0	280	101±4	5	7	6	86
HOCP01-523	37±1	.	.	.	10	.	.
HOCP02-618	35±0	273	91±2	4	13	4	31
HOCP04-838	41±1	262	72±2	8	15	7	47
HOCP04-847	40±1	276	91±3	9	22	5	23
HOCP09-804	40±1	269	83±1	4	26	8	31
HOCP09-814	39±0	283	102±7	8	10	4	40
HOCP14-802	38±1	.	.	.	14	.	.
HOCP14-885	39±1	283	109±3	3	31	13	42
HOCP17-701	39±0	.	.	.	5	.	.
HOCP17-702	39±0	.	.	.	4	.	.
HOCP18-801	44±0	322	113±0	6	11	2	18
HOCP18-803	39±0	294	117±14	4	7	2	29
HOCP18-815	39±0	.	.	.	3	.	.
HOCP18-829	39±0	266	266	9	4	1	25
HOCP18-846	39±0	264	83±4	4	6	6	100
HOCP85-845	39±0	294	294	3	9	1	11
HOCP91-552	39±1	257	72±2	4	22	18	82
HOCP92-618	40±1	305	305	3	11	1	9
HOCP92-624	39±1	262	74±2	7	24	8	33
HOCP95-951	37±1	.	.	.	13	.	.
HOCP96-540	40±1	283	108±6	4	28	7	25
HOCP96-561	39±1	264	86±3	6	21	11	52
HOCP97-609	39±1	264	81±4	4	20	8	40

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
HOL15-508	35±0	266	266	3	6	1	17
L01-283	40±1	285	107±13	7	17	2	12
L01-299	40±1	259	83±5	3	31	12	39
L01-315	35±0	259	259	8	10	1	10
L03-371	41±1	297	297	8	13	1	8
L05-448	40±1	257	79±2	3	23	21	91
L05-457	40±1	255	74±2	8	31	25	81
L06-001	41±1	262	84±2	4	28	18	64
L06-038	35±0	259	86±5	4	13	6	46
L06-040	44±0	285	78±2	7	8	4	50
L07-057	41±1	255	68±3	7	19	14	74
L08-088	39±0	262	80±4	7	9	6	67
L08-090	39±1	257	82±2	7	32	19	59
L09-099	39±1	259	82±4	3	30	18	60
L09-112	40±1	273	105±6	4	22	6	27
L09-123	40±1	259	74±2	8	22	20	91
L09-131	38±0	322	322	3	19	1	5
L10-146	40±1	297	107±1	6	13	2	15
L10-147	41±1	262	74±1	7	18	9	50
L11-183	40±1	257	76±4	9	26	17	65
L11-187	40±1	266	93±4	6	29	15	52
L12-201	41±1	276	94±5	8	22	3	14
L12-202	39±1	269	90±4	4	17	12	71
L12-218	35±0	280	99±3	8	13	3	23
L12-227	42±1	269	85±5	4	11	7	64
L13-243	35±0	262	78±2	2	5	5	100
L13-251	39±1	255	85±8	4	30	12	40
L14-264	44±0	283	283	8	3	1	33
L14-265	39±0	283	92±0	8	4	2	50
L14-266	44±0	287	287	4	6	1	17
L14-267	39±1	276	103±6	3	26	6	23
L14-269	44±0	305	105±9	6	6	2	33
L14-273	44±0	276	78±4	8	11	7	64
L14-275	44±0	.	.	.	4	.	.
L14-276	44±0	290	92±6	8	10	5	50
L14-282	41±1	269	81±1	9	22	11	50
L15-298	44±0	290	89±8	9	7	2	29
L15-300	35±0	280	95±1	3	4	3	75
L15-305	39±0	266	82±3	9	5	5	100
L15-306	38±1	305	305	9	22	1	5
L15-320	42±1	273	68±3	7±1	17	5	29
L15-337	39±0	273	96±5	2	22	9	41
L17-410	35±0	262	86±11	6	4	2	50
L17-428	44±0	292	84±1	2	4	2	50
L18-438	44±0	.	.	.	5	.	.
L18-441	35±0	266	266	3	6	1	17
L19-006	44±0	.	.	.	6	.	.

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
L19-021	37±1	255	72±3	3	9	8	89
L19-486	39±0	259	75±3	6	5	5	100
L19-497	39±0	266	82±3	7	9	7	78
L19-498	39±0	322	322	.	4	1	25
L20-029	39±0	262	73±2	9	3	3	100
L20-055	39±0	259	259	9	5	1	20
L86-454	39±0	287	98±2	9	3	2	67
L94-426	42±1	276	85±0	4	8	2	25
L94-433	37±1	.	.	.	9	.	.
L97-128	39±0	285	99±4	4	5	3	60
L98-207	39±1	283	105±5	6	17	3	18
L98-209	42±1	276	91±6	4	12	2	17
L99-226	42±1	276	79±5	7	9	5	56
L99-233	38±1	262	80±1	4	43	27	63
LCP81-010	39±1	255	75±2	4	49	34	69
LCP81-030	41±1	259	74±1	4	20	13	65
LCP85-384	35±0	264	81±4	4	4	2	50
LHO20-057	39±1	290	115±16	4	30	2	7
N27	39±0	292	292	6	6	1	17
N37	35±0	.	.	.	6	.	.
N39	35±0	.	.	.	6	.	.
US01-040	35±0	305	305	.	11	1	9
L86-454	35±0	305	127±9	7	4	2	50
L94-426	44±0	.	.	.	6	.	.
L94-433	37±1	255	72±3	3	9	8	89

Table 5. Crosses and seed made in 2020

Cross	Female	Male	Seed
XL22-001	HO09-9401	L19-006	234
XL22-002	L05-457	L19-006	0
XL22-003	L07-057	L19-006	477
XL22-004	L05-457	L13-251	0
XL22-005	L05-457	L99-233	865
XL22-006	L11-183	HO18-878	465
XL22-007	HO09-9401	HO18-878	182
XL22-008	L05-457	L05-448	19
XL22-009	L05-457	L19-006	0
XL22-010	L01-315	L19-006	125
XL22-011	L05-457	L08-090	0
XL22-012	HO09-9401	L08-090	0
XL22-013	HO09-9401	L99-233	381
XL22-014	HO17-776	HO18-878	0
XL22-015	L19-021	HO18-878	148
XL22-016	L05-457	L13-251	16
XL22-017	HO09-9401	L13-251	8
XL22-018	L05-457	L06-038	13
XL22-019	L01-315	L06-038	127
XL22-020	HO09-9401	L06-038	107
XL22-021	L05-457	L09-099	11
XL22-022	L11-183	L09-099	44
XL22-023	HO17-776	L19-006	0
XL22-024	L20-029	L19-006	0
XL22-025	HO09-9401	L99-233	644
XL22-026	L11-183	L99-233	902
XL22-027	L09-123	L99-233	841
XL22-028	L11-183	HOCP91-552	1088
XL22-029	L09-123	HOCP91-552	249
XL22-030	L11-183	LCP81-010	0
XL22-031	L09-123	LCP81-010	0
XL22-032	L01-299	SELF	25
XL22-033	HO09-840	L06-001	0
XL22-034	L05-457	L06-001	11
XL22-035	L09-123	L06-001	195
XL22-036	L11-183	L06-001	0
XL22-037	HO09-9401	L06-001	93
XL22-038	HO09-840	L99-226	73
XL22-039	L19-021	L99-226	430
XL22-040	L09-123	L99-226	171
XL22-041	HO09-840	HO08-730	0
XL22-042	L19-021	HO08-730	36
XL22-043	HO09-840	L05-448	0
XL22-044	L17-410	L05-448	87
XL22-045	L11-183	L05-448	0
XL22-046	L08-090	L05-448	17
XL22-047	L10-147	HO06-563	2964
XL22-048	L09-123	HO06-563	1321
XL22-049	L10-147	L99-233	1577
XL22-050	HOCP92-624	L99-233	530
XL22-051	L05-457	L99-233	940
XL22-052	L09-123	L99-233	203
XL22-053	HO09-9401	L99-233	0
XL22-054	HOCP04-838	L99-233	730
XL22-055	HO09-9401	22P1	68
XL22-056	HOCP92-624	22P2	49
XL22-057	L09-123	L09-099	96
XL22-058	L11-183	L09-099	595
XL22-059	L09-123	L13-243	9
XL22-060	L11-183	L13-243	339
XL22-061	L08-088	L13-243	11
XL22-062	HOCP04-838	L13-243	103
XL22-063	L08-090	LCP81-010	0
XL22-064	L05-457	LCP81-010	15
XL22-065	HOCP04-838	LCP81-010	320
XL22-066	HO09-9401	HOCP91-552	0
XL22-067	L08-090	HOCP91-552	68
XL22-068	HO09-840	L99-226	359
XL22-069	L10-147	L99-226	1918
XL22-070	L08-088	L99-226	22
XL22-071	L09-123	HO08-730	0
XL22-072	HOCP96-561	HO06-563	319
XL22-073	L05-457	HO06-563	1168
XL22-074	L11-183	HO06-563	1194
XL22-075	HOCP92-624	L06-001	1048
XL22-076	HO09-9401	HOCP97-609	930
XL22-077	L05-457	L13-251	376
XL22-078	L09-099	22P3	771
XL22-079	HOCP91-552	22P4	1208
XL22-080	L13-243	22P5	12
XL22-081	L99-233	22P6	0
XL22-082	LCP81-010	22P7	219
XL22-083	LCP81-030	22P8	180
XL22-084	HOCP92-624	L99-226	527
XL22-085	L11-187	L99-226	481
XL22-086	HOCP18-829	L99-226	0
XL22-087	L19-498	L99-226	14
XL22-088	HOCP00-950	HOCP18-846	93
XL22-089	L07-057	HOCP18-846	23
XL22-090	L15-305	L13-251	737
XL22-091	L19-486	L13-251	164
XL22-092	L19-486	L09-099	732
XL22-093	L19-498	L09-099	48
XL22-094	L08-088	LCP81-010	0
XL22-095	L01-299	SELF	0
XL22-096	HO09-840	L06-001	207
XL22-097	HOCP96-561	L06-001	9
XL22-098	HOCP92-624	L99-233	139

Table 5. Continued

Cross	Female	Male	Seed
XL22-099	L15-305	L99-233	99
XL22-100	L14-282	HOCP97-609	0
XL22-101	HO12-615	HOCP97-609	0
XL22-102	L14-282	L05-448	0
XL22-103	L19-498	L05-448	0
XL22-104	L14-282	HOCP09-804	0
XL22-105	L10-147	HOCP09-804	0
XL22-106	HO12-615	HOCP09-804	0
XL22-107	HOCP04-838	HOCP09-804	377
XL22-108	L14-282	HOCP18-846	0
XL22-109	L19-021	HOCP18-846	19
XL22-110	HO17-776	HO08-730	0
XL22-111	L19-486	HO08-730	0
XL22-112	L11-183	HO08-730	19
XL22-113	L11-187	L99-226	0
XL22-114	L05-457	L99-226	19
XL22-115	HO09-9401	L12-227	7
XL22-116	L08-090	L13-243	0
XL22-117	L01-299	L12-202	11
XL22-118	HOCP91-552	L12-202	0
XL22-119	L14-282	L13-251	0
XL22-120	L11-187	L13-251	0
XL22-121	HO16-600	L99-226	78
XL22-122	L07-057	L99-226	34
XL22-123	HO09-827	L99-226	151
XL22-124	L09-123	L99-226	198
XL22-125	HO17-776	L06-038	0
XL22-126	L07-057	L06-038	0
XL22-127	L07-057	HO08-730	0
XL22-128	HOCP91-552	HO08-730	0
XL22-129	L07-057	L06-001	546
XL22-130	L11-187	L06-001	45
XL22-131	HO09-9401	L99-233	39
XL22-132	L08-090	L99-233	14
XL22-133	L01-299	L99-233	337
XL22-134	L09-123	L99-233	178
XL22-135	HO09-9401	HOCP09-804	15
XL22-136	L15-305	HOCP09-804	16
XL22-137	L08-088	L05-448	0
XL22-138	L11-183	L05-448	0
XL22-139	LCP81-030	L12-202	0
XL22-140	LCP81-010	L12-202	0
XL22-141	L01-299	L12-202	0
XL22-142	CP83-644	L19-006	0
XL22-143	HO16-600	L19-006	0
XL22-144	HO09-840	L13-251	127
XL22-145	HO04-838	L13-251	0
XL22-146	L07-057	L09-112	0
XL22-147	HOCP00-950	L09-112	0

Cross	Female	Male	Seed
XL22-148	L15-320	L15-337	0
XL22-149	HOCP96-561	L15-337	0
XL22-150	L15-320	HOCP02-618	0
XL22-151	HOCP92-624	HOCP02-618	0
XL22-152	L19-486	HOCP09-804	191
XL22-153	L99-233	HOCP09-804	69
XL22-154	HO09-827	L99-226	184
XL22-155	HOCP91-552	L99-226	17
XL22-156	HO09-827	L99-226	46
XL22-157	L15-305	L99-226	86
XL22-158	L09-123	L99-226	113
XL22-159	HO09-840	L98-207	10
XL22-160	HO17-776	L98-207	175
XL22-161	HOCP92-624	L98-207	726
XL22-162	HO09-840	HOCP18-846	0
XL22-163	L12-201	HOCP18-846	93
XL22-164	L14-273	HOCP18-846	18
XL22-165	L12-201	L09-112	0
XL22-166	HO17-776	L09-112	0
XL22-167	L07-057	L09-112	11
XL22-168	HO12-615	HO11-532	0
XL22-169	HO16-600	HO11-532	939
XL22-170	L15-320	HO11-532	690
XL22-171	HOCP04-847	L14-267	53
XL22-172	L14-273	L14-267	190
XL22-173	L07-057	L14-267	467
XL22-174	HOCP00-950	L99-233	188
XL22-175	HOCP96-561	L99-233	138
XL22-176	L05-457	L99-233	594
XL22-177	L07-057	L99-233	23
XL22-178	L08-090	L99-233	163
XL22-179	L09-123	L99-233	104
XL22-180	L98-209	L99-233	0
XL22-181	L01-299	L01-299	0
XL22-182	HOCP91-552	22P9	0
XL22-183	HOCP96-561	22P10	292
XL22-184	L13-251	22P11	211
XL22-185	L86-454	22P12	0
XL22-186	HO09-840	HO06-563	0
XL22-187	HOCP92-624	HO06-563	25
XL22-188	HO17-776	HOCP18-846	34
XL22-189	L19-021	HOCP18-846	32
XL22-190	L11-187	HOCP18-846	9
XL22-191	L19-486	L99-233	33
XL22-192	CP83-644	L99-233	63
XL22-193	L11-187	L12-227	0
XL22-194	L15-320	L12-227	0
XL22-195	L05-457	L12-227	5
XL22-196	L10-147	L05-448	11

Table 5. Continued

Cross	Female	Male	Seed
XL22-197	HOCP04-838	L05-448	82
XL22-198	L07-057	HOCP02-618	7
XL22-199	L05-457	HOCP02-618	7
XL22-200	HO09-9401	HOCP02-618	0
XL22-201	L05-457	L09-099	0
XL22-202	L98-209	L09-099	9
XL22-203	HOCP01-517	HO11-532	0
XL22-204	L10-147	HO11-532	29
XL22-205	HO09-827	HO11-532	0
XL22-206	HOCP04-847	L14-267	9
XL22-207	L12-218	L14-267	0
XL22-208	L07-057	L15-337	0
XL22-209	L08-088	L15-337	0
XL22-210	L05-457	L15-337	0
XL22-211	L11-183	L15-300	0
XL22-212	L05-457	L15-300	2
XL22-213	L11-183	L12-202	0
XL22-214	L09-123	L12-202	0
XL22-215	L10-147	L19-006	30
XL22-216	HO09-827	L19-006	5
XL22-217	L06-038	L99-226	3
XL22-218	L99-233	L99-226	169
XL22-219	LCP81-010	L99-226	57
XL22-219	LCP81-010	L99-226	0
XL22-220	HOCP91-552	HO08-730	0
XL22-221	L05-448	HO08-730	7
XL22-222	HO09-840	HOCP14-885	4
XL22-223	HO12-615	HOCP14-885	0
XL22-224	HOCP09-814	HOCP14-885	297
XL22-225	L11-187	HOCP14-885	22
XL22-226	HOCP01-517	HO13-705	0
XL22-227	HO17-776	HO13-705	0
XL22-228	HO12-615	HO13-705	0
XL22-229	L11-183	HO13-705	0
XL22-230	HO09-827	HOCP97-609	64
XL22-231	L14-264	HOCP97-609	0
XL22-232	L05-457	HOCP97-609	0
XL22-233	L08-088	HOCP97-609	0
XL22-234	HO12-615	HOCP02-618	0
XL22-235	L09-123	HOCP02-618	0
XL22-236	HO12-615	HOCP96-540	0
XL22-237	CP83-644	HOCP96-540	24
XL22-238	L99-233	HOCP96-540	89
XL22-239	HO12-615	L05-448	0
XL22-240	HOCP09-814	L05-448	55
XL22-241	L08-090	L05-448	0
XL22-242	L98-209	L05-448	0
XL22-243	HO12-615	L09-099	0
XL22-244	HO12-615	L12-227	0
XL22-245	L14-265	L12-227	0
XL22-246	L14-265	L14-267	42
XL22-247	L17-410	L14-267	77
XL22-248	L05-457	L15-300	5
XL22-249	L15-305	L15-300	0
XL22-250	L05-457	L12-202	0
XL22-251	LCP81-010	L12-202	0
XL22-252	LCP81-010	L99-226	0
XL22-253	HO12-615	L01-283	0
XL22-254	L11-187	L01-283	0
XL22-255	L14-273	L01-283	0
XL22-256	HO12-615	HO11-532	0
XL22-257	L06-040	HO11-532	0
XL22-258	L99-233	HO11-532	0
XL22-259	HO12-615	L13-251	0
XL22-260	L09-123	L13-251	25
XL22-261	HOCP96-561	HOCP09-804	125
XL22-262	L06-040	HOCP09-804	0
XL22-263	L09-123	L15-337	0
XL22-264	L12-218	L15-337	8
XL22-265	LCP81-010	L15-337	0
XL22-266	L06-040	L05-448	0
XL22-267	L12-202	L05-448	0
XL22-268	LCP81-010	L05-448	0
XL22-269	L99-233	L94-433	0
XL22-270	HOCP97-609	L94-433	0
XL22-271	L01-299	SELF	0
XL22-272	HO09-840	L15-337	0
XL22-273	HO15-971	L15-337	0
XL22-274	HO12-615	L15-337	0
XL22-275	L20-055	L99-226	0
XL22-276	HOCP96-561	L99-226	17
XL22-277	L15-320	L99-226	108
XL22-278	CP83-644	L99-226	16
XL22-279	HO12-615	L14-266	0
XL22-280	L14-273	L14-266	0
XL22-281	L11-187	L14-266	0
XL22-282	HO15-971	HO11-532	18
XL22-283	HOCP00-950	HO11-532	38
XL22-284	L07-057	HO11-532	0
XL22-285	HO12-615	L94-433	0
XL22-286	L08-090	L94-433	0
XL22-286	L08-090	L94-433	0
XL22-287	HOCP04-838	L06-001	286
XL22-288	HOCP96-561	L06-001	528
XL22-289	L14-273	L06-001	20
XL22-290	L14-282	L09-099	0
XL22-291	L10-147	L09-099	0
XL22-292	L08-090	L09-099	0

Table 5. Continued

Cross	Female	Male	Seed
XL22-293	L01-299	SELF	0
XL22-294	L14-276	L06-001	10
XL22-295	HOCP00-950	L06-001	0
XL22-296	L15-298	L06-001	14
XL22-297	L15-337	L06-001	0
XL22-298	L14-276	HOCP09-804	0
XL22-299	L14-273	HOCP09-804	0
XL22-300	L05-448	HOCP09-804	0
XL22-301	HOCP01-517	HO11-532	1472
XL22-302	L14-282	HO11-532	210
XL22-303	HOCP18-846	HO11-532	0
XL22-304	L05-448	HO11-532	49
XL22-305	L99-233	HO11-532	29
XL22-306	HOCP04-847	HOCP14-885	27
XL22-307	HOCP00-950	HOCP14-885	14
XL22-308	L19-486	HOCP14-885	627
XL22-309	HOCP00-950	HO13-705	0
XL22-310	HOCP96-561	HO13-705	8
XL22-311	L14-282	HO13-705	0
XL22-312	L11-187	L14-267	0
XL22-313	L14-282	L14-267	324
XL22-314	L12-202	L14-267	0
XL22-315	L12-201	L09-099	344
XL22-316	HOCP96-540	L09-099	117
XL22-317	L99-226	L09-099	0
XL22-318	L99-233	L09-099	0
XL22-319	L01-299	LCP85-384	0
XL22-320	LCP85-384	L01-299	74
XL22-321	L14-282	HO11-532	574
XL22-322	L06-040	HO11-532	0
XL22-323	LHO20-057	L06-001	0
XL22-324	HO17-776	L17-428	94
XL22-325	L12-218	L17-428	359
XL22-326	L14-276	HOCP97-609	240
XL22-327	L09-099	HOCP97-609	0
XL22-328	HOCP01-517	L06-001	477
XL22-329	HOCP85-845	L06-001	99
XL22-330	HOCP01-517	L99-226	1056
XL22-331	L06-038	L99-226	0
XL22-332	L14-282	HOCP18-803	990
XL22-333	HO17-776	HOCP18-803	30
XL22-334	HO12-615	HOCP18-803	0
XL22-335	HO09-827	HO08-730	32
XL22-336	HOCP00-950	HO08-730	0
XL22-337	HOCP09-814	HO13-705	126
XL22-338	L08-090	HO13-705	0
XL22-339	L12-202	HO13-705	0
XL22-340	L08-090	L15-337	0
XL22-341	HOCP00-950	L15-337	0
XL22-342	L05-448	L15-337	0
XL22-343	L97-128	L17-428	2
XL22-344	L11-183	HO11-532	350
XL22-345	L11-187	HO11-532	0
XL22-346	L08-090	HO11-532	39
XL22-347	L10-146	HOCP14-885	444
XL22-348	HOCP96-561	HOCP14-885	223
XL22-349	L03-371	HOCP14-885	121
XL22-350	L08-090	HOCP14-885	37
XL22-351	HOCP00-950	L12-202	0
XL22-352	HO95-988	L12-202	0
XL22-353	L01-299	SELF	0
XL22-354	HOCP04-847	HOCP96-540	24
XL22-355	L09-099	HOCP96-540	47
XL22-356	L94-433	HOCP96-540	49
XL22-357	HOCP09-804	HO11-532	0
XL22-358	L12-227	HO11-532	0
XL22-359	L13-251	HO11-532	361
XL22-360	HOCP14-885	SELF	0
XL22-361	L09-123	HOCP96-540	409
XL22-362	L15-306	HO11-532	188
XL22-363	L98-209	HO11-532	254
XL22-364	HO15-971	L06-001	128
XL22-365	L15-298	HOCP14-885	459
XL22-366	L14-269	HOCP14-885	6
XL22-367	US01-040	HOCP92-618	129
XL22-368	HO15-971	HOCP01-517	16
XL22-369	L11-187	HOCP01-517	0
XL22-370	HO09-827	HOCP14-885	38
XL22-371	L14-273	HOCP14-885	33
XL22-372	HO12-615	L09-112	0
XL22-373	L14-276	L09-112	33
XL22-374	HOCP04-847	L12-227	0
XL22-375	HOCP09-814	L14-267	578
XL22-376	HOCP14-885	SELF	397

References

Burr, G.O., C.E. Hartt, H.W. Brodie, T. Tanimoto, H.P. Kortschak, D. Takahashi, F.M. Ashton, and R.E. Coleman. 1957. The sugarcane plant annual review. Plant Physiol. 8:275-307.

Clements, H.F. and M. Awada. 1967. Experiments on the artificial induction of flowering in sugarcane. Proc. Int. Soc. Sugar Cane Technol. 12:795-812.

Coleman, R.E. 1969. Physiology of flowering in sugarcane. Proc. Int. Soc. Sugar Cane Technol. 13:992-999.

Julien, M.R. 1973. Physiology of flowering in Saccharum I. Daylength control of floral initiation and development in S. spontaneum L. J. Exp. Bot., 24:549-557.

LaBorde, Christopher Michael 2007. Sugarcane tasseling under artificial photoperiod conditions as affected by nitrogen rate and temperature. [electronic resource]: Louisiana State University.

SELECTIONS, ADVANCEMENTS, AND ASSIGNMENTS OF THE LSU AGCENTER'S SUGARCANE VARIETY DEVELOPMENT PROGRAM FOR 2021

Michael J. Pontif[1], Collins Kimbeng[1], Brayden Blanchard[1], Zachary Taylor[1], Warner Simon[1], Mavis Daigle[1], and Alphonse Coco[1]
[1]Sugar Research Station

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 59,049 seedlings from 124 crosses were planted in the field in the spring of 2022. The majority of these seedlings are progeny of bi-parental crosses among commercial and elite experimental varieties. In the fall of 2022, family selection was practiced on the 30,967 stubble seedlings, planted in 2021, surviving the winter. This selection resulted in the planting of 1,471 first-line trial plots. At the same time, superior clones were selected and advanced through subsequent stages (245 to second line trials, 194 to the increase stage). Assignments of permanent "L22" numbers were given to the 31 best clones of the 2017 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 59,049 seedlings from 124 crosses of the 2021 crossing series were planted to the field in the spring of 2022 (Table 1). Many of these seedlings were progeny of crosses among commercial and superior experimental varieties. In the fall of 2022, individual selection was practiced on the 30,967 stubble single stools of the 2020 crossing series, planted in 2021, that survived the winter. The 1,471 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 662 first-line trial plots of the 2019 crossing series were visually appraised for cane yield potential in August of 2022 (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 245 clones in single row, 16-foot, second line trials plots.

The 449 plant-cane, second line trial plots of the 2018 crossing series were visually appraised for yield potential August 2022. Based on the field evaluation, comments and sucrose lab data collected in 2021, 194 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 2023.

Of the 409 candidates from the first stubble crop of the second line trial plots, the best 31 clones from the 2017 crossing series were assigned permanent "L22" numbers (Table 5). These newly assigned "L22" 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 2017 through 2021 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 2022 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 (L22 Assignments)
			number of clones					
X17	20	230	71,116	67,041	1,076	409	154	31
X18	--	70	72,661	44,689	1,373	449	194	
X19	50	96	46,969	21,951	662	245		
X20	50	144	52,985	30,967	1,471			
X21	--	124	59,049					

Table 2. Dates of seedling and line trials planted or harvested in 2022

Crossing Series	Test	Crop	Date Planted	Date Harvested
X21	Seedlings	Planted	04/20-04/26/22	
X20	Seedlings	First Stubble	04/22-04/29/21	?
X20	First Line Trails	Planted	10/12/22	
X19	First Line Trials	Plant-cane	10/19/21	09/26/22 ?
X18	First Line Trials	First Stubble	10/08/20	11/29/22
X19	Second Line Trials	Planted	09/28/22	
X18	Second Line Trials	Plant-cane	10/11/21	11/01/22
X17	Second Line Trials	First Stubble	09/16/20	10/24/22
X16	Second Line Trials	Second Stubble	09/24/19	11/22/22
X18	Light Soil Increase	Planted	11/02/22	
X17	Light Soil Increase	Plant-cane	10/27/21	?
X16	Light Soil Increase	First Stubble	09/29/20	12/08/22
X17	Heavy Soil Increase	Plant-cane	10/27/21	12/06/22
X16	Heavy Soil Increase	First Stubble	09/30/20	12/06/22

Table 3. Numbers of experimental clones dropped for identified faults in the 2019 crossing series first-line trials

	Fault	
Trait	Frequency	Percent
---------------------------- 662 clones enter first round of evaluation ------------------------------		
Rating	331	50.00
-------------------------- 331 clones enter second round of evaluation ----------------------------		
Pith	21	6.34
Smut	4	1.21
Lodge / Broken	1	0.30
Tube	55	16.62
Rating	7	2.11
Other	0	0
-- 85 clones dropped --------------------------------------		
Clones advanced	246	37.16

Table 4. Number of experimental clones dropped for identified faults in the 2018 crossing series of the plant-cane second line trial prior to advancement to the increase stage

	Fault	
Trait	Frequency	Percent
--------------------------- 449 clones enter first round of evaluation -----------------------------		
Lodged	78	17.37
Rating	105	23.39
Pith	27	6.01
Tube	3	0.67
Smut	3	0.67
Leaf Scald	0	0
Other	21	4.68
--------------------------- 224 clones enter second round of evaluation ---------------------------		
Ratings	30	6.68
-- 30 clones dropped ---------------------------------------		
Clones advanced to Increase stage	194	43.21

Table 5. First stubble second line trial data for 2021 "L" assignments. Assignments were made at the second line first stubble stage and included data accumulated from the proceeding stages. The population parameters (mean, minimum, maximum and standard deviation) reported are for the assigned data only.

Variety	Female	Male	Sugar per Acre	Stalk weight	Fiber
			Ibs/Ton	Ibs/stalk	%
Ho12-615	TUCCP77-042	HoCP96-540	276.7	1.2	13.8
L 12-201	L97-128	HoCP96-540	283.1	1.9	11.3
HoCP09-804	HOCP02-625	HOCP01-523	262.7	1.4	12.7
L01-299	L93-365	LCP85-384	250.2	1.6	12.7
HoCP96-540	LCP86-454	LCP85-384	259.6	2.2	11.0
L21-088	HOCP92-618	L06-001	258.6	2.5	9.4
L21-089	L14-265	L99-226	266.7	1.4	12.6
L21-090	L14-265	L99-226	277.6	1.7	11.6
L21-091	L98-209	L08-090	250.4	1.6	12.7
L21-092	L05-457	HOCP13-726	259.0	1.7	13.2
L21-093	HOCP01-523	CP83-644	242.8	1.2	13.4
L21-094	N27	L99-226	257.6	2.2	10.6
L21-095	L13-260	L99-233	270.0	1.5	10.9
L21-096	HO09-827	L08-090	253.2	1.6	12.6
L21-097	HOCP92-618	L13-251	276.5	1.5	12.6
L21-098	N27	L99-226	249.4	1.3	12.9
L21-099	L05-457	L99-226	252.3	2.1	12.2
L21-100	HOCP92-618	HO06-563	273.9	2.0	12.0
L21-101	L14-269	HOCP97-609	272.0	1.4	13.4
L21-102	L05-457	L06-001	267.2	1.7	12.2
L21-073	L14-295	L06-001	292.3	1.6	12.8
L21-074	L14-295	L06-001	269.1	1.6	12.9
L21-075	L14-295	L06-001	316.6	1.8	10.8
L21-076	L05-457	L01-299	265.0	1.7	12.1
L21-077	HOCP97-609	HOCP09-804	258.6	2.2	12.2
L21-078	L05-457	L99-226	288.8	1.3	13.1
L21-079	HO09-832	L06-001	253.1	1.8	11.0
L21-080	HO09-840	HO06-563	259.4	1.9	11.6
L21-081	L14-265	L08-090	258.2	2.1	13.4

Table 5. Continued

Variety	Female	Male	Sugar per Acre	Stalk weight	Fiber
			Ibs/Ton	Ibs/stalk	%
L21-082	HOCP01-517	HOCP96-540	273.6	1.5	12.9
L21-083	L94-428	HOCP91-552	255.1	1.5	12.3
L21-084	L05-457	L01-299	258.2	1.8	11.7
L21-085	L14-265	L08-090	269.4	1.3	11.0
L21-086	HO09-827	HO06-563	254.2	1.7	11.7
L21-087	HOCP92-618	HO06-563	293.7	1.8	11.1
Mean			266.4	1.7	12.1
Min			242.8	1.2	9.4
Max			316.6	2.5	13.8
Std Dev			15.3	0.32	0.98

Table 6. Advancement summary of the crosses in 2016 through 2019 series

			1st Line		2nd Line		Increases		Assignments	
Female	Male	Survive	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile	No.	Rank Percentile
2020 Crossing Series										
Mix 1	Mix2	65	0	12	.	.	.	.	.	.
Ho16-622	Ho12-630	482	23	72	.	.	.	.	.	.
HoCP09-804	L13-251	145	8	78	.	.	.	.	.	.
L16-386	L13-251	182	4	53	.	.	.	.	.	.
Ho16-646	L12-201	150	7	72	.	.	.	.	.	.
HoCP15-996	HoCP09-804	212	3	46	.	.	.	.	.	.
Ho16-608	Ho11-532	156	0	12	.	.	.	.	.	.
L01-299	L12-201	180	2	41	.	.	.	.	.	.
HoCP09-804	L12-201	152	0	12	.	.	.	.	.	.
Ho16-617	L12-201	114	0	12	.	.	.	.	.	.
HoCP16-670	Ho12-630	352	1	26	.	.	.	.	.	.
Ho08-730	Ho12-630	316	7	54	.	.	.	.	.	.
HoCP16-685	Ho11-532	143	0	12	.	.	.	.	.	.
CR94-1006	CP14-1649	384	9	56	.	.	.	.	.	.
Ho08-730	L12-201	416	11	60	.	.	.	.	.	.
Ho11-532	HoL15-993	209	13	81	.	.	.	.	.	.
Ho16-600	Ho15-930	202	18	91	.	.	.	.	.	.
L15-312	Ho15-930	201	0	12	.	.	.	.	.	.
HoCP14-885	HoL15-508	205	0	12	.	.	.	.	.	.
HoCP14-885	HoL15-501	444	30	82	.	.	.	.	.	.
Ho13-739	Ho13-708	551	5	38	.	.	.	.	.	.
Ho13-739	HoCP14-885	119	0	12	.	.	.	.	.	.
HoCP13-737	Ho11-573	353	18	74	.	.	.	.	.	.
Ho16-666	Poly18-4	195	3	46	.	.	.	.	.	.
Ho11-532	Ho12-630	147	3	52	.	.	.	.	.	.
CP14-1490	CP06-2897	249	19	88	.	.	.	.	.	.
L99-226	L12-201	812	42	75	.	.	.	.	.	.
Ho16-622	L12-201	615	11	50	.	.	.	.	.	.
L11-183	L12-201	575	0	12	.	.	.	.	.	.
Ho13-739	L14-282	203	1	29	.	.	.	.	.	.
L16-380	Ho11-532	399	8	51	.	.	.	.	.	.
HoCP14-855	Ho11-532	126	1	34	.	.	.	.	.	.
Ho08-730	HoCP14-855	166	4	57	.	.	.	.	.	.
HoL15-501	Ho11-532	441	1	25	.	.	.	.	.	.
H08-9504	Ho11-532	226	16	85	.	.	.	.	.	.
L16-380	HoCP 04-838	102	1	39	.	.	.	.	.	.
LCP85-384	Ho12-630	424	54	97	.	.	.	.	.	.
L16-375	Ho12-630	412	5	44	.	.	.	.	.	.
Ho08-730	Ho12-630	180	0	12	.	.	.	.	.	.
L16-375	HoCP96-540	84	6	85	.	.	.	.	.	.

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
H08-9504	HoCP96-540	295	5	48	.	.	.	.	.	.
Ho12-630	HoL15-993	90	2	55	.	.	.	.	.	.
Ho15-972	Ho12-630	320	50	99	.	.	.	.	.	.
Ho17-724	Ho12-630	233	13	78	.	.	.	.	.	.
Ho16-600	Ho12-630	416	9	53	.	.	.	.	.	.
Ho13-739	HoCP04-852	248	9	68	.	.	.	.	.	.
Ho16-601	Ho11-512	208	0	12	.	.	.	.	.	.
HoCP13-737	Ho16-600	220	9	69	.	.	.	.	.	.
Ho15-963	Ho16-600	380	6	47	.	.	.	.	.	.
Ho16-608	HoCP14-826	219	0	12	.	.	.	.	.	.
HoCP14-867	Ho12-630	285	9	64	.	.	.	.	.	.
HoCP16-670	Ho16-635	229	13	79	.	.	.	.	.	.
Ho11-573	Ho16-635	248	3	43	.	.	.	.	.	.
HoCP96-540	Ho16-635	197	21	94	.	.	.	.	.	.
Ho12-630	L12-218	469	25	76	.	.	.	.	.	.
Ho16-678	Ho11-573	613	0	12	.	.	.	.	.	.
Ho11-573	HoCP09-857	400	18	70	.	.	.	.	.	.
HoCP13-737	HoCP09-857	445	33	87	.	.	.	.	.	.
L16-353	HoCP09-857	209	6	62	.	.	.	.	.	.
HoL15-508	HoCP14-826	410	13	65	.	.	.	.	.	.
Ho15-963	HoCP14-826	673	22	66	.	.	.	.	.	.
Ho16-680	HoCP14-826	962	79	89	.	.	.	.	.	.
Ho15-964	Ho12-630	217	25	95	.	.	.	.	.	.
Ho15-963	Ho12-630	614	0	12	.	.	.	.	.	.
Ho16-627	Ho12-630	62	0	12	.	.	.	.	.	.
CP11-2412	CP12-1753	562	19	67	.	.	.	.	.	.
Ho15-960	Ho11-573	166	13	89	.	.	.	.	.	.
Ho11-512	Ho11-573	239	7	63	.	.	.	.	.	.
HoL15-511	Ho15-930	171	2	42	.	.	.	.	.	.
Ho05-961	Ho11-573	157	0	12	.	.	.	.	.	.
HoCP13-737	Ho11-573	458	2	27	.	.	.	.	.	.
Ho15-972	Ho11-573	228	1	28	.	.	.	.	.	.
HoCP91-555	Ho11-573	420	22	76	.	.	.	.	.	.
HoCP14-885	Ho11-573	408	10	59	.	.	.	.	.	.
HoCP05-920	Ho11-573	173	0	12	.	.	.	.	.	.
L16-372	Ho11-573	158	0	12	.	.	.	.	.	.
HoCP05-920	HoCP14-826	358	11	63	.	.	.	.	.	.
Ho11-573	HoCP14-826	455	32	84	.	.	.	.	.	.
L15-306	HoCP14-826	141	21	98	.	.	.	.	.	.
Ho11-512	Ho15-960	381	4	40	.	.	.	.	.	.
Ho11-573	HoCP14-830	430	38	91	.	.	.	.	.	.

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
Ho13-739	HoL15-993	289	0	12	.	.	.	.	.	.
Ho17-9512	Ho12-630	395	57	97	.	.	.	.	.	.
HoCP17-728	Ho11-573	151	11	87	.	.	.	.	.	.
Ho08-730	Ho15-930	191	1	31	.	.	.	.	.	.
CP13-4028	CP09-1822	209	26	96	.	.	.	.	.	.
L16-353	Ho11-573	188	0	12	.	.	.	.	.	.
HoCP14-885	Ho13-708	455	49	95	.	.	.	.	.	.
Ho15-930	Ho13-708	356	22	80	.	.	.	.	.	.
L15-306	Ho13-708	192	0	12	.	.	.	.	.	.
H08-9507	Ho11-573	366	17	71	.	.	.	.	.	.
Ho15-972	HoCP14-885	467	11	57	.	.	.	.	.	.
Ho16-627	HoCP14-885	307	7	55	.	.	.	.	.	.
HoCP14-885	Ho13-739	206	5	58	.	.	.	.	.	.
Ho13-739	HoCP14-885	230	16	83	.	.	.	.	.	.
Ho15-960	Poly19-7	198	0	12	.	.	.	.	.	.
Ho11-573	Poly19-9	690	2	27						
L16-353	Poly19-10	204	11	77						
Ho12-630	Ho18-878	902	36	68						
HoCP17-702	Ho18-878	357	38	93						
Ho09-840	Ho18-878	395	19	73						
Ho18-878	Ho12-630	208	15	86						
Ho09-840	Ho12-630	235	21	92						
Ho12-630	Ho18-877	711	0	12						
CP14-4430	CP11-1314	312	6	51						
Ho14-722	Ho13-739	504	3	31						
L11-183	Ho13-739	231	3	45						
HoCP18-857	Ho13-739	862	1	24						
L14-282	HoCP18-847	556	4	34						
Ho14-722	HoCP18-847	644	11	48						
HoCP18-857	HoCP18-847	1090	9	36						
Ho11-556	HoCP18-847	294	0	12						
Ho12-630	HoCP17-714	449	2	29						
L14-282	HoCP17-714	426	12	61						
HoCP18-852	HoCP17-714	171	3	49						
HoCP18-857	HoCP17-714	963	11	42						
L14-282	Ho17-722	365	3	35						
L16-386	Ho17-722	117	0	12						
L17-434	Ho17-722	159	10	82						
L17-410	HoCP18-847	247	7	61						
Ho17-9513	HoCP18-847	374	1	25						
L11-183	HoCP18-847	165	8	74						

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
L14-282	HoCP18-857	191	2	40						
HoCP09-804	HoCP17-714	385	0	12						
L11-183	HoCP17-714	463	19	70						
L17-426	Ho17-722	191	0	12						
Ho15-971	HoCP17-714	141	14	93						
Ho08-730	HoCP17-714	61	0	12						
HoCP18-827	HoCP17-714	357	21	80						
L17-424	HoCP17-714	629	4	32						
L17-398	HoCP17-714	324	8	59						
L17-424	HoCP18-866	718	9	44						
Ho12-630	HoCP18-866	219	18	90						
L17-405	Ho11-532	202	0	12						
Ho05-961	HoCP14-885	218	7	65						
HoL15-508	HoCP14-885	386	2	30						
CPCL05-1201	CG04-09694	335	3	36						
CP08-1968	Poly 20-15	62	0	12						
L12-201	Poly19-9	288	2	33						
L09-123	L99-233	192	0	12						
HOCP91-552	HOCP91-552	641	0	12						
L05-457	L15-320	221	2	37						
L09-123	L15-337	352	0	12						
HO09-9401	L99-233	434	4	38						
L09-123	L15-337	155	0	12						
2019 Crossing Series										
12-202	HO06-563	543	5	48	1	52				
HO06-530	HO13-705	157	0	11	0	26				
HO06-530	L99-226	1288	6	29	4	57				
HO06-563	19P4	172	0	11	0	26				
HO06-563	HOCP04-838	453	6	59	4	78				
Ho07-613	HoCP14-885	227	0	11	0	26				
HO08-717	L06-001	203	6	82	2	79				
HO08-730	L01-299	212	2	50	0	26				
HO09-827	L99-233	199	0	11	0	26				
HO09-827	L99-233	560	11	73	7	90				
HO09-840	L99-226	142	5	88	0	26				
HO09-840	HOCP14-802	917	14	63	8	77				
HO11-9406	L99-226	330	5	62	2	71				
HO11-9406	L16-386	870	14	69	6	74				
Ho13-708	HoCP 14-885	225	0	11	0	26				

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
Ho13-708	HoCp14-885	396	0	11	0	26	.	.	.	.
Ho13-739	HoCp14-885	164	1	37	0	26	.	.	.	.
Ho15-960	Ho13-708	282	4	60	0	26	.	.	.	.
Ho15-963	Ho13-708	700	6	44	3	61	.	.	.	.
Ho15-964	HoCP 14-885	872	2	22	2	54	.	.	.	.
HOCP00-950	L06-001	121	0	11	0	26	.	.	.	.
HOCP04-838	L06-001	359	1	25	0	26	.	.	.	.
HoCp04-852	Ho11-573	385	1	23	0	26	.	.	.	.
HoCP09-804	Ho12-630	188	0	11	0	26	.	.	.	.
HoCP09-804	HoCP14-885	98	0	11	0	26	.	.	.	.
HOCP09-814	HO11-532	1126	11	53	4	59	.	.	.	.
HoCP13-738	Ho11-573	211	1	30	1	64	.	.	.	.
HoCP13-752	Ho12-630	170	8	92	0	26	.	.	.	.
HoCP14-885	Ho11-573	196	5	78	4	93	.	.	.	.
HOCP91-552	19P3	211	2	52	0	26	.	.	.	.
HOCP92-618	CP83-644	354	3	43	2	69	.	.	.	.
HOCP95-951	L16-386	441	7	68	2	63	.	.	.	.
HOCP96-561	L99-226	176	2	57	0	26	.	.	.	.
HOCP96-561	L99-233	897	18	74	9	80	.	.	.	.
L01-283	HO11-532	423	19	91	5	88	.	.	.	.
L03-371	HoCP14-890	133	7	94	0	26	.	.	.	.
L05-457	L06-001	198	0	11	0	26	.	.	.	.
L05-457	L99-233	338	0	11	0	26	.	.	.	.
L05-457	HOCP04-838	87	0	11	0	26	.	.	.	.
L05-457	HOCP91-552	82	0	11	0	26	.	.	.	.
L05-457	HO06-563	171	1	36	0	26	.	.	.	.
L05-457	L99-226	230	2	45	0	26	.	.	.	.
L05-457	HOCP96-552	183	2	55	0	26	.	.	.	.
L05-457	HOCP14-802	211	2	52	0	26	.	.	.	.
L05-457	L99-233	455	3	39	0	26	.	.	.	.
L05-457	L99-233	407	6	61	5	89	.	.	.	.
L05-457	HOCP91-552	394	10	77	4	82	.	.	.	.
L05-457	HO06-563	185	12	97	4	94	.	.	.	.
L06-040	L16-386	201	1	31	0	26	.	.	.	.
L07-057	HO06-563	182	1	34	0	26	.	.	.	.
L07-057	HOCP91-552	127	1	42	0	26	.	.	.	.
L07-057	HOCP97-609	197	6	83	1	65	.	.	.	.
L08-090	L99-226	147	1	41	0	26	.	.	.	.
L08-090	HO11-532	636	7	56	0	26	.	.	.	.
L09-099	19P3	452	3	40	0	26	.	.	.	.
L09-099	19P5	1386	8	35	4	55	.	.	.	.

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
L09-112	L12-201	178	6	87	0	26	.	.	.	.
L09-123	L06-001	159	0	11	0	26	.	.	.	.
L09-123	L99-226	458	0	11	0	26	.	.	.	.
L09-123	L99-233	115	1	45	0	26	.	.	.	.
L09-123	L99-233	939	3	28	2	53	.	.	.	.
L09-123	L99-233	182	3	70	0	26	.	.	.	.
L10-147	L99-233	411	0	11	0	26	.	.	.	.
L10-147	L12-227	318	1	27	0	26	.	.	.	.
L10-147	HOCP96-552	742	2	24	0	26	.	.	.	.
L10-147	HO13-705	530	5	50	2	60	.	.	.	.
L10-147	L06-001	1383	15	54	6	62	.	.	.	.
L11-168	HO11-532	191	3	67	1	68	.	.	.	.
L11-168	L99-233	408	23	95	12	96	.	.	.	.
L11-183	HO11-532	149	4	80	0	26	.	.	.	.
L11-183	19P4	191	19	98	2	85	.	.	.	.
L11-187	L99-226	229	11	93	7	97	.	.	.	.
L11-187	L99-233	452	27	96	14	98	.	.	.	.
L12-202	19P5	338	1	26	1	56	.	.	.	.
L12-202	HO11-532	498	11	76	3	70	.	.	.	.
L12-227	19P5	320	4	58	1	58	.	.	.	.
L13-243	HOCP97-609	236	0	11	0	26	.	.	.	.
L13-243	19P6	180	0	11	0	26	.	.	.	.
L13-243	L09-099	413	13	85	9	95	.	.	.	.
L14-265	L16-386	314	2	38	0	26	.	.	.	.
L14-265	L99-226	774	4	32	4	67	.	.	.	.
L14-265	HOCP97-609	883	27	84	10	86	.	.	.	.
L14-265	L09-099	859	35	89	14	92	.	.	.	.
L14-282	L14-266	194	3	65	2	84	.	.	.	.
L15-298	L99-233	219	0	11	0	26	.	.	.	.
L16-360	HOCP97-609	877	23	79	6	73	.	.	.	.
L16-360	L01-299	983	27	81	7	76	.	.	.	.
L16-391	19P4	389	6	64	4	83	.	.	.	.
L99-233	19P5	572	5	47	0	26	.	.	.	.
LCP81-010	L12-202	176	0	11	0	26	.	.	.	.
LCP81-010	L99-233	422	7	71	3	75	.	.	.	.
LCP81-010	L99-226	490	10	75	3	72	.	.	.	.
LCP81-010	L99-226	1732	31	72	20	87	.	.	.	.
LCP81-010	L06-001	781	33	90	11	91	.	.	.	.
LCP81-010	L06-001	1392	45	86	14	81	.	.	.	.
US01-040	HO11-532	59	0	11	0	26	.	.	.	.

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
2018 Crossing Series									.	.
HO15-964	HOCP14-885	118	0	7	0	15	0	24	.	.
HO13-739	HOL15-501	131	3	65	2	91	1	93	.	.
HOCP14-885	HO11-573	136	2	47	0	15	0	24	.	.
HOL15-508	HO11-573	142	0	7	0	15	0	24	.	.
HO11-573	HOCP14-826	115	3	73	1	75	1	95	.	.
L12-201	HO12-630	227	6	74	3	85	0	24	.	.
L09-112	L12-201	329	2	22	1	44	0	24	.	.
HO09-840	L12-201	107	4	84	1	78	0	24	.	.
L14-282	L12-201	138	0	7	0	15	0	24	.	.
L14-282	HO12-630	499	0	7	0	15	0	24	.	.
HO11-532	HO12-630	117	0	7	0	15	0	24	.	.
L01-299	HO11-532	112	2	51	2	94	0	24	.	.
L14-282	HOL15-508	464	0	7	0	15	0	24	.	.
HO13-739	HOL15-993	132	2	48	0	15	0	24	.	.
HO13-739	HO15-930	80	0	7	0	15	0	24	.	.
HOCP14-885	HOL15-501	137	5	83	2	88	1	92	.	.
HO13-708	HO12-630	446	0	7	0	15	0	24	.	.
HO13-739	HOCP14-826	135	0	7	0	15	0	24	.	.
L99-233	18P1	299	7	69	0	15	0	24	.	.
L99-233	18P1	1798	3	14	0	15	0	24	.	.
L09-123	18P1	396	4	35	1	40	0	24	.	.
L07-057	18P1	236	15	98	9	99	6	99	.	.
L99-233	18P2	934	0	7	0	15	0	24	.	.
L09-123	18P2	314	2	23	0	15	0	24	.	.
L05-457	18P2	248	7	77	3	84	2	94	.	.
HO09-9401	18P2	240	5	61	0	15	0	24	.	.
L99-233	18P3	365	0	7	0	15	0	24	.	.
L07-057	18P3	576	2	19	1	34	0	24	.	.
HO09-840	HOCP04-838	252	9	81	3	83	1	77	.	.
L09-123	HOCP04-838	1714	11	24	0	15	0	24	.	.
HO09-840	L99-233	736	5	26	2	43	1	58	.	.
L09-123	18P4	332	13	86	0	15	0	24	.	.
L11-168	HOCP04-838	160	8	94	1	61	0	24	.	.
L12-227	18P6	2540	8	18	1	30	0	24	.	.
L12-202	18P6	215	13	96	5	97	1	81	.	.
L12-202	18P6	344	8	68	2	59	0	24	.	.
HOCP92-624	HOCP15-510	410	4	34	2	55	0	24	.	.
HOCP92-624	HO06-563	239	15	97	4	93	0	24	.	.
L11-187	HOCP97-609	393	19	93	6	91	3	93	.	.
L05-457	L99-233	2402	33	43	17	66	13	85		

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
L11-183	HOCP91-552	374	9	70	2	58	0	24	.	.
HO09-827	HOCP04-838	1518	21	44	5	47	1	49	.	.
L05-457	HOCP04-838	3728	31	30	12	46	4	55	.	.
US01-040	HO14-835	463	18	85	7	90	5	96	.	.
L07-057	HO14-835	119	0	7	0	15	0	24	.	.
L11-187	HO14-835	200	5	71	1	57	0	24	.	.
L05-457	HOCP14-802	659	24	82	15	96	9	97	.	.
HOCP92-624	L99-233	1626	27	50	12	68	4	70	.	.
US01-040	18P7	390	23	95	4	79	2	84	.	.
HO11-9406	18P8	884	4	21	1	31	0	24	.	.
L05-457	HOCP04-838	413	16	85	3	67	0	24	.	.
HOCP95-951	HOCP96-540	246	5	58	0	15	0	24	.	.
L05-457	L99-233	239	3	37	0	15	0	24	.	.
LCP81-010	L06-038	2386	23	33	4	33	1	48	.	.
HO09-827	L06-001	2844	58	59	18	62	12	79	.	.
HOL15-993	18P9	1310	10	29	3	37	1	50	.	.
L14-275	18P9	243	0	7	0	15	0	24	.	.
L15-337	18P9	234	5	64	2	73	0	24	.	.
L14-275	18P9	295	4	42	0	15	0	24	.	.
L12-218	L09-099	353	15	90	3	71	1	71	.	.
L05-457	L12-227	192	4	61	0	15	0	24	.	.
LCP81-010	18P10	1296	4	17	0	15	0	24	.	.
HOCP04-838	18P10	351	3	31	0	15	0	24	.	.
L12-218	HO13-705	479	14	80	4	69	1	64	.	.
HOCP96-561	L99-233	2160	28	39	9	50	4	63	.	.
L13-251	18P11	2510	19	28	5	36	3	56	.	.
L11-168	L09-099	154	2	40	0	15	0	24	.	.
HOCP14-867	HO13-705	2558	18	27	6	38	2	51	.	.
L14-282	L01-299	596	12	57	5	70	3	83	.	.
L14-275	L12-202	69	1	46	0	15	0	24	.	.
LCP81-010	HOCP91-552	2578	35	42	12	53	2	50	.	.
HO08-730	HO11-532	1261	29	66	6	54	3	69	.	.
HO09-827	HO11-532	1464	64	91	22	89	6	78	.	.
L09-123	L09-099	322	6	53	1	45	1	73	.	.
L11-168	L09-099	638	26	89	9	87	2	74	.	.
L15-337	L09-099	453	13	79	4	76	1	66	.	.
LCP81-010	HO11-9406	1510	28	52	14	77	8	85	.	.
HOCP92-624	HO11-9406	617	10	49	4	64	2	75	.	.
HOCP92-624	L99-226	684	19	75	8	81	3	80	.	.
HOCP14-867	HO11-532	2250	28	36	12	57	4	62	.	.
L13-243	18P12	1099	24	64	12	80	8	91	.	.

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
HOCP91-552	18P12	369	5	41	1	42	0	24	.	.
L14-273	L99-226	436	11	72	3	65	1	67	.	.
HOCP00-950	HO11-532	191	0	7	0	15	0	24	.	.
L13-243	HO11-532	499	23	92	8	92	3	89	.	.
L14-273	HO11-532	235	11	92	3	85	0	24	.	.
LCP81-010	HO11-532	1996	7	20	3	32	2	53	.	.
HOCP92-618	18P13	1610	17	35	4	39	2	57	.	.
L99-233	18P13	767	7	32	5	64	2	71	.	.
HOCP95-951	L01-299	475	10	63	4	71	1	65	.	.
HO09-827	L01-299	702	12	50	3	50	1	59	.	.
L11-187	L01-299	211	0	7	0	15	0	24	.	.
L CP81-010	L06-001	352	14	88	3	72	2	87	.	.
HO09-827	L09-099	331	13	87	6	95	2	90	.	.
HO09-827	HO11-532	1171	33	76	11	78	2	60	.	.
HOCP96-561	HO11-532	1102	22	57	2	35	1	52	.	.
HOCP96-561	HO13-705	1544	6	21	0	15	0	24	.	.
L98-209	L99-226	371	1	16	1	42	0	24	.	.
HOL15-993	L99-226	523	10	55	1	35	1	64	.	.
L14-282	L99-226	809	0	7	0	15	0	24	.	.
HOCP04-838	18P14	935	13	45	4	51	1	54	.	.
HO11-9406	18P14	421	12	78	5	82	1	68	.	.
L10-147	18P14	1238	24	56	8	63	5	78	.	.
HOCP97-609	18P14	448	1	15	0	15	0	24	.	.
L14-273	L01-299	492	40	99	16	98	9	98	.	.
HOCP92-624	L99-226	1047	20	54	9	74	6	88	.	.
LCP81-010	L99-226	3092	22	28	8	41	4	57	.	.
L11-183	HOCP04-838	293	6	60	1	48	0	24	.	.
L94-433	18P15	1017	29	78	6	60	4	76	.	.
L11-183	L06-001	1740	22	38	6	49	3	61	.	.
HO09-827	L99-226	1954	13	25	9	52	6	72	.	.
L14-276	L99-226	367	9	71	5	86	2	86	.	.
HO08-730	18P16	604	14	67	3	56	3	82	.	.
2017 Crossing Series										
HO11-512	HO11-532	626	6	35	2	43	0	27	0	41
HOCP14-897	L01-299	382	14	87	12	96	5	95	0	41
HOCP14-897	HO12-630	203	0	6	0	15	0	27	0	41
HOCP09-857	HO09-832	135	5	90	2	87	0	27	0	41
HOCP09-804	HOCP14-885	328	14	93	6	91	2	88	1	92
HO12-630	L01-299	595	23	90	5	70	0	27	0	41

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
HOCP96-540	HO11-532	428	17	91	5	83	1	67	0	41
L14-282	HO12-630	232	1	16	0	15	0	27	0	41
HOCP16-685	HO12-630	440	0	6	0	15	0	27	0	41
HO11-532	HO12-630	224	9	92	0	15	0	27	0	41
HO11-512	HOCP14-867	190	23	99	10	98	4	97	1	97
HOCP15-506	HOCP14-867	226	4	63	4	90	1	80	0	41
HO15-959	HOCP14-867	421	0	6	0	15	0	27	0	41
HO11-512	HO11-532	626	6	35	2	43	0	27	0	41
L09-112	HO11-532	240	4	62	0	15	0	27	0	41
HO11-515	HO11-532	206	3	56	2	76	0	27	0	41
HO15-959	L12-201	196	0	6	0	15	0	27	0	41
HOCP16-685	L12-201	389	3	24	2	59	0	27	0	41
HOCP16-685	HOL15-993	353	0	6	0	15	0	27	0	41
HO15-964	HOCP14-885	412	11	80	9	92	4	93	2	95
L14-285	HO15-930	373	0	6	0	15	0	27	0	41
HO09-832	HOCP14-885	171	0	6	0	15	0	27	0	41
HOCP13-737	HOCP14-885	200	3	58	3	88	1	83	1	96
HOCP14-901	HOCP14-885	858	26	82	9	78	4	82	0	41
HOCP04-838	09P1	204	7	86	2	77	0	27	0	41
HOCP00-930	11P24	185	0	6	0	15	0	27	0	41
L09-131	12P12	208	1	18	0	15	0	27	0	41
HO09-840	L99-226	94	0	6	0	15	0	27	0	41
HO09-827	HO06-563	177	3	63	0	15	0	27	0	41
HO11-9406	L99-233	1696	31	67	18	80	3	61	0	41
L99-233	HO11-9406	264	8	82	3	82	1	78	0	41
L05-457	L99-226	1100	14	46	6	61	0	27	0	41
L05-457	L01-299	229	3	47	3	85	3	96	1	94
HO09-832	L06-001	425	12	81	4	75	1	68	0	41
HOCP85-845	L06-001	224	2	30	1	53	0	27	0	41
HOCP92-618	CP83-644	236	1	16	0	15	0	27	0	41
L14-275	HOCP96-540	168	2	43	0	15	0	27	0	41
HOCP92-624	HOCP09-804	194	1	20	0	15	0	27	0	41
L94-433	HOCP09-804	403	5	45	1	36	0	27	0	41
L07-057	HOCP04-838	358	0	6	0	15	0	27	0	41
L09-123	HOCP04-838	380	1	13	0	15	0	27	0	41
HO09-840	L99-233	465	10	75	0	15	0	27	0	41
HOCP92-624	L99-233	1240	26	74	7	63	3	70	2	89
L05-457	L99-233	2765	40	54	7	38	3	57	0	41
L09-123	HO06-563	391	3	23	1	40	0	27	0	41
L05-457	HOCP04-838	333	6	65	3	73	0	27	0	41
L05-457	L12-202	139	2	52	2	86	0	27	0	41

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
HO09-827	L99-233	1370	26	71	12	72	4	73	0	41
L15-324	17P5	942	13	49	3	42	0	27	0	41
L05-448	17P5	179	4	76	1	63	0	27	0	41
L07-057	HOCP97-609	901	9	37	7	70	3	75	0	41
HO09-827	L01-299	694	13	69	3	49	0	27	0	41
L05-457	HOCP91-552	462	4	30	0	15	0	27	0	41
L09-123	HOCP91-552	412	2	19	0	15	0	27	0	41
L98-207	L08-090	355	1	13	0	15	0	27	0	41
L09-123	L09-099	209	3	51	0	15	0	27	0	41
L05-457	L99-233	2765	40	54	7	38	6	64	1	82
HO11-9406	L99-233	1696	31	67	18	80	12	90	1	85
L05-457	L99-233	2765	40	54	7	38	3	57	0	41
HO11-9406	L99-233	1696	31	67	18	80	3	61	1	85
L01-315	HOCP96-540	549	6	40	1	33	0	27	0	41
L14-289	L06-001	107	0	6	0	15	0	27	0	41
L14-275	HO09-804	764	9	42	1	30	0	27	0	41
US01-040	HO09-804	143	16	98	5	96	2	96	0	41
HO08-730	L12-202	346	5	53	2	65	1	73	0	41
L98-207	L12-202	175	0	6	0	15	0	27	0	41
L11-183	HOCP91-552	155	4	80	4	93	1	89	0	41
HOCP92-624	L01-299	1190	19	60	4	45	4	76	1	86
L01-315	L99-233	232	0	6	0	15	0	27	0	41
L14-276	HOCP04-838	179	2	41	0	15	0	27	0	41
L10-146	HOCP04-838	130	7	96	4	95	0	27	0	41
L05-448	HO11-532	209	5	79	0	15	0	27	0	41
HO09-827	L01-299	694	13	69	3	49	0	27	0	41
US01-040	L01-299	381	14	88	2	60	2	84	0	41
HOCP92-624	L01-299	1190	19	60	4	45	0	27	0	41
HO06-530	L11-187	106	1	32	0	15	0	27	0	41
L14-275	HOCP09-804	488	2	14	1	34	0	27	0	41
L13-251	HOCP09-804	1458	33	76	20	86	8	86	2	87
L13-723	L09-099	559	5	31	3	60	2	77	1	90
US01-040	L99-233	1198	5	15	0	15	0	27	0	41
HOCP92-624	HOCP96-540	1786	17	33	11	66	6	76	0	41
HOCP01-523	L13-251	508	12	78	9	90	5	93	0	41
HOCP92-624	HO06-563	1245	15	43	6	56	1	54	0	41
HOCP96-561	L99-226	360	3	25	1	40	0	27	0	41
L14-275	L06-001	849	17	73	6	67	2	69	0	41
L14-296	L01-299	211	3	50	1	56	0	27	0	41
L14-282	HOCP04-838	1956	19	36	10	58	6	74	1	83

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
HOCP13-723	HOCP04-838	789	6	23	1	30	1	60	0	41
L01-315	L09-099	472	7	57	3	66	1	63	0	41
L15-304	L09-099	452	7	59	1	35	0	27	0	41
L14-282	L09-099	902	17	70	8	73	1	59	0	41
HOCP13-723	L09-099	278	2	22	1	46	0	27	0	41
HO09-840	L09-099	169	3	64	0	15	0	27	0	41
L14-265	L12-227	146	7	94	4	94	1	90	1	98
HO09-840	L12-227	596	6	38	1	33	0	27	0	41
HO09-827	L12-227	104	0	6	0	15	0	27	0	41
CP83-644	LCP85-384	1237	13	40	2	32	1	55	0	41
LCP81-010	LCP85-384	1445	15	39	2	31	0	27	0	41
HO09-840	HOCP97-609	51	1	73	0	15	0	27	0	41
LCP81-010	L99-226	1490	64	93	17	83	4	72	0	41
HOCP92-624	L99-226	2709	23	27	12	52	6	65	0	41
LCP81-010	HOCP04-838	703	6	29	0	15	0	27	0	41
HOCP92-624	L99-226	2709	23	27	12	52	3	58	0	41
L05-457	L99-226	1100	14	46	6	61	6	86	2	90
L14-282	HOCP04-838	1956	19	36	10	58	0	27	0	41
L14-275	L11-187	205	18	97	12	99	5	98	1	96
L14-276	L06-001	696	4	20	2	41	0	27	0	41
L11-183	L99-226	239	16	96	1	48	0	27	0	41
L14-265	HOCP97-609	1151	11	33	5	50	3	71	0	41
L14-265	L12-202	1289	30	77	16	84	7	85	4	93
HOCP92-624	L99-226	2709	23	27	12	52	15	87	1	83
L01-283	HOCP13-723	361	7	72	4	81	0	27	0	41
L14-276	HO13-705	124	6	95	5	97	5	99	2	99
HOCP92-624	HO13-705	422	14	85	4	76	1	70	0	41
L14-269	L06-001	245	0	6	0	15	0	27	0	41
HO09-827	L09-099	120	4	86	2	89	1	92	0	41
L14-296	L09-099	522	16	83	2	47	1	63	0	41
HOCP95-951	L99-226	236	2	26	2	71	1	80	1	93
CP83-644	HO11-532	1217	15	44	4	44	1	56	0	41
HO09-827	L06-001	1548	21	48	11	68	6	79	0	41
L14-273	L99-226	414	6	56	0	15	0	27	0	41
HOCP13-726	L01-299	652	24	89	15	93	7	94	1	88
L11-183	L01-299	215	0	6	0	15	0	27	0	41
L98-209	L06-001	881	16	66	5	64	4	81	1	86
HOCP13-726	HOCP96-540	820	5	21	2	36	1	60	0	41
L14-295	HOCP96-540	445	2	17	2	54	1	66	1	91
LCP81-010	HO13-705	868	14	61	4	55	2	66	0	41

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
L05-457	L09-099	214	3	50	2	74	1	83	0	41
HOCP00-950	L09-099	130	4	84	1	69	1	91	0	41

2022 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM NURSERY AND INFIELD VARIETY TRIALS

Michael J. Pontif[1], Collins Kimbeng[1], Mavis Daigle[1], Zachary Taylor[1], Brayden Blanchard[1], Alphonse Coco[1], Edwis Dufrene[2], Michael J. Duet[2], and Francis J. Adams[2]

[1]Sugar Research Station, [2] USDA-ARS Sugarcane Research Unit

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, L01-299, Ho 12-615, HoCP 14-885, L 15-306, and HoL 15-508 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.

The 2022 Louisiana sugarcane industry had a mild and dry start, with warm average temperatures and below average rainfall. These mild conditions continued into the spring with above average temperatures and below average rainfall, with Baton Rouge having a 17% decrease in rainfall from the average for this season. These mild and dry conditions can be partially attributed to La Nina weather patterns and a persistent ridge of high pressure over the Gulf of Mexico. The hurricane season was favorable due to these conditions, as Louisiana was not impacted by any hurricanes in 2022. Baton Rouge received 56.6” of rain in 2022 which is 5.4” under the 30-year average. The harvest season was warmer and wetter than average. The most widely grown varieties in Louisiana in 2022 were L 01-299 and HoCP 09-804, occupying 55% and 10% of the state’s acreage, respectively. Recommended cultural practices were followed at all test locations. Mean separation used least square means probability differences where P=0.05. Varieties that are significantly higher or lower than L 01-299 are denoted by a plus (+) or minus (-), respectively, next to the value for each unit.

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

Table 1. 2022 Location, soil texture, and planting and harvest dates for the nursery and infield tests

					Harvest Date	Varieties	
Series	Location†	Stage	Soil Texture	Planting Date	2022	No. Planted	No. Harvested
2017	Blackberry Farms	Infield	Commerce silt loam	09/17/18	Not Harvested	39	0
2017	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/15/18	Not Harvested	39	0
2017	Newton Cane, Inc	Nursery	Norwood silt loam	08/16/18	09/30/22	60	1
2017	Michael Melancon	Nursery	Loreauville silt loam	09/18/18	09/27/22	60	1
2017	Landry Farms	Nursery	Sharkey silty clay loam	09/19/18	10/19/22	60	1
2018	Sugar Research Station	Nursery	Commerce silt loam	11/16/18	Not Harvested	28	0
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	10/18/22	31	1
2018	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/14/19	12/01/22	31	1
2018	Newton Cane, Inc	Nursery	Norwood silt loam	08/13/19	09/30/22	54	2
2018	Michael Melancon	Nursery	Loreauville silt loam	09/05/19	09/27/22	54	2
2018	Landry Farms	Nursery	Sharkey silty clay loam	09/14/19	10/19/22	54	2
2019	Sugar Research Station	Nursery	Commerce silt loam	11/11/19	11/29/22	42	2
2019	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/20/19	11/10/22	42	2
2019	Iberia Research Station	Nursery	Baldwin silty clay	11/07/19	11/02/22	42	2
2019	Blackberry Farms	Infield	Commerce silt loam	09/09/20	10/18/22	36	4
2019	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/13/20	10/04/22	36	4
2019	Newton Cane, Inc	Nursery	Norwood silt loam	08/19/20	09/30/22	54	5
2019	Michael Melancon	Nursery	Loreauville silt loam	08/18/20	09/27/22	54	5
2019	Landry Farms	Nursery	Sharkey silty clay loam	08/11/20	10/19/22	54	5
2020	Sugar Research Station	Nursery	Commerce silt loam	11/02/20	11/30/22	27	4
2020	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/04/20	11/10/22	33	4
2020	Iberia Research Station	Nursery	Baldwin silty clay	11/05/20	11/02/22	38	4
2020	Blackberry Farms	Infield	Commerce silt loam	09/27/21	12/07/22	34	7
2020	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/19/21	12/01/22	34	7
2020	Newton Cane, Inc	Nursery	Norwood silt loam	08/17/21	11/17/22	52	13
2020	Michael Melancon	Nursery	Loreauville silt loam	09/28/21	11/17/22	52	13
2020	Landry Farms	Nursery	Sharkey silty clay loam	08/24/21	10/19/22	52	13
2021	Sugar Research Station	Nursery	Commerce silt loam	11/09/21	12/09/22	29	15
2021	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/15/21	11/10/22	29	15
2021	Iberia Research Station	Nursery	Baldwin silty clay	11/11/21	11/02/22	29	15
2021	Blackberry Farms	Infield	Commerce silt loam	09/16/22		24	
2021	Circle A Farm	Infield	Coteau-Patoutville-Frost silt loam	08/18/22		24	
2022	Newton Cane, Inc	Nursery	Norwood silt loam	09/07/22		46	
2022	Michael Melancon	Nursery	Loreauville silt loam	09/20/22		46	
2022	Landry Farms	Nursery	Sharkey silty clay loam	09/14/22		46	
2022	Sugar Research Station	Nursery	Commerce silt loam	10/27/22		31	
2022	Ardoyne Farm—U.S.D.A	Nursery	Commerce silt loam	11/09/22		31	
2022	Iberia Research Station	Nursery	Baldwin silty clay	11/01/22		31	

† 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 second-stubble means of the 2018 “HoCP” assignment series on a Commerce silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2022.

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	10261	50.4	204	1.97 +	51728	10.9 -
L01-299	10636	48.8	218	1.62	60077	13.2
HoCP 09-804	8024 -	35.4 -	228	1.36 -	52272	13.4
L 12-201	9266 -	37.4 -	248 +	1.77	42290 -	11.3 -
Ho 12-615	11093	47.0	236	1.59	59169	13.1
HoCP 18-803	9858	41.0 -	241	1.65	49550	12.8
HoCP 18-878	10766	45.2	238	1.30 -	69696	11.8 -

Table 3. Off-station nursery second-stubble means of the 2018 “HoCP” assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2022.

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	4502 -	15.2 -	297 -	1.15	26318 -	12.7
L01-299	12652	36.3	348	1.29	56447	11.9
HoCP 09-804	9894	30.8	321 -	1.09	56628	13.5 +
L 12-201	8519 -	26.6	322 -	1.42	37026 -	10.9
Ho 12-615	10290	32.3	319 -	1.04	61892	12.3
HoCP 18-803	8079 -	27.9	290 -	1.36	41201	11.9
HoCP 18-878	11599	37.1	313 -	1.28	60077	11.8

Table 4. Off-station nursery second-stubble means of the 2018 “HoCP” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2022.

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	12155	46.9	259	2.02	46101 -	12.6 -
L01-299	16038	58.7	273	1.77	66248	13.5
HoCP 09-804	12069	41.0	295 +	1.36	60440	14.0
L 12-201	12947	44.6	290 +	2.17	41201 -	11.0 -
Ho 12-615	11774	45.7	258	1.41	64614	13.9
HoCP 18-803	15523	56.7	274	1.76	64070	14.7
HoCP 18-878	17306	59.7	290 +	1.78	67155	12.4 -

Table 5. Off-station nursery second-stubble means of the 2018 “HoCP” assignment series across 3 locations (Newton, Melancon, and Landry) in 2022.

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	8973	37.5	253	1.71	41382 -	12.1
L01-299	13109	47.9	280	1.56	60924	12.9
HoCP 09-804	10049	36.2	281	1.29	56447	13.6
L 12-201	10244	36.2	287	1.78	40172 -	11.0 -
Ho 12-615	11053	41.6	271	1.35	61892	13.1
HoCP 18-803	11154	41.8	268	1.59	51607	13.1
HoCP 18-878	13224	47.3	280	1.45	65643	12.0

Table 6. Off-station nursery first-stubble means of the 2019 “L” and “HoCP” assignment series on a Commerce silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	8308	36.6	226	1.84	39567	11.6
HoCP 09-804	12006	51.7	234	1.75	58625 +	12.1
L 12-201	11563	49.4	235	2.10	47009	11.1
Ho 12-615	11082	56.8	195	1.71	66792 +	12.5
Ho 13-739	12142	50.4	241	2.23	45738	11.6
L 19-006	12027	55.4	217	2.09	52998	10.7
L 19-021	10505	43.7	240	2.10	41382	12.5
HoCP 19-907	8792	42.4	206	1.79	47553	11.1
HoCP 19-947	13086	53.4	246	2.22	47916	11.3
HoCP 19-960	13887	61.7	226	2.23	54813 +	12.1

Table 7. Off-station nursery first-stubble means of the 2019 “L” and “HoCP” assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	6789	26.6	256	1.30	41019	12.6
HoCP 09-804	8539	35.9	238 -	1.19	60621 +	13.4 +
L 12-201	9800 +	41.5 +	236 -	1.94 +	43016	11.3 -
Ho 12-615	8256	41.5 +	200 -	1.55	53543 +	14.0 +
Ho 13-739	10485 +	38.9 +	270	1.85 +	42108	12.1
L 19-006	9616 +	42.0 +	229 -	1.95 +	43197	11.6 -
L 19-021	7641	33.5	228 -	1.65	40838	12.1
HoCP 19-907	10924 +	43.8 +	250	1.84 +	47916 +	12.5
HoCP 19-947	15214 +	54.7 +	278 +	2.40 +	45738	11.6 -
HoCP 19-960	10585 +	46.7 +	227 -	2.12 +	43923	13.9 +

Table 8. Off-station nursery first-stubble means of the 2019 “L” and “HoCP” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	18635	79.0	236	2.43	64977	14.1
HoCP 09-804	12114 -	46.8 -	262	1.53 -	60440	13.9
L 12-201	12205 -	50.1 -	245	2.36	42653 -	11.0 -
Ho 12-615	11878 -	50.7 -	235	1.62 -	62436	14.2
Ho 13-739	15443	55.3 -	279	2.26	49005 -	12.2 -
L 19-006	13500 -	52.8 -	255	2.04	51728 -	12.1 -
L 19-021	12559 -	47.1 -	266	2.16	43742 -	12.4
HoCP 19-907	11187 -	45.7 -	244	2.01	45557 -	11.5 -
HoCP 19-947	16660	62.4	267	2.47	50457 -	11.1 -
HoCP 19-960	16999	67.6	251	2.60	52272 -	13.0

Table 9. Off-station nursery first-stubble means of the 2019 “L” and “HoCP” assignment series across 3 locations (Newton, Melancon, and Landry) in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	11244	47.4	239	1.85	48521	12.8
HoCP 09-804	10886	44.8	245	1.49 -	59895 +	13.1
L 12-201	11189	47.0	239	2.13	44226	11.2 -
Ho 12-615	10406	49.7	210 -	1.63	60924 +	13.6
Ho 13-739	12690	48.2	263 +	2.11	45617	12.0
L 19-006	11714	50.1	234	2.02	49308	11.4 -
L 19-021	10235	41.4	245	1.97	41987	12.3
HoCP 19-907	10301	44.0	233	1.88	47009	11.7 -
HoCP 19-947	14987	56.8	264 +	2.36 +	48037	11.3 -
HoCP 19-960	13824	58.7	235	2.32 +	50336	13.0

Table 10. Off-station nursery plantcane means of the 2020 “L” and “HoCP” assignment series on a Commerce silt loam soil at Newton Cane, Inc. in Bunkie, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	11024	39.2	280	2.41	32489	13.7
Ho 13-739	14374	48.1	299	2.81	34304	12.3 -
L 14-267	13357	42.6	314 +	2.94 +	28859	12.1 -
HoCP 14-885	16579	52.1	319 +	2.77	37389	10.7 -
L 20-37	13222	42.4	312 +	2.82	30311	12.8 -
L 20-46	12102	40.4	299	2.11	38297	12.1 -
L 20-61	9708	32.6	297	2.22	29403	12.7
L 20-65	13520	40.4	334 +	2.59	31218	11.8 -
HoCP 20-501	12567	42.3	297	2.71	31218	11.1
HoCP 20-513	13410	46.1	292	2.21	41745 +	14.5
HoCP 20-521	12926	42.9	302 +	2.05	41927 +	12.1 -
HoCP 20-527	13572	46.5	293	2.67	35030	13.5
HoCP 20-535	10619	37.3	284	2.30	32489	12.8
HoCP 20-558	13364	47.1	284	2.03	46464 +	11.7 -
HoCP 20-560	9519	31.6	301 +	1.58	40112	14.9 +
HoCP 20-568	11498	38.1	302 +	2.21	34485	12.5
HoCP20-570	8934	32.1	277	2.18	29040	13.3

Table 11. Off-station nursery plantcane means of the 2020 “L” and “HoCP” assignment series on a Baldwin silty clay soil at Melancon Farms in Henderson, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	8445	29.1	290	1.88	31400	13.6
Ho 13-739	11983 +	39.2	306	2.54	31400	12.7
L 14-267	9781	32.3	302	2.42	26681	12.6
HoCP 14-885	7440	25.2	291	1.89	25773	11.2 -
L 20-37	8800	26.3	335 +	2.14	25047	12.2 -
L 20-46	12999 +	44.9 +	289	2.12	42471 +	12.4 -
L 20-61	13183 +	41.4 +	319 +	2.12	38841 +	12.6
L 20-65	10051	29.6	338 +	2.25	26318	12.0 -
HoCP 20-501	10997	34.5	318 +	2.27	29948	11.3 -
HoCP 20-513	11886 +	38.1	311	1.86	41201 +	13.8
HoCP 20-521	10055	32.4	310	1.80	36845	12.7
HoCP 20-527	10607	36.5	292	2.37	31581	13.5
HoCP 20-535	11551 +	39.0	298	2.22	35030	14.2
HoCP 20-558	10538	35.0	301	1.84	38297	11.8 -
HoCP 20-560	12603 +	41.3 +	306	1.87	44468 +	13.8
HoCP 20-568	8984	26.4	339 +	2.20	24503	11.4 -
HoCP20-570	9719	32.6	298	2.07	31763	13.4

Table 12. Off-station nursery plantcane means of the 2020 “L” and “HoCP” assignment series on a Commerce silt loam soil at Landry Farms in Paincourtville, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	10514	42.5	248	1.87	45557	13.4
Ho 13-739	10506	37.7	279 +	2.14	35211 -	12.0 -
L 14-267	11146	44.2	252	2.46 +	35937 -	11.9 -
HoCP 14-885	14748 +	58.5 +	252	2.36 +	49550	10.5 -
L 20-37	11518	42.0	272 +	2.35 +	35756 -	11.5 -
L 20-46	11819	45.1	262	1.92	47009	11.5 -
L 20-61	11342	39.8	285 +	2.03	39204	12.5
L 20-65	13845 +	43.3	320 +	2.22	39023 -	11.5 -
HoCP 20-501	11369	44.7	255	2.24	39930	11.1
HoCP 20-513	11118	41.5	268	1.68	49731	13.6
HoCP 20-521	14919 +	58.1 +	257	2.29	50820	12.3
HoCP 20-527	13768 +	52.5 +	262	2.19	48098	13.5
HoCP 20-535	10418	42.8	243	2.08	41201	11.4 -
HoCP 20-558	12548	48.7	260	1.88	46827	12.1
HoCP 20-560	10933	40.9	267	1.75	47190	14.1
HoCP 20-568	11624	48.8	238	2.39 +	41019	11.3 -
HoCP20-570	8400	35.5	237	2.10	33941 -	12.9

Table 13. Off-station nursery plantcane means of the 2020 “L” and “HoCP” assignment series across 3 locations (Newton, Melancon, and Landry) in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	9994	36.9	273	2.05	36482	13.5
Ho 13-739	12288	41.7	295 +	2.49 +	33638	12.4 -
L 14-267	11428	39.7	289	2.60 +	30492	12.2 -
HoCP 14-885	12922	45.3	288	2.34	37571	10.8 -
L 20-37	11180	36.9	306 +	2.43 +	30371 -	12.1 -
L 20-46	12307	43.5	283	2.05	42592 +	12.0 -
L 20-61	11411	37.9	300 +	2.12	35816	12.6 -
L 20-65	12472	37.8	331 +	2.35	32186	11.8 -
HoCP 20-501	11644	40.5	290	2.41 +	33699	11.2 -
HoCP 20-513	12138	41.9	290	1.92	44226 +	13.9
HoCP 20-521	12633	44.5	289	2.04	43197 +	12.4 -
HoCP 20-527	12649	45.2	282	2.41 +	38236	13.5
HoCP 20-535	10863	39.7	275	2.20	36240	12.8 -
HoCP 20-558	12168	43.6	281	1.91	43863 +	11.8 -
HoCP 20-560	11018	37.9	291	1.73 -	43923 +	14.3 +
HoCP 20-568	10702	37.8	293 +	2.27	33336	11.8 -
HoCP20-570	9018	33.4	271	2.12	31581	13.2

Table 14. On-station nursery second-stubble means of the 2019 "L" assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2022.

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	3848	14.6	267	2.63	5672	13.6
HoCP 09-804	3997	14.3	284	1.87	17923	14.6
L 12-201	6167 +	21.2 +	293	2.36	9529	12.9
Ho 12-615	3316	12.1	279	1.56	8394	14.6
L 19-006	8509 +	29.1 +	292	1.89	31309 +	15.7
L 19-021	8319 +	28.3 +	294	1.75	32670 +	13.3

Table 15. On-station nursery second-stubble means of the 2019 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2022.

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	1551 -	6.1 -	250	1.62	7941 -	12.4
L 01-299	14723	54.7	269	1.83	59668	12.7
HoCP 09-804	10234	38.0	269	1.33	59895	14.3
L 11-183	7655 -	29.1 -	267	1.82	32670	11.8
L 19-006	7152 -	24.8 -	286	1.96	25183 -	12.5
L 19-021	7013 -	25.7 -	274	1.38	36981	12.1

Table 16. On-station nursery second-stubble means of the 2019 "L" assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2022.

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	9706	35.2	276	2.01	34712 -	13.3
L 01-299	15620	56.9	275	2.00	56492	14.0
HoCP 09 -804	11889	42.5	280	1.40	61029	15.5
L 12-201	10149	34.9	292	2.07	33351 -	12.7
Ho 12-615	11407	45.4	249 -	1.70	55358	13.2
L 19-006	10583	38.3	276	1.78	42653	14.1
L 19-021	11915	39.4	303 +	1.79	43787	13.0

Table 17. On-station nursery second-stubble means of the 2019 "L" assignment series across 3 locations (St. Gabriel, Iberia, and U.S.D.A. -Ardoyne Farm) in 2022.

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	4923 -	18.0 -	266	1.95	16108	13.2
L 01-299	14361	52.6	275	1.95	40686	13.7
HoCP 09 -804	9205 -	33.1 -	279	1.44 -	46283	15.0 +
L 11-183	8654	31.9	274	1.91	29946	12.7
L 12-201	7561 -	26.0 -	291	2.06	22801	12.5
Ho 12-615	7349 -	29.2 -	258	1.55	33238	13.4
L 19-006	8748 -	30.7 -	285	1.88	33048	14.1
L 19-021	9082 -	31.1 -	291	1.64	37813	12.8

Table 18. On-station nursery first-stubble means of the 2020 "L" assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2022.

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	14281	49.7	287	2.58 +	37888	13.6 -
L 01-299	12536	41.2	305	2.01	41064	15.1
HoCP 09 -804	9244	32.2	287	1.63	39703	14.9
L 12-201	14877	48.5	307	2.65 +	36527	12.0 -
Ho 12-615	14731	49.6	297	2.00	49686	14.6
L 20-37	15902	50.1	317	2.76 +	36300	14.1
L 20-46	13045	44.1	295	1.93	45602	13.3 -
L 20-61	11001	34.3	318	2.31	29494	13.2 -
L 20-65	13999	40.5	346 +	2.19	37208	13.4 -

Table 19. On-station nursery first-stubble means of the 2020 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2022.

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	7867 -	30.0	263	2.34	24956	12.7 -
L 01-299	16942	61.2	271	2.08	58761	13.8
HoCP 09 -804	9843	34.5	286	1.57 -	44014	14.5
L 12-201	10505	36.9	285	2.03	36300	11.9 -
Ho 12-615	11382	43.3	263	1.91	45375	13.6
L 20-37	10423	34.4	303 +	1.88	36981	11.8 -
L 20-46	11663	41.4	281	1.74 -	47644	11.8 -
L 20-61	7362 -	24.7	298	1.95	25410	12.3 -
L 20-65	12418	38.9	319 +	1.58 -	49459	12.7 -

Table 20. On-station nursery first-stubble means of the 2020 "L" assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2022.

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	15791	57.6	275	2.25	50820	12.6 -
L 01-299	19753	71.0	278	2.48	57399	13.7
HoCP 09 -804	13289	44.7	297	1.46 -	61256	14.4
L 12-201	12910	44.9	287	2.29	39249 -	11.8 -
Ho 12-615	14752	55.9	266	1.79 -	62164	13.9
L 20-37	18511	61.9	304	2.73	45829	13.9
L 20-46	12192	42.0	290	1.91 -	44014	11.9 -
L 20-61	15494	49.9	309 +	2.10	47190	12.8 -
L 20-65	8792	28.6	325 +	1.57 -	37208 -	12.7 -

Table 21. On-station nursery first-stubble means of the 2019 "L" assignment series across 3 locations (St. Gabriel, Iberia, and U.S.D.A. -Ardoyne Farm) in 2022.

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	12646	45.8	275	2.39	37888 -	13.0 -
L 01-299	16410	57.8	285	2.19	52408	14.2
HoCP 09 -804	10792	37.1	290	1.55 -	48324	14.6
L 12-201	12764	43.4	293	2.32	37359 -	11.9 -
Ho 12-615	13622	49.6	276	1.90	52408	14.0
L 20-37	14785	47.7	309 +	2.43	39601 -	13.2 -
L 20-46	12300	42.5	289	1.86	45753	12.3 -
L 20-61	11286	36.3	308 +	2.12	34031 -	12.8 -
L 20-65	12738	38.3	331 +	1.80 -	42580	12.9 -

Table 22. On-station nursery plantcane means of the 2021 “L” assignment series on a Commerce silt loam soil at U.S.D.A-Ardoyne Farm in Chacahoula, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	8426	31.0	269	2.31	26771	13.7
Ho13 -739	10756	37.2	289	2.56	29040	11.6 -
L 14-267	12570	42.6	296	2.81	30174	12.6 -
HoCP 14-885	15436	56.2	275	3.04 +	36981	11.5 -
L 21-74	11813	44.1	270	2.38	36981	13.4
L 21-77	7315	25.9	281	2.50	21553	13.9
L 21-78	10155	33.0	307 +	1.81	36527	13.8
L 21 79	11282	49.0	230 -	2.46	39930 +	15.0 +
L 21-80	12429	44.3	280	2.75	32216	12.8
L 21-81	9914	36.6	269	2.80	26091	13.2
L 21-86	11384	47.7	239 -	2.35	40611 +	13.3
L 21-91	9044	37.3	243	2.45	30401	13.5
L 21-92	9274	32.7	284	1.93	33804	16.3 +
L 21-93	10221	39.7	258	2.93 +	27225	12.5 -
L 21-95	11258	39.6	284	2.04	39249 +	14.1
L 21-96	10407	42.8	245	2.11	40157 +	14.0
L 21-97	11875	41.8	283	2.83 +	29494	14.4
L 21-99	11309	39.8	284	2.39	34712	13.6
L 21-102	13701	48.8	279	2.56	38342 +	13.2

Table 23. On-station nursery plantcane means of the 2021 "L" assignment series on a Baldwin silty clay soil at Iberia Research Station in Jeanerette, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	8311	31.1	266	1.73	35846	13.1
Ho13-739	6680	24.8	270	2.09	24049	12.6
L 14 -267	10532	38.4	275	2.54 +	29721	12.1
HoCP 14-885	9727	33.6	290	1.85	36754	11.5 -
L 21-74	9229	33.4	278	2.40 +	27906	12.6
L 21-77	7277	26.7	273	2.01	26544	12.5
L 21-78	7684	27.3	280	1.39	39476	12.7
L 21 79	7905	32.4	244	1.61	40838	13.5
L 21-80	7082	26.5	267	2.05	25864	12.5
L 21-81	11349	47.2	239 -	2.67 +	35166	12.1
L 21-86	9371	42.8	220 *	1.99	42653	13.2
L 21-91	7628	30.5	252	1.92	31763	12.9
L 21-92	6141	21.7	283	1.58	27679	15.0 -
L 21-93	6926	29.0	240 -	2.16	26998	12.3
L 21-95	8443	32.1	264	2.07	29948	12.7
L 21-96	7644	32.6	239 -	1.58	40838	13.2
L 21-97	9496	35.3	269	2.36 +	29948	14.3 +
L 21-99	9074	35.6	253	2.01	35393	12.3
L 21-102	7867	28.8	273	1.78	31536	12.4

Table 24. On-station nursery plantcane means of the 2021 "L" assignment series on a Commerce silt loam soil at Sugar Research Station in St. Gabriel, Louisiana in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299			263	2.06		12.6
Ho13-739			260	2.62 +		12.1
L 14-267			251	2.36		11.9
HoCP 14-885			261	2.50		10.5 -
L 21-74			260	2.30		13.2
L 21-77			264	2.42		12.7
L 21-78			262	1.93		13.8
L 21 79			230 -	2.66 +		14.5 +
L 21-80			263	2.65 +		13.3
L 21-81			252	2.37		13.2
L 21-86			214 -	2.15		12.5
L 21-91			247 -	2.15		12.8
L 21-92			274	2.23		14.8 +
L 21-93			245 -	2.85 +		12.6
L 21-95			268	1.81		14.2 +
L 21-96			233 -	1.98		14.3 +
L 21-97			254	2.92 +		14.1 +
L 21-99			250	2.22		12.8
L 21-102			256	2.39		13.1

Table 25. On-station nursery plantcane means of the 2021 “L” assignment series across 3 locations (St. Gabriel, Iberia, and U.S.D.A. -Ardoyne Farm) in 2022.

Variety	Sugar Per Acre	Cane Yield	Sugar Per Ton	Stalk Weight	Stalk Number	Fiber
	(lbs./A)	(tons/A)	(lbs/ton)	(lbs)	(stalks/A)	(%)
L01-299	8368	31.1	266	2.03	31309	13.1
Ho13-739	8718	31.0	273	2.42 +	26544	12.1 -
L 14-267	11551 +	40.5	274	2.57 +	29948	12.2 -
HoCP 14-885	12581 +	44.9	275	2.46 +	36867	11.2 -
L 21-74	10521	38.7	269	2.36	32443	13.1
L 21-77	7296	26.3	273	2.31	24049	13.0
L 21-78	8919	30.2	283 +	1.71	38002	13.4
L 21 79	9593	40.7	235 -	2.24	40384 +	14.4 +
L 21-80	9755	35.4	270	2.48 +	29040	12.8
L 21-81	10632	41.9	253	2.61 +	30628	12.9
L 21-86	10377	45.3	224 -	2.16	41632 +	13.0
L 21-91	8336	33.9	247 -	2.17	31082	13.1
L 21-92	7707	27.2	280	1.91	30742	15.3 +
L 21-93	8574	34.3	248 -	2.65 +	27112	12.5
L 21-95	9851	35.8	272	1.97	34598	13.7
L 21-96	9026	37.7	239 -	1.89	40497 +	13.8
L 21-97	10685	38.6	268	2.70 +	29721	14.3 +
L 21-99	10181	38.1	260	2.21	35052	12.8
L 21-102	10784	38.8	269	2.24	34939	12.9

2022 LOUISIANA "Ho" NURSERY VARIETY TRIALS

E. O. Dufrene, M. J. Duet, L. Lovell, and J.R. Todd
USDA-ARS, Sugarcane Research Unit (SRU)

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. Because assignments take place later in the year when most farmers have finished their plantings, these nursery trials are planted on research stations. In 2022, trials were planted at USDA's Ardoyne Farm in Schriever, LSU AgCenter's Iberia Research Station in Jeanerette, and Sugar Research Station in St. Gabriel. Plots in these trials 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. 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 to or higher than the control varieties and not susceptible to diseases are advanced for further testing.

Table 1 lists the planting and harvest dates of USDA nursery evaluations. 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. A nursery trial was planted on heavy soil at Ardoyne Farm in 2021, but because of soil conditions, there was very poor germination. Thus, it was decided not to collect data from this test in 2022. Results of trials harvested in 2022 are in tables 2 to 13. Varieties where both the cross and selection were done 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 done in Houma have a "HoCP" prefix. Varieties having a "HoL" prefix are derived from a cross made at the LSU AgCenter 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 2022.

				Harvest Dates			
Series	Location[1]	Soil Series [2]	Planting	2019	2020	2021	2022
2018	IRS	Bscl	10/19/18	11/04		11/19	10/25
2019	AFL	CbA	11/07/19		12/21	12/03	11/15
2019	IRS	Bscl	11/19/19			11/19	10/25
2019	STG	Csl	11/21/19		12/15	12/15	11/02
2020	AFH	ShA	11/17/20			12/02	10/12
2020	AFL	CbA	11/04/20			12/20	11/17
2020	STG	Csl	11/19/20			12/16	11/21
2021	IRS	Bscl	11/08/21				10/25
2021	STG	Csl	11/10/21				11/21
2022	AFH	ShA	10/27/22				
2022	IRS	Bscl	11/01/22				
2022	STG	Csl	11/02/22				

[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, ShA = Schriever clay

Table 2. Nursery third-stubble means of the 2018 "Ho" and "HoCP" assignment series on a Baldwin silty clay soil at the Iberia Research Station in Jeanerette, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	14188	60.1	236	1.69	71352
HoCP 04-838	10675	40.5	265	1.52	52408
HoCP 96-540	6693 -	31.1 -	215	1.66	37775 -
HoCP 09-804	9474	34.9 -	270 +	1.26 -	55017
L 11-183	10663	42.9	249	1.47	58534
HoCP 18-803	12181	47.8	253	1.48	64773
Ho 18-878	10665	39.8	266 +	1.18 -	67382
Mean	10649	42.4	251	1.46	58177

Table 3. Nursery second-stubble means of the 2019 “Ho” and “HoCP” assignment series on a Cancienne silt loam soil at the Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	13113	44.1	298	1.74	51274
HoCP 96-540	12270	41.8	294	2.16	38796 -
HoCP 09-804	12579	41.8	301	1.58	52862
L 12-201	16282	55.9	291	2.89 +	38682 -
Ho 12-615	16418	54.7	300	1.71	64206 +
HoCP 19-907	12751	42.5	300	1.77	47530
HoCP 19-947	15610	50.5	309	2.19	46396
HoCP 19-960	12302	41.9	293	1.96	42766
Mean	13916	46.6	298	2.00	47814

Table 4. Nursery second-stubble means of the 2019 “Ho” and “HoCP” assignment series on a Baldwin silty clay soil at the Iberia Research Station in Jeanerette, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	8725	35.6	247	1.95	34621
HoCP 96-540	2936	12.6	233	1.63	15654
HoCP 09-804	7369	27.4	267	1.28 -	43220
L 12-201	8355	32.9	254	1.94	33691
Ho 12-615	6971	30.1	232	1.26 -	51047
HoCP 19-907	9297	36.5	255	1.37 -	53316
HoCP 19-947	10918	40.0	272	1.84	43447
HoCP 19-960	6957	29.0	240	1.59	36187
Mean	7165	28.3	250	1.58	36896

Table 5. Nursery second-stubble means of the 2019 “Ho” and “HoCP” assignment series on a Commerce silt loam soil at the Sugar Research Station in St. Gabriel, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	4937	16.9	292	1.61	21780
HoCP 96-540	8567	31.2	273	1.85	33578
HoCP 09-804	11029	37.4 +	295	1.51	49686 +
L 12-201	5429	19.8	275	1.79	23595
Ho 12-615	10525	38.2 +	274	1.48	51728 +
HoCP 19-907	13579	46.7 +	291	1.99	47190 +
HoCP 19-947	11504	37.9 +	303	1.80	42426
HoCP 19-960	9359	34.7	270	1.90	36754
Mean	9662	33.9	284	1.74	39446

Table 6. Nursery second-stubble means of the 2019 “Ho” and “HoCP” assignment series across locations (Ardoyne Farm, Iberia Research Station, & Sugar Research Station) in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	9095	32.8	279	1.72	38587
HoCP 96-540	7924	28.5	267	1.88	29343
HoCP 09-804	10326	35.5	288	1.45	48589
L 12-201	10022	36.2	274	2.21 +	31989
Ho 12-615	11305	41.0	269	1.48	55660 +
HoCP 19-907	11876	41.9	282	1.71	49345
HoCP 19-947	12677	42.8	295 +	1.94	44089
HoCP 19-960	9539	35.2	268	1.81	38569
Mean	10346	36.7	278	1.78	42021

Table 7. Nursery first-stubble means of the 2020 "Ho" and "HoCP" assignment series on a Cancienne silt loam soil at the Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	15952	52.1	307	2.17	48211
HoCP 09-804	14496	48.0	302	1.63 -	58874 +
L 12-201	15595	55.7	281 -	2.87 +	38796 -
Ho 12-615	16770	56.6	296	2.21	51387
Ho 13-739	17010	56.6	301	2.53	44694
HoCP 20-501	16450	55.3	299	2.49	44241
HoCP 20-513	16803	53.4	314	2.15	49686
HoCP 20-521	15052	51.0	295	2.00	50933
HoCP 20-527	14369	48.7	295	2.51	38796 -
HoCP 20-535	10859 -	37.7 -	289 -	1.90	39476 -
HoCP 20-558	13200	45.0	294	1.92	46963
HoCP 20-560	14355	47.3	303	2.10	45148
HoCP 20-568	16149	55.3	292 -	2.46	45148
HoCP 20-570	13852	47.2	294	2.49	37888 -
Mean	15065	50.7	297	2.24	45732

Table 8. Nursery first-stubble means of the 2020 "Ho" and "HoCP" assignment series on a Schriever clay soil at the Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	11543	40.7	284	1.72	47303
HoCP 09-804	10456	37.0	283	1.88	40270
L 12-201	10962	41.7	263 -	2.33 +	35846 -
Ho 12-615	9837	35.2	279	1.69	41745
Ho 13-739	13335	44.5	300 +	2.13	41858
HoCP 20-501	11883	43.3	274	2.20 +	39476
HoCP 20-513	12740	42.4	301 +	1.60	53202
HoCP 20-521	12956	45.9	282	2.04	45035
HoCP 20-527	12390	45.3	274	2.31 +	38909 -
HoCP 20-535	11782	42.2	279	2.21 +	38342 -
HoCP 20-558	8834	33.6	262 -	1.84	36300 -
HoCP 20-560	11765	38.9	302 +	1.65	46850
HoCP 20-568	9658	34.9	276	2.07	33804 -
HoCP 20-570	10728	37.7	285	2.06	36754 -
Mean	11348	40.2	282	1.98	41121

Table 9. Nursery first-stubble means of the 2020 "Ho" and "HoCP" assignment series on a Commerce silt loam soil at the Sugar Research Station in St. Gabriel, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	13217	45.2	292	1.59	57173
HoCP 09-804	10917	35.3	309 +	1.46	47644
L 12-201	11681	40.2	291	2.39 +	33804 -
Ho 12-615	16579	54.9	302 +	1.76	62391
Ho 13-739	12078	37.2	324 +	1.96	37888 -
HoCP 20-501	12560	41.4	304 +	2.01	41064 -
HoCP 20-513	10024	31.7	317 +	1.66	38342 -
HoCP 20-521	15087	48.1	314 +	1.82	53089
HoCP 20-527	15712	55.2	285	2.34 +	47417
HoCP 20-535	10952	35.6	308 +	1.72	41518 -
HoCP 20-558	13598	44.5	306 +	1.82	49005
HoCP 20-560	13324	40.5	329 +	1.77	46283
HoCP 20-568	15222	51.2	297	2.46 +	41518 -
HoCP 20-570	9012	28.9	313 +	1.72	31989 -
Mean	12855	42.1	306	1.89	44937

Table 10. Nursery first-stubble means of the 2020 "Ho" and "HoCP" assignment series across locations (Ardoyne Farm light & heavy soil, and Sugar Research Station) in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	13571	46.0	294	1.82	50896
HoCP 09-804	11957	40.1	298	1.65	48929
L 12-201	12746	45.9	278 -	2.53 +	36149 -
Ho 12-615	14395	48.9	292	1.89	51841
Ho 13-739	14141	46.1	308 +	2.21 +	41480 -
HoCP 20-501	13631	46.7	292	2.23 +	41594 -
HoCP 20-513	13189	42.5	311 +	1.80	47077
HoCP 20-521	14365	48.3	297	1.95	49686
HoCP 20-527	14157	49.7	285	2.39 +	41707 -
HoCP 20-535	11198	38.5	292	1.94	39779 -
HoCP 20-558	11878	41.0	287	1.86	44089
HoCP 20-560	13148	42.2	311 +	1.84	46093
HoCP 20-568	13676	47.2	288	2.33 +	40157 -
HoCP 20-570	11198	37.9	297	2.09	35544 -
Mean	13089	44.4	295	2.04	43930

Table 11. Nursery plant cane means of the 2021 “Ho” and “HoCP” assignment series on a Baldwin silty clay soil at the Iberia Research Station in Jeanerette, LA in 2021.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	8866	38.3	234	2.09	36527
Ho 13-739	7283	28.1 -	259	1.98	28586
L 14-267	10638	41.8	254	2.33	35960
HoCP 14-885	13082 +	51.5 +	254	2.37	43560
HoCP 21-600	8016	34.7	231	1.92	36187
Ho 21-601	7567	29.7 -	255	1.54 -	38682
Ho 21-605	8684	32.5	267 +	1.78	36527
HoCP 21-606	8524	30.3	281 +	1.41 -	42993
HoCP 21-608	7929	30.4	260	1.79	34258
Ho 21-616	7286	31.5	231	2.43 +	26091 -
HoCP 21-617	8837	34.7	254	2.14	32670
HoCP 21-618	6044 -	23.8 -	254	1.67 -	28586
HoCP 21-619	8121	34.2	236	2.14	31536
HoCP 21-621	8469	31.3	270 +	1.68 -	37434
HoCP 21-622	6639	24.8 -	267 +	1.53 -	32557
HoCP 21-623	5508 -	25.1 -	219	1.68 -	29834
HoCP 21-624	9268	34.4	269 +	2.18	31649
HoCP 21-625	6828	27.5 -	249	1.78	30742
HoCP 21-626	6367 -	22.8 -	278 +	1.34 -	34258
HoCP 21-629	9612	40.8	236	2.14	38228
HoCP 21-630	9374	38.4	244	1.75 -	44014
HoCP 21-632	8861	36.5	244	1.50 -	49005 +
HoCP 21-633	5548 -	21.5 -	260 +	1.63 -	26318 -
HoCP 21-636	7498	34.0	220	2.12	32103
HoCP 21-642	8605	32.3	266 +	1.90	34031
HoCP 21-644	7165	32.7	219	1.72 -	38002
HoCP 21-646	8790	39.6	224	1.66 -	47644 +
HoCP 21-647	7649	29.8	257	1.87	32103
HoCP 21-648	8788	44.0	199 -	2.36	37434
HoCP 21-649	8045	33.6	239	2.11	31876
HoCP 21-652	8528	32.7	261 +	2.05	31989
HoCP 21-653	6646	24.9 -	268 +	1.38 -	36073
HoCP 21-655	10765	42.0	256	2.30	36754
HoCP 21-658	6461 -	31.0	209 -	1.60 -	38796
HoCP 21-659	10992	39.6	277 +	2.03	39476
Mean	8208	33.2	249	1.88	35499

Table 12. Nursery plant-cane means of the 2021 “Ho” and “HoCP” assignment series on a Commerce silt loam soil at the Sugar Research Station in St. Gabriel, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)
L 01-299	10533	35.4	298	1.98	35733
Ho 13-739	13615	44.8	304	2.50 +	35733
HoCP 14-885	15664 +	56.4 +	279	2.47 +	45829 +
L 14-267	16698 +	55.2 +	303	2.49 +	44468
HoCP 21-600	12567	44.4	283	2.15	41405
Ho 21-601	11132	38.2	292	1.74	44127
Ho 21-605	12087	43.7	277	2.16	40497
HoCP 21-606	11521	35.7	323 +	1.59	45148 +
HoCP 21-608	15468 +	50.9 +	304	2.17	47077 +
Ho 21-616	16489 +	55.1 +	299	3.02 +	36527
HoCP 21-617	15528 +	51.9 +	299	2.35	44354
HoCP 21-618	13445	47.9	281	2.07	46283 +
HoCP 21-619	13358	48.5	276 -	2.28	42539
HoCP 21-621	12144	41.0	297	1.87	43900
HoCP 21-622	13116	43.4	302	2.18	39930
HoCP 21-623	11202	39.5	284	1.83	43333
HoCP 21-624	14707 +	51.7 +	282	2.51 +	41178
HoCP 21-625	12158	41.0	295	1.97	41632
HoCP 21-626	9069	32.6	278	1.64	39930
HoCP 21-629	16166 +	54.2 +	299	2.60 +	41745
HoCP 21-630	17342 +	59.3 +	293	2.14	55698 +
HoCP 21-632	11755	40.7	289	1.71	47644 +
HoCP 21-633	13792	45.1	306	2.19	40951
HoCP 21-636	14608 +	53.5 +	273 -	2.25	47984 +
HoCP 21-642	11446	40.0	286	2.01	39930
HoCP 21-644	11737	44.7	267 -	1.94	45148 +
HoCP 21-646	14812 +	48.4	306	1.88	51387 +
HoCP 21-647	15164 +	52.9 +	286	2.25	46963 +
HoCP 21-648	8686	35.1	248 -	2.25	31309
HoCP 21-649	11249	39.6	285	2.02	39136
HoCP 21-652	13655	43.3	314	2.45 +	35166
HoCP 21-653	11457	36.0	319	1.57	45942 +
HoCP 21-655	14188	48.7	291	2.27	42993
HoCP 21-658	14408	51.7 +	279	2.05	50820 +
HoCP 21-659	16046 +	52.9 +	303	2.53 +	41632
Mean	13343	45.8	291	2.14	42973

Table 13. Nursery plant cane means of the 2021 “Ho” and “HoCP” assignment series across locations (Iberia Research Station & Sugar Research Station) in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)	
L 01-299	9699		36.8		266		2.03		36130	
Ho 13-739	10449		36.4		282		2.24		32160	
L 14-267	13668	+	48.5	+	278		2.41	+	40214	+
HoCP 14-885	14373	+	53.9	+	266		2.42	+	44694	
HoCP 21-600	10291		39.5		257		2.03		38796	
Ho 21-601	9350		34.0		274		1.64	-	41405	
Ho 21-605	10385		38.1		272		1.97		38512	
HoCP 21-606	10023		33.0		302	+	1.50	-	44070	+
HoCP 21-608	11698		40.7		282		1.98		40667	
Ho 21-616	11888		43.3		265		2.73		31309	
HoCP 21-617	12183		43.3		276		2.24		38512	
HoCP 21-618	9745		35.9		268		1.87		37434	
HoCP 21-619	10739		41.3		256		2.21		37037	
HoCP 21-621	10306		36.2		284		1.77		40667	
HoCP 21-622	9878		34.1		285		1.85		36243	
HoCP 21-623	8355		32.3		251		1.75	-	36584	
HoCP 21-624	11987		43.0		276		2.34	+	36413	
HoCP 21-625	9493		34.3		272		1.88		36187	
HoCP 21-626	7718		27.7		278		1.49	-	37094	
HoCP 21-629	12889	+	47.5		267		2.37	+	39987	
HoCP 21-630	13358	+	48.9	+	268		1.94		49856	+
HoCP 21-632	10308		38.6		266		1.60	-	48324	+
HoCP 21-633	9670		33.3		283		1.91		33634	
HoCP 21-636	11053		43.7		247		2.19		40043	
HoCP 21-642	10026		36.2		276		1.96		36981	
HoCP 21-644	9451		38.7		243		1.83		41575	
HoCP 21-646	11801		44.0		265		1.77		49515	+
HoCP 21-647	11406		41.4		272		2.06		39533	
HoCP 21-648	8737		39.6		223	-	2.30		34372	
HoCP 21-649	9647		36.6		262		2.06		35506	
HoCP 21-652	11091		38.0		287		2.25		33578	
HoCP 21-653	9051		30.4		293	+	1.47	-	41008	
HoCP 21-655	12477		45.4		274		2.28		39873	
HoCP 21-658	10435		41.3		244		1.82		44808	+
HoCP 21-659	13519	+	46.2		290		2.28		40554	
Mean	10776		39.5		270		2.01		39236	

2022 LOUISIANA VARIETY DEVELOPMENT PROGRAM INFIELD TRIALS

E. O. Dufrene[1], M. J. Duet[1], L. Lovell[1], and J. R. Todd[1], M. J. Pontif[2], M. F. Daigle[2], and C. A. Kimbeng[2]
[1]USDA-ARS, Sugarcane Research Unit (SRU) & [2]Sugar Research Station

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 2022, tests were planted at USDA's Ardoyne Farm in Schriever (Ho varieties only) and commercial farms located in Vacherie and Maurice, LA, representing three distinct regions and soil types of the Louisiana sugarcane industry.

Personnel from the variety programs at the USDA and LSU AgCenter work cooperatively to evaluate, plant, and harvest infield tests on commercial farms. The test at Ardoyne Farm in Schriever is conducted by the USDA personnel only. 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 equipped 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 15. Because there were no active varieties in the 2016 assignment series, third stubble tests were not harvested in 2022. 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 2022.

'Ho' Series	'L' Series	Location[1/]	Soil Series [2/]	Planting Date	Harvest Dates 2020	2021	2022
2017		AFH	ShA	9/26/19	12/11	11/16	11/03
2017	2018	BLK	CmA	9/12/19	12/11	11/03	10/18
2017	2018	CAF	Co	8/14/19	12/01	11/23	12/01
2018		AFH	ShA	9/17/20		11/16	11/03
2018	2019	BLK	CmA	9/09/20		11/03	10/18
2018	2019	CAF	Co	8/13/20		11/23	10/04
2019		AFH	ShA	10/14/21			12/08
2019	2020	BLK	CmA	9/27/21			12/07
2019	2020	CAF	Co	8/19/21			12/01
2020		AFH	ShA	10/06/22			
2020	2021	BLK	CmA	9/16/22			
2020	2021	CAF	Co	8/18/22			

[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 second-stubble means of the 2017 "Ho" assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton		Weight/ stalk		Stalks/ acre	Fiber	
	(lbs.)	(tons)	(lbs.)		(lbs.)		(no.)	(%)	
L 01-299	7596	31.0	245		1.46		42804	13.6	
HoCP 96-540	9662	36.7	262		1.96	+	38300	12.7	-
HoCP 09-804	5736	22.7	253		1.41		32644	14.8	+
L 12-201	6231	23.2	269	+	1.99	+	23373	11.8	-
Ho 12-615	5795	23.3	249		1.36		34303	14.2	
Ho 17-738	7087	27.7	255		1.65		33837	14.2	
Means	7018	27.5	256		1.64		34210	13.5	

Table 3. Infield second-stubble means of the 2017 "Ho" assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	10542		44.3		238		1.80		49591		12.5	
HoCP 96-540	7380	-	33.0	-	224	-	1.93		34150	-	11.6	
HoCP 09-804	8256		34.4		240		1.35	-	51402		14.7	+
L 12-201	9088		35.6		256	+	1.92		36850		9.9	-
Ho 12-615	8677		38.9		223	-	1.39	-	56294		12.5	
Ho 17-738	10126		40.7		249		1.53	-	53786		13.2	
Means	9012		37.8		238		1.65		47012		12.4	

Table 4. Infield second-stubble means of the 2017 "Ho" assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	12024		37.9		317		2.06		36511		11.8	
HoCP 96-540	13466		44.7		301		1.97		46184		11.0	
HoCP 09-804	7848	-	26.6		295		1.38	-	38413		13.5	+
L 12-201	9016		28.5		317		2.54	+	22480	-	10.5	
Ho 12-615	9846		34.2		288		1.90		35987		13.4	+
Ho 17-738	10253		33.8		303		2.05		33085		13.3	
Means	10409		34.3		303		1.98		35443		12.2	

Table 5. Infield second-stubble means of the 2017 "Ho" assignment series across three locations (Ardoyne Farm, Blackberry Farm and Circle A Farm) in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	10054		37.7		267		1.77		42969		12.6	
HoCP 96-540	10169		38.1		262		1.95		39544		11.8	-
HoCP 09-804	7280	-	27.9	-	263		1.38	-	40819		14.3	+
L 12-201	8112		29.1	-	280		2.15	+	27567		10.7	-
Ho 12-615	8106		32.2		253		1.55		42195		13.4	
Ho 17-738	9156		34.1		269		1.74		40236		13.5	+
Means	8813		33.2		266		1.76		38889		12.7	

Table 6. Infield first-stubble means of the 2018 “Ho” assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	10169		38.3		266		1.83		42247		14.1	
HoCP 09-804	10465		38.2		274		1.70		44835		14.4	
L 12-201	7759	-	28.4	-	273		2.67	+	21560	-	11.5	-
Ho 12-615	8745		33.6		260		1.68		40155		14.8	
Ho 13-739	8776		31.6		278		2.06		30659	-	12.5	-
HoCP 18-803	12112		41.9		289		2.15		39359		12.5	-
Ho 18-878	7183	-	25.0	-	288		1.43		34918		13.3	
Means	9316		33.9		275		1.93		36248		13.3	

Table 7. Infield first-stubble means of the 2018 “Ho” and 2019 “L” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2022.

Variety	Sugar/ acre		Tons/ acre		Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)		(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	9984		44.9		222		1.82		50546		13.0	
HoCP 09-804	10823		43.5		249	+	1.56		55695		14.2	+
L 12-201	9365		37.1		253	+	2.73	+	27162	-	10.3	-
Ho 12-615	9965		41.4		240	+	1.63		51643		13.5	
Ho 13-739	10302		36.4		283	+	1.99		36891		11.1	-
HoCP 18-803	10908		41.7		262	+	2.09		39878		12.6	
Ho 18-878	8428		32.5	-	259	+	1.70		38516		12.7	
L 19-006	6699	-	27.4	-	245	+	2.14		25647	-	12.1	
L 19-021	6751	-	26.9	-	251	+	1.69		31915	-	13.1	
Means	9247		36.9		252		1.92		39766		12.5	

Table 8. Infield first-stubble means of the 2018 "Ho" and 2019 "L" assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	6865	32.1	217	1.40	45938	12.0
HoCP 09-804	8467	32.3	262	1.42	46302	13.4
L 12-201	8401	32.2	264	1.97 +	32586 -	10.2
Ho 12-615	7729	33.5	231	1.51	44447	13.1
Ho 13-739	6400	29.7	273	1.92 +	22361 -	11.6
HoCP 18-803	8921	41.6	215	1.89 +	43837	12.8
Ho 18-878	8067	32.5	248	1.23	53718	12.1
L 19-006	7601	31.1	245	1.89 +	33021	11.8
L 19-021	5855	23.0	256	1.57	29181 -	13.0
Means	7659	32.0	244	1.64	40025	12.3

Table 9. Infield first-stubble means of the 2018 "Ho" and 2019 "L" assignment series across three locations (Ardoyne Farm, Blackberry Farm and Circle A Farm) in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	9006	38.4	235	1.68	46244	13.0
HoCP 09-804	9918	38.0	262 +	1.56	48944	14.0 +
L 12-201	8508	32.5 -	263 +	2.45 +	27103 -	10.7 -
Ho 12-615	8813	36.2	244	1.61	45415	13.8 +
Ho 13-739	8656	32.6 -	277 +	1.99 +	31416 -	11.6 -
HoCP 18-803	10647	41.7	255	2.04 +	41025	12.6
Ho 18-878	7893	30.0 -	265 +	1.45	42384	12.7
Means	9104	35.6	257	1.83	40589	12.7

Table 10. Infield first-stubble means of the 2018 “Ho” and 2019 “L” assignment series across two locations (Circle A Farm & Blackberry Farm) in 2021.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	8424	38.5	219	1.61	48242	12.5
HoCP 09-804	9645	37.9	256 +	1.49	50998	13.8 +
L 12-201	8883	34.6	259 +	2.35 +	29874 -	10.3 -
Ho 12-615	8847	37.4	236	1.57	48045	13.3
Ho 13-739	8617	33.1	280 +	1.96	31267 -	11.2 -
HoCP 18-803	9914	41.6	239	1.99 +	41857	12.7
Ho 18-878	8247	32.5	254 +	1.46	46117	12.4
L 19-006	7150	29.3 -	245	2.01 +	29334 -	12.0
L 19-021	6303	25.0 -	253 +	1.63	30548 -	13.1
Means	8476	34.4	248	1.78	39892	12.4

Table 11. Infield plant-cane means of the 2019 “Ho” assignment series on a Schriever clay soil at Ardoyne Farm in Schriever, LA in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	8501	31.5	270	2.16	29110	13.7
Ho 13-739	8189	31.1	261	2.84 +	22341	12.2 -
L 14-267	5490	19.9	276	2.91 +	13657 -	12.8
HoCP 14-885	8422	29.6	284	2.30	25947	10.8 -
HoCP 19-907	9543	35.2	270	2.36	29634	13.6
HoCP 19-947	8434	30.7	275	3.00 +	20475	12.7
HoCP 19-960	5465	21.1	258	2.50	16950 -	13.0
Means	7720	28.5	271	2.58	22588	12.7

Table 12. Infield plant-cane means of the 2019 “Ho” and 2020 “L” assignment series on a Cancienne silt loam soil at Blackberry Farm in Vacherie, LA in 2022.

Variety	Sugar/ acre		Tons/ acre	Sugar/ ton		Weight/ stalk		Stalks/ acre		Fiber	
	(lbs.)		(tons)	(lbs.)		(lbs.)		(no.)		(%)	
L 01-299	11921		42.4	281		1.95		43516		12.2	
Ho 13-739	11952		43.9	272		3.01	+	29380	-	12.2	
L 14-267	11181		40.8	274		2.46		33204	-	11.9	
HoCP 14-885	13803		49.1	281		2.69	+	36418		11.0	
HoCP 19-907	9326		33.2	278		2.36		28033	-	13.4	
HoCP 19-947	12216		42.6	287		2.74	+	31090	-	13.0	
HoCP 19-960	11596		46.9	248	-	2.83	+	33167	-	15.2	+
L 20-037	12394		44.8	276		2.67	+	34460	-	12.5	
L 20-046	8545	-	30.0	285		2.06		29255	-	11.4	
L 20-061	8991		34.4	262		2.09		32945	-	13.9	
L 20-065	8965		30.5	294		1.92		31847	-	12.6	
Means	10990		39.9	276		2.43		33029		12.7	

Table 13. Infield plant-cane means of the 2019 “Ho” and 2020 “L” assignment series on a Coteau-Patoutville-Frost silt loam soil at Circle A Farm in Maurice, LA in 2022.

Variety	Sugar/ acre		Tons/ acre	Sugar/ ton		Weight/ stalk		Stalks/ acre	Fiber	
	(lbs.)		(tons)	(lbs.)		(lbs.)		(no.)	(%)	
L 01-299	9957		33.0	302		2.20		30237	12.0	
Ho 13-739	11757		37.5	313		2.41		31870	12.5	
L 14-267	8742		27.8	316		2.80		19610	12.3	
HoCP 14-885	15807	+	46.3	342	+	2.66		35577	10.3	-
HoCP 19-907	10312		34.7	297		1.90		36606	12.3	
HoCP 19-947	15173		44.9	338	+	2.77	+	32398	10.6	
HoCP 19-960	10426		38.2	272	-	2.31		33471	12.7	
L 20-037	8555		27.0	317		2.45		22167	11.4	
L 20-046	9393		31.8	295		2.22		28830	12.1	
L 20-061	12046		40.4	298		2.31		34976	13.1	
L 20-065	9666		27.7	348		2.37		23563	12.2	
Means	11076		35.4	312		2.40		29937	12.0	

Table 14. Infield plant-cane means of the 2019 “Ho” assignment series across three locations (Ardoyne Farm, Blackberry Farm & Circle A Farm) in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	10126	35.6	284	2.10	34288	12.7
Ho 13-739	10633	37.5	282	2.75 +	27864	12.3
L 14-267	8471	29.5	289	2.72 +	22157 -	12.4
HoCP 14-885	12677	41.7	302	2.55 +	32647	10.7 -
HoCP 19-907	9727	34.4	282	2.20	31424	13.1
HoCP 19-947	11941	39.4	300	2.84 +	27987	12.1
HoCP 19-960	9162	35.4	259 -	2.54 +	27863	13.7
Means	10391	36.2	285	2.53	29176	12.4

Table 15. Infield plant-cane means of the 2019 “Ho” and 2020 “L” assignment series across two locations (Circle A Farm & Blackberry Farm) in 2022.

Variety	Sugar/ acre	Tons/ acre	Sugar/ ton	Weight/ stalk	Stalks/ acre	Fiber
	(lbs.)	(tons)	(lbs.)	(lbs.)	(no.)	(%)
L 01-299	10939	37.7	292	2.07	36876	12.1
Ho 13-739	11855	40.7	293	2.71 +	30625	12.3
L 14-267	9962	34.3	295	2.63 +	26407	12.1
HoCP 14-885	14805 +	47.7	311	2.67 +	35997	10.7
HoCP 19-907	9819	34.0	287	2.13	32320	12.8
HoCP 19-947	13694	43.7	312	2.76 +	31744	11.8
HoCP 19-960	11011	42.6	260 -	2.57	33319	14.0 +
L 20-037	10475	35.9	297	2.56	28314	11.9
L 20-046	8969	30.9	290	2.14	29042	11.7
L 20-061	10519	37.4	280	2.20	33961	13.5
L 20-065	9316	29.1	321	2.14	27705	12.4
Means	11033	37.6	294	2.41	31483	12.3

2022 LOUISIANA SUGARCANE VARIETY DEVELOPMENT PROGRAM OUTFIELD VARIETY TRIALS

Zachary Taylor[1], Collins Kimbeng[1], Edwis Dufrene[2], Mike Duet[2], Herman Waguespack, Jr.[3], Atticus Finger[3] and Wilson Judice[3]
[1]Sugar Research Station, [2]USDA-ARS, Sugarcane Research Laboratory, [3]American Sugar Cane League

The Outfield Variety Trials represent the final stage of testing for experimental sugarcane varieties, assessing their potential for commercial production in Louisiana. These trials contribute to variety advancement and crossing decisions and are conducted through a collaborative effort between the LSU AgCenter, USDA-ARS, and the American Sugar Cane League in accordance to the provisions of the "Three-way Agreement of 2007." To capture the diverse soil types in the Louisiana sugarcane belt, the trials take place across up to 12 distinct locations.

For an experimental variety to be considered for release, it must match or surpass the performance of commercial varieties in terms of yield and harvestability across different locations, crops, and years. Comprehensive varietal evaluation necessitates both overall yield performance data and performance data under challenging harvest conditions. This report aims to deliver overall yield data, specific location yield data by crop, and multi-year yield analyses for relevant test varieties from the 2022 outfield trials.

Each outfield location employed a randomized complete block design with three replications. Test plots consisted of two rows, each 50 feet long, with a 5-foot alley separating them. All locations utilized a combine harvester for harvesting, and a weigh wagon equipped with load cells mounted on each axle and hitch for weighing each plot. A 10-stalk, whole-stalk sample, topped but unstripped of leaves, was collected from each plot and sent to the USDA-ARS sucrose laboratory for analysis. The samples were hand-cut, weighed, milled, and the juice was evaluated for Brix and pol levels. The final data reported the pounds of theoretical recoverable sugar per ton of cane.

Cane Yield for each plot was estimated by plot weight, reduced by 14% to adjust for leaf trash 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 yield data from a single year can be misleading, as the relative performance of varieties may fluctuate from one year to another. Similarly, relying solely on across-location means can be deceptive since a variety, whether experimental or commercial, may exhibit inconsistent performance across different locations. Multi-year and multi-location testing help mitigate these issues by averaging out the variable performances.
Additionally, relying on mean values alone can be deceiving, as they may not fully capture the variability and the true nature of the data. Mean values are sensitive to extreme values or outliers, which can distort the overall representation of the data. Furthermore, the mean does not provide information about the distribution of data points or the presence of potential patterns or trends.

To gain a more comprehensive understanding of the performance of experimental and commercial varieties, it is essential to consider other statistical measures, such as the median, range, and standard deviation, along with graphical representations like box plots and scatter plots. By incorporating these additional metrics and visualization techniques, a more accurate and nuanced assessment of the data can be achieved.

The most widely grown varieties in Louisiana (listed with % of total acreage in the industry) in 2022 were L01-299 (55.6%), HoCP09-804 (10.6%), HoCP96-540 (8%), L01-283 (7.6%), Ho12-615 (6.3%), also it is worth noting that HoCP14-885, released in 2020, now occupies 0.9% of the states acreage.

In the data analysis, L01-299 was used as the check variety and is highlighted in the tables. A linear mixed model is fit for each trait, and to adjust for missing data estimated marginal means (EMMs) are calculated using the 'emmeans' package in R. Pairwise comparisons are performed using the Dunnett's test, with L01-299 serving as the reference variety. 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. This approach enables the identification of significant differences among the crop varieties in comparison to the check variety.
Thirteen varieties from the 2020 assignment series were introduced to ten outfield locations for seed increase in 2022 (Table 1). Seven experimental and seven commercial varieties were planted at these locations. Thirty-six trials were harvested in 2022 spanning 11 different locations, these included ten plant cane, ten first-ratoon, ten-second ratoon, three third -ratoon, and 2 fourth-ratoon crops.

The 2022 Louisiana sugarcane industry has a mild and dry start, with warm average temperatures and below average rainfall. These mild conditions continued into the spring with above average temperatures and below average rainfall, with Baton Rouge having a 17% decrease in rainfall from the average for this season. These mild and dry conditions can be partially attributed to La Nina weather patterns and a persistent ridge of high pressure over the Gulf of Mexico. The hurricane season was favorable due to these conditions, as Louisiana was not impacted by any hurricanes in 2022. Baton Rouge received 56.6” of rain in 2022 which is 5.4” under the 30-year average. Harvest season was warmer than average and wetter than average. The final outfield trial was harvested on December 21, 2022.

HoCP17-738 was evaluated in the plant cane and first ratoon this year, which will be eligible for release in 2024. Varieties HoCP18-803 and Ho18-878 were evaluated in the plant cane, which will be up for release in 2025.

Acknowledgments

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.

Table 1. Commercial and experimental varieties planted in the outfield in 2022.

Commercial Varieties		Experimental Varieties		Experimental Varieties Introduced to the Outfield		
L01-299	HoCP14-885	Ho17-738	L19-021	L20-037	HoCP20-501	HoCP20-568
HoCP09-804	L15-306	HoCP18-803	HoCP19-907	L20-046	HoCP20-513	HoCP20-570
Ho12-615	HoL15-508	Ho18-878	HoCP19-947	L20-061	HoCP20-521	
Ho13-739			HoCP19-960	L20-065	HoCP20-527	
					HoCP20-535	
HoCP96-540*	HoCP04-838*				HoCP20-558	
*Only planted in 2 locations					HoCP20-560	

Table 2. Harvest and planting dates for all Outfield locations harvested in 2022.

Location	Parish	2022 Planting Date	Plant-Cane 2022 Harvest Date	Plant-Cane 2021 Planting Date	First-Ratoon 2022 Harvest Date	First-Ratoon 2020 Planting Date	Second-Ratoon 2022 Harvest Date	Second-Ratoon 2019 Planting Date	Third-Ratoon 2022 Harvest Date	Third-Ratoon 2018 Planting Date
Heavy Soil										
Al Landry	Iberville	9/08	11/14	9/08	10/12	8/17	10/12	9/11		
Allains	St. Mary	9/28	11/01	10/22	11/01	9/10	11/01	9/18		
Alma	Pt. Coupee	9/07	9/29	9/7	9/29	8/12	9/29	9/03		
Mary	Lafourche	9/27	**	9/27	9/30	9/11	**	9/23		
Light Soil										
Brunswick	Pt. Coupee	9/12	12/07	9/12	12/07	9/09	10/14	9/12	10/14	9/24
Domingue	Vermillion	*		*		*	10/11	9/13		
Glenwood	Assumption	9/15	12/08	9/15	12/08	8/19	12/08	9/20		
Harper	Rapides	9/13	12/21	9/13	12/21	9/14	10/10	9/16	10/10	9/14
Lanaux	St. John	8/16	12/13	8/16	10/18	9/04	10/18	8/23		
St. John	St. Martin	9/18	11/22	9/19	11/22	8/18	**	8/30		
R. Hebert	Iberia	9/26	12/05	9/29	12/05	9/03	10/27	9/18	10/27	9/19

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

Table 3. Plant cane sugar per acre for ten commercial and four experimental varieties at nine outfield locations in 2022.

	HEAVY			LIGHT						
Variety	Allains	Alma	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds/A)					
L01-299	7185	5807	8562	7914	12272	9398	10345	9302	8429	8741
HoCP04-838				9274		9990				9632
HoCP09-804	7606	8487 +	9238	8768	11088	9196	10606	9682	8280	9215
L12-201	8231	7302	9216	8627	12667	9451	10319	8324	7391	9059
Ho12-615	7173	7203	11375 +	10957 +	12705	11176	11690	9968	6718	9987 +
Ho13-739	7593	5864	9623	9533	11548	9389	9336	9745	7439	8770
L14-267	6774	6382	9796	6580	9353 -	11976 +	9934	7780	8445	8643
HoCP14-885	8406	8181 +	11937 +	8110	14849 +	11528 +	13085 +	10859	9965	10769 +
L15-306	7919	7818 +	10604	6946	12806	9577	11147	10389	7365	9350
HoL15-508	8375	4958	12331 +	9342	13937	8748	9067	10794	9831	9709
Ho17-738	8081	6270	8958	8939	10530	10555	10015	8095	9366	8917
Ho17-776						11112				11112
HoCP18-803	8208	6229	11780 +	12216 +	11135	10033	12620 +	11534 +	9738	10388 +
Ho18-878	6548	7386	10997 +	6294	14171 +	**	10178	8595	9327	9187

Table 4. Plant cane cane yield for ten commercial and four experimental varieties at nine outfield locations in 2022.

	HEAVY			LIGHT						
Variety	Allains	Alma	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(tons /A)					
L01-299	28.8	35.7	31.7	29.1	39.2	34.5	39.1	33.6	27.4	33.2
HoCP04-838				33.1		37.0				35.0
HoCP09-804	26.7	38.5	31.8	32.1	35.1	32.7	36.1	33.0	27.9	32.7
L12-201	29.8	38.0	34.1	30.5	42.0	33.4	35.1	30.4	26.7	33.3
Ho12-615	26.4	41.8	40.1 +	39.7 +	42.7	41.1	41.8	36.6	24.5	37.4 +
Ho13-739	24.2	26.1 -	30.8	32.3	38.3	35.4	34.3	34.0	24.8	30.8
L14-267	24.6	31.7	33.0	24.0	30.6 -	41.7 +	32.8	26.1 -	27.9	30.2
HoCP14-885	29.0	41.9	39.1 +	27.4	47.1 +	38.6	44.1	35.2	31.6	37.1 +
L15-306	28.3	40.3	33.8	24.7	40.1	36.0	37.2	35.8	26.2	33.6
HoL15-508	29.0	24.2 -	39.5 +	34.0	42.6	29.7	28.7 -	35.6	32.2	32.8
Ho17-738	29.7	34.4	29.7	30.3	34.7	36.1	34.2	28.9	31.5	32.2
Ho17-776						37.8				37.8
HoCP18-803	31.2	34.8	39.2 +	42.4 +	34.8	40.9	42.9	37.6	33.2	37.4 +
Ho18-878	24.4	34.7	34.8	21.6 -	43.1		33.7	28.4	30.1	31.4

Table 5. Plant cane sucrose content for ten commercial and four experimental varieties at nine outfield locations in 2022.

	HEAVY			LIGHT						
Variety	Allains	Alma	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds /ton)					
L01-299	249	162	270	272	313	273	275	277	307	266
HoCP04-838				280		270				275
HoCP09-804	285 +	220 +	294	274	316	280	294	293	297	283
L12-201	276 +	193 +	271	284	301	283	293	274	278 -	273
Ho12-615	273 +	172	284	276	298	272	280	273	275 -	268
Ho13-739	313 +	221 +	312 +	295 +	302	265	276	288	299	285
L14-267	275 +	206 +	297 +	282	305	288	303 +	297	303	284
HoCP14-885	290 +	194 +	305 +	296 +	315	299 +	298	309 +	315	291 +
L15-306	281 +	192 +	308 +	283	320	266	300 +	291	281 -	279
HoL15-508	289 +	208 +	313 +	274	328	295	316 +	303 +	306	292 +
Ho17-738	272 +	175	302 +	295 +	304	279	292	281	298	278
Ho17-776						294				294
HoCP18-803	263	174	301 +	288	320	243 -	294	306 +	293	276
Ho18-878	269	214 +	315 +	292	329		302 +	303 +	310	292 +

Table 6. Plant cane stalk weight for ten commercial and four experimental varieties at nine outfield locations in 2022.

	HEAVY			LIGHT						
Variety	Allains	Alma	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds)					
L01-299	1.91	2.40	2.31	2.22	2.12	2.21	1.85	2.29	2.62	2.22
HoCP04-838				1.97		2.12				2.05
HoCP09-804	1.69	1.53 -	1.84 -	2.20	1.73	1.95	1.79 +	1.95	1.96 -	1.85 -
L12-201	2.47 +	2.67	2.91 +	2.50	3.00 +	2.73 +	3.13 +	2.97 +	2.57	2.77 +
Ho12-615	1.71	2.34	2.13	2.59	2.38	2.27	2.35 +	2.34	2.53	2.30
Ho13-739	2.43 +	2.02	2.60	2.65 +	2.65 +	2.65 +	2.71 +	2.99 +	2.80	2.61 +
L14-267	2.54 +	2.47	2.57	2.80 +	2.33	2.80 +	2.67 +	2.43	2.87	2.61 +
HoCP14-885	2.35 +	2.51	2.43	2.38	2.44	2.83 +	2.77 +	2.74 +	2.71	2.57 +
L15-306	2.16	2.58	2.36	2.39	2.58 +	2.64 +	2.28 +	2.49	2.49	2.44 +
HoL15-508	2.34 +	1.98 -	2.53	2.24	2.24	2.29	2.37 +	2.41	2.24	2.29
Ho17-738	2.20	2.29	2.04	2.38	2.36	2.85 +	2.46 +	2.42	2.54	2.38
Ho17-776						2.19				2.19
HoCP18-803	2.32 +	2.32	2.69	2.81 +	2.71 +	2.43	2.94 +	2.49	2.47	2.58 +
Ho18-878	2.24	1.70	1.74 -	2.31	1.85		1.92	2.01	1.81 -	1.95 -

Table 7. Plant cane stalk number for ten commercial and four experimental varieties at nine outfield locations in 2022.

	HEAVY			LIGHT						
Variety	Allains	Alma	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(stalks/A)					
L01-299	31035	29701	27608	26335	36860	31323	42592	29293	21329	30675
HoCP04-838				33883		35980				34931
HoCP09-804	31715	50281 +	34427	29667	40967	33641	41291	33905	29220	36190 +
L12-201	24369	28739	23459	24326	28125	24782	22528 -	20437	21135	24211 -
Ho12-615	30849	35812	37769 +	30713	36750	36354	35496	31414	19868	32924
Ho13-739	20238 -	25091	24037	24426	29306	27639	25726 -	22699	17833	23909 -
L14-267	19844 -	25328	26248	17168	27695	30296	24880 -	21001	19578	23492 -
HoCP14-885	24711	33391	32474	22996	38560	27339	31609 -	25838	23583	28945
L15-306	26316	31624	29438	20561	31140	27329	32794 -	28871	21396	27654
HoL15-508	24974	24703	31200	30937	37983	26031	24259 -	30052	28772	28768
Ho17-738	26951	29841	29460	25503	29784	26535	28154 -	23865	25062	27268
Ho17-776						35701				35701
HoCP18-803	27334	32739	29452	30210	25658 -	34851	29276 -	30254	27157	29659
Ho18-878	22325	40809 +	41240 +	18704	46452 +		36225	28960	34644 +	33670

Table 8. First Ratoon sugar per acre for twelve commercial and two experimental varieties at ten outfield locations in 2022.

	HEAVY				LIGHT						
Variety	Allains	Alma	Landry	Mary	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds/A)						
HoCP96-540					8580		8095				8337
CP01-1372	6428	3112 -	8136		9715	11049 -		7538	10214 -	9542	8217 -
L01-299	7897	5765	9319	6036	9864	13133	9830	8777	13343	11068	9503
HoCP04-838					8023		11105				9564
Ho05-961	8233	3938	7510	8085 +	7605 -	7789 -		7110	12038	11091	8155 -
HoCP09-804	9476	5688	7958	7058	10803	10384 -	10484	7126	12435	9938	9135
L12-201	8263	5753	8460	6506	10455	11419	9572	7572	10089 -	10435	8852
Ho12-615	9512	5951	10198	6256	12056 +	10060 -	8949	8101	13650	10558	9529
Ho13-739	8432	1726 -	10103	7345	9755	10653 -	9458	8249	11736	9971	8743
L14-267	7701	3755 -	8839		10842	10316 -	8130	8503	11580	10982	8961
HoCP14-885	8746	6505	10203	6331	11491	11755	12785 +	9274	12843	11900	10183
L15-306	8924	4769	9530		9208	10022 -	9159	8060	10876 -	11333	9098
HoL15-508	8402	5373	10750	8529 +	11101	10009 -	10204	7275	11346 -	10394	9338
Ho17-738	8658	6247	9637	7126	10488	10087 -	10175	7768	10080 -	11806	9176

Table 9. First Ratoon cane yield for twelve commercial and two experimental varieties at ten outfield locations in 2022.

	HEAVY				LIGHT						
Variety	Allains	Alma	Landry	Mary	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
						(tons/A)					
HoCP96-540					30		31.9				30.9
CP01-1372	23.4	15 -	32.5		35.2	36.7		28.3	34.1 -	32.9	29.8 -
L01-299	27.8	29.1	36.4	27.6	32.6	42.7	34.4	32	46.7	36	34.5
HoCP04-838					29.6		38.8				34.2
Ho05-961	27.8	18.3 -	25 -	30	26.2	26.1 -		23.6 -	39.3 -	34.3	27.9 -
HoCP09-804	32.2	27.9	29.3 -	27.9	36.4	33.8 -	36.5	24.3 -	41.5	32.3	32.2
L12-201	29.3	29.4	33.5	28	36.4	38	34.8	28.7	35.7 -	32.7	32.6
Ho12-615	33	32.5	39.2	26.6	41.9 +	34.3 -	32	29.5	46.6	34.8	35.1
Ho13-739	26.4	7.8 -	34.2	27.2	33.4	35.6 -	33.9	26.8	38.9 -	32	29.6 -
L14-267	25	16.5 -	33.8		36.2	34.5 -	28.8	27.2	38.8 -	34.6	30.6 -
HoCP14-885	28.5	30.6	35.7	29	36.2	37.8	41.6 +	32.6	40.2	36.7	34.9
L15-306	29.3	23.1	34.7		30.3	33.3 -	31.9	26.9	37 -	35.5	31.3 -
HoL15-508	28	24.3	35.9	32.9	36.3	32.5 -	34.4	22.3 -	36.6 -	32.3	31.6
Ho17-738	30.5	31	33.2	29	35.8	34.4 -	40.8	26.9	34.4 -	37.4	33.3

Table 10. First Ratoon sucrose content for twelve commercial and two experimental varieties at ten outfield locations in 2022.

	HEAVY				LIGHT						
Variety	Allains	Alma	Landry	Mary	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds/ton)						
HoCP96-540					286		252 -				269
CP01-1372	275	211	250		276 -	301		268	300	290	271
L01-299	284	198	256	218	302	308	286	274	285	307	272
HoCP04-838					271 -		287				279
Ho05-961	296	215	299 +	270 +	292	297		301 +	306	323	289
HoCP09-804	294	205	272	254 +	297	307	286	294	300	308	282
L12-201	281	196	253	232	288	301	275	264	283	319	269
Ho12-615	288	183	260	235	288	293	280	274	293	303	270
Ho13-739	319 +	234 +	295 +	270 +	292	300	279	308 +	301	312	291 +
L14-267	308 +	225 +	262		299	300	281	313 +	298	317	289
HoCP14-885	306	212	286 +	218	317	311	307	284	319 +	324	288
L15-306	305	208	274		304	301	286	300 +	294	319	288
HoL15-508	300	221 +	299 +	259 +	306	308	297	326 +	310 +	321	295 +
Ho17-738	284	203	290 +	247 +	293	293	249 -	289	284	315	274

Table 11. First Ratoon stalk weight for twelve commercial and two experimental varieties at ten outfield locations in 2022.

	HEAVY				LIGHT						
Variety	Allains	Alma	Landry	Mary	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(pounds)						
HoCP96-540					2.56 +		2.47				2.51 +
CP01-1372	1.51 -	1.56	1.9		1.79	1.57		1.98	1.94	1.73	1.75
L01-299	2.12	1.52	1.67	1.45	1.8	1.98	2.28	1.87	2.07	1.84	1.86
HoCP04-838					2.66 +		2.05				2.36 +
Ho05-961	2.25	1.7	1.62	2.04 +	2.07	1.64		1.71	2.38	2.21	1.96
HoCP09-804	1.49 -	1.32	1.61	1.28	1.72	1.59	1.67 -	1.39 -	1.84	1.76	1.57 -
L12-201	2.46	1.83	2.4 +	2.18 +	3.02 +	2.73 +	2.59	2.57 +	2.98 +	2.46 +	2.52 +
Ho12-615	1.65 -	1.91	1.76	1.38	1.94	1.66	1.87 -	1.68	2.01	1.66	1.75
Ho13-739	2.31	1.12	2.28 +	1.85	2.37 +	2.18	2.65	1.91	2.38	2.33 +	2.14 +
L14-267	2.43	1.67	2.22 +		2.73 +	2.13	2.61	1.98	2.9 +	2	2.30 +
HoCP14-885	2.19	1.68	2.05	1.65	2.37 +	2.08	2.75 +	2.06	2.84 +	1.86	2.15 +
L15-306	1.88	1.66	1.89		2.17	1.71	2.05	1.77	2.43	2.1	1.96
HoL15-508	2.03	1.38	1.83	1.6	2.01	1.88	2.24	1.9	2.27	2.13	1.93
Ho17-738	2.1	1.84	1.58	1.75	2.05	2.11	2.51	1.86	1.82	2.06	1.97

Table 12. First Ratoon stalk number for twelve commercial and two experimental varieties at ten outfield locations in 2022.

	HEAVY				LIGHT						
Variety	Allains	Alma	Landry	Mary	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	St.John	Overall Mean
					(stalks/A)						
HoCP96-540					24758 -		26388				25573 -
CP01-1372	32176	18665 -	34371 -		40008	47776		28821	35357 -	38762	34492
L01-299	26100	39245	43895	38680	37164	43194	30361	34988	45139	41699	38046
HoCP04-838					23204 -		38215				30710 -
Ho05-961	24668	21682 -	32417 -	29751	25268 -	31691 -		27887	33308 -	31219 -	28655 -
HoCP09-804	43541 +	42285	36348	44184	42611	42864	43717 +	34822	45401	36856	41263
L12-201	23861	32708	27921 -	26146 -	24138 -	28016 -	26922	22414 -	24039 -	26869 -	26304 -
Ho12-615	40774 +	34645	45609	39202	44377	41446	34320	35220	46609	42160	40436
Ho13-739	23034	13659 -	30096 -	30153	28126	32651 -	25933	28321	33044 -	27377 -	27239 -
L14-267	20807	19165 -	31193 -		26881 -	32441 -	23274	27952	27152 -	35624	27165 -
HoCP14-885	26131	36951	34907	35244	30496	36763	30609	32234	28679 -	39608	33162 -
L15-306	31499	27397 -	36740		27708 -	39804	31234	30302	30917 -	33974	32175 -
HoL15-508	27962	35393	39752	41585	36325	34843	30716	23528 -	32312 -	30506 -	33292 -
Ho17-738	29378	33815	41909	33047	35029	32710 -	32538	29333	41212	36427	34540 -

Table 13. Second Ratoon sugar per acre for twelve commercial varieties at nine outfield locations in 2022.

	HEAVY				LIGHT					
Variety	Allains	Alma	Domingue	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	Overall Mean
					(pounds/A)					
HoCP96-540	8008	4024	4237 -	6862 -	5518	10649 -	4667 -	5690	5791 -	6161 -
L01-299	8882	5146	6805	9108	6477	13683	7801	7531	9891	8369
Ho05-961		4578	3879 -	7174 -	6313		5997	7967	9233	6449 -
HoCP09-804	8397	5546	6644	8948	8292	9265 -	7571	8325	9160	7979
L11-183	7447	3088 -	4191 -	6080 -	7131	9576 -	4286 -	6981	8183	6407 -
L12-201	7281	5047	4458 -	7462	7000	9163 -	6577	7217	8272	6942
Ho12-615	8924	4727	3402 -	8112	9453 +	10336 -	5395 -	7997	7039 -	7265
Ho13-739	8878	4532	6292	8837	8476 +	10188 -	6014	6571	7933 -	7525
L14-267	8565	4489	5417	8729	8207	10940 -	7426	7541	9369	7872
HoCP14-885	10525	6002	6872	8851	8221	10913 -	8455	8735	9774	8705
L15-306	9144	5204	5840	7616	7404	11073 -	6093	8201	7963 -	7615
HoL15-508	10107	6468	5970	7651	9586 +	11482 -	6949	7123	9674	8334

Table 14. Second Ratoon cane yield for twelve commercial varieties at nine outfield locations in 2022.

Variety	HEAVY Allains	Alma	Domingue	Landry	LIGHT Brunswick	Glenwood	Harper	Lanaux	R. Hebert	Overall Mean
					(tons/A)					
HoCP96-540	30.4	23.5	16.8 -	24.3	22.6	38.4	25.9 -	25.7	21.5 -	25.5 -
L01-299	33	26.2	24	30.1	25.3	45.2	38	29.8	35.1	31.9
Ho05-961		26.8	15 -	23.7	21.3		28.1 -	28.2	30.2	24.8 -
HoCP09-804	30.6	28.6	23	27.7	29.1	30.9 -	34.6	30.4	32.2	29.7
L11-183	26.5	17.1 -	16.8 -	22 -	28.2	32.7 -	26 -	29.4	28 -	25.2 -
L12-201	26.6	25.7	17.4	25.1	25.3	30.8 -	30.4 -	27	28.7	26.3 -
Ho12-615	31	26	14.8 -	26.7	33.3 +	35.3 -	27.5 -	31	25.2 -	27.9 -
Ho13-739	28.3	18.3 -	20.5	26.8	28.3	36.1 -	25.8 -	22.5 -	26.7 -	25.9 -
L14-267	27.8	20.2	20.1	28	29.2	35.7 -	31.5	26.2	31.3	27.6 -
HoCP14-885	33.7	30	23.3	28.2	29.1	35.6 -	36.1	31.6	32.5	31.1
L15-306	31.8	29.1	22.8	25.9	28.1	36.4 -	29.3 -	28.9	27 -	28.8
HoL15-508	35.7	33 +	22.8	27.9	33.5 +	36 -	30.7 -	23.5	32.8	30.7

Table 15. Second Ratoon sucrose content for twelve commercial varieties at nine outfield locations in 2022.

	HEAVY				LIGHT					
Variety	Allains	Alma	Domingue	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	Overall Mean
					(pounds/ton)					
HoCP96-540	263	173	251 -	283	245	279 -	182 -	222 -	269	241 -
L01-299	269	194	281	303	256	304	206	252	283	261
Ho05-961		172	256 -	301	297 +		213	283 +	307 +	261
HoCP09-804	275	193	288	314	286 +	300	217	274	283	268
L11-183	281	182	253 -	277 -	254	293	178 -	237	292	253
L12-201	274	197	254 -	298	279 +	297	217	266	289	263
Ho12-615	287	184	225 -	304	283 +	293	194	258	279	256
Ho13-739	313 +	247 +	306 +	330 +	300 +	283	233 +	290 +	297	289 +
L14-267	308 +	221 +	267	311	281 +	307	235 +	288 +	300	282 +
HoCP14-885	312 +	201	296	314	283 +	307	234 +	277 +	299	280
L15-306	288	180	255 -	294	266	304	210	283 +	295	264
HoL15-508	283	198	261	277 -	286 +	318	225	303 +	295	272

Table 16. Second Ratoon stalk weight for twelve commercial varieties at nine outfield locations in 2022.

	HEAVY				LIGHT					
Variety	Allains	Alma	Domingue	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	Overall Mean
					(pounds)					
HoCP96-540	1.99	1.89	1.67	1.6	1.71	2.16 +	2.01	1.99 +	1.8	1.87 +
L01-299	1.65	1.66	1.51	1.65	1.37	1.65	2.08	1.49	1.63	1.63
Ho05-961		2.16 +	1.14	1.36	1.5		1.89	1.98 +	1.91	1.71
HoCP09-804	1.78	1.43	1.29	1.24	1.18	1.41	1.66 -	1.57	1.35	1.44 -
L11-183	1.99	1.56	1.21	1.45	1.56	2.06 +	1.93	2.08 +	1.81	1.74
L12-201	2.5 +	1.81	1.66	1.66	1.87 +	2.59 +	2.01	2.16 +	2.62 +	2.10 +
Ho12-615	1.5	1.6	1.1	1.24	1.47	1.33	1.44 -	1.63	1.48	1.42 -
Ho13-739	1.8	1.81	1.67	1.83	1.74	2.14 +	2.19	1.97 +	2.13 +	1.92 +
L14-267	2.32 +	1.64	1.81	1.78	1.82 +	2.07 +	1.97	2.12 +	2.36 +	1.99 +
HoCP14-885	1.83	1.8	1.6	1.71	1.66	2.1 +	1.87	2.09 +	2.02	1.85 +
L15-306	1.89	2.1 +	1.49	1.49	1.67	1.69	1.75	1.92 +	1.6	1.73
HoL15-508	2.25 +	1.64	1.29	1.67	1.67	1.72	2.08	2.01 +	1.95	1.81 +

Table 17. Second Ratoon stalk number for twelve commercial varieties at nine outfield locations in 2022.

	HEAVY				LIGHT					
Variety	Allains	Alma	Domingue	Landry	Brunswick	Glenwood	Harper	Lanaux	R. Hebert	Overall Mean
					(stalks/A)					
HoCP96-540	30594 -	24997	20072 -	30232	26796 -	35515 -	25858 -	25842 -	26658 -	27396 -
L01-299	40944	32201	32052	36582	37401	55851	36708	40409	43455	39511
Ho05-961		24859	26180	34827	28392		30050	28650 -	32433 -	29342 -
HoCP09-804	37647	40191	35670	45197	49243 +	45189 -	41996	38798	48214	42354
L11-183	26589 -	21809 -	27321	31166	37258	32554 -	27303 -	28302 -	30997 -	29256 -
L12-201	21681 -	28481	20779 -	30132	26811 -	23899 -	31840	25200 -	21952 -	25642 -
Ho12-615	41888	32286	27200	43004	45561	53720	37947	38077	34275	39329
Ho13-739	31496 -	20340 -	24891	29282	32667	34240 -	23556 -	23814 -	25139 -	27269 -
L14-267	23988 -	23544	21925 -	31667	32909	35368 -	32013	24873 -	26605 -	27949 -
HoCP14-885	36827	33410	29026	33035	35146	34250 -	38653	30751 -	32854 -	33772 -
L15-306	33811	28534	30537	35671	35625	43084 -	33505	30040 -	34386	33910 -
HoL15-508	31973	40168	35246	33615	40296	42596 -	29711	23800 -	34084 -	34610 -

Table 18. Third Ratoon sugar per acre for thirteen commercial and one experimental variety at three outfield locations in 2022.

	LIGHT			
Variety	Brunswick	Harper	R. Hebert	Overall Mean
			(pounds/ton)	
HoCP96-540	4386 -	2663 -	7211 -	4443 -
L01-299	8477	6314	9930	8240
Ho04-838	6915	5017	7675 -	6536
HoCP09-804	6587 -	6739	7357 -	6894
L11-183	7501	4265 -	8008 -	6591
Ho11-573	6001 -	4831	6665 -	5833 -
L12-201	7293	3547 -	8453	6431
Ho12-615	8373	5341	8921	7545
Ho13-739	8047	5041	8487	7192
L14-267	7800	6336	11030	8056
HoCP14-802	7532	6567	10208	8171
HoCP14-885	8859	6214	10411	8495
L15-306	8183	6310	8062 -	7518
HoL15-508	10941 +	6351	9260	8850

Table 19. Third Ratoon cane yield for thirteen commercial and one experimental variety at three outfield locations in 2022.

Variety	Brunswick (LIGHT)	Harper (LIGHT)	R. Hebert (LIGHT)	Overall Mean
		(Tons/A)		
HoCP96-540	20.6 -	16.8 -	25.6 -	21.0 -
L01-299	34.1	32.4	33	33.2
Ho04-838	25.6 -	23.7 -	25.1 -	24.8 -
HoCP09-804	26.4 -	31.8	25.5 -	27.9
L11-183	30.8	25.8	27.8	28.1
Ho11-573	25.1 -	26	22.7 -	24.6 -
L12-201	26.6 -	19 -	28.4	24.7 -
Ho12-615	34	30.6	31.1	31.9
Ho13-739	28	23.4 -	25.9 -	25.7 -
L14-267	29.7	29.1	34.2	31.0
HoCP14-802	33.3	34.8	35.7	34.7
HoCP14-885	33.1	29.1	31.7	31.3
L15-306	33.7	29.9	26.4	30.0
HoL15-508	39.2	28	30.4	32.5

Table 20. Third Ratoon sucrose content for thirteen commercial and one experimental variety at three outfield locations in 2022.

Variety	LIGHT Brunswick	Harper	R. Hebert	Overall Mean
			(pounds/ton)	
HoCP96-540	214 -	156 -	264 -	205 -
L01-299	250	197	302	249
Ho04-838	268	212	306	262
HoCP09-804	251	212	289	251
L11-183	244	166 -	290	233
Ho11-573	241	186	293	240
L12-201	275 +	192	298	255
Ho12-615	246	175	288	236
Ho13-739	287 +	215	328 +	277
L14-267	264	219 +	303	257
HoCP14-802	238	189	287	238
HoCP14-885	267	214	328 +	270
L15-306	242	211	307	254
HoL15-508	278 +	228 +	305	271

Table 21. Third Ratoon stalk weight for thirteen commercial and one experimental variety at three outfield locations in 2022.

	LIGHT			
Variety	Brunswick	Harper	R. Hebert	Overall Mean
		(pounds)		
HoCP96-540	1.76	1.97	2.47 +	2.07 +
L01-299	1.6	1.64	1.47	1.57
Ho04-838	1.63	1.67	1.91 +	1.74
HoCP09-804	1.28	1.32	1.43	1.34
L11-183	1.62	1.83	1.64	1.69
Ho11-573	2	1.99	1.94 +	1.98 +
L12-201	2.15 +	2.01	2.43 +	2.20 +
Ho12-615	1.35	1.58	1.6	1.51
Ho13-739	1.7	2.04	1.97 +	1.90 +
L14-267	1.99	2.14 +	2.11 +	2.08 +
HoCP14-802	1.46	1.54	1.66	1.56
HoCP14-885	1.74	1.92	2.05 +	1.90 +
L15-306	1.54	1.79	1.71	1.68
HoL15-508	1.68	1.47	1.89 +	1.68

Table 22. Third Ratoon stalk number for thirteen commercial and one experimental variety at three outfield locations in 2022.

Variety	LIGHT Brunswick	Harper	R. Hebert	Overall Mean
		(stalks/A)		
HoCP96-540	23576 -	16606 -	20769 -	20317 -
L01-299	43688	39392	45481	42854
Ho04-838	31814 -	29101 -	26792 -	29236 -
HoCP09-804	41048	49108 +	39582	43246
L11-183	38089	28274 -	33849 -	33404 -
Ho11-573	25101 -	26207 -	23874 -	25061 -
L12-201	25031 -	18572 -	23575 -	22393 -
Ho12-615	50716	38670	38912	42766
Ho13-739	32953 -	22889 -	26338 -	27393 -
L14-267	30920 -	27040 -	32791 -	30250 -
HoCP14-802	46209	45099	43768	44881
HoCP14-885	37883	30317	31068 -	33089 -
L15-306	43692	33492	31194 -	36126 -
HoL15-508	47145	37850	32126 -	39041

Table 23. Fourth Ratoon sugar per acre for twelve commercial and one experimental variety at two outfield locations in 2022.

	LIGHT	HEAVY	
	Glenwood	Mary	Overall Mean
		(pounds/A)	
HoCP96-540	4399 -	6775	5587
L01-283	8443	7616	8029
L01-299	8019	7075	7547
Ho04-838	8441	6415	7428
HoCP09-804	7009	7415	7212
L11-183	5588	6634	6111
Ho11-573	6834	7626	7230
L12-201	8598	7839	8219
Ho12-615	5886 -	8353	7119
Ho13-739	7608	7145	7377
L14-267	8166	8224	8195
HoCP14-802	10234 +	7754	8741
HoCP14-885	8891	7119	8005

Table 24. Fourth Ratoon cane yield for twelve commercial and one experimental variety at two outfield locations in 2022.

	LIGHT	HEAVY	
	Glenwood	Mary	Overall Mean
		(Tons/acre)	
HoCP96-540	15.7 -	33.4	24.5 -
L01-283	28.5	32.4	30.5
L01-299	30.5	34.1	32.3
Ho04-838	27.5	26.7 -	27.1
HoCP09-804	23.6 -	28.0	25.8
L11-183	23.7 -	31.8	27.8
Ho11-573	25.8	36.3	31.0
L12-201	29.3	35.6	32.5
Ho12-615	22.0 -	35.0	28.5
Ho13-739	23.7 -	27.9	25.8
L14-267	27.7	33.0	30.4
HoCP14-802	33.0	33.6	33.3
HoCP14-885	29.1	29.7	29.4

Table 25. Fourth Ratoon sucrose yield for twelve commercial and one experimental variety at two outfield locations in 2022.

	LIGHT	HEAVY	
	Glenwood	Mary	Overall Mean
		(pounds/ton)	
HoCP96-540	281	203	242
L01-283	296 +	235 +	265
L01-299	263	206	235
Ho04-838	306 +	240 +	273
HoCP09-804	297 +	267 +	282 +
L11-183	235 -	209	222
Ho11-573	265	208	237
L12-201	294 +	221	258
Ho12-615	268	242 +	255
Ho13-739	322 +	257 +	289 +
L14-267	294 +	249 +	272
HoCP14-802	268	231 +	250
HoCP14-885	305 +	239 +	272

Table 26. Fourth Ratoon stalk weight for twelve commercial and one experimental variety at two outfield locations in 2022.

	LIGHT	HEAVY	
	Glenwood	Mary	Overall Mean
		(pounds)	
HoCP96-540	1.77 +	1.68	1.73
L01-283	1.39	1.50	1.44
L01-299	1.34	1.49	1.42
Ho04-838	1.47	1.47	1.47
HoCP09-804	1.08	1.12	1.10
L11-183	1.49	1.53	1.51
Ho11-573	1.88 +	2.01 +	1.95 +
L12-201	1.92 +	2.11 +	2.01 +
Ho12-615	1.33	1.38	1.35
Ho13-739	1.56	1.59	1.57
L14-267	1.71	1.85	1.78 +
HoCP14-802	1.53	1.45	1.49
HoCP14-885	1.43	1.54	1.48

Table 27. Fourth Ratoon stalk number for twelve commercial and one experimental variety at two outfield locations in 2022.

	LIGHT	HEAVY	
	Glenwood	Mary	Overall Mean
		(stalks/A)	
HoCP96-540	18468 -	39831	29149 -
L01-283	41353	43547	42450
L01-299	45752	46415	46083
Ho04-838	38276	36647 -	37462 -
HoCP09-804	45449	49769	47609
L11-183	32281 -	41947	37114 -
Ho11-573	27621 -	36639 -	32130 -
L12-201	30507 -	34061 -	32284 -
Ho12-615	33328 -	50702	42015
Ho13-739	30324 -	35680 -	33002 -
L14-267	32578 -	35703 -	34140 -
HoCP14-802	51541	46620	48594
HoCP14-885	42688	38572	40630

Table 28. Plant cane means from nine outfield locations in 2022: Allains, Alma, Brunswick, Glenwood, Harper, Lanaux, Landry, R.Hebert, and St.John..

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(pounds/A)	(tons/A)	(pounds/ton)	(pounds)	(stalks/A)
L01-299	8741	33.2	266	2.22	30675
HoCP04-838	9632	35.0	275	2.05	34931
HoCP09-804	9215	32.7	283	1.85 -	36190 +
L12-201	9059	33.3	273	2.77 +	24211 -
Ho12-615	9987 +	37.4 +	268	2.30	32924
Ho13-739	8770	30.8	285	2.61 +	23909 -
L14-267	8643	30.2	284	2.61 +	23492 -
HoCP14-885	10769 +	37.1 +	291 +	2.57 +	28945
L15-306	9350	33.6	279	2.44 +	27654
HoL15-508	9709	32.8	292 +	2.29	28768
Ho17-738	8917	32.2	278	2.38	27268
Ho17-776	11112	37.8	294	2.19	35701
HoCP18-803	10388 +	37.4 +	276	2.58 +	29659
Ho18-878	9187	31.4	292 +	1.95 -	33670

Table 29. First Ratoon means from ten outfield locations in 2022: Allains, Alma, Brunswick, Glenwood, Harper, Lanaux, Landry, Mary, R.Hebert, and St.John..

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(pounds/A)	(tons/A)	(pounds/ton)	(pounds)	(stalks/A)
HoCP96-540	8337	30.9	269	2.51 +	25573 -
CP01-1372	8217 -	29.8 -	271	1.75	34492
L01-299	9503	34.5	272	1.86	38046
HoCP04-838	9564	34.2	279	2.36 +	30710 -
Ho05-961	8155 -	27.9 -	289	1.96	28655 -
HoCP09-804	9135	32.2	282	1.57 -	41263
L12-201	8852	32.6	269	2.52 +	26304 -
Ho12-615	9529	35.1	270	1.75	40436
Ho13-739	8743	29.6 -	291 +	2.14 +	27239 -
L14-267	8961	30.6 -	289	2.30 +	27165 -
HoCP14-885	10183	34.9	288	2.15 +	33162 -
L15-306	9098	31.3 -	288	1.96	32175 -
HoL15-508	9338	31.6	295 +	1.93	33292 -
Ho17-738	9176	33.3	274	1.97	34540 -

Table 30. Second Ratoon means from nine outfield locations in 2022: Allains, Alma, Brunswick, Domingue, Glenwood, Harper, Lanaux, Landry, and R.Hebert,..

Variety	Sugar per Acre (pounds/A)	Cane Yield (tons/A)	Sugar per Ton (pounds/ton)	Stalk Weight (pounds)	Stalk Number (stalks/A)
HoCP96-540	6161 -	25.5 -	241 -	1.87 +	27396
L01-299	8369	31.9	261	1.63	39511
Ho05-961	6449 -	24.8 -	261	1.71	29342 -
HoCP09-804	7979	29.7	268	1.44 -	42354
L11-183	6407 -	25.2 -	253	1.74	29256 -
L12-201	6942 -	26.3 -	263	2.10 +	25642 -
Ho12-615	7265	27.9 -	256	1.42 -	39329
Ho13-739	7525	25.9 -	289 +	1.92 +	27269 -
L14-267	7872	27.6 -	282 +	1.99 +	27949 -
HoCP14-885	8705	31.1	280	1.85 +	33772 -
L15-306	7615	28.8	264	1.73	33910 -
HoL15-508	8334	30.7	272	1.81 +	34610 -

Table 31. Third Ratoon means from three outfield locations in 2022: Brunswick, Harper, and R. Hebert.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(pounds/A)	(tons/A)	(pounds/ton)	(pounds)	(stalks/A)
HoCP96-540	4443 -	21.0 -	205 -	2.07 +	20317 -
L01-299	8240	33.2	249	1.57	42854
Ho04-838	6536	24.8 -	262	1.74	29236 -
HoCP09-804	6894	27.9	251	1.34	43246
L11-183	6591	28.1	233	1.69	33404 -
Ho11-573	5833 -	24.6 -	240	1.98 +	25061 -
L12-201	6431	24.7 -	255	2.20 +	22393 -
Ho12-615	7545	31.9	236	1.51	42766
Ho13-739	7192	25.7 -	277	1.90 +	27393 -
L14-267	8056	31.0	257	2.08 +	30250 -
HoCP14-802	8171	34.7	238	1.56	44881
HoCP14-885	8495	31.3	270	1.90 +	33089 -
L15-306	7518	30.0	254	1.68	36126 -
HoL15-508	8850	32.5	271	1.68	39041

Table 32. Fourth Ratoon means from two outfield locations in 2022: Glenwood and Mary.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(pounds/A)	(tons/A)	(pounds/ton)	(pounds)	(stalks/A)
HoCP96-540	5587	24.5 -	242	1.73	29149 -
L01-283	8029	30.5	265	1.44	42450
L01-299	7547	32.3	235	1.42	46083
Ho04-838	7428	27.1	273	1.47	37462 -
HoCP09-804	7212	25.8	282 +	1.10	47609
L11-183	6111	27.8	222	1.51	37114 -
Ho11-573	7230	31.0	237	1.95 +	32130 -
L12-201	8219	32.5	258	2.01 +	32284 -
Ho12-615	7119	28.5	255	1.35	42015
Ho13-739	7377	25.8	289 +	1.57	33002 -
L14-267	8195	30.4	272	1.78 +	34140 -
HoCP14-802	8741	33.3	250	1.49	48594
HoCP14-885	8005	29.4	272	1.48	40630

Table 33. Plant cane means across outfield locations from 2020 to 2022.

Variety	Sugar per Acre (pounds/A)	Cane Yield (tons/A)	Sugar per Ton (pounds/ton)	Stalk Weight (pounds)	Stalk Number (stalks/A)
L01-299	9026	32.8	274	2.24	29720
HoCP09-804	9025	31.6	286 +	1.80 -	35739 +
L12-201	9098	32.8	277	2.73 +	24173 -
Ho12-615	9928 +	36.5 +	272	2.13 -	34755 +
Ho13-739	8956	31.4	285 +	2.51 +	25297 -
L14-267	9084	31.9	284 +	2.63 +	24511 -
HoCP14-885	10933 +	37.4 +	292 +	2.51 +	30013
L15-306	9550	33.9	282	2.44 +	27882 -
HoL15-508	9690 +	32.6	297 +	2.31	28607

Table 34. First Ratoon means across outfield locations from 2021 to 2022.

Variety	Sugar per Acre	Cane Yield	Sugar per Ton	Stalk Weight	Stalk Number
	(pounds/A)	(tons/A)	(pounds/ton)	(pounds)	(stalks/A)
HoCP96-540	6924 -	25.8 -	266	2.20 +	24114 -
L01-299	8623	30.8	277	1.73	35896
HoCP04-838	9409	33.3	282	2.21 +	31317
Ho05-961	7678 -	26.3 -	289 +	1.91 +	27501 -
HoCP09-804	8376	29.2	285	1.52 -	38257
L12-201	7843	28.2	277	2.37 +	24129 -
Ho12-615	8437	30.6	275	1.65	37203
Ho13-739	8011	27.4 -	290 +	2.03 +	26529 -
L14-267	8235	28.2	289 +	2.13 +	26778 -
HoCP14-885	8968	30.3	293 +	1.99 +	30606 -
L15-306	8412	29.0	288 +	1.83	31915 -
HoL15-508	8738	29.4	295 +	1.82	32556 -

SUCROSE LABORATORY AT THE SUGAR RESEARCH STATION

Mavis Daigle, Michael Pontif, and Collins Kimbeng
Sugar Research Station

The Sugar Research Station Sucrose Laboratory processed 3,974 samples during the 2022 harvest season (Table 1).

A total of 3,494 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 480 samples. 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 August 2022 to December 2022.

Table 1. Number of sugarcane samples processed at the Sugar Research Station sucrose laboratory during the 2022 harvest season

Unit/Project Area	Leader	Number of Samples
School of Plant, Environmental, and Soil Sciences	Luciano Shiratsuchi	40
	Niranjan Baisakh	1,182
	Brenda Tubana	497
Plant Pathology and Crop Physiology	Jeff Hoy	96
LSU AgCenter Southeast Region	Albert Orgeron	401
LSU AgCenter Central Region	Andre Reis	360
Audubon Institute	Anurag Mandalika	60
LCES	Kenneth Gravois	56
Sugar Research Station/Variety Development	Line Trials	592
	Increase	157
	Nursery	437
Contract Services		96
TOTAL		3,974

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 2022-2023 production season, more than 13,300 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
L 01-299	6,430
HoCP 14-885	3,592
Ho 12-615	2,662
Ho 17-738	288
Ho 13-739	126
HoL 15-508	144
L 15-306	144
Total	13,386

THE 2022 LOUISIANA SUGARCANE VARIETY SURVEY

Kenneth A. Gravois
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. There was sugarcane grown in West Feliciana parish (Turnbull Island), but this acreage is reported in Pointe Coupee parish. According to USDA-Farm Service Agency (FSA), there were 512,274 acres planted to sugarcane in Louisiana in 2022.

Agents collected acreage according to variety and crop. A total of nine sugarcane varieties, HoCP 96-540, L 01-283, L 01-299, HoCP 04-838, HoCP 09-804, L 11-183, L 12-201, Ho 12-615, Ho 13-739, L 14-267, and HoCP 14-885 were listed along with "Others" in the survey. The category of "Others" included, but was not limited to, small acreages of HoCP 85-845, HoCP 00-950, 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 2022 was 512,274 acres, representing an increase of 0.67% compared to acreage in 2021.

Sugarcane Distribution by Variety
Statewide sugarcane acreage in percent by variety and crop is shown in Table 2. The leading variety for 2022 was L 01-299, which occupied 56% of the Louisiana sugarcane acreage. This percentage was two points lower than the acreage of L 01-299 in 2021 (Gravois, 2022). HoCP 96-540, L 01-283, and HoCP 09-804 were next in total acreage, planted on 8%, 8%, and 11%, respectively, of the state's acreage. The varieties planted in the next largest areas were Ho 12-615, HoCP 04-383, L 11-183, and Ho 13-739, each occupying 6%, 3%, 1%, and 1% of the state's acreage, respectively. All other varieties in the survey had 1% or less of the planted area for the 2022 crop. Newly released HoCP 14-885 was planted on 0.94% of the Louisiana sugarcane acreage, which was a large percentage for a newly released sugarcane variety.

Sugarcane Distribution by Region and Crop
The total sugarcane acreage was highest for the Teche region (194,014 acres), followed by the Northern region (159,229 acres), and the River-Bayou Lafourche region (158,922) [Table 3]. The northern area showed the greatest increase in acreage, with Avoyelles, Concordia, Evangeline, Lafourche, Pointe Coupee, and St. Landry parishes showing large increases in acreage in recent years. It should be noted that the northern sugarcane growing regions had more acreage than the Mississippi River-Bayou Lafourche area.

In 2022, 23.6% of the state's acreage was grown as third and older stubble crops, which was higher than the acreage of the same category for 2021. In 2022, 26.6%, 25.1%, and 24.7% 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 Bayou Teche region (30.3%). For the third and older stubble crops, the River-Bayou Lafourche and Northern regions had the highest percentage at 31.0% and 31.1%, respectively, whereas the Bayou Teche regions had the lowest acreage devoted to third and older stubble crops at 20.3%.

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 planting of L 01-299 and increased older stubble crops devoted to L 01-299. The River-Bayou Lafourche region had a larger percentage of L 01-299 (67.3%) than the Northern and Bayou Teche regions, 52.0% and 49.0%, respectively. The Northern region had more acres devoted to HoCP 09-804 than the other two regions. HoCP 96-540 was more widely grown (16.0%) in the Bayou Teche region, followed by the northern region and the River-Bayou Lafourche region at 4.0% and 2.2%, respectively. The survey showed more acres of Ho 12-615 planted in the Northern region.

Variety Trends

HoCP 96-540, released for commercial planting in 2003, occupied 8% of the state's 2022 acreage, a decrease of two percentage points from the previous year. The variety continues to perform well for some growers. The main reasons for decreasing acreage of HoCP 96-540 are lower yield potential in older stubble crops. HoCP 96-540 is better adapted to sandier soils. Rust infections can be high in the plantcane crop. HoCP 96-540 possesses superior cold tolerance.

L 01-283, released for commercial planting in 2008, occupied 8 percent of the Louisiana acreage in 2022. 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 56% of the state's acreage in 2022. 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 has 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 recovery and stubbles well, with its most notable attribute being superior cold tolerance. HoCP 04-838 has consistently been the top performing variety based on juice quality in cold tolerance trials conducted after severe freezes. Cane yield in stubble crops can be erratic; the variety does not take the drought well.

HoCP 09-804 was released to growers in 2016 and grown on 11% of the acreage. 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. Based on the variety survey, HoCP 09-804 was preferred in the northern sugarcane producing parishes.

L 11-183 was released to growers in 2018. The new variety was derived from the cross HoCP 92-624 x 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 has been negatively affected in older stubble crops following freezes.

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. L 12-201 has average stubbling ability.

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 three sugarcane variety freeze trials, Ho 12-615 was rated as having poor cold tolerance. Spring stands can be negatively affected by glyphosate ripeners applied the previous fall.

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

L 14-267 was released in 2021. Growers are encouraged to continue to increase L 14-267 on the farm. L 14-267 has a good disease package and sugar yield. One of the parents of L 14-267 is L 01-283, which provided good stubbling ability and a few off-types in the new variety. L 14-267 had very good sugar yield in third stubble outfield yield trials in 2021 and 2022.

HoCP 14-885 was released in 2021. HoCP 14-885 increased well from initial seed cane increase in 2022. The new variety has early maturity, excellent yield potential, and low fiber content (hogs will be attracted to this variety). The variety will lodge in bad weather and has a poor cold tolerance rating. In outfield variety trials, the new variety had excellent sugar yield in all crops including third stubble. HoCP 14-885 will be widely planted in 2023.

New sugarcane varieties L 15-306 and HoL 15-508

Two new sugarcane varieties were released in 2022. Seed cane was distributed through the American Sugar Cane. Growers are encouraged to expand both new varieties to see where each might be a fit in their farming operation.

Relying on a single variety can lead to changing disease reactions and insect infestations. This was seen with brown rust in LCP 85-384, HoCP 96-540, and L 01-283. 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 2023.

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

Gravois, K.A. 2022. The 2021 Louisiana sugarcane variety survey. Sugar Bulletin 100(9):15-19.

Table 1. Total area planted to sugarcane in Louisiana by region and parish, 2022.[1]

Region	Parish	2022 Acreage
Bayou Teche	Acadia	5,227
Bayou Teche	Calcasieu	85
Bayou Teche	Cameron	39
Bayou Teche	Iberia	56,502
Bayou Teche	Jeff Davis	180
Bayou Teche	Lafayette	8,781
Bayou Teche	St. Martin	32,106
Bayou Teche	St. Mary	46,019
Bayou Teche	Vermilion	45,478
Northern	Avoyelles	21,148
Northern	Concordia	294
Northern	Evangeline	1,507
Northern	Pointe Coupee	72,681
Northern	Rapides	19,659
Northern	St. Landry	27,579
Northern	West Baton Rouge	16,067
River-Bayou Lafourche	Ascension	18,289
River-Bayou Lafourche	Assumption	34,365
River-Bayou Lafourche	Iberville	38,700
River-Bayou Lafourche	Lafourche	25,946
River-Bayou Lafourche	St. Charles	1,265
River-Bayou Lafourche	St. James	25,915
River-Bayou Lafourche	St. John	6,369
River-Bayou Lafourche	Terrebonne	8,073
	Total	512,274

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

Table 2. Estimated statewide sugarcane percentage by variety and crop, all regions, 2022.[1]

Variety	Plant-cane	First-stubble	Second-stubble	Third-stubble and older	Total
	---------------------------- Percentage	--------------------------------------			
HoCP96-540	9,631.9	10,243.2	11,006.4	10,175.1	8.0
L01-283	3,456.2	6,917.1	16,324.1	12,287.0	7.6
L01-299	65,174.1	67,829.9	70,947.8	80,921.8	55.6
HoCP04-838	2,842.5	3,737.7	3,497.8	2,888.7	2.5
HoCP09-804	13,765.5	15,713.8	14,837.1	9,823.5	10.6
L11-183	1,653.4	2,201.7	2,424.2	877.6	1.4
L 12-201	7,166.3	2,989.0	788.7	99.5	2.2
Ho 12-615	18,964.3	10,932.0	1,922.4	241.5	6.3
Ho 13-739	3,220.7	1,371.0	118.6	117.7	0.9
L 14-267	727.8	110.7	35.7	24.7	0.2
HoCP 14-885	4,071.9	553.3	129.2	39.6	0.9
Others	5,531.8	6,012.8	4,273.8	3,543.6	3.8
% Crop	26.6	25.1	24.7	23.6	512,165

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

Table 3. Estimated sugarcane distribution by region and crop in Louisiana, 2022.[1]

Crop	Bayou Teche	River-Bayou Lafourche	Northern	State Total
Plant-cane Area (acres) Percent (%)	58,811 30.3	38,178 24.0	39,218 25.3	139,100 27.3
First-stubble Area (acres) Percent (%)	52,530 27.1	41,197 25.9	34,886 21.9	130,036 25.5
Second-stubble Area (acres) Percent (%)	43,246 22.3	43,433 27.3	39,627 24.9	123,901 24.3
Third-stubble and older Area (acres) Percent (%)	39,427 20.3	36,114 22.7	45,499 28.6	117,314 23.0
Total area (acres) Percent (%)	194,014 37.9	158,922 31.0	159,229 31.1	512,165

[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, 2022.[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP 96-540	13.1	15.6	19.5	17.2	16.0
L 01-283	2.4	3.6	16.4	5.7	6.5
L 01-299	47.1	50.5	43.1	56.5	49.0
HoCP 04-838	3.4	3.9	3.1	3.6	3.5
HoCP 09-804	8.3	10.4	7.8	9.3	9.0
L 11-183	1.6	2.5	3.1	1.7	2.2
L 12-201	2.1	1.4	0.5	0.0	1.1
Ho 12-615	10.0	5.7	1.3	0.0	4.9
Ho 13-739	2.1	1.3	0.0	0.0	1.0
L 14-267	0.6	0.1	0.0	0.0	0.2
HoCP 14-885	4.1	0.1	0.0	0.0	1.3
Others	5.2	4.9	5.2	6.0	5.3

[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, 2022.[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP 96-540	1.8	2.0	1.7	3.6	2.2
L 01-283	4.6	6.9	9.6	12.8	8.4
L 01-299	64.1	62.5	70.9	71.7	67.3
HoCP 04-838	1.5	2.7	2.3	2.0	2.2
HoCP 09-804	2.1	4.8	6.6	5.7	4.8
L 11-183	1.8	1.9	2.1	0.4	1.6
L 12-201	3.6	2.7	0.8	0.2	1.8
Ho 12-615	12.1	9.1	2.0	0.5	5.9
Ho 13-739	2.0	1.0	0.1	0.3	0.8
L 14-267	0.4	0.1	0.1	0.1	0.1
HoCP 14-885	2.2	1.0	0.2	0.1	0.9
Others	3.7	5.3	3.6	2.6	3.8

[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, 2022[1]

Variety	Plant-cane crop (%)	First-stubble crop (%)	Second-stubble crop (%)	Third-stubble crop & older (%)	Total (%)
HoCP96-540	3.2	3.5	4.6	4.6	4.0
L01-283	0.6	6.3	12.8	11.9	8.1
L01-299	33.2	44.5	54.3	72.0	52.0
HoCP04-838	0.6	1.6	2.9	1.6	1.7
HoCP09-804	20.6	23.7	21.7	9.0	18.3
L11-183	0.0	0.4	0.4	0.2	0.2
L 12-201	11.7	3.2	0.5	0.0	3.7
Ho 12-615	21.6	12.0	1.2	0.1	8.3
Ho 13-739	3.0	0.8	0.2	0.0	1.0
L 14-267	0.6	0.1	0.0	0.0	0.2
HoCP 14-885	2.1	0.2	0.1	0.0	0.6
Others	2.8	3.6	1.2	0.5	1.9

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

Table 7. Louisiana sugarcane variety trends, by variety and years, all regions, 2017-2022[1].

	Area planted to sugarcane by variety and year (%)						
Variety	2017	2018	2019	2020	2021	2022	1 Year Change
HoCP96-540	25	20	15	12	10	8	-2
L01-283	12	14	14	10	10	8	-2
L01-299	45	51	56	59	58	56	-2
HoCP04-838	8	5	4	3	3	3	0
HoCP09-804	1	3	5	9	10	11	+1
L11-183		<1	<1	1	2	1	-1
L 12-201			<1	<1	1	2	+1
Ho 12-615			<1	<1	3	6	+3
Ho 13-739				<1	<1	1	+1
L 14-267						<1	0
HoCP 14-885						1	+1

[1] Based on annual variety surveys by county.

PERFORMANCE OF FLORIDA SUGARCANE VARIETIES IN LOUISIANA

Kenneth Gravois
Sugar Research Station

Sugarcane varieties developed in Florida are unadapted to Louisiana soils and growing conditions. However, Florida sugarcane varieties have been used by breeders to expand the germplasm base of Louisiana sugarcane varieties, often appearing as grandparents or older generations in the lineage of Louisiana sugarcane varieties. Additionally, the *Bru1* QTL (quantitative trait loci) confers resistance to brown rust disease and is more prevalent in Florida sugarcane varieties. Before using a sugarcane variety for crossing, it is important to evaluate those varieties under Louisiana growing conditions.

Each year a few stalks of Florida sugarcane varieties are obtained from the Kleentek quarantine greenhouse and used to plant a small seed cane increase at the Sugar Research Station, St. Gabriel, LA. Yield trials are planted each subsequent year during August. 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 2022, a new trial was planted on September 12th.

Standard cultural practices were followed during each growing season. No glyphosate ripeners were applied to the trials. The first and second stubble trials were harvested on October 6, 2022; the plantcane trial was harvested on December 1, 2022. 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 using NIR to estimate fiber content (%), and TRS (theoretical recoverable sugar [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.

Table 1. Plantcane Florida variety yield trial harvested on December 1, 2022, at the Sugar Research Station, St. Gabriel, LA.

Variety	Sugar Yield	Cane Yield	TRS	Fiber
Plantcane	lbs./acre	tons/acre	lbs./ton of cane	%
CP09-1385	10312	41.2	250	13.4
CP09-4758	6451	27.3	237	11.3
CP10-1208	6924	28.9	240	13.8
CP10-1619	4661	19.4	241	11.2
HO12-615	10741	42.9	250	14.0
HOCP09-804	9176	34.6	266	14.7
HOCP14-885	10924	41.8	261	11.4
L01-299	8957	36.8	243	14.0
Magnolia Mound	8371	41.8	200	14.1

Table 2. First Stubble Florida variety yield trial harvested on October 6, 2022, 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	5246	34.3	154	15.1
CP09-1385	5387	27.5	193	11.2
CP09-4758	3511	26.2	134	10.8
CP10-1208	4495	26.2	173	12.8
CP10-1619	4196	24.5	172	11.3
HO12-615	8301	42.3	196	14.2
HOCP09-804	6290	30.2	208	12.6
HOCP14-885	7199	32.4	222	11.0
L01-299	8010	43.6	185	12.0

Table 3. Second stubble Florida variety yield trial harvested on October 6, 2022, 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	6243	33.6	186	10.8
CP06-2042	5093	26.9	189	14.6
CP07-2137	3443	18.3	189	12.0
CP07-2320	3214	14.9	216	10.1
CP08-1110	3265	19.0	172	12.6
CP08-1968	4229	27.9	151	14.0
CP96-1252	3139	19.8	158	11.7
Ho12-615	5531	29.0	191	13.6
HoCP09-804	7471	34.2	219	15.3
L01-299	5656	30.6	184	13.0

EVALUATION OF MODELS FOR UTILIZATION IN GENOMIC PREDICTION OF AGRONOMIC TRAITS IN THE LOUISIANA SUGARCANE BREEDING PROGRAM

Subhrajit Satpathy[1], Dipendra Shahi[1], Brayden Blanchard[2], Michael Pontif[2], Kenneth Gravois[2], Collins Kimbeng[2], Anna Hale[3], James Todd[3], Niranjan Baisakh[1,*]
[1]School of Plant, Environmental and Soil Sciences, [2]Sugar Research Station, & [3]Sugar Research Unit, USDA-ARS

INTRODUCTION

Phenotypic recurrent selection among clones is done in sugarcane breeding, yet, the time required from initial crossing of the parents to the release of an improved, desired commercial clone using conventional phenotypic selection approach requires up to 12 years. Reducing the length of the breeding cycle without significant loss in the accuracy of breeding value of selected clones in each generation is an important goal of sugarcane breeding. Also, traditional phenotypic recurrent selection can be difficult and expensive, especially for difficult-to-select traits, and inaccurate for traits with low heritability. Marker-assisted selection (MAS) can overcome the limitations of conventional breeding efforts, where indirect selection of the trait(s) of interest is accomplished in experimental breeding clones by using molecular markers linked to desirable traits. While MAS has been successfully implemented in other crops, application in sugarcane has lagged, primarily due to its genetic complexity. Nevertheless, quantitative trait loci (QTLs) have been identified for several traits in sugarcane with the first successful application of MAS achieved with the identification of markers linked to Bru1, a major QTL for brown rust resistance, which have been widely used to screen sugarcane clones in various sugar industries including Louisiana. However, MAS based on a few QTLs governing the trait expression fails when the trait expression is controlled by a large number of minor QTLs with small effects. Genomic selection (GS) can overcome such limitations and has been efficiently used in selecting individuals for desirable traits in the early stages by estimating their breeding value using genome-wide marker information with all major and minor QTLs controlling the trait of interest.

The prediction models in GS allow us to identify the best performing individuals to be used as parents in a breeding program or for next-generation advancement by using their genomic-estimated breeding values (GEBVs) based on SNPs generated by high-throughput genotyping by sequencing. A prediction model is developed by using phenotypic data and genome-wide marker data of a training population (TP) to evaluate determine the GEBV. Genome-wide SNP makers have been utilized for prediction of GEBVs of parents and genotypes through GS in several crops, including sugarcane. In this study, different statistical modesl such as ridge regression best linear unbiased prediction (rrBLUP) and different Bayesian approaches (Bayes A, Bayes B, Bayes C, Bayesian Lasso, Bayesian ridge regression) were used for comparative evaluation of prediction accuracies.

MATERIALS AND METHODS

The study was conducted with 97 sugarcane clones that included cultivars, elite and historic clones from the Louisiana sugarcane breeding program. The clones were planted as 3 m plots with a row spacing of 1.8 m in 2015 and 2016 in both light and heavy soil at the Sugar Research Station, St. Gabriel, Louisiana. Data on traits, such as sucrose content, cane and sugar

yield from plant cane (2016 and 2017) and ratoon crops (1st ratoon 2017 and 2018; 2nd ratoon 2018 and 2019; and 3rd ratoon 2019) were recorded for each soil type. Briefly, millable stalk counts per plot were made in August each year. The trials were harvested in December of each crop year. A 6-stalk sample was handcut and the leaves stripped off and weight per stalk (kg) was recorded. The sample was then shredded and analyzed in a Bruker NIR unit to determine theoretical recoverable sugar (sucrose content, kg Mg^{-1}). Cane yield (Mg ha^{-1}) and sugar yield (Mg ha^{-1}) per hectare were calculated from the stalk counts, stalk weight per plot, and sucrose content.

Based on soil type and/or crop, the dataset was further subdivided into four subsets (light soil and heavy soil) and crop (plant cane and ratoon). Further, all the subsets of data were processed by averaging the phenotypes of each clone to make unique sets. Another set of data was constructed from the original dataset by taking the average of the phenotypes of each clone irrespective of any condition. The resulting five subsets were named as plant cane, ratoon cane, light soil, heavy soil, and all combined. To develop a genomic selection model, the performance of six different statistical models was examined using the five datasets. Phenotypic data were analyzed for correlation between years, soil type, and crop, and broad sense heritability using JMP Pro version 14.0.0.

Genotyping of the clones identified several SNPs that were filtered by removing 1,020 SNPs with minor allelic frequency of less than 0.1, 10% missing data, and markers with same genotypic information. Ultimately, 3,906 SNPs were used for the genomic selection models with 94 clones that were represented under most conditions.

Models used for genomic prediction

To counter the regression problem associated with large number of markers and small number of indivduals, various approaches that perform shrinkage of estimates, selection of variables, or both combined are commonly used. As a result, the problem mainly focuses on the type of penalization and shrinkage procedure. In this study, the SNP effects were predicted using six different statistical models: ridge regression best linear unbiased prediction (rrBLUP), Bayesian ridge regression (BRR), Bayesian least absolute shrinkage and selection operator (Bayesian Lasso), Bayes A and B, and Bayes C. Model implementation was done using R programming language with different packages and functions.

For all approaches, a linear mixed model was used for fitting the genotypic information, i.e.,

$y = \mathrm{X}\beta + \mathrm{Z}u + \varepsilon$ with fixed effect and $y = \mu + \mathrm{Z}u + \varepsilon$ without fixed effect,

where y is the vector of different phenotypic traits, X is the full rank design matrix associated with fixed effects β that includes the general mean, Z is the design matrix associated with random effects u due to the genome-wide variants (or SNPs), ε is the vector of residuals, and μ is the intercept or the general mean.

Model efficiency

The efficiency of the prediction model was measured by calculating the Pearson's correlation coefficient between the predicted (GEBV) and actual phenotypic values (BLUE) using the formula, $\rho_{\hat{y}y} = \frac{Cov(\hat{y},y)}{\sigma_{\hat{y}}\sigma_y} = \frac{\sum_i(\hat{y}_i-\bar{\hat{y}})(y_i-\bar{y})}{\sqrt{\sum_i(\hat{y}_i-\bar{\hat{y}})^2}\sqrt{\sum_i(y_i-\bar{y})^2}}$

where, $\rho_{\hat{y}y}$ is the Pearson's correlation coefficient between the predicted $\hat{y}$ and actual y, $Cov(\hat{y}, y)$ is the covariance between the predicted and actual phenotypes, and $\sigma_{\hat{y}}$ and σ_y are the standard deviation of predicted and actual phenotype respectively.

Sugarcane clones were ranked based on the phenotypes (BLUEs) and genomic estimated breeding values (GEBVs) calculated by the six models. The correlation between the ranks was calculated by Spearman's correlation coefficient to check the correlation between the ranks without and with the use of marker data by using the formula,

$$r_s = 1 - \frac{6\sum_i d_i^2}{n(n^2-1)}$$

where, r_s is the Spearman's rank correlation coefficient, d_i is the difference between the ranks estimated by phenotype only and GEBVs of i^{th} clone and n is the total number of clones used for ranking.

RESULTS

Phenotypic variation

Data on sucrose content showed that N27 had the lowest value in both crop types, plant cane and ratoon cane and for both soil types, light as well as heavy soil (Table 1). Conversely, Ho 09-803 had the highest sucrose content in plant cane for heavy soil. The ratoon crop of L 06-001 recorded the highest value for sucrose content in light soil. For cane yield and sugar yield, L 09-107 had the highest value for plant cane in heavy soil, whereas L 81-010 was the best in ratoon cane and light soil. L 06-038 recorded the lowest values for cane yield and sugar yield in plant cane, while L CP 86-454 and HoCP 09-841 (for cane yield only) were the clones with the lowest values in ratoon cane for both soil types. When the data were pooled and averaged over crop type and soil type, N27 had the minimum value for sucrose, whereas L 06-001 recorded the highest value for % sucrose. For cane yield and sugar yield, LCP 86-454 and L 81-010 had the lowest and highest values, respectively.

The correlation of traits between years were consistently moderate to high for all traits except for cane yield, where the correlation between 2016 and 2017 was exceptionally low in plant cane for heavy soil (Table 2). In general, the correlation values were higher for all traits but cane yield in 2nd ratoon in light soil. On the other hand, the correlation of traits in different soil type and crop data sets were mostly low for all traits except between 1st and 2nd ratoon crops for light soil, which was high (0.67-0.68). All the traits had moderate to high heritability ranging from 42% for Sucrose in ratoon in heavy soil to 85% for cane yield and sugar yield in combined data, closely followed by 84% for cane yield and sugar yield in light soil. In general, heritability (H^2) of the traits was higher in light soil and ratoon cane compared to heavy soil and plant cane. Heritability values of the cane yield and the sugar yield over crop and soil type were comparable and higher. When the data were pooled over both crop and soil types, H^2 values were generally higher with 77% for sucrose content and 85% for both cane yield and sugar yield. Shapiro-Wilks

test showed cane yield and sugar yield data fit to normal distribution in most datasets whereas sucrose content displayed a skewed distribution.

Prediction accuracy (without fixed effects)

Model predictability was examined without any fixed component in the model. For this, total five datasets were retrieved, named light soil, heavy soil, plant cane, ratoon, and all combined. Each dataset containing 94 genotypes and 3,906 SNPs (markers) was partitioned randomly into 10 parts of which nine parts were used for training data for every model and the remaining one part for validation. Each random part consisted of nine or ten random genotypes.

Table 1. Phenotypic values and broad-sense heritability of sucrose percent, cane yield and sugar yield in different datasets

Data	Traits	Min	Max	Mean	SD	$\sigma^2 g$	H^2	*h*	*CVg*
Light soil (L)	Sucrose	11.17 (N27)	20.60 (L 06-001)	16.92	1.78	5.29	0.65	0.27	13.59
	Cane Yield	16.03 (LCP 86-454, HoCP 09-841)	331.90 (L 81-010)	102.54	19.71	1234.17	0.84	0.32	85.65
	Sugar Yield	1.43 (L CP 86-454)	33.75 (L 81-010)	11.22	2.24	16.19	0.84	0.36	89.63
Heavy soil (H)	Sucrose	9.23 (N27)	20.48 (HoCP 09-803)	16.38	1.90	4.80	0.60	0.24	13.38
	Cane Yield	19.225 (L CP 86-454, HoCP 89-846)	319.08 (L 09-107)	113.65	18.65	495.86	0.62	0.23	48.98
	Sugar Yield	2.05 (HoCP 89-846)	29.70 (L 09-107)	11.92	2.06	6.09	0.62	0.22	51.78
Light plant cane (L.Pc)	Sucrose	12.36 (HoL 08-723)	20.09 (L 98-207)	18.17	1.25	1.91	0.61	0.25	7.60
	Cane Yield	17.85 (L 06-038)	226.6 (L 09-112)	100.16	17.85	431.27	0.69	0.21	51.83
	Sugar Yield	2.23 (L 06-038)	27.00 (L 99-226)	11.85	2.14	6.61	0.73	0.20	54.22
Heavy plant cane (H.Pc)	Sucrose	11.28 (N27)	20.48(HoCP 09-803)	16.66	1.82	2.85	0.43	0.35	10.14
	Cane Yield	149.45(L 98-209)	319.075 (L 09-107)	138.92	19.28	337.45	0.45	0.22	33.06
	Sugar Yield	5.75 (L 98-209)	29.675 (L 09-107)	14.73	1.95	4.50	0.59	0.21	36.00
Light ratoon (L.R)	Sucrose	11.17 (N27)	20.60 (L 06-001)	16.41	1.72	4.10	0.61	0.27	12.34
	Cane Yield	16.03(L CP 86-454, HoCP 09-841)	331.90 (L 81-010)	103.53	20.44	928.33	0.77	0.29	73.58
	Sugar Yield	1.43 (L CP 86-454)	33.75 (L 81-010)	10.96	2.27	11.28	0.76	0.33	76.62
Heavy ratoon (H.R)	Sucrose	9.23 (N27)	19.83 (HoCP 09-803)	16.19	1.92	2.99	0.42	0.24	10.67
	Cane Yield	19.23(L CP 86-454, 89-846)	233.48 (L 99-226)	97.09	14.92	346.30	0.69	0.18	47.92
	Sugar Yield	2.05 (HoCP 89-846)	24.78 (L 12-202)	10.07	1.78	3.86	0.58	0.18	48.81
Plant cane (Pc)	Sucrose	11.28 (N27)	20.48 (HoCP 09-803)	17.44	1.73	4.00	0.60	0.26	11.46
	Cane Yield	17.85 (L 06-038)	319.08 (L 09-107)	118.99	20.09	557.47	0.62	0.19	49.61
	Sugar Yield	2.23 (L06-038)	29.70 (L 09-107)	13.25	2.13	8.04	0.71	0.22	53.48
Ratoon (R)	Sucrose	9.23 (N27)	20.60(L 06-001)	16.33	1.80	6.34	0.70	0.26	15.42
	Cane Yield	16.03 (L CP 86-454, HoCP 09-841)	331.90 (L 81-010)	101.12	18.59	1126.70	0.83	0.27	82.99
	Sugar Yield	1.43 (L CP 86-454)	33.75 (L 81-010)	10.63	2.11	13.34	0.81	0.29	85.93
Combined (C)	Sucrose	9.23 (N27)	20.60 (L 06-001)	16.70	1.85	9.32	0.77	0.29	18.28
	Cane Yield	16.03 (L CP 86-454, HoCP09-841)	331.90 (L 81-010)	107.11	19.40	1500.81	0.85	0.17	90.42
	Sugar Yield	1.43 (L CP 86-454)	33.75 (L 81-010)	11.51	2.17	19.16	0.85	0.17	95.10

σ2g, genotypic variance; H2, broad-sense heritability; h, narrow-sense heritability; CVg, % coefficient of genetic variation

Table 2. Correlations between different combinations of year and crop type datasets

Datasets	Sucrose content	Cane yield	Sugar yield
L.Pc.2016 vs L.Pc.2017	0.57	0.54	0.56
H.Pc.2016 vs H.Pc.2017	0.58	0.18	0.26
L. Fr.2017 vs L.Fr.2018	0.49	0.48	0.50
L.Sr.2018 vs L.Sr.2019	0.70	0.39	0.38
L.Pc vs H.Pc	0.30	0.26	0.21
L.Pc vs L.Fr	0.12	0.24	0.25
L.Fr vs L.Sr	0.67	0.67	0.68
H.Fr vs H.Sr	0.28	0.24	0.26
H.Sr vs H.Tr	0.29	0.28	0.15

L: Light soil, H: Heavy soil, Pc: Plant cane, Fr: First ratoon, Sr: Second ratoon, and Tr: Third ratoon.

This process was iterated until all the 10 parts were exhausted for the testing set for the traits to perform 10-fold cross-validation. Further, the correlation between the BLUEs and GEBVs of the clones was calculated for every trait by using all datasets.

Table 3 shows the mean of the correlation between the actual and predicted phenotypic values by different models calculated over 10-fold validation in light soil. Though the means of the correlation values show negative results, the fold-wise information (Table 4) reveals correlation values, ranging from highly positive to highly negative. In heavy soil, the performance of rrBLUP was better than the other models correlations of 0.06, 0.16, and 0.19 for sucrose content, cane yield, and sugar yield, respectively (Table 5). However, for sugar yield and cane yield, low to moderate positive correlations were produced by all the models under study. For cane yield, BRR showed the highest correlation at 0.19 and BL shows the lowest at 0.08, while for sugar yield, Bayes-C resulted in the highest correlation (0.23) and BL showed the lowest correlation (0.16).

Table 3. Pearson correlation between actual (BLUEs) and predicted values (GEBVs) using various models on different datasets

Data sets	Traits	rrBLUP	BL	BRR	Bayes-A	Bayes-B	Bayes-C
Light soil (L)	Sucrose	-0.02	-0.06	-0.12	-0.06	-0.10	-0.12
	Cane yield	-0.15	-0.25	-0.31	-0.27	-0.31	-0.29
	Sugar yield	-0.01	0.00	-0.08	-0.12	-0.06	-0.051
Heavy soil (H)	Sucrose	0.06	0.02	0.02	0.00	-0.01	0.00
	Cane yield	0.16	0.08	0.19	0.17	0.14	0.12
	Sugar yield	0.19	0.16	0.20	0.20	0.22	0.23
Plant cane (Pc)	Sucrose	0.05	-0.01	0.00	-0.02	0.00	-0.04
	Cane yield	0.00	-0.05	0.02	0.01	0.00	0.00
	Sugar yield	0.11	0.09	0.11	0.06	0.10	0.08
Ratoon (R)	Sucrose	0.19	0.13	0.01	0.09	0.05	0.04
	Cane yield	0.04	-0.04	-0.02	-0.08	-0.03	-0.04
	Sugar yield	0.03	0.06	0.05	0.02	0.06	0.03
All Combined (C)	Sucrose	-0.12	-0.20	-0.20	-0.25	-0.28	-0.23
	Cane yield	0.04	-0.06	-0.08	-0.05	-0.06	-0.03
	Sugar yield	0.09	0.19	0.23	0.19	0.19	0.19

In plant cane, BRR performed better than the rest of the models for the sugar yield with a correlation of 0.11 followed by rrBLUP and Bayes-B with a correlation of 0.11 and 0.10, respectively. In ratoon crop, all models demonstrated positive correlation for sucrose content and sugar yield with the highest correlation by rrBLUP and BL (closely followed by Bayes-B) for cane yield, respectively (Table 3). However, for cane yield, negative correlations were obtained with all models except rrBLUP, which showed a low positive correlation of 0.04.

With the combined dataset, all models produced negative prediction accuracy for sucrose content. However, all models had positive correlation for sugar yield with BRR resulting in the highest correlation (0.23) followed by Bayes B with a correlation of 0.19 while rrBLUP showed the lowest correlation (0.09). On the other hand, only rrBLUP showed low positive correlation for cane yield at 0.04 with other models resulting in negative correlations (Table 3).

Table 4. Fold-wise information of correlation of actual phenotype and predicted values

Data	Traits	Model	Fold 1	Fold 2	Fold 3	Fold 4	Fold 5	Fold 6	Fold 7	Fold 8	Fold 9	Fold 10
L	Sucrose content	rrBLUP	0.09	0.17	0.28	0.24	0.52	-0.61	0.24	0.13	0.24	-0.92
		rrBLUP-FE	0.21	-0.51	-0.11	-0.11	-0.01	-0.43	0.17	-0.04	-0.55	-0.20
		BL	0.14	0.12	0.29	0.18	0.32	-0.55	0.28	0.13	0.20	-0.91
		BRR	0.12	-0.38	0.26	0.07	0.22	-0.58	0.26	-0.08	-0.09	-0.92
		Bayes-A	0.18	0.03	0.25	0.08	0.21	-0.53	0.23	0.01	-0.05	-0.92
		Bayes-B	0.21	-0.32	0.23	0.11	0.30	-0.59	0.10	-0.11	-0.01	-0.91
		Bayes-C	0.18	-0.27	0.27	0.11	0.19	-0.51	0.21	-0.11	-0.11	-0.91
	Cane yield	rrBLUP	-0.57	-0.34	0.65	0.26	-0.24	-0.30	-0.10	-0.04	-0.19	0.17
		rrBLUP-FE	0.54	0.25	0.11	0.24	0.15	-0.42	0.28	0.61	0.17	-0.30
		BL	-0.57	-0.29	0.36	0.21	-0.37	-0.35	-0.31	-0.45	-0.23	-0.35
		BRR	-0.47	-0.31	0.30	0.13	-0.41	-0.38	-0.28	-0.41	-0.58	-0.32
		Bayes-A	-0.39	-0.34	0.24	0.24	-0.35	-0.39	-0.32	-0.32	-0.52	-0.35
		Bayes-B	-0.45	-0.31	0.24	0.15	-0.38	-0.36	-0.26	-0.44	-0.54	-0.29
		Bayes-C	-0.47	-0.26	0.28	0.20	-0.39	-0.41	-0.31	-0.40	-0.60	-0.29
	Sugar yield	rrBLUP	-0.20	0.55	0.75	-0.26	0.42	0.27	-0.21	0.24	-0.15	-0.35
		rrBLUP-FE	-0.23	0.30	-0.11	0.31	0.22	-0.22	0.30	-0.07	0.45	0.20
		BL	-0.34	0.52	0.38	-0.25	-0.10	0.38	0.23	-0.30	-0.11	-0.38
		BRR	-0.33	0.46	0.36	-0.21	-0.17	0.21	0.12	-0.40	-0.29	-0.41
		Bayes-A	-0.42	0.36	0.33	-0.23	-0.21	0.12	0.06	-0.31	-0.28	-0.45
		Bayes-B	-0.39	0.50	0.35	-0.26	-0.16	0.14	0.12	-0.40	-0.28	-0.42
		Bayes-C	-0.37	0.42	0.42	-0.26	-0.18	0.24	0.10	-0.41	-0.20	-0.38
H	Sucrose content	rrBLUP	-0.14	0.27	-0.62	-0.08	0.55	0.32	0.33	0.63	0.07	-0.10
		rrBLUP-FE	0.06	0.43	-0.37	-0.30	-0.08	0.05	0.02	0.62	-0.33	0.03
		BL	-0.17	0.60	-0.40	-0.13	0.30	0.23	0.13	0.14	0.18	-0.17
		BRR	-0.14	0.75	-0.24	-0.24	-0.11	0.29	-0.10	0.08	0.21	-0.31
		Bayes-A	-0.15	0.75	-0.21	-0.21	-0.13	0.27	-0.10	0.04	0.14	-0.34
		Bayes-B	-0.16	0.77	-0.21	-0.23	-0.18	0.30	0.06	-0.05	0.08	-0.28

		Bayes-C	-0.15	0.74	-0.21	-0.16	0.09	0.33	0.04	0.02	0.17	-0.34
	Cane yield	rrBLUP	0.13	0.45	0.27	-0.06	0.65	0.15	-0.35	0.08	0.38	0.60
		rrBLUP-FE	0.33	-0.34	-0.44	-0.21	0.36	0.58	-0.49	-0.10	0.23	0.78
		BL	0.21	0.43	0.20	-0.01	0.00	0.13	-0.34	-0.01	0.16	0.67
		BRR	0.22	0.44	0.27	0.07	0.64	0.16	-0.34	0.04	0.37	0.64
		Bayes-A	0.17	0.43	0.22	-0.02	0.64	0.16	-0.35	0.06	0.44	0.58
		Bayes-B	0.19	0.46	0.25	0.02	0.67	0.13	-0.33	0.03	0.36	0.63
		Bayes-C	0.19	0.44	0.21	0.05	0.61	0.16	-0.33	0.04	0.39	0.62
	Sugar yield	rrBLUP	0.33	0.49	0.60	0.01	0.60	-0.28	0.62	-0.39	0.10	0.18
		rrBLUP-FE	0.16	-0.20	-0.30	-0.10	0.37	-0.23	0.46	0.23	-0.13	-0.07
		BL	0.32	0.48	0.63	-0.02	0.66	-0.25	0.65	-0.29	0.15	0.12
		BRR	0.34	0.50	0.63	0.02	0.66	-0.26	0.64	-0.39	0.08	0.13
		Bayes-A	0.32	0.49	0.58	-0.01	0.64	-0.28	0.66	-0.35	0.09	0.13
		Bayes-B	0.33	0.46	0.63	0.04	0.60	-0.26	0.65	-0.32	0.08	0.22
		Bayes-C	0.31	0.50	0.62	0.02	0.65	-0.27	0.63	-0.35	0.08	0.11
Pc	Sucrose content	rrBLUP	-0.43	0.38	0.20	0.20	-0.17	0.43	-0.08	-0.12	0.27	-0.53
		rrBLUP-FE	-0.35	-0.36	0.39	0.23	-0.44	0.59	-0.25	-0.24	0.58	0.00
		BL	-0.43	0.23	0.19	-0.02	-0.35	0.36	-0.27	-0.01	0.50	-0.63
		BRR	-0.45	0.21	-0.16	-0.14	-0.33	0.24	-0.36	0.07	0.83	-0.58
		Bayes-A	-0.40	0.26	-0.05	-0.05	-0.35	0.22	-0.50	0.01	0.81	-0.62
		Bayes-B	-0.41	0.26	0.03	-0.01	-0.34	0.18	-0.27	0.04	0.80	-0.62
		Bayes-C	-0.46	0.24	0.00	-0.12	-0.33	0.27	-0.24	-0.03	0.83	-0.63
	Cane yield	rrBLUP	0.02	0.41	-0.56	0.47	0.04	0.30	0.18	0.01	0.54	-0.36
		rrBLUP-FE	0.17	0.14	0.21	0.11	-0.08	0.17	0.22	0.27	0.38	-0.15
		BL	-0.06	0.30	-0.51	0.49	0.09	-0.05	0.20	0.24	-0.38	-0.40
		BRR	-0.15	0.24	-0.55	0.48	0.01	0.33	0.10	0.37	-0.37	-0.31
		Bayes-A	-0.10	0.17	-0.53	0.44	-0.03	0.38	0.15	0.37	-0.47	-0.31
		Bayes-B	-0.13	0.17	-0.58	0.46	0.09	0.32	0.13	0.34	-0.37	-0.31
		Bayes-C	-0.09	0.19	-0.57	0.47	0.05	0.36	0.08	0.37	-0.43	-0.30
	Sugar yield	rrBLUP	0.26	0.17	0.32	-0.15	-0.22	0.08	0.15	0.11	0.10	0.32

		rrBLUP-FE	0.09	-0.04	0.38	0.48	0.00	0.05	0.49	0.66	0.40	0.54
		BL	0.30	0.16	0.36	-0.19	-0.22	0.04	-0.13	0.36	0.10	0.19
		BRR	0.36	0.19	0.39	-0.12	-0.21	-0.19	-0.09	0.37	0.04	0.18
		Bayes-A	0.38	0.16	0.37	-0.14	-0.14	-0.23	-0.15	0.39	0.03	0.08
		Bayes-B	0.42	0.25	0.38	-0.16	-0.20	-0.23	-0.09	0.40	0.07	0.10
		Bayes-C	0.42	0.19	0.31	-0.14	-0.24	-0.22	-0.12	0.34	0.10	0.21
R	Sucrose content	rrBLUP	0.61	0.01	0.45	0.56	-0.02	0.53	0.31	-0.09	-0.82	0.03
		rrBLUP-FE	0.61	-0.10	-0.20	0.37	0.39	0.19	0.21	0.02	-0.63	-0.19
		BL	0.68	0.03	0.16	0.55	-0.19	0.23	0.52	0.06	-0.82	-0.19
		BRR	0.63	-0.07	-0.16	0.31	-0.29	0.12	0.57	0.07	-0.79	-0.32
		Bayes-A	0.67	-0.09	0.04	0.23	-0.18	0.08	0.54	0.03	-0.79	-0.23
		Bayes-B	0.66	-0.08	0.01	0.40	-0.40	0.17	0.56	-0.02	-0.81	-0.21
		Bayes-C	0.64	-0.05	0.03	0.39	-0.31	0.08	0.53	0.00	-0.80	-0.36
	Cane yield	rrBLUP	-0.29	0.48	0.04	0.30	0.11	-0.07	0.10	0.25	-0.28	-0.54
		rrBLUP-FE	0.19	0.52	0.00	0.17	0.72	0.59	0.50	0.32	-0.07	0.30
		BL	-0.36	0.00	-0.17	0.24	0.04	0.20	0.24	0.13	-0.32	-0.46
		BRR	-0.61	0.11	-0.18	0.17	-0.13	0.25	0.32	0.09	-0.35	-0.39
		Bayes-A	-0.57	0.13	-0.20	0.23	-0.30	0.20	0.39	0.06	-0.37	-0.46
		Bayes-B	-0.62	0.06	-0.13	0.32	-0.24	0.20	0.33	-0.03	-0.38	-0.36
		Bayes-C	-0.62	0.09	-0.13	0.24	-0.30	0.23	0.35	0.09	-0.38	-0.41
	Sugar yield	rrBLUP	0.65	0.56	0.20	-0.04	-0.09	0.45	0.36	-0.36	-0.40	0.02
		rrBLUP-FE	0.73	0.31	0.60	0.25	0.40	0.51	0.38	-0.48	-0.43	0.16
		BL	0.70	0.47	0.32	0.07	-0.09	0.39	0.27	-0.35	-0.35	-0.18
		BRR	0.74	0.17	0.36	0.24	-0.07	0.24	0.20	-0.35	-0.33	-0.59
		Bayes-A	0.66	0.36	0.37	0.09	-0.10	0.23	0.31	-0.33	-0.26	-0.63
		Bayes-B	0.71	0.22	0.36	0.34	-0.06	0.30	0.28	-0.32	-0.36	-0.66
		Bayes-C	0.69	0.20	0.30	0.14	-0.05	0.29	0.24	-0.31	-0.27	-0.57
C	Sucrose content	rrBLUP	0.09	-0.78	0.28	-0.35	0.19	-0.57	0.06	-0.17	-0.43	0.38
		rrBLUP-FE	-0.24	-0.33	0.56	0.03	-0.33	-0.14	-0.46	-0.34	0.30	-0.13
		BL	0.10	-0.80	0.16	-0.45	0.19	-0.48	-0.04	-0.29	-0.44	0.20

		BRR	0.22	-0.87	0.02	-0.43	0.07	-0.31	-0.34	-0.21	-0.37	0.00
		Bayes-A	0.19	-0.88	0.06	-0.34	0.14	-0.37	-0.41	-0.30	-0.28	0.04
		Bayes-B	0.14	-0.88	0.08	-0.46	0.11	-0.50	-0.35	-0.19	-0.49	-0.07
		Bayes-C	0.17	-0.88	0.05	-0.37	0.11	-0.33	-0.37	-0.21	-0.33	0.03
	Cane yield	rrBLUP	-0.41	0.03	0.17	-0.15	-0.16	0.02	0.10	0.62	0.41	0.23
		rrBLUP-FE	-0.21	0.01	0.71	0.41	0.52	0.30	0.14	0.66	-0.16	0.07
		BL	-0.38	-0.13	0.00	-0.16	-0.18	0.03	0.04	-0.05	0.40	-0.03
		BRR	-0.38	-0.11	-0.08	-0.13	-0.19	0.01	0.29	-0.31	0.39	-0.07
		Bayes-A	-0.38	-0.16	-0.06	-0.13	-0.18	-0.02	0.22	-0.30	0.44	-0.10
		Bayes-B	-0.40	-0.10	-0.05	-0.14	-0.13	-0.01	0.22	-0.24	0.40	-0.06
		Bayes-C	-0.40	-0.23	-0.06	-0.08	-0.18	-0.02	0.29	-0.20	0.38	-0.08
	Sugar yield	rrBLUP	-0.43	0.43	-0.18	0.60	0.25	0.43	0.37	0.31	0.26	-0.03
		rrBLUP-FE	0.08	0.23	-0.24	0.42	-0.20	0.50	0.64	0.33	0.38	0.40
		BL	-0.28	0.25	-0.20	0.21	0.25	0.45	0.62	0.51	0.30	0.03
		BRR	-0.44	0.18	-0.24	0.48	0.29	0.32	0.68	0.57	0.40	0.05
		Bayes-A	-0.43	0.17	-0.24	0.47	0.25	0.23	0.66	0.57	0.35	0.03
		Bayes-B	-0.44	0.12	-0.27	0.43	0.32	0.30	0.68	0.39	0.35	0.02
		Bayes-C	-0.42	0.17	-0.25	0.51	0.26	0.24	0.64	0.56	0.30	0.01

L: Light soil, H: Heavy soil, Pc: Plant cane, R: Ratoon, , C: Combined, and FE: fixed effects (SNPs)

Overall, the prediction accuracy values were low or most times negative. However, fold-wise information showed that the correlation between the BLUEs and GEBVs was drastically changed based on clones in testing set (Table 4).

Prediction accuracy with putative causal SNPs as fixed effects

The SNPs, significantly associated with sucrose content, cane yield, and sugar yield through genome-wide association mapping, were used as fixed effect covariates in rrBLUP model to determine their effect on genomic prediction accuracy of the traits. The results (Table 5) showed no definitive pattern in the increase/decrease of correlation between the actual and predicted phenotypic values. Except under heavy soil condition, there was an increase in the prediction accuracy for cane yield and sugar yield, with the highest increase from 0.04 to 0.27 for cane yield in ratoon cane and from 0.11 to 0.28 for sugar yield in plant cane. On the other hand, for sucrose content, it decreased in all conditions, except a slight increase from -0.12 to -0.08 for all combined data.

Table 5: Pearson correlation between actual (BLUEs) and predicted values (GEBVs) using rrBLUP with sucrose content, cane yield, and sugar yield associated SNPs as fixed effect

	Light soil	Heavy soil	Plantcane	Ratoon cane	All Combined
Sucrose	-0.06	0.04	-0.04	0.06	-0.08
Cane Yield	0.15	0.14	0.09	0.27	0.31
Sugar Yield	0.03	0.03	0.28	0.23	0.22

Prediction accuracy: All vs individual conditions

Another approach evaluated different datasets as training population and the individual conditions as testing population. For instance, in the models developed for light soil plant cane, the training population was averaged over two years of plant cane data of light soil and the testing populations were the plant cane data of the corresponding two different years of light soil. Likewise, in the model developed for heavy soil plant cane, the training population was averaged over two years of plant cane data of heavy soil and the testing populations were the plant cane data of the corresponding two different years of heavy soil. However, in the models developed for light soil ratoon and heavy soil ratoon, the training datasets were the data averaged over different years as well as different crop (i.e. first ratoon, second ratoon, and third ratoon), and the testing datasets were the data of different crop types of their respective soil type.

Similarly, in the models developed for plant cane, the training datasets were the data averaged over soil types (i.e. light soil and heavy soil) as well as different years and the testing datasets were the data of each year of plant cane in each soil type and the plant cane data of each soil type averaged over the years. In the models developed for ratoon, the training dataset was the data averaged over the soil types, plant types as well as years and the testing datasets were the data of different plant types (i.e. first ratoon, second ratoon, and third ratoon) in different soil type averaged over different years. In the models developed for light soil and heavy soil, the training datasets were the data averaged over different plant types as well as different years and the testing datasets were the data of different plant types averaged over different years in light soil and heavy soil respectively. Finally, models were developed for combined data where the training dataset comprised of the data averaged over soil types, plant types as well as years, and testing datasets were the data of different plant types in each soil type averaged over the years.

The results of correlation between actual and predicted phenotypic value for individual conditions (test data) by taking all combined dataset as training data is shown in Fig. 1.

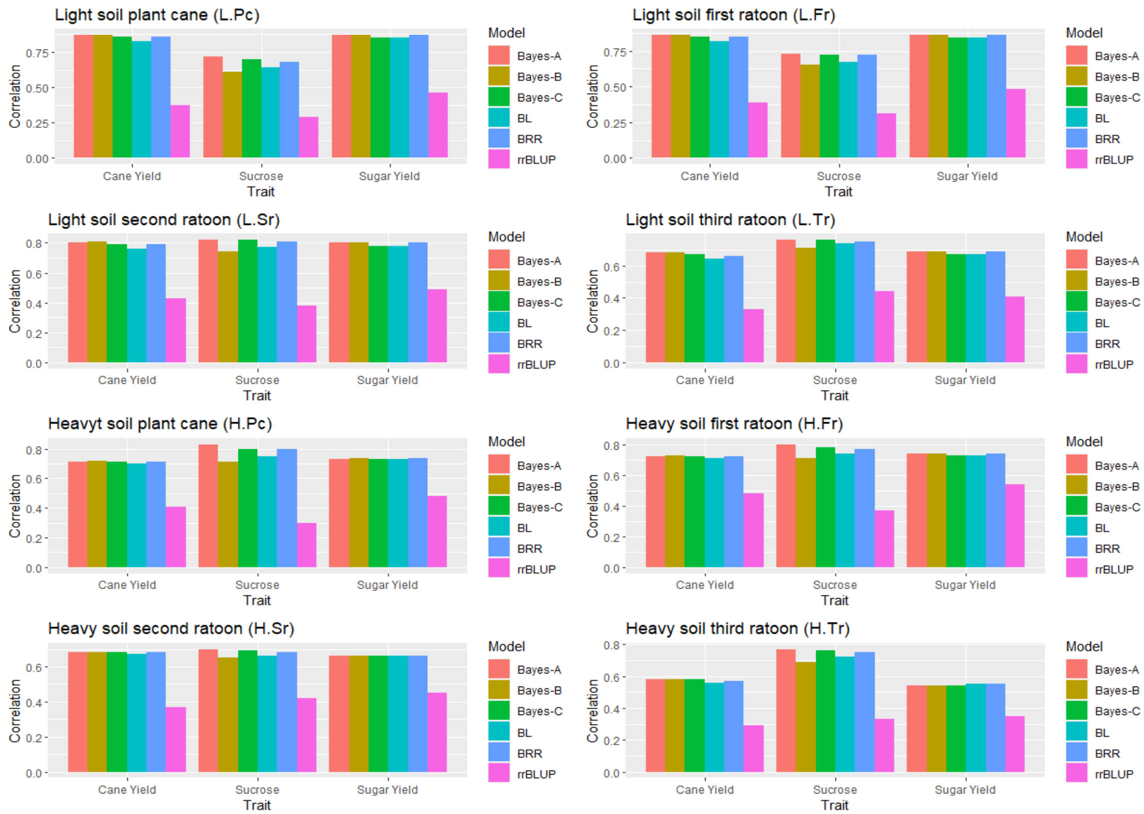

Fig. 1. Rank correlation between the actual (BLUEs) and predicted phenotypic values (GEBVs) by taking all combined dataset as training data (no fixed effect). Light soil (averaged over crop type); plant cane (averaged over soil type); ratoon cane (averaged over soil type). L: light soil, H: heavy soil, Pc: plant cane, R: ratoon, and Fr: first ratoon.

The cross-validation results showed that the correlation between the actual and predicted phenotype was comparably very high in Bayes-A, Bayes-B, Bayes-C, and in Bayesian ridge regression irrespective of the traits studied. For cane and sugar yield, all models except rrBLUP had comparable prediction accuracy. On the contrary, rrBLUP showed the least correlation between the actual and predicted phenotypic values, ranging from 0.29 for sucrose in plant cane under light soil to 0.54 for sugar yield in first ratoon under heavy soil.

Prediction accuracy: soil type and/or crop type as fixed effects

With crop type as fixed effect in the models, the rank correlation values between phenotypic BLUEs and GEBVs increased significantly in both light and heavy soils. Nevertheless, the correlation values were comparable under light and heavy soil types except for cane and sugar yield where the values in heavy soil were significantly higher than the light soil. Sucrose had generally less prediction accuracy than cane and sugar yields for all models whereas rrBLUP resulted in the lowest values compared to other models for all traits. For sucrose, cane yield, and sugar yield in light soil, the highest correlation values were observed in Bayes-A (0.92), Bayes-A (0.98) followed by Bayes-A (0.97), and BRR (0.95), respectively. On the other hand, rrBLUP recorded the highest correlation values for cane yield (0.98), similar to BL, and sugar yield (0.98) compared to other models (Table 6).

Similarly, rank correlations between phenotypic BLUEs and GEBVs obtained from different models were higher than that without fixed effect, when the data were combined over soil types (used as fixed effects) for both plant cane and ratoon crops. Except for sugar yield in plant cane where high yet comparable correlation was observed for all the models, rrBLUP generated low correlation values in comparison to other models in both plant cane and ratoon cane. In plant cane, the highest correlation for sucrose was observed in Bayes-A (0.96); for cane yield, BL, Bayes-A, and Bayes-B had similar values at 0.97; and for sugar yield, the highest correlation was observed in Bayes-A (0.98). In ratoon cane crop, Bayes-A model predicted performance for all three traits with the highest accuracy values.

When the datasets were combined across both soil and plant types, the lowest rank correlation between phenotypic BLUEs and GEBVs was observed for all traits in rrBLUP with values of 0.52, 0.63, and 0.71 for sucrose, cane yield, and sugar yield, respectively (Table 6). For sucrose content, the highest correlation was observed in Bayes-B (0.93), for cane yield, Bayes-C (0.96) followed by BRR (0.95), and for sugar yield, three models (BRR, Bayes-A, and Bayes-C) produced the highest correlation at 0.95.

Table 6. Rank correlation between phenotypic (BLUEs) and predicted values (GEBVs) using various models in different datasets

Condition	Trait	rrBLUP	BL	BRR	Bayes-A	Bayes-B	Bayes-C
Light soil (L)	Sucrose	0.54	0.86	0.91	0.92	0.92	0.91
	Cane Yield	0.68	0.97	0.95	0.98	0.97	0.95
	Sugar Yield	0.62	0.91	0.96	0.95	0.95	0.93
Heavy soil (H)	Sucrose	0.53	0.91	0.91	0.91	0.95	0.89
	Cane Yield	0.98	0.98	0.97	0.93	0.95	0.96
	Sugar Yield	0.98	0.86	0.95	0.97	0.97	0.93
Plant cane (Pc)	Sucrose	0.62	0.93	0.94	0.96	0.95	0.94
	Cane Yield	0.60	0.97	0.96	0.97	0.97	0.95
	Sugar Yield	0.94	0.93	0.97	0.98	0.95	0.96
Ratoon (R)	Sucrose	0.50	0.84	0.90	0.93	0.88	0.91
	Cane Yield	0.60	0.96	0.95	0.97	0.90	0.94
	Sugar Yield	0.66	0.87	0.95	0.97	0.96	0.92
All Combined (C)	Sucrose	0.52	0.92	0.88	0.92	0.93	0.87
	Cane Yield	0.63	0.91	0.95	0.95	0.94	0.96
	Sugar Yield	0.72	0.91	0.95	0.95	0.93	0.96

Cross-validation: crop type/soil types as fixed effect

In this study, a fixed effect component due to environment was also introduced into the models. Two different environmental conditions were soil type as light or heavy and crop type as plant cane and first ratoon. For this, three different datasets were retrieved and named as L.Pc-vs-H.Pc, L.Pc-vs-L.Fr, and H.Pc-vs-H.Fr. In L.Pc-vs-H.Pc dataset, average data of plant cane under light soil and average data of plant cane under heavy soil were stacked. Similarly, in L.Pc-vs-L.Fr, average data of plant cane under light soil and average data of first ratoon under light soil were stacked and the same thing was done for heavy soil to get the H.Pc-vs-H.Fr dataset. Further, all the datasets were used to develop prediction models. In L.Pc-vs-H.Pc dataset, soil

type (i.e. light and heavy soil) was taken as a fixed effect component in the prediction model. However, in L.Pc-vs-L.Fr and H.Pc-vs-H.Fr, crop type (i.e. plant cane and only first ratoon) was taken as a fixed effect component in the model.

As mentioned earlier, all the datasets were randomly partitioned into ten parts and in each fold of the cross-validation, nine parts were taken for training the model and remaining one part was used for prediction. All the results of the 10-fold cross-validation are summarized in Supplementary Table S8. Interestingly, all the models gave similar correlation values when averaged over the 10-folds for all three traits in L.Pc vs H.Pc and H.Pc vs H.Fr. However, in L.Pc vs L.Fr, rrBLUP showed slightly less correlation (0.47) compared to other models for sucrose only, while for other traits, all models resulted in similar prediction accuracy (Fig. 2).

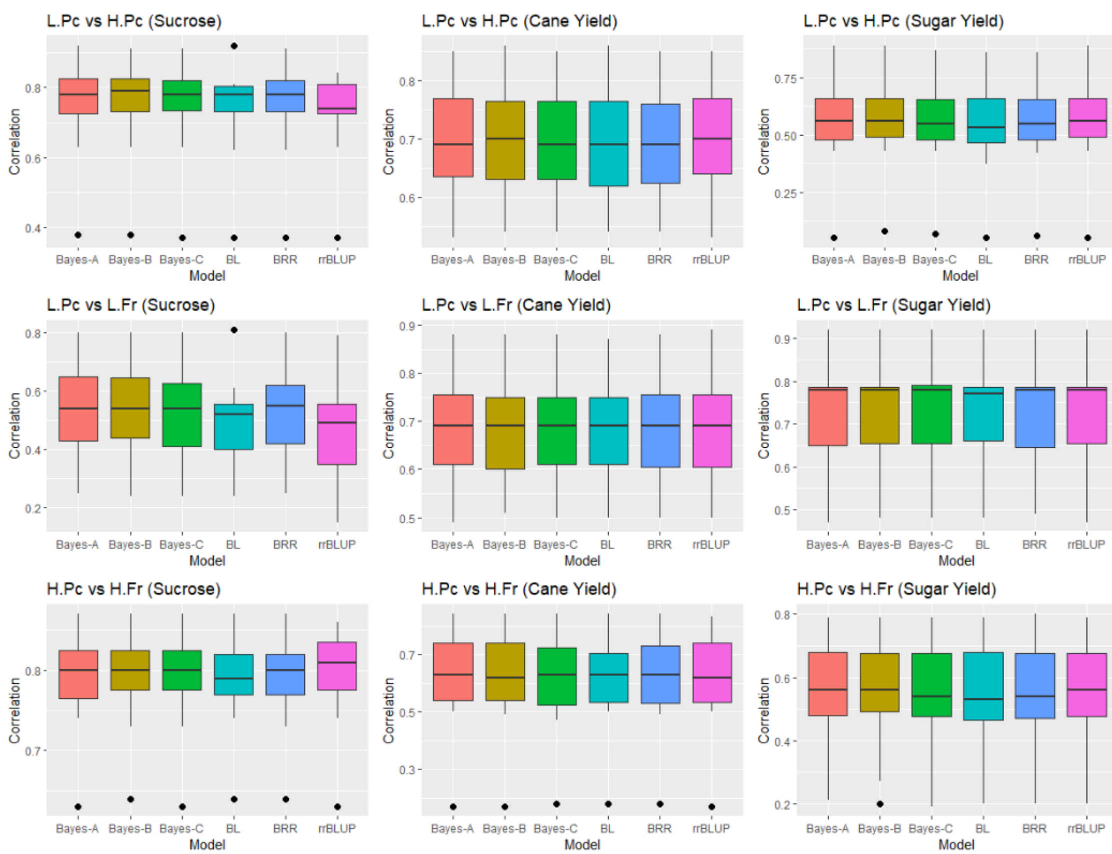

Fig. 2. Boxplots showing rank correlations between the actual and predicted phenotype in 10-fold cross-validation. L: Light soil, H: Heavy soil, Pc: Plant cane, R: Ratoon, and Fr: First ratoon.

The efficiency of genomic selection models may vary with breeding populations, trait(s) of interest, genes or markers governing their expression, etc. Prediction accuracies can be improved in sugarcane by including non-additive gene actions and large-effect QTLs into the GS models, which contribute significantly to the cexpression of omplex traits in sugarcane. Despite the small size of the training/testing population and marker density, the results from this study

suggest that genomic selection can be effectively utilized as a marker-assisted breeding tool in Louisiana sugarcane breeding.

Acknowledgments
The study was funded by a grant from the American Sugar Cane League.