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Evaluation of New Canal Point Sugarcane Clones

2008–2009 Harvest Season

Abstract

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Twenty-eight replicated experiments were conducted on 10 farms (representing 4 muck and 3 sand soils) to evaluate 36 new Canal Point (CP) and 26 new Canal Point and Clewiston (CPCL) clones of sugarcane from the CP 04, CP 03, CP 02, CP 01, CPCL 02, CPCL 01, CPCL 00, CPCL 99, and CPCL 95 series. Experiments compared the cane and sugar yields of the new clones, complex hybrids of *Saccharum* spp., primarily with yields of CP 89-2143, and to a lesser extent with CP 72-2086 and CP 78-1628. All three were major sugarcane cultivars in Florida. Each clone was tested for its fiber content and its tolerance to diseases and cold temperatures. Based on results of these and previous years' tests, one new clone—CPCL 99-4455—was released for commercial production in Florida.

The audience for this publication includes growers, geneticists and other researchers, extension agents, and individuals who are interested in sugarcane cultivar development.

Keywords: Brown rust, histosol, muck soil, orange rust, organic soil, *Puccinia kuehnii*, *Puccinia melanocephala*, *Saccharum* spp., *Sporisorium scitaminea*, sugarcane cultivars, sugarcane smut, sugarcane yields, sugar yields.

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Contents

Abbreviations

ARS	Agricultural Research Service
CP	Canal Point
CPCL	Canal Point and Clewiston
CV	Coefficient of variation
KS/T	Theoretical recoverable yield of 96^{o} sugar in kilograms per metric ton of cane
LSD	Least significant difference
NIRS	Near infrared reflectance spectroscopy
TC/H	Cane yields in metric tons per hectare
TS/H	Theoretical yields of 96^{o} sugar in metric tons per hectare
USSC	United States Sugar Corporation

Evaluation of New Canal Point Sugarcane Clones 2008-2009 Harvest Season

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Breeding and selection for clones that can be used for commercial production of sugarcane, complex hybrids of *Saccharum* spp., support the continued success of this crop in Florida. Though production of sugar per unit area is a principal selection characteristic, it is not the only factor on which sugarcane is evaluated. In addition, analyses are made on the concentration of sugar and on the fiber content of the cane. The economic value of each clone integrates its harvesting, transportation, and milling costs with its expected returns from sugar production. Deren et al. (1995) developed an economic index for clonal evaluation in Florida. Evaluation of clonal suitability also includes its reactions to endemic pathogens.

This report summarizes the cane production and sugar yields of the clones in the plant-cane, first-ratoon, and second-ratoon stage IV experiments sampled in Florida's 2008-2009 sugarcane harvest season. This information is used to identify commercial cultivars in Florida and identify clones with useful characteristics for the Canal Point sugarcane breeding and selection program. The information is also used by representatives of other sugarcane industries to request Canal Point clones. Throughout this report, the term clone or genotype refers to a genetically unique sugarcane entry in Stage IV, or any other stage of the Canal Point sugarcane breeding and selection program. The term sugarcane cultivar refers to any genotype that was released for commercial production.

The time of year and the duration that a clone yields its highest quantity of sugar per unit area are important because the Florida sugarcane harvest season extends from October to April. Because sugarcane is commercially grown in plant and ratoon crops, clones are evaluated accordingly. Adaptability to mechanical harvesters is an important trait in Florida. All sugarcane sent to Florida mills and much of the sugarcane used for planting is mechanically harvested. Before a new clone is released, Florida growers judge its acceptability for mechanical operations.

Genotypes with desired agronomic characteristics also must be productive in the presence of harmful diseases, insects, and weeds. Some pathogens rapidly develop new, virulent races or strains. Because of these changes in pathogen populations, clonal resistance is not considered permanent. The selection team at Canal Point uses some genotypes as parents that are too susceptible to pests to be grown commercially, but does not advance these genotypes in its selection program.

Two rust fungi in Florida have infected a large number of genotypes in the Canal Point program. From 2000 to 2005, this program discarded 15 clones that were within 1 year of commercial release due to new infections of brown rust, caused by *Puccinia melanocephala* Syd & P. Syd. During the summer of 2007, orange rust, caused by *Puccinia kuehnii* E.J. Butler, was detected in infected commercial sugarcane fields in Florida (Comstock et al. 2008). The pathogen against which this program has had its most success in selecting resistant cultivars is sugarcane smut, caused by *Sporisorium scitaminea* (Syd.) M. Piepenbring, M. Stoll, & F. Oberwinkler. Other diseases the Canal Point program must contend with are leaf scald, caused by *Xanthomonas albilineans* (Ashby) Dow; sugarcane yellow leaf virus, a disease caused by a luteovirus (Lockhart

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et al. 1996); sugarcane mosaic strain E; and ratoon stunting, caused by *Leifsonia xyli* subsp. *xyli* Evtsuhenko et al. Ratoon stunting has probably been the most damaging, though the least visible, sugarcane disease in Florida. A program to improve resistance of CP clones to ratoon stunting is underway (Comstock et al. 2001). In addition to improved resistance, growers can also minimize yield losses by planting stalks that do not contain the bacteria that cause ratoon stunting. This can be accomplished either by planting stalks that have been treated with hot-water therapy that kills the ratoon stunting bacteria or by using disease-free stalks derived from meristem tissue culture.

Scientists at Canal Point screen clones in their selection program for resistance to brown rust, orange rust, smut, leaf scald, sugarcane yellow leaf virus, mosaic, ratoon stunting, and eye spot caused by *Bipolaris sacchari* (E.J. Butler) Shoemaker. Eye spot is not currently a commercial problem in Florida.

Recently, researchers in Florida have begun assessing fungicide control of sugarcane orange rust. Otherwise, sugarcane growers in Florida prefer to rely on genotype resistance to sugarcane diseases. However, it is increasingly difficult to develop high-yielding cultivars that are resistant to all diseases, so growers are also accepting some new cultivars with tolerance, rather than resistance, to some diseases. In the 2008 growing season, 6 cultivars comprised 88.4 percent of Florida's sugarcane (Rice et al. 2009). All six of these cultivars—CP 72-2086 (Miller et al. 1984), CP 78-1628 (Tai et al. 1991), CP 80-1743 (Deren et al. 1991), CP 84-1198 (Glaz et al. 1994), CP 88-1762 (Tai et al. 1997), and CP 89-2143 (Glaz et al. 2000)—were at least moderately susceptible to one or more of the following sugarcane diseases: brown rust, orange rust, mosaic, leaf scald, smut, and ratoon stunting. Glaz et al. (1986) presented a formula and procedure to help growers distribute their available sugarcane cultivars while considering possible attacks of new pests.

Damaging insects in Florida are the sugarcane borer, *Diatraea saccharalis* (F.); the sugarcane lace bug, *Leptodictya tabida;* the sugarcane wireworm, *Melanotus communis;* the sugarcane grub, *Ligyrus subtropicus;* and the West Indian cane weevil, *Metamasius hemipterus* (L.).

Winter freezes are common in the region of Florida where much of the sugarcane is produced. The severity and duration of a freeze and the tolerance of specific sugarcane cultivars are the major factors that determine how much damage occurs. The damage caused by such freezes ranges from no damage to death of the mature sugarcane plant. The rate of deterioration of juice quality after a freeze depends on the ambient air temperature: Warmer post-freeze temperatures result in more rapid deterioration of juice quality. Freezes also damage young sugarcane plants. Stalk populations may decline after severe freezes kill aboveground parts of recently emerged plants. The most severe damage occurs when the growing point is frozen, which is more likely if the plant has emerged from the soil. Tai and Miller (1996) reported that resistance to a light freeze (-1.7 ^{o}C to -2.8 ^{o}C) was not significantly correlated to fiber content, but resistance to a moderate freeze (-5.0 ^{o}C) was.

The United States Sugar Corporation (USSC), based in Clewiston, Florida, discontinued its breeding program in 2004. Approximately the top 25 percent of clones in all selection stages from the USSC program were donated to the Canal Point program. Clones from the USSC program were designated with a CL (Clewiston) prefix. Each donated clone described in this report has a CPCL (Canal Point and Clewiston) designation.

Each year at Canal Point, 50,000 to 100,000 seedlings are evaluated from crosses derived from a diverse germplasm collection. However, Deren (1995) suggested that the genetic base of U.S. sugarcane breeding programs was too narrow. About 80 percent of the cytoplasm in commercial sugarcane is *Saccharum officinarum*. This year, 53.2 percent of our parental clones adapted to Florida originated from Canal Point, while the remainder were developed by USSC (34.1 percent were CPCL clones and 12.7 percent were CL clones). Additional parents not adapted to Florida originated from Louisiana or Texas breeding programs as well as from programs outside the United States.

The seedling stage planted in 2009 contained approximately 60,000 new clones that originated from true seeds planted in the greenhouse and were then transplanted to the field. Once selected as seedlings, clones are vegetatively propagated. Because of this vegetative propagation, from this stage (seedling stage) on in the selection program, each plant (clone) is genetically identical to its precursor, assuming no mutations. The stage I trial planted in January 2009 contained 13,696 new genotypes. The stage II trial, planted in November 2008, had 1,476 new clones. The 2008 plant-cane stage III trial had 136 new clones (135 CP clones and 1 CPCL clone) that were tested in replicated experiments on 4 grower farms. Each of the first three stages (seedling, stage I, and stage II) was evaluated for 1 year in the plant-cane crop at Canal Point. Selection is visual in the seedling phase. In stage I, the first selection process is visual. The clones that are selected visually are then analyzed with a hand-punch Brix, and heavy emphasis is placed on Brix results. The primary selection criteria for stage II and all subsequent stages are sugar yield (in metric tons of sugar per hectare), theoretical recoverable sucrose, cane tonnage, and disease resistance.

The 135 stage III genotypes are evaluated for 2 years, in the plant-cane and first-ratoon crops, in commercial sugarcane fields at four locations—three with organic (muck) soils and one with a sand soil. Independently for muck and sand soils, the 13 most promising clones identified in stage III receive continued testing for 4 more years in the stage IV experiments where they are planted in successive years and evaluated in the plant-cane, first-ratoon, and second-ratoon crops. Genotypes that successfully complete these experimental phases undergo 2 to 4 years of evaluation and expansion by the Florida Sugar Cane League, Inc., before commercial release. Some of the League's evaluation occurs concurrently with the stage IV evaluations. The Canal Point selection program is summarized in appendix 1.

Edmé et al. (2005a) found that the CP program has been responsible for substantial sugarcane yield improvements in Florida. However, these yield improvements occurred on the muck soils on which sugarcane is grown in Florida (about 80 percent of Florida's sugarcane) and not on the 20 percent of Florida's sugarcane that is grown on sand soils. Based on this finding, scientists are conducting a comprehensive review of the CP program to identify changes that can improve results for sand soils without compromising successes on muck soils. Based on the recommendation of Glaz and Kang (2008), one location with a muck soil was dropped from stage IV and one with a sand soil was added. Thus, this program now plants at three, rather than at two, locations in stage IV on sand soils, but it has not increased the total number of locations in stage IV. Glynn et al. (2009) reported that it would be unlikely to expect improvement in selecting genotypes for sand soils by adding a stage II on sand soils.

Clones with characteristics that may be valuable for sugarcane breeding programs are identified throughout the selection process. Even though the Canal Point program breeds and selects sugarcane in Florida, some CP clones have been productive commercial cultivars in Texas and outside of the United States. An example of the potential adaptability of Canal Point genotypes is CP 88-1165 (Juárez et al. 2008). CP 88-1165 was not selected for commercial use in Florida, but scientists in Guatemala requested it from Canal Point and later selected it for commercial use in Guatemala. Sugarcane geneticists in other programs often request clones from Canal Point. From May 2008 to April 2009, clones or seeds from the Canal Point program were requested from and sent to Costa Rica, Guatemala, Nicaragua, Mauritius, and Tanzania.

Test Procedures

In 28 experiments, 62 new CP and CPCL clones (36 CP clones and 26 CPCL clones) were evaluated. Five clones of the CP 04 series, seven clones of the CPCL 02 series, and one clone of the CPCL 95 series were evaluated at five farms with muck soils in the plant-cane crop. Eight clones of the CP 04 series and five clones of the CPCL 02 series were evaluated at three farms with sand soils in the plant-cane crop. Eight clones (CP 04-1252, CP 04-1321, CP 04-1619, CPCL 02-0843, CPCL 02-0908, CPCL 02-0926, CPCL 02-1295, and CPCL 02-2913) were evaluated at all eight locations (muck and sand soils), five were evaluated on muck soils only, and five were evaluated on sand soils only. Three clones of the CP 03 series, eight clones of the CPCL 00 series, and two clones of the CPCL 01 series were evaluated at two farms with muck soils in the plant-cane crop and at six farms with muck soil in the first-ratoon crop. Seven clones of the CP 03 series, three clones of the CPCL 00 series, and three clones of the CPCL 01 series were evaluated at two farms with sand soils in the first-ratoon crop. Eight clones (CP 03-1160, CP 03-1491, CP 03-2188, CPCL 00-1373, CPCL 00-4027, CPCL 00-6131, CPCL 01-0271, and CPCL 01-0571) were evaluated at all 10 locations (muck and sand soils), five were evaluated on muck soils only, and five were evaluated on sand soils only. Six clones of the CP 02 series and seven clones of the CPCL 99 series were evaluated at two farms in the first-ratoon crop and at six farms in the second-ratoon crop. Thirteen clones of the CP 01 series were evaluated at two farms in the second-ratoon crop.

CP 89-2143 was the primary reference clone on muck soils, and CP 78-1628 was the primary reference clone on sand soils. In 2008, CP 89-2143 was the most widely grown cultivar in Florida and CP 78-1628 the most widely grown cultivar on sand soils in Florida (Rice et al. 2009). CP 72-2086 was sometimes used as a reference clone for KS/T. CP 72-2086 was the fifth most widely grown cultivar in Florida in 2008 (Rice et al. 2009).

Agronomic practices, such as fertilization, pest and water control, and cultivation, were conducted by the farmer or farm manager responsible for the field in which each experiment was planted.

The plant-cane and first-ratoon experiments at A. Duda and Sons, Inc., (Duda) southeast of Belle Glade and all three experiments planted in the successive rotation at Okeelanta Corporation (Okeelanta) south of South Bay were conducted on Dania muck soil. As described by Rice et al. (2002), Dania muck is the shallowest of the histosols (organic soils) comprised primarily of decomposed sawgrass (*Cladium jamaicense* Crantz) in the Everglades Agricultural Area. The maximum depth to the bedrock of Dania muck is 51 cm. The other organic soils similar to Dania muck are Lauderhill muck (51 to 91 cm depth to bedrock), Pahokee muck (91 to 130 cm to bedrock), and Terra Ceia muck (more than 130 cm to bedrock).

All experiments at Knight Management, Inc., (Knight) southwest of 20-Mile Bend, Sugar Farms Cooperative North-SFI Region S05 (SFI) near 20-Mile Bend in Palm Beach County and Wedgworth Farms, Inc. (Wedgworth) east of Belle Glade, as well as the three experiments not planted in the successive rotation at Okeelanta, were conducted on Lauderhill muck.

Both experiments at Sugar Farms Cooperative North-Osceola Region S03 (Osceola) were conducted on Pahokee muck. The three experiments at Eastgate Farms, Inc., (Eastgate) north of Belle Glade were conducted on Torry muck. Both experiments at Hilliard Brothers of Florida, Ltd., (Hilliard) west of Clewiston were on Malabar sand. The three experiments at Lykes Brothers, Inc., (Lykes) near Moore Haven in Glades County were on Pompano fine sand, and the plant-cane experiment at the United States Sugar Corporation-Townsite (Townsite) was on Margate sand.

At Okeelanta, clones of the CP 03, CPCL 00, and CPCL 01 series experiment in the plant-cane crop, the CP 02 and CPCL 99 series in the first-ratoon crop, and the CP 01 series in the second-ratoon experiment were planted on fields in successive sugarcane rotations. In this rotation in Florida, a new crop of sugarcane is planted within about 2 months of the previous sugarcane harvest, a practice that increases the number of harvests per year but decreases yields per hectare (Glaz and Ulloa 1995). All other experiments were planted in fields that had not been cropped to sugarcane for approximately 1 year. In all experiments, plots were arranged in randomized-complete-block designs with six replications.

In all experiments of CP and CPCL clones, all plots had three rows, a border row, and two inside rows used for yield determination. These two rows were 10.7 m long and 3.0 m wide (0.0032 ha). The distance between rows was l.5 m, and 1.5-m alleys separated the front and back ends of the plots. The outside row of each plot was a border row and it was usually planted with the same genotype as the two adjacent rows. All inside rows of each plot in all replications and the border row of each plot in three replications were planted with two lines of stalks. The border row of each plot in the remaining three replications was planted with one line of stalks. Experiments were two clones (6 rows) wide, and each replication was 16 plots long. An extra 1.5 m of sugarcane protected each row at the front and back of each test.

Samples of 10 stalks were cut from unburned cane from a middle row of each plot in each experiment between October 14, 2008, and February 9, 2009. In addition, preharvest samples of 10 stalks were cut from 2 replications of all plant-cane experiments between October 8 and October 15, 2008. Once a stool of sugarcane was chosen for cutting, the next 10 stalks in the row were cut as the 10-stalk sample. The range of sample dates for each crop was as follows:

Plant-cane crop	December 22, 2008, to February 9, 2009
First-ratoon crop	October 29, 2008, to January 23, 2009
Second-ratoon crop	October 14, 2008, to January 16, 2009

After each stalk sample was transported to the USDA-Agricultural Research Service (ARS) Sugarcane Field Station at Canal Point, FL, for weighing and milling, crusher juice from the milled stalks was analyzed for Brix and pol, and commercial recoverable yield of 96^{o} sucrose, in kg per metric ton of cane, (kg sucrose per ton of cane: KS/T) was determined as a measure of sugar content. The fiber percentage of each clone was used to calculate commercial recoverable yield (Legendre 1992). The values of theoretical recoverable yield determined by the Legendre method were multiplied by 0.86 to estimate the commercial recoverable yield in a Florida sugarcane mill. Brix and pol were usually estimated by near infrared reflectance spectroscopy (NIRS); Brix and pol were measured for samples with unacceptable NIRS calibrations by refractometer and polarimeter, respectively.

Using 3-stalk samples collected from border rows, an average of 11, 11, 12, 14, 6, 13, 11, and 14 fiber samples were calculated for the clones of the CP 01, CP 02, CP 03, CP 04, CPCL 95, CPCL 00, CPCL 01, and CPCL 02 series, respectively. Leaves were stripped from these stalks, which were then processed through a Jeffco1 cutter-grinder (Jeffries Brothers, Ltd., Brisbane Queensland, Australia). About 400 g of material (bagasse) processed through the cutter-grinder were collected and weighed. Juice was extracted from the bagasse by pressing it at 69 MPa for 30 seconds. Brix of the juice was measured by refractometer. The pressed bagasse was then weighed, crumbled, placed in paper bags, and dried at 60^{o} C until it reached a constant weight. Fiber percentage was then measured as described by Tanimoto (1964). All fiber percentages calculated on a given day were corrected to the historical fiber percentage of the reference clone.

Total millable stalks per plot were counted between April 16 and September 16, 2008. Cane yields, in metric tons per hectare, (tons of cane per hectare: TC/H) were calculated by multiplying stalk weights by number of stalks. Theoretical yields of sugar (in metric tons per hectare: TS/H) were calculated by multiplying TC/H by KS/T and dividing by 1,000.

To assess cold tolerance, stage IV clones were subjected to freezing temperatures in two field experiments established at the Hague Farm of the Florida Institute of Food and Agricultural Sciences, University of Florida, in Hague, near Gainesville, FL. Air temperatures usually go down to -2 to -4 ^{o}C at the testing site during winter months, which guarantees exposure of the clones to harsher freeze temperatures than normally found in south Florida. Clones of the CP 01, CP 02, and CPCL 99 series were planted on March 16, 2006, as randomized-complete-block experiments with four replications in single-row plots 1.5 m long and 2.4 m apart. Plots had 2.4 m breaks between replications, and clones were compared with three reference cultivars—CP 72-2086, CP 78-1628, and CP 89-2143. Five stalks were sampled from each plot on January 13, February 6, and March 5, 2007. Clones of the CP 03, CPCL 00, and CPCL 01 series were planted similarly to the previous series on March 5, 2007. Five-stalk samples were collected from the plant-cane crop on December 6, 2007, and February 6, 2008, and from the first-ratoon crop on December 4, 2008, and January 12, 2009. Cold-tolerance rankings for all three experiments were based on temporal deterioration of juice quality in mature stalks after exposure to freezing temperatures.

Prior to their advancement to stage IV, CP clones were evaluated in separate tests by artificial inoculation for susceptibility to sugarcane smut, sugarcane mosaic virus, leaf scald, and ratoon stunting. CP clones were inoculated in stage II plots to determine eye spot susceptibility. Since being advanced to stage IV, separate artificial-inoculation tests were repeated on clones for smut, ratoon stunting, mosaic, and leaf scald. Each clone was also field rated for its emergence, early plant height, tillering, and shading, as well as for its reactions to natural infection by sugarcane smut, sugarcane brown rust, sugarcane orange rust, sugarcane mosaic virus, and leaf scald in stage IV.

Statistical analyses of the stage IV experiments were based on a mixed model using SAS software (SAS version 9.1, 2003; SAS Institute, Inc., Cary, NC) with clones as fixed effects and locations and replications as random effects. Least squares means were calculated for clones. Means of locations were estimated by empirical best linear unbiased predictors. Significant differences were sought at the 10-percent probability level. Differences among clones were tested by the least significant difference *(LSD)*, which was used regardless of significance of F-ratios to protect against high type-II error rates (Glaz and Dean 1988). The SAS estimation of the mean square error used for separating clone means was the error term used to calculate this *LSD*. Clones that had significantly higher yields than the reference clone were also identified by individual t tests calculated by SAS. Values of *LSD* were also calculated to approximate significant differences among locations using the mean square error of replications within locations as the error term.

Results and Discussion

Table 1 lists the parentage, percentage of fiber, and reactions to smut, brown rust, orange rust, leaf scald, mosaic, and ratoon stunting for each clone included in these experiments. Tables 2-5 contain the results of clones from the CP 04, CPCL 02, and CPCL 95 series in plant-cane experiments at locations with muck soils, and tables 6-7 contain the results for plant-cane experiments of clones from the CP 04 and CPCL 02 series planted at locations with sand soils. Tables 8-9 contain the results of plant-cane experiments of clones from the CP 03, CPCL 00, and CPCL 01 series, and tables 10-12 and table 13 contain results of clones from these three series in first-ratoon experiments on muck and sand soils, respectively. Table 14 contains the results of the CP 02 and CPCL 99 first-ratoon experiments, and tables 15-17 contain the results of clones from these two series in second-ratoon experiments. Table 18 contains the results of the CP 01 second-ratoon experiments. Table 19 gives the dates that stalks were counted in each experiment. Table 20 gives cold-tolerance ratings for clones of the CP 01, CP 02, CP 03, CPCL 99, CPCL 00, and CPCL 01 series.

Plant-Cane Crop, CP 04, CPCL 02, and CPCL 95 Series on Muck Soils

When averaged across all five locations, CPCL 02-1295 was the only clone that yielded significantly more TC/H (metric tons of cane per hectare) and TS/H (metric tons of sugar per hectare) than CP 89-2143 (tables 2 and 5). CPCL 02-1295 also had high TC/H yields at four of the five locations with muck soils (Knight, Okeelanta, SFI, and Wedgworth) (table 2). At the fifth location with muck soil (Duda), the TC/H yield of CPCL 02-1295 was similar to the mean of all clones tested. The preharvest and harvest KS/T (theoretical recoverable yield of 96^{o} sugar in kg per metric ton of cane) values of CPCL 02-1295 were significantly lower than those of CP 89-2143 (tables 3 and 4). The female parent of CPCL 02-1295 was CP 88-1762 (table 1) which was the second most widely planted sugarcane cultivar in Florida in 2008 (Rice et al. 2009).

In addition to CPCL 02-1295, CPCL 02-2273 and CPCL 95-2287 had significantly greater TC/H than CP 89-2143 (table 2). The TS/H yields of CPCL 02-2273 and CPCL 95-2287 did not differ significantly from CP 89-2143, CPCL 02-1295, or from each other (table 5). The preharvest KS/T value of CPCL 95-2287 was significantly less than that of CP 89-2143, and the preharvest KS/T of CPCL 02-2273 was significantly less than that of CPCL 95-2287 (table 3). The harvest KS/T values of CPCL 95-2287 and CPCL 02-2273 did not differ significantly, but the KS/T of each of these new clones was significantly less than that of CP 89-2143 (table 4). The female parent of CPCL 02-2273 was CP 89-2143 and the male parent was CL 88-4730, a proprietary cultivar of USSC (table 1).

CP 04-1321 was the only clone that had significantly higher preharvest and harvest KS/T values than CP 89-2143 when averaged across the five muck-soil locations (tables 3 and 4). The mean TC/H yield of CP 04-1321 was similar to that of CP 89-2143 but significantly lower than that of CPCL 02-1295 (table 2). At SFI and Wedgworth, the TC/H yields of CP 04-1321 were significantly higher than those of CP 89-2143. However, at Knight, the TC/H yield of CP 04-1321 was significantly less than the TC/H yields CP 89-2143 and 11 of the other 13 clones tested. The mean TS/H of CP 04-1321 did not differ significantly from the TS/H yields of CP 89-2143 or CPCL 02-1295, but the TS/H yield of CP 04-1321 at Knight was significantly lower than that of CP 89-2143 and significantly lower than the TS/H yields of 10 of the 13 other genotypes tested at Knight (table 5). The female parent of CP 04-1321 was CP 96-1252 (table 1 and Edmé 2005b), a minor cultivar in Florida.

Sugarcane in Florida is propagated by planting stem sections (referred to as seed cane) from which axillary buds emerge. The Florida Sugar Cane League, Inc., has begun increasing seed cane of CP 04-1321 and CPCL 95-2287 at all stage IV locations with muck soils and has begun increasing seed cane of CPCL 02-1295 at all stage IV locations (table 1). As seed cane of these clones is increased, more disease testing will be conducted. There is particular concern regarding the susceptible ratings of CP 04-1321 and CPCL 02-1295 to leaf scald. The fiber contents of CP 04-1321, CPCL 95-2287, and CPCL 02-1295 were 9.31, 12.35, and 10.97 percent, respectively.

Plant-Cane Crop, CP 04 and CPCL 02 Series on Sand Soils

When averaged across all three locations with sand soils, no new clone yielded significantly more TS/H than CP 78-1628 (table 7). CP 04-1844 had significantly higher TC/H than CP 78-1628 when averaged across all locations and at Hilliard and Townsite. However, the preharvest and harvest KS/T values of CP 04-1844 were significantly lower than those of CP 78-1628 (table 6). The male parent of CP 04-1844 was CP 84-1198 and the female parent was CP 97-1989 (table 1 and Glaz et al. 2005). CP 84-1198 was the sixth most widely planted sugarcane cultivar in Florida in 2008 (Rice et al. 2009), and CP 97-1989 is a minor cultivar that was released for sand soils in Florida.

Three new clones—CPCL 02-0908, CP 04-1321, and CP 04-1935—had significantly higher preharvest KS/T than CP 78-1628 (table 6). The harvest KS/T of CPCL 02-0908 was also significantly higher than that of CP 78-1628. However, the TC/H and TS/H yields of CPCL 02-0908 and CP 04-1321 were significantly lower than those of CP 78-1628 (table 7). The TC/H and TS/H yields of CP 04-1935 were significantly higher than those of CPCL 02-0908 and CP 04-1321 but did not differ significantly from those of CP 78-1628.

CP 04-1566 was the only clone with TC/H and TS/H yields that did not differ significantly from those of CP 04-1844 (table 7), and its harvest and preharvest KS/T yields were higher than those of CP 04-1844. The female parent of CP 04-1566 was CP 89-2377 (table 1 and Miller et al. 2000), which is a minor cultivar in Florida, and the female parent was CP 96-1252.

The Florida Sugar Cane League, Inc., has begun increasing seed cane of CP 04-1566 and CP 04-1844 at stage IV locations with sand soils (table 1). Currently there are no disease concerns for CP 04-1566, but CP 04-1844 is susceptible to leaf scald. The fiber contents of CP 04-1566 and CP 04-1844 were 9.73 and 9.95 percent, respectively (table 1). There are currently no plans to increase seed cane of CP 04-1935; it has no disease concerns and a fiber content of 10.57 percent.

Plant-Cane Crop, CP 03, CPCL 00, and CPCL 01 Series on Muck Soils

Last year's report contained the results from five locations with muck soils of the CP 03, CPCL 00, and CPCL 01 series plant-cane crop (Glaz et al. 2009). This year, plant-cane results are available from Eastgate and the successively planted test at Okeelanta (tables 8-9). Averaged across these two locations, no new genotype had significantly higher mean yields of TC/H, preharvest or harvest KS/T, or TS/H, than CP 89-2143.

First-Ratoon Crop, CP 03, CPCL 00, and CPCL 01 Series on Muck Soils

When averaged across all six farms with muck soils in the first-ratoon crop, eight new clones—CPCL 00-6131, CPCL 00-4111, CP

03-1160, CPCL 01-0271, CP 03-2188, CPCL 00-4027, CPCL 00-6756, and CPCL 00-0129—yielded significantly more TS/H than CP 89-2143 (table 12). However, CP 78-1628, the primary reference cultivar for sand soils, also had a TS/H yield significantly higher than that of CP 89-2143; and no new clone yielded significantly more TS/H than CP 78-1628. In addition, five of the eight new clones that had TS/H yields higher than the TS/H yield of CP 89-2143—CPCL 00-6131, CP 03-1160, CPCL 00-0271, CPCL 00-4027, and CPCL 00-6756—were too susceptible to either brown or orange rust for commercial production in Florida (table 1).

The TC/H yields of CPCL 00-4111 and CP 03-2188 were significantly higher those of CP 89-2143 (table 10), and there were no significant differences among the KS/T values of these three clones (table 11). Conversely, there were no significant differences between the TC/H yields of CP 00-0129 and CP 89-2143, but CP 00-0129 was the only new clone with a KS/T higher than that of CP 89-2143 (tables 10 and 11). Last year in the plant-cane crop on muck soils, yields of these three new clones were generally similar to their yields this year in the first-ratoon crop (Glaz et al. 2009). CPCL 00-4111 had a high TC/H yield and its KS/T was similar to that of CP 89-2143. CP 03-2188 also had a high TC/H yield last year, but one difference between the two years is that the KS/T value of CP 03-2188 was significantly lower than that of CP 89-2143 last year. The relative TC/H yields of CPCL 00-0129 and CP 89-2143 were similar this year and last year, but the KS/T value of CPCL 00-0129 was not significantly higher than that of CP 89-2143 last year.

Seed cane of CPCL 00-4111 is being increased at stage IV locations with muck soils (table 1). CPCL 00-4111 has no major disease concerns except for its susceptibility to ratoon stunting, and it had a fiber content of 11.23 percent (table 1). The freeze tolerance of CPCL 00-4111 ranked 7th out of 21 clones tested (table 20).

First-Ratoon Crop, CP 03, CPCL 00, and CPCL 01 Series on Sand Soils

CP 03-1912 was the only new clone with a significantly higher yield of TS/H than CP 78-1628 when averaged across Hilliard and Lykes (table 13). In addition, the TC/H yield of CP 03-1912 was higher than that of CP 78-1628 and higher than the TC/H yields of all clones in the test except CPCL 00-4027, CP 03-1160, and CPCL 00-6131. Last year in the plant-cane crop on sand soils, CP 03-1912 had similarly high TC/H and TS/H yields (Glaz et al. 2009). The KS/T values of only two new clones—CP 03-1491 and CPCL 00-1373—differed significantly from the KS/T of CP 78-1628. Compared with CP 78-1628, the KS/T of CP 03-1491 was higher and that of CPCL 00-1373 was lower.

The Florida Sugar Cane League, Inc., has begun increasing seed cane of CP 03-1912 at all stage IV locations with sand soils (table 1). There are no disease concerns for CP 03-1912. However, growers are concerned that its stalks are more easily broken by wind than is normal for Florida sugarcane. Also, the cold tolerance of CP 03-1912 was the worst in this group (table 20). The fiber content of CP 03-1912 was 9.96 percent.

First-Ratoon Crop, CP 02 and CPCL 99 Series

Last year's report contained information for the CP 02 and CPCL 99 series in the first-ratoon crop at eight locations and in the plant-cane crop at Eastgate and Okeelanta (Glaz et al. 2009). In addition, Glaz et al. (2008) reported on results of these clones from eight locations in the plant-cane crop. This year, in the first-ratoon crop combined yields at

Okeelanta and Eastgate, four new clones—CP 02-1143, CP 02-1564, CPCL 99-2574, and CPCL 99-1401—yielded significantly more TC/H and TS/H than CP 89-2143 (table 14). There were no significant differences in KS/T values among the four new clones, CP 89-2143, and CP 72-2086. CP 02-1143 (orange rust), CP 02-1564 (brown rust and ratoon stunting), and CPCP 99-1401 (brown rust, orange rust, and leaf scald) are not candidates for release because of disease susceptibilities (table 1). CPCL 99-2574 had moderately high yields of KS/T and TS/H in the plant-cane and first-ratoon crops and was a candidate for release. However, CPCL 99-2574 had low second-ratoon yields this year, which will be discussed in the next section, and is no longer being considered for release. CPCL 99-4455 was recently released for commercial production in Florida, based largely on its high KS/T values, which were higher than 13 of the 15 other clones tested at Eastgate and Okeelanta (table 14). However, its TC/H and TS/H yields were lower than 10 and 5 clones, respectively, at Eastgate and Okeelanta.

Second-Ratoon Crop, CP 02 and CPCL 99 Series

When averaged across all six locations, CP 02-1564 yielded significantly more TC/H and TS/H than any other clone in the test (tables 15 and 17). The KS/T values of CP 02-1564, CP 89-2143, and CP 72-2086 did not differ significantly (table 16). As noted in the previous section, CP 02-1564 is not being considered for commercial release because of susceptibilities to brown rust and ratoon stunting.

CPCL 99-4455 was released for commercial production in Florida in October 2009. This year as second ratoon, CPCL 99-4455 had a significantly higher KS/T value than any other clone in the test. However, although the TC/H yields of CPCL 99-4455 and CP 89-2143 did not differ significantly, the TC/H yield of CPCL 99-4455 was significantly less than the TC/H yields of 9 of the 14 other genotypes in the experiment (table 15). The TS/H yields of CPCL 99-4455 and CP 89-2143 did not differ significantly (table 17). The relative plant-cane and first-ratoon crop KS/T and TC/H yields of CPCL 99-4455 were similar to those of this year in the second-ratoon crop (Glaz et al. 2008 and Glaz et al. 2009). CPCL 99-4455 was susceptible to smut and ratoon stunting and had a fiber content of 10.19 percent.

In the plant-cane crop, CPCL 99-2574 had moderate TC/H yields but high KS/T and TS/H yields (Glaz et al. 2008). In the first-ratoon crop, the KS/T values of CPCL 99-2574 remained high, but its TC/H and TS/H yields were moderately low (Glaz et al. 2009). Based on these results, along with its lack of disease concerns, CPCL 99-2574 was being considered for potential release in Florida. However, second-ratoon TC/H yield of CPCL 99-2574 was significantly lower than that of CP 89-2143 (table 15); and although it had a high KS/T value, the KS/T of CPCL 99-2574 was significantly lower than that of CPCL 99-4455 (table 16). Therefore, CPCL 99-2574 is no longer under consideration for release in Florida (table 1).

Second-Ratoon Crop, CP 01 Series

When combined across Okeelanta and Eastgate in the second-ratoon crop, four new clones—CP 01-1564, CP 01-2390, CP 01-1378, and CP 01-1372—had significantly higher TC/H and TS/H yields than CP 89-2143 (table 18). However, because of disease susceptibilities, CP 01-1564 (brown rust) and CP 01-1378 (brown rust, orange rust, and leaf scald) are not being considered for commercial production (table 1). CP 01-2390 also had high TS/H yields on sand soils in the plant-cane through second-ratoon crops (Glaz et al 2007, 2008, 2009) but has not been considered for commercial release due to its susceptibility to ratoon stunting and its severe susceptibility to smut (table 1).

Last year, CP 01-1372 (Edmé et al. 2009) was released for commercial production in Florida (table 1). Based on yields the previous 3 years, CP 01-1372 was recommended for (Glaz et al. 2007, 2008, 2009). This year as second ratoon, CP 01-1372 had significantly higher yields of TC/H and TS/H than CP 89-2143 (table 18). The KS/T values of CP 01-1372, CP 89-2143, and CP 72-2086 were not significantly different. The only disease concern regarding CP 01-1372 was its susceptibility to smut (table 1). The fiber content of CP 01-1372 was 9.45 percent. Rankings for freeze tolerance of CP 78-1628, CP 89-2143, CP 01-1372, and CP 72-2086 were 1st, 3rd, 4th, and 12th, respectively (table 20).

Summary

This is the second report in this long series in which clones in some plant-cane tests were advanced from stage III to stage IV muck and sand locations independently. For genotypes from the CP 04, CPCL 02, and CPCL 95 series reported on for the first time in stage IV this year, as well as for the CP 03 and CPCL 00 series in the first-ratoon crop, there were eight genotypes common to all tests, five genotypes only at locations with muck soils, and five genotypes only at locations with sand soils.

Clones from the CP 04, CPCL 02, and CPCL 95 series were tested in the plant-cane crop at five locations with muck soil and at three locations with sand soil this year. On both the muck and sand soils, CPCL 02-1295 had high TC/H and TS/H yields but low KS/T yields, and its seed cane is being expanded on both soil types by the Florida Sugar Cane League, Inc., for potential commercial release in Florida. CPCL 02-1295 is resistant to all major sugarcane diseases in Florida except leaf scald.

The Florida Sugar Cane League, Inc., began increasing seed cane of CP 04-1321 and CPCL 95-2287 on muck soils and of CP 04-1566, CP 04-1844, and CP 04-1935 on sand soils. CP 04-1321 had high KS/T values and moderate TC/H yields on muck soils, and CPCL 95-2287 had high TC/H yields and low KS/T values on muck soils. On sand soils, CP 04-1566 had moderately high TC/H yields and moderate KS/T values, CP 04-1844 had high TC/H yields with low KS/T values, and CP 04-1935 had moderate TC/H yields with high KS/T values. The only disease concerns among these five new clones were the susceptibilities of CP 04-1321 and CP 04-1844 to leaf scald.

One group of clones from the CP 03, CPCL 00, and CPCL 01 series was tested on muck soils in the plant-cane crop at two locations this year and at five locations last year. This group of new clones was also tested at six location in the first-ratoon crop this year. CPCL 00-4111 has had consistently high TC/H and TS/H yields with acceptable yields of KS/T across these tests. Seed cane of CPCL 00-4111 is being expanded on muck soils by the Florida Sugar Cane League, Inc., for potential commercial release in Florida. The only disease concern of CPCL 00-4111 is that it is susceptible to ratoon stunting. CP 03-2188 had high yields of TC/H and TS/H, but it is not being expanded for potential release due to its low KS/T yields.

A second group of CP 03, CPCL 00, and CPCL 01 clones was tested in the plant-cane crop last year and in the first-ratoon crop this year at two locations with sand soils. CP 03-1912 had no disease concerns, high yields of TC/H and TS/H, and acceptable yields of KS/T in both years of testing. However, growers are concerned that its stalks are more easily broken by wind than is normal for Florida sugarcane. The Florida Sugar Cane League, Inc., is expanding seed cane of CP 03-1912 on sand soils for potential commercial release in Florida.

Genotypes from the CP 02 and CPCL 99 series were tested in the plant-cane crop at two locations last year and at eight locations two years ago. These clones were also tested in the first-ratoon crop at two locations this year and at eight locations last year and in the second-ratoon crop at six locations this year. In October 2009, the USDA-ARS, the University of Florida, and the Florida Sugar Cane League, Inc., jointly released CPCL 99-4455 for commercial production in Florida. CPCL 99-4455 had consistently high KS/T yields across years and locations; however, its yields of TC/H and TS/H were generally mediocre. The only disease concerns of CPCL 99-4455 are its susceptibility to smut and ratoon stunting.

Stage IV testing of the CP 01 series was completed this year with two second-ratoon experiments. Previous testing of these clones included 2 years and 10 locations as plant cane, 2 years and 10 locations as first ratoon, and 7 locations as second ratoon last year. Combined across all locations in the plant-cane through the second-ratoon crop cycles, CP 01-1372 had significantly higher (at $p < 0.001$) yields of TC/H (164.31 vs. 122.31 tons ha^{-1}) and TS/H (19.345 vs. 14.382 tons ha^{-1}) than CP 89-2143. The harvest KS/T yields throughout the three-crop cycle of CP 01-1372 (118.7 kg ton^{-1}) and CP 89-2143 (116.91 kg ton^{-1}) did not differ significantly. CP 01-1372 was jointly released by USDA-ARS, the University of Florida, and the Florida Sugar Cane League, Inc., for commercial production on muck and sand soils in Florida in September 2008. The only disease concern regarding CP 01-1372 was its susceptibility to smut. CP 01-1372 had excellent tolerance to freezing temperatures.

References

Comstock, J.C., J.M. Shine, Jr., P.Y.P. Tai, and J.D. Miller. 2001. Breeding for ratoon stunting disease resistance: Is it both possible and effective? *In* International Society of Sugar Cane Technologists: Proceedings of the XXIV Congress, vol. 2, September 17-21, 2001, pp. 471-476. Brisbane, Australia.

Comstock, J.C., S.G. Sood, et al. 2008. First report of *Puccinia kuehnii*, causal agent of orange rust of sugarcane, in the United States and in the Western Hemisphere. Plant Disease 92:175.

Deren, C.W. 1995. Genetic base of U.S. mainland sugarcane. Crop Science 35:1195-1199.

Deren, C.W., J. Alvarez, and B. Glaz. 1995. Use of economic criteria for selecting clones in a sugarcane breeding program. Proceedings of the International Society of Sugar Cane Technologists 21:2, March 5-14, 1992, pp. 437-447. Bangkok, Thailand.

Deren, C.W., B. Glaz, P.Y.P. Tai, J.D. Miller, and J.M. Shine, Jr. 1991. Registration of ‘CP 80-1743’ sugarcane. Crop Science 31:235-236.

Edmé, S.J., R.W. Davidson, et al. 2009. Registration of ‘CP 01-1372’ Sugarcane. Journal of Plant Registrations 3:150-157.

Edmé, S.J., J.D. Miller, et al. 2005a. Genetic contributions to yield gains in the Florida sugarcane industry across 33 years. Crop Science 45:92-97.

Edmé, S.J., P.Y.P. Tai, et al. 2005b. Registration of ‘CP 96-1252’ sugarcane. Crop Science 45:423.

Glaz, B., J. Alvarez, and J.D. Miller. 1986. Analysis of cultivar-use options with sugarcane as influenced by threats of new pests. Agronomy Journal 78:503-506.

Glaz, B., J.C. Comstock, et al. 2008. Evaluation of new Canal Point sugarcane clones: 2006-2007 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-169.

Glaz, B., R.W. Davidson, et al. 2007. Evaluation of new Canal Point sugarcane clones: 2005-2006 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-167.

Glaz, B., and J.L. Dean. 1988. Statistical error rates and their implications in sugarcane clone trials. Agronomy Journal 80:560-562.

Glaz, B., S.J. Edmé, et al. 2009. Evaluation of new Canal Point sugarcane clones: 2007-2008 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-170.

Glaz, B., S.J. Edmé, et al. 2005. Registration of 'CP 97-1989' sugarcane. Crop Science 45:2660-2661.

Glaz, B., and M.S. Kang. 2008. Location contributions determined via GGE biplot analysis of multienvironment sugarcane genotype-performance trials. Crop Science 48:941-950.

Glaz, B., J.D. Miller, et al. 2000. Registration of 'CP 89-2143' sugarcane. Crop Science 40:577.

Glaz, B., J.M Shine, Jr., et al. 1994. Registration of 'CP 84-1198' sugarcane. Crop Science 34:1404-1405.

Glaz, B., and M.F. Ulloa. 1995. Fallow and successive planting effects on sugarcane yields in Florida. Journal American Society of Sugar Cane Technologists 15:41-53.

Glynn, N.C., R.A. Gilbert, et al. 2009. Repeatability between two intermediate sugarcane genotype selection stages in Florida. Journal of Crop Improvement 23:252-265.

Juárez, J.L., J.D. Miller, et al. 2008. Registration of 'CP 88-1165' sugarcane. Journal of Plant Registrations 2:102-109.

Legendre, B.L. 1992. The core/press method for predicting the sugar yield from cane for use in cane payment. Sugar Journal 54(9):2-7.

Lockhart, B.E.L., M.J. Irey, and J.C. Comstock. 1996. Sugarcane bacilliform virus, sugarcane mild mosaic virus and sugarcane yellow leaf syndrome. *In* B.J. Croft, C.M. Piggin, E.S. Wallis, and D.M. Hogarth, eds., Sugarcane Germplasm Conservation and Exchange, pp. 108-112. Australian Centre for International Agricultural Research, Canberra, Australia, Proceedings No. 67.

Miller, J.D., P.Y.P. Tai, et al. l984. Registration of 'CP 72-2086' sugarcane. Crop Science 24:210.

Miller J.D., C.W. Deren, et al. 2000. Registration of 'CP 89-2377' sugarcane. Crop Science 40:577-578.

Rice, R.W., L. Baucum, and B. Glaz. 2009. Sugarcane Variety Census: Florida 2008. Sugar Journal 72(7):6-12.

Rice, R.W., R.A. Gilbert, and S.H. Daroub. 2002. Application of the soil taxonomy key to the organic soils of the Everglades Agricultural Area. Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, SS-AGR-246. Available online at http://edis.ifas.ufl.edu/AG151 (May 2002, verified Sept. 9, 2002).

Tai, P.Y.P., J.D. Miller, et al. 1991. Registration of 'CP 78-1628' sugarcane. Crop Science 31:236.

Tai, P.Y.P., J.M. Shine, Jr., et al. 1997. Registration of 'CP 88-1762' sugarcane. Crop Science 37:1388.

Tai, P.Y.P., and J.D. Miller. 1996. Selection for frost resistance in sugarcane. Sugar Cane 1996(3):13-18.

Tanimoto, T. 1964. The press method of cane analysis. Hawaii. Plant. Rec. 57:133-150.

Tables

Notes (tables 2-18):

1. Clonal yields approximated by least squares ($p = 0.10$) within and across locations.

2. Location yields approximated by empirical linear unbiased predictors.

3. *LSD* = least significant difference.

4. *CV* = coefficient of variation.

Table 1. Parentage, fiber content, increase status, and ratings of susceptibility to smut, brown rust, orange rust, leaf scald, mosaic, and ratoon stunting for CP 72-2086, CP 78-1628, CP 89-2143, 36 new CP sugarcane clones, and 26 new CPCL sugarcane clones

	Parentage				Rating[*]					
						Rust		Leaf		Ratoon
Clone	Female	Male	Increase status[H]	Percent fiber	Smut	Brown	Orange	scald	Mosaic	stunting[I]
CP 72-2086	CP 62-374	CP 63-588	Commercial	8.97	R	R	L	R	S	R
CP 78-1628	CP 65-0357	CP 68-1026	Commercial	10.39	S	S	L	L	R	R
CP 89-2143	CP 81-1254	CP 72-2086	Commercial	9.85	R	R	R	L	L	L
CP 01-1178	CP 84-1198	CP 82-1172	None	9.97	R	U	S	L	L	R
CP 01-1181	CP 84-1198	CP 82-1172	None	8.01	R	L	S	S	R	L
CP 01-1205	CP 94-2095	CP 89-2143	None	8.45	L	L	S	L	S	S
CP 01-1321	CP 82-1172	CP 89-2143	None	9.39	L	S	S	S	S	R
CP 01-1338	CP 94-1200	CP 89-2143	None	9.00	R	L	U	S	L	R
CP 01-1372	CP 94-1200	CP 89-2143	Commercial	9.45	S	R	R	L	L	R
CP 01-1378	CP 94-1200	CP 89-2143	None	10.48	R	S	S	S	R	S
CP 01-1391	CP 81-1384	CP 94-1528	None	8.62	R	R	U	S	S	R
CP 01-1564	CP 93-1634	CP 89-2143	None	10.64	R	L	S	L	L	R
CP 01-1957	CP 88-1762	Unknown	None	12.47	R	R	U	S	R	S
CP 01-2056	CP 89-2143	Unknown	None	10.55	L	R	U	R	L	R
CP 01-2390	CP 95-3218	CP 94-1528	None	9.77	S	L	U	L	R	S
CP 01-2459	US 95-1023	CP 85-1308	None	11.32	L	L	R	S	R	L
CP 02-1143	CP 93-1382	CP 92-1666	None	10.80	R	L	S	L	S	R
CP 02-1458	CP 85-1382	CP 80-1743	None	11.90	R	S	S	L	R	R
CP 02-1554	CP 92-1561	CP 94-2059	None	12.13	R	L	S	R	L	R
CP 02-1564	CP 94-1528	CP 72-2086	None	9.70	R	S	L	L	L	S
CP 02-2015	CP 85-1491	CP 80-1743	None	11.84	R	L	L	L	L	U
CP 02-2281	CP 94-1200	CP 92-1167	None	11.93	R	L	R	L	S	R
CP 03-1160	CP 92-1435	CP 92-1435	None	10.73	R	S	R	R	R	L
CP 03-1173	HoCP 85-845	HoCP 85-845	None	9.62	R	L	R	L	L	S
CP 03-1401	CP 90-1424	CP 92-1167	None	12.05	L	S	R	R	R	L
CP 03-1491	CP 92-1561	CP 92-1167	None	10.48	R	S	S	R	R	R
CP 03-1912	CP 92-1167	CP 95-1039	Sand	9.96	R	R	R	L	R	L
CP 03-1939	CP 82-1172	CP 95-1039	None	9.71	S	R	R	R	R	R
CP 03-2188	CP 95-1569	CP 97-1362	None	10.29	R	L	R	L	R	L
CP 04-1252	CP 97-2068	CP 97-1362	None	12.43	R	R	R	S	R	L
CP 04-1258	CP 96-1252	01 P04	None	10.94	R	L	L	R	R	L
CP 04-1321	CP 96-1252	01 P04	Muck	9.31	R	R	R	S	R	L
CP 04-1367	CP 97-2068	CP 94-1607	None	13.24	R	L	L	L	R	R
CP 04-1374	CP 97-2068	CP 94-1607	None	11.82	R	L	L	R	R	R
CP 04-1426	CP 95-1712	CP 84-1198	None	12.75	L	R	S	L	L	R
CP 04-1566	CP 89-2377	CP 96-1252	Sand	9.73	L	R	R	R	L	R
CP 04-1619	CP 95-1569	CP 84-1198	None	10.45	R	R	L	R	R	R
CP 04-1844	CP 97-1989	CP 84-1198	Sand	9.95	R	R	R	S	L	L

Table 1. Parentage, fiber content, increase status, and ratings of susceptibility to smut, brown rust, orange rust, leaf scald, mosaic, and ratoon stunting for CP 72-2086, CP 78-1628, CP 89-2143, 36 new CP sugarcane clones, and 26 new CPCL sugarcane clones

	Parentage				Rating[*]					
			Increase	Percent		Rust		Leaf		Ratoon
Clone	Female	Male	status[H]	fiber	Smut	Brown	Orange	scald	Mosaic	stunting[I]
CP 72-2086	CP 62-374	CP 63-588	Commercial	8.97	R	R	L	R	S	R
CP 78-1628	CP 65-0357	CP 68-1026	Commercial	10.39	S	S	L	L	R	R
CP 89-2143	CP 81-1254	CP 72-2086	Commercial	9.85	R	R	R	L	L	L
CP 01-1178	CP 84-1198	CP 82-1172	None	9.97	R	U	S	L	L	R
CP 01-1181	CP 84-1198	CP 82-1172	None	8.01	R	L	S	S	R	L
CP 01-1205	CP 94-2095	CP 89-2143	None	8.45	L	L	S	L	S	S
CP 01-1321	CP 82-1172	CP 89-2143	None	9.39	L	S	S	S	S	R
CP 01-1338	CP 94-1200	CP 89-2143	None	9.00	R	L	U	S	L	R
CP 01-1372	CP 94-1200	CP 89-2143	Commercial	9.45	S	R	R	L	L	R
CP 01-1378	CP 94-1200	CP 89-2143	None	10.48	R	S	S	S	R	S
CP 01-1391	CP 81-1384	CP 94-1528	None	8.62	R	R	U	S	S	R
CP 01-1564	CP 93-1634	CP 89-2143	None	10.64	R	L	S	L	L	R
CP 01-1957	CP 88-1762	Unknown	None	12.47	R	R	U	S	R	S
CP 01-2056	CP 89-2143	Unknown	None	10.55	L	R	U	R	L	R
CP 01-2390	CP 95-3218	CP 94-1528	None	9.77	S	L	U	L	R	S
CP 01-2459	US 95-1023	CP 85-1308	None	11.32	L	L	R	S	R	L
CP 02-1143	CP 93-1382	CP 92-1666	None	10.80	R	L	S	L	S	R
CP 02-1458	CP 85-1382	CP 80-1743	None	11.90	R	S	S	L	R	R
CP 02-1554	CP 92-1561	CP 94-2059	None	12.13	R	L	S	R	L	R
CP 02-1564	CP 94-1528	CP 72-2086	None	9.70	R	S	L	L	L	S
CP 02-2015	CP 85-1491	CP 80-1743	None	11.84	R	L	L	L	L	U
CP 02-2281	CP 94-1200	CP 92-1167	None	11.93	R	L	R	L	S	R
CP 03-1160	CP 92-1435	CP 92-1435	None	10.73	R	S	R	R	R	L
CP 03-1173	HoCP 85-845	HoCP 85-845	None	9.62	R	L	R	L	L	S
CP 03-1401	CP 90-1424	CP 92-1167	None	12.05	L	S	R	R	R	L
CP 03-1491	CP 92-1561	CP 92-1167	None	10.48	R	S	S	R	R	R
CP 03-1912	CP 92-1167	CP 95-1039	Sand	9.96	R	R	R	L	R	L
CP 03-1939	CP 82-1172	CP 95-1039	None	9.71	S	R	R	R	R	R
CP 03-2188	CP 95-1569	CP 97-1362	None	10.29	R	L	R	L	R	L
CP 04-1252	CP 97-2068	CP 97-1362	None	12.43	R	R	R	S	R	L
CP 04-1258	CP 96-1252	01 P04	None	10.94	R	L	L	R	R	L
CP 04-1321	CP 96-1252	01 P04	Muck	9.31	R	R	R	S	R	L
CP 04-1367	CP 97-2068	CP 94-1607	None	13.24	R	L	L	L	R	R
CP 04-1374	CP 97-2068	CP 94-1607	None	11.82	R	L	L	R	R	R
CP 04-1426	CP 95-1712	CP 84-1198	None	12.75	L	R	S	L	L	R
CP 04-1566	CP 89-2377	CP 96-1252	Sand	9.73	L	R	R	R	L	R
CP 04-1619	CP 95-1569	CP 84-1198	None	10.45	R	R	L	R	R	R
CP 04-1844	CP 97-1989	CP 84-1198	Sand	9.95	R	R	R	S	L	L

Table 1. Parentage, fiber content, increase status, and ratings of susceptibility to smut, rust, leaf scald, mosaic, and ratoon stunting for CL 77-0797, CP 72-2086, CP 78-1628, CP 89-2143, and 80 new sugarcane clones

	Parentage				Rating*					
			Increase	Percent		Rust		Leaf		Ratoon
Clone	Female	Male	status[H]	fiber	Smut	Brown	Orange	scald	Mosaic	stunting[I]
CP 04-1935	CP 94-2059	CP 84-1322	Sand	10.57	R	R	R	L	L	L
CPCL 95-2287	CL 78-1120	CL 78-1600	Muck	12.35	R	L	L	L	R	R
CPCL 99-1225	CL 87-2608	CP 80-1743	None	11.52	S	S	S	R	R	L
CPCL 99-1401	CL 74-0259	CP 81-1238	None	10.67	R	S	S	S	R	R
CPCL 99-1777	CL 83-3586	CL 84-4234	None	11.05	R	S	S	R	R	R
CPCL 99-2103	CL 86-4047	CL 84-3152	None	11.99	S	S	S	R	R	S
CPCL 99-2206	CL 87-1630	CP 80-1743	None	9.66	R	S	S	S	L	S
CPCL 99-2574	CL 83-3431	MIX 98C'	None	11.89	R	L	L	L	R	R
CPCL 99-4455	CL 90-4643	CP 84-1198	Commercial	10.19	S	R	R	L	R	S
CPCL 00-0129	CL 84-3878	Mix 91V	None	10.23	R	L	L	R	R	R
CPCL 00-0458	CL 87-2882	CL 89-5189	None	10.44	R	S	S	R	R	U
CPCL 00-1373	CL 83-1900	CL 88-4730	None	12.27	R	S	L	R	R	U
CPCL 00-4027	CL 83-1364	CL 86-4590	None	11.59	R	S	S	R	R	U
CPCL 00-4111	CL 83-3431	CL 89-5189	Muck	11.23	R	R	R	L	R	S
CPCL 00-4611	CL 80-1575	CP 85-1491	None	11.75	L	S	S	R	R	R
CPCL 00-6131	CL 87-1630	CP 84-1198	None	11.24	L	L	S	R	L	R
CPCL 00-6756	CL 83-1364	CL 92-5431	None	12.19	R	S	S	R	R	R
CPCL 01-0271	CL 86-4340	Poly 00-3	None	10.88	R	L	S	R	L	S
CPCL 01-0571	CL 87-2944	CL 86-4590	None	11.09	R	L	S	L	L	R
CPCL 01-0877	CL 90-4725	CL 88-4730	None	10.70	R	L	L	R	R	R
CPCL 02-0843	CL 89-5189	CP 80-1743	None	10.55	L	R	S	L	R	L
CPCL 02-0908	CL 92-0775	LCP 85-0384	None	9.83	R	S	S	S	R	L
CPCL 02-0926	CP 80-1743	CL 92-0046	None	10.36	R	R	R	L	S	L
CPCL 02-1295	CP 88-1762	CL 91-1637	All	10.97	R	R	L	S	R	R
CPCL 02-2273	CP 89-2143	CL 88-4730	Muck	11.60	R	L	L	L	R	R
CPCL 02-2913	CL 88-4730	CP 80-17434	None	10.32	R	S	S	L	S	L
CPCL 02-2975	CL 94-4155	CL 84-4302	None	10.36	R	S	S	R	S	L

* R = resistant enough for commercial production; L = low levels of disease susceptibility; S =too susceptible for production; U = undetermined susceptibility (available data not sufficient to determine the level of susceptibility).

[H] Commercial = Released for commercial production; None = Not considered as potential release candidate; Otherwise, increasing acreage of seed cane at all locations, locations with sand soils only, or locations with muck soils only.

[I] Ratoon stunting can be controlled by using heat treated or tissue cultured vegetative planting material.

' 01 P04 and Mix 98c refer to polycrosses. In 01 P04, female parent (CP 96-1252) exposed to pollen from many clones in 2001 crossing season; in Mix 98c, CL 83-3431 exposed to pollen from many clones; and therefore, male parents of CP 04-1258 and CPCL 99-2574 unknown. Similar explanations for CP 04-1321, CPCL 00-0129, and CPCL 01-0271.

Table 2. Yields of cane in metric tons per hectare (TC/H) from plant cane on Dania muck and Lauderhill muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck				
Clone	Duda 12/30/2008	SFI 12/22/2008	Knight 12/29/2008	Wedgworth 1/22/2009	Okeelanta 2/4/2009	Mean yield, all farms
CPCL 02-1295	143.44	223.90 *	105.30	251.49 *	151.47 *	175.12 *
CPCL 02-2273	166.52	193.63	96.13	201.14 *	153.36 *	162.15 *
CPCL 95-2287	174.26 *	192.05	84.71	213.15 *	137.74	160.07 *
CP 04-1367	150.91	178.98	116.10 *	191.71	141.04	155.75
CP 78-1628	155.17	189.01	-----	187.18	145.92	154.28
CPCL 02-0926	131.69	212.30 *	76.90	193.23	147.65 *	152.19
CP 04-1321	144.73	210.05 *	47.16	228.93 *	128.05	151.79
CPCL 02-0843	150.63	163.91	111.20	177.45	150.92 *	150.82
CP 04-1619	136.63	183.66	92.59	190.31	132.27	147.09
CP 04-1252	135.50	202.79 *	81.00	183.26	125.82	145.67
CP 04-1426	144.75	160.92	102.50	163.01	143.24	143.28
CP 89-2143	149.10	177.65	88.71	169.46	125.63	142.11
CPCL 02-2975	124.04	176.20	88.22	179.07	122.72	137.90
CPCL 02-2913	127.49	173.84	89.91	162.77	126.50	136.10
CPCL 02-0908	122.87	149.57	66.88	201.69 *	91.72	126.54
CP 72-2086	113.15	150.58	46.85	167.57	117.06	119.04
Mean	141.93	183.69	86.28	191.34	133.82	147.49
LSD ($p = 0.1$)†	24.44	20.21	24.14	27.84	19.08	17.38
CV (%)	11.43	11.82	23.74	12.66	12.01	9.30

*Significantly greater than CP 89-2143 at $p = 0.10$ based on t test.
†*LSD* for location means of cane yield = 10.99 TC/H at $p = 0.10$.

Table 3. Preharvest yields of theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from plant cane on Dania muck and Lauderhill muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck				
Clone	Duda 10/8/09	Okeelanta 10/14/09	Knight 10/15/09	SFI 10/8/09	Wedgworth 10/15/09	Mean yield, all farms
CP 04-1321	109.9 *	111.7 *	114.0	104.4	85.1	105.0 *
CPCL 02-0908	92.6	106.6 *	111.9	102.8	92.9	101.4
CP 89-2143	96.1	95.7	107.9	101.5	94.2	99.1
CPCL 02-2975	98.2	95.4	105.3	103.3	91.3	98.7
CPCL 02-2913	91.2	93.6	105.8	105.4	93.0	97.8
CP 72-2086	88.4	93.0	108.2	99.3	93.0	96.4
CPCL 02-0926	86.0	94.0	99.2	109.5 *	84.0	94.5
CPCL 95-2287	88.7	94.8	89.8	97.4	92.4	92.6
CP 04-1367	84.5	96.9	92.7	91.3	86.2	90.3
CP 04-1252	78.9	90.7	89.7	97.3	85.3	88.4
CPCL 02-1295	88.7	91.3	90.5	85.5	73.2	85.8
CPCL 02-0843	71.2	93.2	97.6	85.8	80.3	85.6
CP 78-1628	79.8	82.1	-----	84.3	89.1	85.5
CPCL 02-2273	82.9	85.5	92.8	86.8	65.7	82.7
CP 04-1426	78.7	84.3	94.6	83.2	72.6	82.7
CP 04-1619	80.3	82.7	89.6	88.1	70.5	82.2
Mean	87.3	93.2	99.3	95.4	84.3	91.8
LSD (p = 0.1)†	7.3	10.1	8.6	5.9	4.7	3.3
CV (%)	10.7	8.5	8.8	9.2	11.0	8.0

*Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of sugar yield = 3.4 KS/T at p = 0.10.

Table 4. Yields of theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from plant cane on Dania muck and Lauderhill muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck				
Clone	Duda 12/30/2008	SFI 12/22/2008	Knight 12/29/2008	Wedgworth 1/22/2009	Okeelanta 2/4/2009	Mean yield, all farms
CP 04-1321	125.1 *	123.6	125.8 *	123.7 *	126.9 *	125.0 *
CPCL 02-0908	121.7	125.5	120.5	125.2 *	126.7 *	123.9 *
CPCL 02-2913	121.8	128.6	122.5	121.5 *	123.1	123.5
CPCL 02-2975	119.3	124.2	122.4	117.9	122.4	121.3
CPCL 02-0926	120.7	123.5	120.4	117.1	123.3	121.0
CP 89-2143	121.1	126.8	121.4	116.4	119.1	121.0
CP 72-2086	118.7	125.8	118.9	116.6	121.7	120.3
CP 78-1628	114.3	124.7	-----	112.0	118.9	117.2
CPCL 02-2273	112.5	122.5	113.5	114.1	121.3	116.8
CPCL 02-0843	116.0	119.9	111.3	109.7	118.6	115.1
CPCL 02-1295	114.1	119.2	111.3	115.0	115.3	115.0
CPCL 95-2287	114.6	116.6	112.1	115.3	115.0	114.7
CP 04-1619	114.7	116.5	116.9	110.2	112.9	114.2
CP 04-1367	107.6	114.9	106.6	106.2	108.7	108.8
CP 04-1252	105.3	107.6	104.2	106.7	108.8	106.5
CP 04-1426	101.8	109.2	106.8	108.0	94.0	104.1
Mean	115.6	120.6	115.6	114.7	117.3	116.8
LSD (p = 0.1)†	3.4	4.2	4.1	4.7	5.4	2.8
CV (%)	5.6	5.1	5.8	5.0	7.1	5.3

*Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of sugar yield = 2.2 KS/T at p = 0.10.

Table 5. Yields of theoretical recoverable 96° sugar in metric tons per hectare (TS/H) from plant cane on Dania muck and Lauderhill muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck				
Clone	Duda 12/30/2008	SFI 12/22/2008	Knight 12/29/2008	Wedgworth 1/22/2009	Okeelanta 2/4/2009	Mean yield, all farms
CPCL 02-1295	16.346	25.772 *	11.675	18.071	29.044 *	20.182 *
CP 04-1321	18.144	26.118 *	5.909	15.887	28.925 *	18.997
CPCL 02-2273	18.762	22.107	10.910	18.800	23.935 *	18.910
CPCL 02-0926	15.894	24.962 *	9.191	18.249	25.280 *	18.683
CPCL 95-2287	19.908	22.142	9.494	16.087	24.761 *	18.455
CP 78-1628	17.733	21.287	-----	18.295	22.786	18.247
CPCL 02-0843	17.517	17.989	12.256	18.134	21.069	17.393
CP 89-2143	18.066	20.739	10.775	15.945	20.206	17.146
CP 04-1367	16.258	19.064	12.370	16.196	20.825	16.943
CPCL 02-2913	15.542	21.127	10.985	16.302	20.035	16.798
CPCL 02-2975	14.838	20.824	10.790	15.259	21.890	16.710
CP 04-1619	15.669	20.189	10.629	15.417	20.305	16.463
CPCL 02-0908	14.955	18.780	8.026	11.488	25.513 *	15.752
CP 04-1252	14.318	21.674	8.301	13.513	19.856	15.532
CP 04-1426	14.764	17.377	10.938	15.657	15.387	14.885
CP 72-2086	13.447	17.597	5.503	14.730	20.810	14.409
Mean	16.385	21.109	9.850	16.127	22.539	17.219
LSD (p = 0.1)†	2.959	2.809	2.612	2.463	3.185	2.946
CV (%)	10.978	12.873	21.386	11.988	15.788	9.363

*Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of sugar yield = 1.321 TS/H at p = 0.10.

Table 6. Yields of preharvest and harvest theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from plant cane on Malabar sand and Pompano fine sand

	Preharvest yield by soil type, farm, and sampling date				Harvest yield by soil type, farm, and sampling date			
	Malabar sand	Pompano fine sand	Margate sand	Mean yield, all farms	Malabar sand	Pompano fine sand	Margate sand	Mean yield, all farms
Clone	Hilliard 10/13/09	Lykes 10/13/09	Townsite 10/13/09		Hilliard 1/27/09	Lykes 1/13/09	Townsite 1/28/09	
CPCL 02-0908	131.8 *	118.3 *	131.9 *	127.3 *	148.8 *	136.7	149.8 *	145.1 *
CP 04-1321	131.3 *	115.7 *	129.5 *	125.5 *	140.0	136.1	145.0	140.3
CP 04 1935	117.0	117.4 *	119.3	117.9 *	140.4	135.4	143.0	139.6
CPCL 02-0843	117.8	110.5 *	114.7	114.3	142.3 *	130.8	141.8	138.3
CP 78-1628	118.4	100.4	116.3	111.7	138.5	133.0	142.3	138.0
CPCL 02-2913	120.8	113.6 *	124.6 *	119.7 *	141.8	132.0	140.2	138.0
CP 04-1619	113.6	101.0	119.9	111.5	145.0 *	126.1	142.6	137.7
CPCL 02-0926	111.7	110.8 *	111.6	111.4	139.9	130.3	139.5	136.6
CP 04-1566	111.0	109.0 *	109.2	109.7	136.9	128.8	142.1	135.9
CP 89-2143	121.2	108.6 *	127.7 *	119.2 *	135.0	128.6	143.1	135.6
CP 04-1258	120.6	110.1 *	119.6	116.8	137.5	127.3	139.9	134.9
CPCL 02-1295	102.8	78.6	111.6	97.7	137.4	124.9	138.2	133.5
CP 04-1374	116.0	102.0	113.9	110.6	135.2	127.6	137.6	133.5
CP 72-2086	116.2	95.8	122.3	111.4	136.5	125.7	136.2	132.8
CP 04-1844	101.9	91.9	104.9	99.6	128.2	124.1	131.1	127.8
CP 04-1252	100.3	101.9	103.9	102.1	122.6	113.8	125.9	120.7
Mean	115.8	105.3	117.6	112.9	137.9	128.8	139.9	135.5
LSD (p = 0.1)†	5.5	5.0	6.2	5.6	3.6	5.3	3.6	3.0
CV (%)	7.8	9.9	7.1	7.4	4.5	4.4	4.0	4.1

* Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.
† *LSD* for location means of preharvest sugar yield = 5.5 KS/T and of harvest sugar yield = 2.2 KS/T at p = 0.10.

Table 7. Yields of cane and theoretical recoverable 96° sugar in metric tons per hectare (TC/H and TS/H) from plant cane on Malabar sand, Margate sand, and Pompano fine sand

	Cane yield by soil type, farm, and sampling date				Sugar yield by soil type, farm, and sampling date			
	Malabar Sand	Pompano Fine Sand	Margate Sand	Mean	Malabar Sand	Pompano Fine Sand	Margate Sand	Mean
Clone	Hilliard 1/27/09	Lykes 1/13/09	Townsite 1/28/09	yield, all farms	Hilliard 1/27/09	Lykes 1/13/09	Townsite 1/28/09	yield, all farms
CP 04-1844	184.17 *	152.58	173.72 *	170.16 *	23.685	19.038	22.732 *	21.818
CP 04-1566	156.36	144.06	164.31 *	154.91	21.417	18.570	23.385 *	21.124
CP 04-1935	172.61	108.15	162.41 *	147.72	24.243	14.602	23.189 *	20.678
CPCL 02-1295	153.48	141.89	162.00 *	152.46	21.089	17.754	22.370 *	20.404
CPCL 02-0843	161.61	138.11	138.78	146.17	23.004	18.076	19.692	20.257
CP 78-1628	158.85	138.65	128.57	141.80	22.014	18.394	18.282	19.535
CPCL 02-0926	151.82	144.64	124.24	140.23	21.183	18.798	17.345	19.109
CP 89-2143	161.95	123.52	133.97	139.81	21.860	15.953	19.184	18.999
CP 04-1374	150.92	148.84	127.42	142.39	20.383	19.002	17.523	18.969
CP 04-1258	156.52	130.69	132.11	139.77	21.522	16.583	18.476	18.860
CP 04-1619	153.76	123.95	124.59	133.77	22.320	15.640	17.723	18.487
CPCL 02-2913	135.55	112.29	131.82	126.55	19.208	14.830	18.468	17.502
CP 04-1321	121.21	113.03	121.82	118.69	16.936	15.402	17.647	16.661
CPCL 02-0908	122.13	115.07	102.20	113.13	18.178	15.615	15.299	16.364
CP 04-1252	130.24	130.72	145.59	135.04	15.918	14.829	17.776	16.066
CP 72-2086	136.56	94.10	120.00	116.89	18.614	11.828	16.309	15.583
Mean	150.48	128.77	137.10	138.72	20.723	16.557	19.087	18.776
LSD (p = 0.1)†	22.62	23.82	17.94	16.90	3.102	3.169	2.480	2.300
CV (%)	11.55	13.00	14.23	10.73	11.426	12.466	13.139	10.062

* Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.

† *LSD* for location means of cane yield = 9.35 TC/H and of sugar yield =1.292 TS/H at p = 0.10.

Table 8. Yields of preharvest and harvest theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from plant cane on Dania muck and Torry muck

	Preharvest yield by soil type, farm, and sampling date			Harvest yield by soil type, farm, and sampling date		
	Dania Muck	Torry Muck		Dania Muck	Torry Muck	
Clone	**Okeelanta 10/14/09**	**Eastgate 10/8/09**	**Mean yield, both farms**	**Okeelanta 2/9/09**	**Eastgate 1/23/09**	**Mean yield, both farms**
CPCL 00-0129	79.1	113.4	96.3	128.8	127.1	128.0
CPCL 01-0271	77.7	107.2	92.5	130.5	124.7	127.6
CPCL 01-0571	69.6	108.7	89.2	124.3	128.6 *	126.4
CP 03-1160	80.4	109.1	94.7	129.3	123.0	126.2
CP 72-2086	86.9	110.2	98.6	128.5	122.7	125.6
CP 89-2143	94.7	109.8	102.3	127.2	123.7	125.4
CPCL 00-4027	62.1	111.2	86.7	124.8	124.6	124.7
CPCL 00-4111	69.2	110.5	89.8	124.6	124.7	124.6
CP 78-1628	90.9	112.3	101.6	126.9	121.0	124.0
CPCL 00-1373	68.0	104.1	86.1	127.6	118.7	123.1
CPCL 00-6756	65.0	99.8	82.4	125.1	116.4	120.7
CP 03-2188	66.4	101.1	83.7	119.5	118.6	119.0
CP 03-1491	64.3	113.0	88.6	115.3	122.2	118.8
CPCL 00-0458	82.6	113.2	97.9	114.9	122.0	118.5
CPCL 00-6131	81.7	107.1	94.4	120.9	115.9	118.4
CPCL 00-4611	62.0	97.6	79.8	108.3	113.2	110.8
Mean	75.0	108.0	91.5	123.5	121.7	122.6
LSD ($p = 0.1$)†	15.7	4.2	7.4	15.4	3.9	7.7
CV (%)	14.1	4.6	7.5	5.0	3.4	3.7

* Significantly greater than CP 78-1628 at $p = 0.10$ based on t test.

† *LSD* for location means of preharvest sugar yield = 4.54 KS/T and of harvest yield = 3.39 KS/T at $p = 0.10$.

Table 9. Yields of cane and of theoretical recoverable 96° sugar in metric tons per hectare (TC/H and TS/H) from plant cane on Dania muck and Torry muck

	Cane yield by soil type, farm, and sampling date			Sugar yield by soil type, farm, and sampling date		
	Dania Muck	Torry Muck		Dania Muck	Torry Muck	
Clone	**Okeelanta 2/9/09**	**Eastgate 1/23/09**	**Mean yield, both farms**	**Okeelanta 2/9/09**	**Eastgate 1/23/09**	**Mean yield, both farms**
CP 03-1160	82.92	246.45	164.68	10.610	30.319	20.465
CPCL 01-0571	49.43	241.23	145.33	6.266	31.091	18.678
CPCL 00-1373	56.45	248.35	152.40	7.198	29.469	18.333
CPCL 00-6131	48.20	263.52	155.86	5.995	30.430	18.213
CP 89-2143	56.64	234.60	145.62	7.125	28.987	18.056
CPCL 00-4111	44.59	225.53	135.06	5.583	28.138	16.860
CPCL 01-0271	62.56	194.04	128.30	8.291	24.215	16.253
CPCL 00-6756	66.65	204.21	135.43	8.264	23.820	16.042
CP 78-1628	58.13	197.77	127.95	7.423	24.064	15.743
CPCL 00-0458	46.78	209.64	128.21	5.764	25.601	15.683
CPCL 00-0129	34.28	209.45	121.86	4.551	26.616	15.583
CP 72-2086	34.44	201.76	118.10	4.389	24.793	14.591
CPCL 00-4611	51.39	192.18	121.78	5.545	21.798	13.671
CPCL 00-4027	41.49	171.98	106.73	5.313	21.513	13.413
CP 03-2188	31.29	187.74	109.52	3.798	22.296	13.047
CP 03-1491	28.88	166.51	97.70	3.555	20.365	11.960
Mean	49.63	212.19	130.91	6.229	25.845	16.037
LSD (p = 0.1)†	15.35	24.61	31.25	2.039	3.115	3.904
CV (%)	28.83	13.37	14.20	29.892	13.635	14.574

† *LSD* for location means of cane yield = 11.83 TC/H and of sugar yield = 1.584 TS/H at p = 0.10.

Table 10. Yields of cane in metric tons per hectare (TC/H) from first-ratoon on Dania muck, Lauderhill muck, and Pahokee muck

	Mean yield by soil type, farm, and sampling date						
	Dania muck	Lauderhill muck				Pahokee muck	Mean yield, all farms
Clone	Duda 12/11/08	Wedgworth 10/29/2008	Knight 10/31/08	SFI 11/28/08	Okeelanta 12/10/08	Osceola 12/21/08	
CPCL 00-6131	152.42 *	174.42 *	121.70	200.59 *	125.29 *	167.73 *	157.03 *
CP 03-1160	104.69	180.87 *	146.68	150.51	113.94 *	177.99 *	145.78 *
CP 78-1628	155.99 *	156.40 *	126.59	-----	72.10	172.78 *	142.44 *
CPCL 00-4111	147.25 *	152.33	99.72	184.99 *	87.11	158.37 *	138.30 *
CPCL 00-6756	142.47 *	154.18	106.36	162.90	109.81 *	151.57 *	137.88 *
CP 03-2188	143.18 *	147.82	120.39	174.65 *	68.81	160.02 *	135.81 *
CPCL 00-1373	137.35 *	150.32	113.92	175.53 *	100.57 *	136.59	135.71 *
CPCL 01-0271	176.70 *	158.24 *	108.44	130.49	94.75 *	127.55	132.70 *
CPCL 00-4027	135.73 *	149.11	107.17	161.92	96.90 *	136.97	131.34 *
CPCL 01-0571	126.36 *	133.81	104.65	149.57	110.58 *	117.43	123.73
CPCL 00-0129	130.38 *	-----	86.82	167.91 *	91.02	115.31	122.30
CPCL 00-0458	125.00 *	135.22	103.45	147.33	94.26 *	125.68	121.82
CPCL 00-4611	141.05 *	155.36 *	86.39	148.79	61.51	121.44	119.22
CP 89-2143	97.36	137.74	-----	145.62	71.94	131.00	112.28
CP 72-2086	118.82	134.09	88.73	125.44	76.55	108.86	108.75
CP 03-1491	76.94	104.30	76.82	118.54	59.90	89.33	87.51
Mean	131.98 †	148.28	106.52	156.32	89.69	137.41	128.29
LSD (p = 0.1)†	25.44	16.91	17.59	21.98	19.82	16.70	14.40
CV (%)	18.37	12.28	16.92	14.38	21.99	18.33	12.96

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 11.58 TC/H at p = 0.10.

Table 11. Yields of theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from first-ratoon on Dania muck, Lauderhill muck, and Pahokee muck

	Mean yield by soil type, farm, and sampling date						
	Dania muck	Lauderhill muck				Pahokee muck	Mean
Clone	Duda 12/11/08	Wedgworth 10/29/2008	Knight 10/31/08	SFI 11/28/08	Okeelanta 12/10/08	Osceola 12/21/08	yield, all farms
CPCL 00-0129	123.8 *	-----	100.1	119.3	121.2	123.9 *	115.8 *
CPCL 01-0271	120.2 *	106.9	97.5	116.1	124.5 *	119.8	114.2
CPCL 00-4027	122.3 *	100.9	90.3	118.5	117.9	116.7	111.2
CP 03-1491	119.3	99.0	92.0	114.1	125.3 *	115.8	111.0
CP 72-2086	118.4	104.2	96.0	114.6	116.8	115.5	110.9
CP 89-2143	115.1	103.8	-----	115.1	118.7	116.3	110.9
CPCL 00-4111	113.1	96.8	103.6	117.5	118.3	109.3	109.8
CPCL 01-0571	118.1	97.7	96.9	114.2	109.1	113.4	108.2
CP 03-2188	116.6	99.3	95.6	114.8	98.5	116.9	106.9
CP 78-1628	113.0	100.4	89.6	-----	111.3	115.7	106.9
CPCL 00-6756	114.7	89.9	97.7	106.4	115.5	114.0	106.4
CPCL 00-0458	113.3	94.3	89.4	107.1	115.6	111.5	105.2
CP 03-1160	106.8	95.1	88.8	110.3	111.5	113.7	104.4
CPCL 00-1373	110.9	99.2	89.6	103.9	114.9	106.3	104.1
CPCL 00-6131	108.1	87.2	82.3	107.8	109.6	112.1	101.2
CPCL 00-4611	107.2	92.9	86.1	106.0	106.7	104.1	100.5
Mean	115.0	97.8	93.0	112.4	114.7	114.1	108.0
LSD (p = 0.1)†	4.4	4.7	4.7	5.8	3.7	4.6	3.7
CV (%)	4.5	5.5	6.2	4.5	6.0	4.2	4.0

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of sugar yield = 1.9 KS/T at p = 0.10.

Table 12. Yields of theoretical recoverable 96° sugar in metric tons per hectare (TS/H) from first-ratoon on Dania muck, Lauderhill muck, and Pahokee muck

	Mean yield by soil type, farm, and sampling date						
	Dania muck	Lauderhill muck				Pahokee muck	Mean yield, all farms
Clone	Duda 12/11/08	Wedgworth 10/29/2008	Knight 10/31/08	SFI 11/28/08	Okeelanta 12/10/08	Osceola 12/21/08	
CPCL 00-6131	16.437 *	15.277	10.030	21.629 *	13.702 *	18.772 *	15.974 *
CP 78-1628	17.613 *	15.770	11.316	-----	8.057	20.002 *	15.302 *
CPCL 00-4111	16.637 *	14.809	10.343	21.731 *	10.357	17.369 *	15.208 *
CP 03-1160	11.422	17.158 *	13.085	16.627	12.720 *	20.209 *	15.203 *
CPCL 01-0271	21.260 *	16.971 *	10.540	15.400	11.791 *	15.258	15.203 *
CP 03-2188	16.607 *	14.604	11.415	20.113 *	6.857	18.710 *	14.718 *
CPCL 00-4027	16.575 *	15.057	9.754	19.092	11.511 *	15.979	14.673 *
CPCL 00-6756	16.307 *	13.879	10.382	17.402	12.680 *	17.087	14.616 *
CPCL 00-0129	16.273 *	-----	8.657	20.140 *	11.057 *	14.298	14.237 *
CPCL 00-1373	15.193 *	14.912	10.275	18.277	11.549 *	14.534	14.123
CPCL 01-0571	14.946 *	13.120	10.122	17.137	11.967 *	13.405	13.449
CPCL 00-0458	14.151	12.769	9.206	15.863	10.874 *	13.990	12.809
CP 89-2143	11.172	14.287	-----	16.775	8.581	15.230	12.414
CP 72-2086	14.071	13.963	8.542	14.438	8.941	12.581	12.089
CPCL 00-4611	15.132 *	14.493	7.464	15.796	6.640	12.599	12.029
CP 03-1491	9.171	10.355	7.110	13.580	7.518	10.356	9.665
Mean	15.185 *	14.495	9.883	17.600	10.300	15.649	13.857
LSD (p = 0.1)†	2.984	1.963	1.753	2.878	2.270	2.093	1.732
CV (%)	18.756	11.482	15.558	14.237	21.688	18.218	12.019

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of sugar yield = 1.338 TS/H at p = 0.10.

Table 13. Yields of cane in metric tons per hectare (TC/H) and theoretical recoverable 96° sugar in kg per metric ton (KS/T) and in metric tons per hectare (TS/H) from first-ratoon cane on Malabar sand and Pompano fine sand.

	Cane yield (TC/H) by soil type, farm, and sampling date			Sugar yield (KS/T) by soil type, farm, and sampling date			Sugar yield (TS/H) by soil type, farm, and sampling date		
Clone	Malabar sand Hilliard 12/15/08	Pompano fine sand Lykes 12/16/08	Mean yield, both farms	Malabar sand Hilliard 12/15/08	Pompano fine sand Lykes 12/16/08	Mean yield, both farms	Malabar sand Hilliard 12/15/08	Pompano fine sand Lykes 12/16/08	Mean yield, both farms
CP 03-1912	61.89	130.49	96.19*	116.8	128.2	122.5	15.275	7.890	11.583*
CPCL 00-4027	57.39	105.19	81.29	125.3	127.6	126.4	13.193	7.220	10.206
CP 03-1160	60.73	102.92	81.83	119.5	126.6	123.0	12.304	7.418	9.861
CPCL 00-6131	38.07	119.88	78.98	121.0	127.4	124.2	14.553	4.785	9.669
CP 03-1173	43.83	94.95	69.51	118.4	124.3	121.4	11.287	5.357	8.338
CP 03-1401	46.21	76.43	61.32	122.3	132.0	127.2	9.332	6.257	7.795
CPCL 00-1373	33.26	90.66	61.96	117.3	123.3	120.3	10.637	4.122	7.379
CP 89-2143	31.76	84.17	57.96	124.7	129.7	127.2	10.528	4.135	7.331
CP 72-2086	30.52	88.59	59.15	122.2	127.4	124.7	10.666	3.871	7.225
CPCL 01-0877	26.43	87.39	56.91	125.1	123.2	124.2	10.930	3.318	7.124
CPCL 01-0271	16.87	95.40	57.79	124.4	116.6	121.1	11.851	1.880	7.102
CP 03-1939	34.72	80.94	57.83	116.8	126.8	121.8	9.561	4.488	7.025
CP 78-1628	22.61	90.21	56.41	122.7	130.0	126.3	11.097	2.942	7.019
CPCL 01-0571	27.48	73.27	50.37	127.0	132.1	129.6	9.313	3.636	6.475
CP 03-1491	35.13	56.47	45.80	127.9	138.1	133.0 *	7.224	4.855	6.040
CP 03-2188	18.78	74.56	46.67	122.3	128.4	125.4	9.199	2.436	5.817
Mean	36.61	90.72	63.75	122.1	127.6	124.9	11.059	4.663	7.874
LSD (p=0.1) †	17.66	21.56	18.48	3.3	5.2	5.6	2.191	2.727	3.500
CV (%)	20.23	61.20	32.17	2.8	4.2	3.7	20.586	60.803	32.713

*Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 22.85 TC/H, of sugar content = 5.1 KS/T, and of sugar yield = 2.880 TS/H at p = 0.10.

Table 14. Yields of cane in metric tons per hectare (TC/H) and theoretical recoverable 96° sugar in kg per metric ton (KS/T) and in metric tons per hectare (TS/H) from first-ratoon on Dania Muck and Torry Muck.

	Cane yield (TC/H) by soil type, farm, and sampling date			Sugar yield (KS/T) by soil type, farm, and sampling date			Sugar yield (TS/H) by soil type, farm, and sampling date		
Clone	Torry Muck Eastgate 1/23/2009	Dania Muck Okeelanta 12/18/2008	Mean yield, both farms	Torry Muck Eastgate 1/23/2009	Dania Muck Okeelanta 12/18/2008	Mean yield, both farms	Torry Muck Eastgate 1/23/2009	Dania Muck Okeelanta 12/18/2008	Mean yield, both farms
CP 02-1143	196.75 *	113.50 *	155.13	127.2	117.9	122.6	25.037 *	13.377 *	19.207 *
CP 02-1564	180.03	122.29 *	151.16	125.4	117.6	121.5	22.568	14.582 *	18.575 *
CPCL 99-2574	187.22 *	98.46 *	142.84	128.5	118.8	123.7	24.040 *	11.798 *	17.919 *
CPCL 99-1401	157.24	118.49 *	137.86	134.3	118.3	126.3	21.008	14.178 *	17.593 *
CP 02-2015	179.58	96.36 *	137.97	124.3	117.0	120.6	22.291	11.316 *	16.804
CP 02-2281	174.55	98.51 *	136.53	121.9	118.9	120.4	21.285	11.775 *	16.530
CPCL 99-1225	163.81	96.94 *	130.38	130.9	118.2	124.6	21.433	11.497 *	16.465
CP 78-1628	154.66	105.06 *	129.86	124.4	122.9	123.7	19.249	12.953 *	16.101
CP 02-1554	170.66	92.11 *	131.38	121.6	116.0	118.8	20.747	10.735 *	15.741
CP 72-2086	143.63	89.66 *	116.65	132.7	118.3	125.5	19.089	10.642 *	14.865
CPCL 99-2206	154.98	93.35 *	124.16	121.3	116.6	118.9	18.797	10.887 *	14.842
CPCL 99-2103	145.93	80.52	113.22	129.7	125.3	127.5	18.908	10.108	14.508
CP 89-2143	161.55	57.58	109.56	131.7	121.9	126.8	21.326	7.141	14.233
CPCL 99-4455	132.32	72.31	102.31	139.4 *	124.4	131.9	18.443	9.052	13.748
CPCL 99-1777	147.43	65.86	106.64	127.5	118.5	123.0	18.765	7.827	13.296
CP 02-1458	116.99	69.96	93.48	121.5	113.2	117.3	14.233	7.974	11.104
Mean	160.46	91.93 †	126.20	127.6	119.0	123.3	20.451	10.990 †	15.721
LSD (p = 0.1)†	19.27	27.08	21.69	3.7	3.8	5.3	2.471	3.329	2.932

*Significantly greater than CP 89 2143 at p = 0.10 based on *t* test.
† LSD for location means of cane yield = 19.83 TC/H of sugar yield = 2.5 KS/T, and of sugar yield = 2.569 TS/H at p = 0.10.

Table 15. Yields of cane in metric tons per hectare (TC/H) from second-ratoon cane on Dania muck, Lauderhill muck, Pahokee muck, Malabar sand, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date						
	Lauderhill muck				Pahokee muck	Pompano fine sand	
Clone	Okeelanta 10/17/2008	Knight 10/21/2008	Wedgworth 10/27/2008	SFI 10/16/2008	Osceola 10/20/2008	Lykes 12/10/2008	Mean yield, all farms
CP 02-1564	107.62 *	91.64	147.99	173.66 *	125.06 *	66.58	119.37 *
CP 02-2281	104.57 *	110.55	116.73	131.03	96.10 *	65.32	103.74 *
CP 02-1554	90.15	104.93	111.56	125.27	108.42 *	81.31 *	103.43
CP 78-1628	87.27	-----	-----	-----	106.03 *	74.57	102.32
CPCL 99-2206	96.34	62.64	137.73	136.87	101.12 *	61.18	100.19
CP 02-2015	100.82 *	105.22	102.07	145.29	90.84 *	48.17	98.42
CP 02-1143	88.94	80.57	97.10	145.61	94.37 *	67.75	96.00
CPCL 99-1225	83.27	99.83	110.30	126.64	90.01	49.96	93.00
CP 89-2143	85.49	-----	-----	140.28	73.05	62.97	91.64
CPCL 99-1401	93.28	61.88	105.11	104.61	95.96 *	76.58	90.53
CPCL 99-2103	76.67	91.30	88.30	117.08	98.12 *	53.12	87.19
CPCL 99-1777	91.05	80.45	90.26	112.07	67.79	63.05	84.08
CPCL 99-2574	77.82	87.49	66.95	125.25	83.02	41.04	79.61
CPCL 99-4455	75.90	99.88	92.46	108.19	74.78	25.90	78.86
CP 72-2086	67.18	58.92	60.89	99.43	73.65	29.85	65.01
CP 02-1458	62.37	52.23	77.86	87.99	57.75	39.25	62.94
Mean	86.80	84.82	100.38	125.28	89.75	56.66	91.02
LSD ($p = 0.1$)†	14.29	32.64	16.04	19.83	17.40	15.96	11.84
CV (%)	14.61	22.70	24.22	17.29	19.24	29.05	16.10

* Significantly greater than CP 89-2143 at $p = 0.10$ based on t test.
† *LSD* for location means of cane yield = 8.94 TC/H at $p = 0.10$.

Table 16. Yields of theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from second-ratoon cane on Dania muck, Lauderhill muck, Pahokee muck, Malabar sand, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date						
	Lauderhill muck				Pahokee muck	Pompano fine sand	
Clone	**Okeelanta 10/17/2008**	**Knight 10/21/2008**	**Wedgworth 10/27/2008**	**SFI 10/16/2008**	**Osceola 10/20/2008**	**Lykes 12/10/2008**	**Mean yield, all farms**
CPCL 99-4455	129.7 *	105.9	105.1	120.4*	134.40 *	128.0	120.6 *
CPCL 99-2574	124.0 *	97.4	98.6	109.8	128.16 *	133.0 *	115.3
CP 89-2143	114.9	-----	-----	113.4	119.90	126.2	111.6
CP 02-1564	119.7	91.9	99.2	105.4	119.49	130.2	111.1
CPCL 99-2103	112.7	97.8	95.1	107.1	120.44	129.0	110.3
CP 02-2281	113.1	98.4	93.1	110.6	120.33	124.9	110.0
CP 78-1628	112.9	-----	-----	-----	125.12	124.2	110.0
CP 02-1143	108.9	90.2	101.3	102.5	121.78	126.2	108.6
CP 72-2086	116.9	93.5	98.4	103.6	116.84	121.2	108.4
CP 02-1458	113.8	97.7	89.9	104.4	120.36	124.8	108.4
CP 02-2015	107.1	96.6	90.5	109.2	122.65	120.6	107.7
CP 02-1554	109.1	90.8	90.5	103.6	123.15	128.4	107.7
CPCL 99-1777	111.0	91.8	90.9	98.0	109.55	123.9	104.1
CPCL 99-1225	112.2	94.1	87.7	91.6	111.60	121.8	103.0
CPCL 99-1401	101.8	86.5	86.2	93.7	109.93	133.3	102.1
CPCL 99-2206	104.5	91.3	92.3	91.2	106.12	122.9	101.3
Mean	113.3	94.6	94.2	104.3	119.36	126.2	108.8
LSD (p = 0.1)†	6.5	8.2	6.5	7.0	6.14	3.8	4.1
CV (%)	6.2	5.1	5.9	7.8	6.11	3.1	4.5

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield =1.8 TC/H at p = 0.10.

Table 17. Yields of theoretical recoverable 96° sugar in metric tons per hectare (TS/H) from second-ratoon cane on Dania muck, Lauderhill muck, Pahokee muck, Malabar sand, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date						
	Lauderhill muck				Pahokee muck	Pompano fine sand	
Clone	Okeelanta 10/17/2008	Knight 10/21/2008	Wedgworth 10/27/2008	SFI 10/16/2008	Osceola 10/20/2008	Lykes 12/10/2008	Mean yield, all farms
CP 02-1564	12.885 *	8.476	14.740	18.313	14.964 *	8.568	13.075 *
CP 78-1628	9.959	-----	-----	-----	13.271 *	9.261	11.366
CP 02-2281	11.837 *	10.852	10.868	14.589	11.593 *	8.157	11.292
CP 02-1554	9.840	9.495	10.125	12.936	13.419 *	10.505 *	11.058
CP 02-2015	10.788	10.154	9.228	15.959	11.150 *	5.805	10.487
CP 02-1143	9.713	7.208	9.904	14.973	11.444 *	8.544	10.335
CP 89-2143	9.898	-----	-----	15.920	8.845	7.964	10.233
CPCL 99-2206	10.097	5.723	12.690	12.567	10.744	7.515	9.964
CPCL 99-2103	8.629	8.913	8.392	12.741	11.822 *	6.838	9.537
CPCL 99-4455	9.756	10.698	9.678	12.990	10.041	3.307	9.342
CPCL 99-1225	9.448	9.381	9.682	11.661	9.986	6.050	9.328
CPCL 99-1401	9.477	5.515	9.114	9.625	10.608	10.191 *	9.168
CPCL 99-2574	9.662	8.743	6.567	13.752	10.662	5.520	9.135
CPCL 99-1777	10.157	7.300	8.183	11.001	7.426	7.838	8.650
CP 72-2086	7.988	5.452	6.010	10.331	8.649	3.611	7.012
CP 02-1458	7.048	5.128	7.008	9.243	6.933	4.898	6.707
Mean	9.824	8.074	9.442	13.107	10.722	7.161	9.793
LSD (p = 0.1)†	1.856	3.283	1.675	2.454	2.159	2.060	1.437
CV (%)	13.750	24.995	24.621	19.452	19.931	30.024	16.245

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield =1.028 TC/H at p = 0.10.

Table 18. Yields of cane in metric tons per hectare (TC/H) and theoretical recoverable 96° sugar in kg per metric ton (KS/T) and in metric tons per hectare (TS/H) from second-ratoon cane on Dania muck and Torry muck

	Cane yield (TC/H) by soil type, farm, and sampling date			Sugar yield (KS/T) by soil type, farm, and sampling date			Sugar yield (TS/H) by soil type, farm, and sampling date		
Clone	Dania muck Okeelanta 10/14/2008	Torry muck Eastgate 1/16/2009	Mean yield, both farms	Dania muck Okeelanta 10/14/2008	Torry muck Eastgate 1/16/2009	Mean yield, both farms	Dania muck Okeelanta 10/14/2008	Torry muck Eastgate 1/16/2009	Mean yield, both farms
CP 01-1564	114.70 *	167.61 *	141.37 *	104.9	141.2	123.1	10.420 *	20.582 *	15.514 *
CP 01-2390	106.86 *	138.62	122.98 *	126.4 *	141.4	133.7	11.611 *	16.952	14.264 *
CP 01-1378	111.94 *	134.62	123.05 *	122.8 *	141.2	131.2	11.819 *	16.503	14.014 *
CP 01-1372	127.70 *	112.15	118.68 *	122.3 *	145.3	133.7	13.591 *	14.106	13.683 *
CP 01-2056	89.93 *	151.31 *	121.80 *	106.0	136.0	121.0	8.306 *	17.679	13.099
CP 01-1321	82.21	132.73	108.30	103.7	146.9	125.4	7.468	16.839	12.259
CP 78-1628	99.40 *	125.99	112.78	98.5	145.1	121.9	8.432 *	15.775	12.147
CP 01-1957	99.63 *	129.60	114.80	98.7	132.5	115.6	8.402 *	14.868	11.652
CP 01-1338	103.77 *	120.75	112.04	98.5	137.6	118.1	8.784 *	14.444	11.606
CP 01-1391	85.63	114.67	100.31	100.6	141.5	121.1	7.459	14.116	10.810
CP 01-2459	80.51	109.41	95.11	107.4	148.4	128.0	7.481	14.035	10.778
CP 01-1205	87.98	91.97	89.35	116.4 *	155.9 *	136.2*	8.809 *	12.516	10.594
CP 89-2143	68.76	117.70	94.01	97.2	147.1	122.3	5.690	14.885	10.388
CP 72-2086	70.27	104.68	87.80	109.4 *	143.3	126.3	6.634	12.766	9.707
CP 01-1181	53.28	97.44	75.99	133.3 *	148.6	140.7*	6.233	12.462	9.357
CP 01-1178	54.40	92.72	74.60	113.4 *	145.8	129.6	5.373	11.729	8.597
Mean	89.81 †	121.37	105.81	110.0 †	143.6	126.7	8.532 †	15.016	11.779
LSD (p = 0.1)†	19.69	30.13	23.15	11.8	5.5	13.2	2.160	3.808	2.888
CV (%)	23.70	17.21	17.59	10.3	3.9	5.5	27.067	15.334	16.471

*Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.

† LSD for location means of cane yield = 21.94 TC/H of sugar yield = 3.6 KS/T, and of sugar yield = 2.704 TS/H at p = 0.10.

Table 19. Dates of stalk counts of 10 plant cane, 9 first ratoon, and 10 second ratoon experiments.

	Crop		
Location	**Plant cane**	**First ratoon**	**Second ratoon**
Duda	07/11/08	07/24/08	08/28/08
Eastgate	04/16/08	08/13/08	09/16/08
Hilliard	07/25/08	08/14/08	09/12/08
Knight	07/10/08	08/04/08	09/11/08
Lykes	07/23/08	08/05/08	08/27/08
Okeelanta	07/21/08	08/01/08	08/22/08
Okeelanta (successive)	07/28/08	08/11/08	08/29/08
Osceola	---	---	09/08/08
SFI	07/09/08	07/31/08	09/02/08
Townsite	07/14/08	---	---
Wedgworth	07/08/08	07/29/08	08/26/08

Table 20. Rankings† of clones and percent rating of CP 89-2143, by series, of damage to juice quality by cold temperatures.

CP 01Series			CP 02 and CPCL 99 Series			CP 03, CPCL 00, and CPCL 01 Series		
Clone	Rank	% of CP 89-2143	Clone	Rank	% of CP 89-2143	Clone	Rank	% of CP 89-2143
CP 72-2086	12	92.0	CP 72-2086	14	92.0	CP72-2086	18	85.7
CP 78-1628	1	103.8	CP 78-1628	1	103.8	CP78-1628	12	92.5
CP 89-2143	3	100.0	CP 89-2143	5	100.0	CP89-2143	1	100.0
CP 01-1178	6	99.6	CP 02-1143	15	90.8	CP03-1160	4	96.5
CP 01-1181	14	90.5	CP 02-1458	6	99.3	CP03-1173	14	91.4
CP 01-1205	7	99.3	CP 02-1554	4	100.5	CP03-1401	6	95.5
CP 01-1321	11	92.1	CP 02-1564	7	97.6	CP03-1491	2	97.9
CP 01-1338	15	88.0	CP 02-1582	12	93.8	CP03-1912	21	78.9
CP 01-1372	4	99.9	CP 02-1736	10	94.5	CP03-1939	11	93.9
CP 01-1378	10	95.5	CP 02-2015	13	92.8	CP03-2188	10	94.9
CP 01-1391	16	82.4	CP 02-2281	17	84.0	CPCL 00-0458	13	92.1
CP 01-1564	8	99.1	CPCL 99-1225	9	95.4	CPCL 00-1373	17	89.9
CP 01-1957	13	91.3	CPCL 99-1401	8	97.4	CPCL 00-4027	9	94.9
CP 01-2056	2	101.0	CPCL 99-1777	16	87.7	CPCL 00-4111	7	95.3
CP 01-2390	5	99.7	CPCL 99-2103	2	102.1	CPCL 00-4611	8	94.9
CP 01-2459	8	98.5	CPCL 99-2206	11	94.1	CPCL 00-6131	19	84.5
			CPCL 99-2574	3	100.8	CPCL 00-6756	3	96.6
						CPCL 01-0129	20	84.2
						CPCL 01-0271	16	90.3
						CPCL 01-0571	5	95.9
						CPCL 01-0877	15	90.9

†The lower the numeric ranking, the better the tolerance to freeze; i.e., a ranking of 1 indicates better tolerance to freeze than a ranking of 2.

Appendix 1. Sugarcane Cultivar Development Program at USDA-ARS in Canal Point, Florida

Timeline	Stage	Population	Field layout	Crop age at selection	Yield and quality selection criteria	Disease and other selection criteria	Seedcane increase scheme
Year 1	Crossing	400-600 crosses producing about 500,000 true seeds	—	—	Germination tests of seed (bulk of seed stored in freezers)	Field progeny tests planted by family	—
Year 2	Seedlings (single stool stage) Seedlings start in the greenhouse from true seed of the previous year	80,000-100,000 individual plants	Transplants spaced 12 in. apart in paired rows on 5-ft. centers	8-10 months	Visual selection for plant type, vigor, stalk diameter, height, density, and population; freedom from diseases	Family evaluation for general agronomic type and disease resistance against rust, leaf scald (LS)*, smut, etc.	One stalk cut for seed from each selected seedling
Year 3	Stage I (First clonal trial)	10,000-15,000 clonal plots	Unreplicated plots, 5 ft. long on 5-ft. row spacing	9-10 months	Essentially the same selection criteria as for Seedlings	Permanent CP-series number assignment made	Eight stalks planted for agronomic evaluation. One stalk planted for RSD screening (inoculation)
Year 4	Stage II (Second clonal trial)	1,000-1,500 clones including five checks	Unreplicated 2-row plots, 15 ft. long on 5-ft. row spacing	12 months	Yield estimates based on stalk number, average stalk weight, and sucrose analysis; freedom from diseases	Family evaluation for disease resistance against RSD* and eye spot (by inoculation) and LS*, yellow leaf syndrome (YLS), and dry top rot (by natural infection)	Eight 8-stalk bundles cut for seed; two stalks used for RSD screening
Year 5-6	Stage III (Replicated test; first stage planted in commercial fields)	135 clones including 2 checks† per location	Four 2-replicate tests (3 organic and 1 sand site) on growers' farms; Two-row plots, 15 ft. long	10-11 months Evaluated in plant cane and first-ratoon crops	Yield estimates based on stalk number, average stalk weight, and sucrose analysis; clonal performance assessed across locations	Disease screening (inoculation) for LS*, smut, mosaic virus, and RSD; also rated for other diseases (rust, etc.)	Two 8-stalk bundles cut for seed at each location
Year 7-9	Stage IV (Final replicated test; planted in commercial fields)	16 clones including 2 checks† per location	Eleven 6-replicate tests (8 organic and 3 sand sites) on growers' farms; Three-row plots, 35 ft. long on 5-ft. row spacing	10-15 months Tests are analyzed in plant cane, first-, and second-ratoon crops	Cane tonnage, sucrose and fiber analyses; yield estimates based on stalk number and average stalk weight	Disease screening for LS*, smut, mosaic, and RSD; also rated for lodging and suitability for mechanical harvest	Initial seed increase for potential commercial release planted from first-ratoon seed following evaluation in the plant cane
Year 8-11	Seedcane increase and distribution	Usually 6 or fewer clones	Plots range from 0.1 to 2.0 hectares	—	Seedcane purity; freedom from diseases and insects	Plots checked and certified for clonal purity and seedcane quality	Seedcane is increased at 9 Stage IV locations (7 muck and 2 sand)
Soil program	Investigates soil microbial activities and plant nutrient availabilities that influence cane and sugar yields						

* LS: leaf scald; RSD: ratoon stunting disease; YLS: yellow leaf syndrome

† Checks in stages III and IV: CP 72-2086 (all locations), CP 78-1628 (sand soils), and CP 89-2143 (organic soils).