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Evaluation of New Canal Point Sugarcane Clones

2011–2012 Harvest Season

Abstract

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Twenty-nine replicated experiments were conducted on 10 farms (representing 4 muck and 3 sand soils) to evaluate 42 new Canal Point (CP) and 21 new Canal Point and Clewiston (CPCL) clones of sugarcane from the CP 07, CP 06, CP 05, CP 04, CPCL 06, CPCL 05, CPCL 02, 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 on muck soils and with CP 78-1628 on sand soils, and to a lesser extent, with CP 72-2086 on both soil types. All three reference clones were commercial sugarcane cultivars in Florida. Each new clone was also tested for its fiber content and its tolerance to diseases and freezing temperatures. Based on results of these and previous years' tests, CP 05-1526, CPCL 02-0926, CPCL 02-1295, and CPCL 02-6848 were released for commercial production on muck and sand soils, CPCL 95-2287, CPCL 05-1102, and CPCL 05-1201 were released for muck soils only, and CPCL 05-1791 was released for commercial production on sand soils in Florida.

The audience for this publication includes growers, agricultural 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, sucrose yields, sugar yields.

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- provide economic opportunities for rural citizens, communities, and society as a whole.

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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} sucrose in kg 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} sucrose in metric tons per hectare
USSC	United States Sugar Corporation

Contents

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The long-term success of sugarcane, complex hybrids of *Saccharum* spp., in Florida has been supported by breeding and selection for clones that can be used for commercial production. Though production of sucrose per unit area is a principal selection trait, it is not the only factor on which sugarcane is evaluated. In addition, analyses are made on the contents of sucrose and fiber of the cane. The fiber content plays a role in determining the economic viability of sugarcane, with optimum fiber ranges in Florida being between 8 and 11 percent (Glaz et al. 2010). Also, clones with high sucrose content are desirable. The economic value of each clone integrates its harvesting, transportation, and milling costs with its expected returns from sucrose 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, sucrose yields, disease reactions, and freeze tolerance of the clones in the plant-cane, first-ratoon, and second-ratoon stage 4 experiments sampled in Florida's 2011–2012 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 research programs and industries that request Canal Point clones for breeding and evaluation. Throughout this report, the term "clone" or "genotype" refers to a genetically unique sugarcane entry in 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 sucrose 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. All of the experiments described in this report were harvested mechanically by commercial operators and the first- and second-ratoon crops were evaluated following mechanical harvests the previous year. Before any new clone is released, Florida growers judge its acceptability for mechanical operations in larger plantings that are used to expand vegetative planting material of these clones.

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 program at Canal Point has plentiful examples of genotypes that had high yields when they were tested at one stage of this program but were not released due to severe susceptibility to one or more diseases identified at a later stage. Sometimes these genotypes are used as parents in the breeding 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

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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 and infected commercial sugarcane fields in Florida (Comstock et al. 2008). Since 2007, the selection team at Canal Point has been applying increasingly stricter selection criteria against both rust fungi. This includes the use of the *Bru1* gene, a major gene for brown rust resistance (Asnaghi et al. 2004; Daugrois et al. 1996), as a consideration for genotype advancement in the breeding program. The methods used to detect *Bru1* are described in Glynn et al. (2012). This is the first reported use of marker-assisted selection in sugarcane. Based on this integrated approach of stricter selection criteria, fewer clones than previously advanced to stage 4 are susceptible to brown or orange rust. Although the percentages of clones susceptible to either of the rust fungi began declining with clones of the CP 03 and CPCL 00 series advanced to stage 4 in 2009, there are still substantial improvements needed in this regard. Even with selection against both rust fungi beginning in stage 1, about 50 percent of the genotypes in stage 2 are lost due to susceptibility to rust each year. In 2012, there were 803 genotypes in stage 2 tested for the presence of *Bru1*. Of these 803 genotypes, 482 (60%) were resistant to brown rust and 282 (59%) of these 482 had the *Bru1* gene. The remaining 322 genotypes had at least a minimal level of susceptibility to brown rust. The *Bru1* gene was identified in 81 of these genotypes and was not present in the remaining 241 susceptible genotypes. Visual symptoms of brown rust infection can be difficult to distinguish from those of orange rust, particularly at low levels of infection. Since 136 of the 322 susceptible genotypes had low levels of brown rust, it is possible that some of those were really orange rust and were mistakenly identified as brown rust.

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 selects against are leaf scald, caused by *Xanthomonas albilineans* (Ashby) Dow; sugarcane mosaic strain E., and sugarcane yellow leaf virus, a disease caused by a luteovirus (Lockhart et al. 1996). Flynn et al. (2005) suggested that losses in sucrose yield due to sugarcane yellow leaf virus were as high as 8 percent in Florida. Dean and Davis (1990) reported that ratoon stunt caused by *Leifsonia xyli* subsp. *xyli* Evtsuhenko et al. caused sucrose yield losses of 5 percent in Florida. More recently, Comstock (2008) reported that ratoon-stunting infections in the plant-cane and first-ratoon crops reduced stalk number, cane yield, and sucrose yield. Reductions were not always significant when compared with healthy plants, but trends were consistent. A program proposed by Comstock et al. (2001) is used at Canal Point to improve resistance of clones to ratoon stunting. 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 pathogen or by using disease-free stalks derived from meristem tissue culture.

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

Recently, growers in Florida have begun applying fungicides to control orange rust and brown rust. Otherwise, growers in Florida rely on cultivar 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 sugarcane diseases. In the 2011 growing season, 9 cultivars comprised 73.6 percent of Florida's sugarcane (Rice et al. 2012). All nine 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), CP 89-2143 (Glaz et al. 2000), CP 96-1252 (Edmé, Tai et al. 2005), CP 00-1101 (Gilbert et al. 2008), and CP 01-1372 (Edmé et al. 2009)—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.

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.); and most recently, the sugarcane rust mite (*Abacarus sacchari*) (Nuessly et al. 2011).

Winter freezes are common in 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 cultivar tolerance and 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 fiber content was not significantly correlated with resistance to a light freeze (1.7 ^{o}C to -2.8 ^{o}C) but was significantly correlated with resistance to a moderate freeze (-5.0 ^{o}C). Edmé and Glaz (2013) reported that genotypes with the highest levels of sucrose concentration at the onset of a freeze tended to sustain levels of acceptable sucrose content longer than genotypes that had lower values of sucrose content at the onset of a freeze.

The United States Sugar Corp. (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. While in the USSC program, these clones were designated with a CL (Clewiston) prefix. After they were donated to the CP selection program, each of these clones retained its original USSC number designation, but the prefix of each donated clone was changed from CL to CPCL (Canal Point and Clewiston).

Edmé and Miller et al. (2005) 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, the CP cultivar selection program is undergoing major changes. The CP program adapted the recommendation of Glaz and Kang (2008) to drop one location with a muck soil from stage 4 and add one location with a sand soil. Other research on this issue has been reported by Glynn et al. (2009), del Blanco et al. (2010), and Zhao et al. (2010). In addition, this research and the changes in the CP program have lead to recent progress in releasing new cultivars adapted to sand soils (Gilbert et al. 2011; Comstock et al. 2013). More fundamentally, the program has now divided into two separate programs, one that still selects for muck and sand soils and a second program that selects clones only for sand soils.

In the program that selects sugarcane genotypes for muck and sand soils (appendix 1), up to 75,000 seedlings are evaluated each year at Canal Point. These seedlings are the progeny of crosses derived from a diverse germplasm collection. However, based on a pedigree analysis, Deren (1995) suggested that the genetic base of the U.S. sugarcane breeding programs was too narrow. About 80 percent of the genome in commercial sugarcane is *Saccharum officinarum*. This year, in the crosses made for Florida, 81.0 percent of the female parents and 89.6 percent of the male parents originated from the Canal Point breeding program, while most of the remainder were developed by USSC (8.8 percent of the female parents and 9.9 percent of the male parents were

CL or CPCL 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 2012 at Canal Point contained approximately 68,400 new clones that originated from true seeds planted first in the greenhouse and later 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 1 trial planted in January 2012 contained 14,298 new genotypes. The stage 2 trial (of mostly CP 12 genotypes) planted in November 2012 at Canal Point had 1,509 new clones. There were 135 new clones in stage 3 of the CP 10 series that were tested in replicated experiments on 4 grower farms. Seedling, stage 1, and stage 2 tests were evaluated for 1 year in the plant-cane crop at Canal Point. Selection is visual in the seedling stage. In stage 1, the first selection process is visual. A hand-punched sample of juice is then taken from the clones that are selected visually and analyzed for Brix. Heavy emphasis is placed on these Brix values and disease resistance for the final selection. The primary selection criteria for stage 2 and all subsequent stages are sucrose yield (in metric tons of sucrose per hectare), theoretical recoverable sucrose, cane tonnage, and disease resistance. Ratings for susceptibility to brown and orange rust are made throughout the summer in stages 1 through 4.

The stage 3 genotypes are evaluated for 2 years, 1 year in the plant-cane crop followed by 1 year in the first-ratoon crop. The stage 3 clones are grown on 3 muck soils and 1 sand soil. Using data from the muck locations separately and the sand location separately, the 13 most promising clones are advanced for 4 more years of testing in the stage 4 experiments where they are planted in successive years and evaluated in the plant-cane, first-ratoon, and second-ratoon crops. Usually between 6 and 8 genotypes are advanced to all stage 4 tests, and the remainder are advanced independently to stage 4 tests on either muck or sand soil. 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. The evaluation and expansion conducted by the Florida Sugar Cane League occurs concurrently with the stage 4 evaluations.

There is now a separate Florida sugarcane cultivar selection program for sand soils (sand program) which complements the traditional program conducted for muck and sand soils. In the sand program, about 10,000 seedlings were planted on the sand soil at Townsite in 2012. While we are waiting to advance these clones, we also planted approximately 500 clones in a stage 2 test at Townsite in 2012. These clones were all the clones from the CP 11 series in the stage 2 test planted at Canal Point in November 2011. There is now a stage 4 test at Townsite with 13 new clones that were selected from a stage 3 test planted at Townsite last year. Results from this test will be included in this report next year. The framework of a new sand-only selection program for sugarcane cultivars in Florida is now in place at Townsite.

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 for testing 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 2011 to April 2012, clones or seeds from the Canal Point program were requested from and sent to Costa Rica, El Salvador, France, Guatemala, India, Mexico, Nicaragua, Pakistan, and Panama.

Test Procedures

In 29 experiments, 68 new CP and CPCL clones (47 CP clones and 21 CPCL clones) were evaluated. Seven clones of the CP 07 series were evaluated in the plant-cane crop at five farms with muck soils and at three farms with sand soils. These clones were CP 07-1606, CP 07-1618, CP 07-1685, CP 07-1746, CP 07-1824, CP 07-2320, and CP 07-2552. Also, CP 07-1278, CP 07-1533, CP 07-2331, CP 07-2460, CP 07-2490, and CP 07-2521 were evaluated in the plant-cane crop on muck soils; and CP 07-1527, CP 07-2137, CP 07-2262, CP 07-2301, CP 07-2542, and CP 07-2547 were evaluated in the plant-cane crop on sand soils.

Ten clones of the CP 06 series and three clones of the CPCL 06 series were evaluated at one farm with muck soils in the plant-cane crop and at five farms with muck soils in the first-ratoon crop. Eleven clones of the CP 06 series and two clones of the CPCL 06 series were evaluated at three locations with sand soils in the first-ratoon crop. Eight of these clones—CP 06-2042, CP 06-2335, CP 06-2400, CP 06-2664, CP 06-2874, CP 06-2897, CPCL 06-3272, and CPCL 06-3432—were evaluated at all eight locations (muck and sand soils) in the first-ratoon crop. The clones evaluated only at locations with muck soils in the first-ratoon crop were CP 06-2164, CP 06-2170, CP 06-2713, CP 04-3040, and CPCL 06-3332. The clones evaluated only at locations with sand soils were CP 06-2274, CP 06-2317, CP 06-2397, CP 06-3025, and CP 06-3098.

Three clones of the CP 05 series, six clones of the CPCL 02 series, and four clones of the CPCL 05 series were evaluated at two farms with muck soils in the first-ratoon crop and at five farms with muck soils in the second-ratoon crop. Three clones of the CP 05 series, seven clones of the CPCL 02 series, and three clones of the CPCL 05 series were evaluated at three locations with sand soils in the second-ratoon crop. Seven of these clones—CP 05-1526, CP 05-1740, CPCL 02-6848, CPCL 02-7610, CPCL 02-8001, CPCL 05-1201, and CPCL 05-1791—were evaluated at all 10 locations (muck and sand soils). The clones evaluated only at the seven locations with muck soils were CP 05-1466, CPCL 02-6225, CPCL 02-7190, CPCL 02-8071, CPCL 05-1102, and CPCL 05-1300. The clones evaluated only at locations with sand soils were CP 05-1679, CPCL 02-7080, CPCL 02-7386, CPCL 02-7500, CPCL 02-8072, and CPCL 05-1009. 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 two farms with muck soils in the second-ratoon crop.

Cultivar CP 89-2143 was the primary reference clone on muck soils and cultivar CP 78-1628 was the primary reference cultivar on sand soils. In 2011, CP 89-2143 was the second most widely grown sugarcane cultivar in Florida and CP 78-1628 the third most widely grown cultivar in Florida and the most widely grown sugarcane cultivar on sand soils in Florida (Rice et al. 2012). CP 72-2086 was sometimes used as a reference clone for sucrose content measured as kg sucrose per ton of cane (KS/T). CP 72-2086 was the ninth most widely grown cultivar in Florida in 2011 (Rice et al. 2012).

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

The plant-cane and second-ratoon experiments at A. Duda and Sons, Inc. (Duda), southeast of Belle Glade, both ratoon experiments planted in the successive rotation at Okeelanta Corporation (Okeelanta) south of South Bay, and the second-ratoon experiment planted following a period of about 1 year without sugarcane at Okeelanta 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). However, there were no experiments conducted on Terra Ceia muck in the 2011-2012 harvest season.

All three experiments at Knight Management, Inc. (Knight) southwest of 20-Mile Bend in Palm Beach County, the plant-cane and first- ratoon experiments planted after a period of about 1 year without sugarcane at Okeelanta and Wedgworth Farms, Inc. (Wedgworth) east of Belle Glade, and the second-ratoon experiment planted at Sugar Farms Cooperative North—SFI Region S05 (SFI) near 20-Mile Bend were conducted on Lauderhill muck. The two ratoon experiments at SFI and the second-ratoon experiment at Wedgworth were conducted on Pahokee muck.

The three experiments at Eastgate Farms, Inc. (Eastgate) north of Belle Glade were conducted on Torry muck. The three experiments at Hilliard Brothers of Florida, Ltd. (Hilliard) west of Clewiston as well as the three experiments at United States Sugar Corporation—Townsite (Townsite) were on Margate sand. All three experiments at Lykes Brothers, Inc. (Lykes) near Moore Haven in Glades County were on Pompano fine sand.

At Okeelanta, clones of the CP 05, CPCL 02, and CPCL 05 series in the first-ratoon crop and the CP 04, CPCL 95, and CPCL 02 series in the second-ratoon crop were planted on fields in successive sugarcane rotations. There was no plant-cane experiment this year at Okeelanta in the successive rotation because the seed cane for that planned experiment was damaged by freezing temperatures before the experiment was planted. In the successive sugarcane rotation in Florida, a new crop of sugarcane is planted within about 2 months of the previous (and final) sugarcane harvest, a practice that increases the number of harvests per year but decreases cane yields per hectare by about 20 percent in the plant-cane crop and 8 percent in the first-ratoon crop (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. 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 on all soils, and 1.5-m alleys separated the front and back ends of the plots on muck soils and these alleys were 1.8 m on sand soils. 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 rows of all plots were planted with two lines of stalks unless seed cane was not sufficient. When there was not enough seed cane of a genotype at a given location, then some or all border rows were planted with one line of stalks or with a different genotype. 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.

Preharvest samples of 10 stalks were cut from 2 replications of all plant-cane experiments between October 3 and October 27, 2011. Throughout the harvest season, samples of 10 stalks were cut from unburned cane from a middle row of each plot in each experiment between September 26, 2011, and February 28, 2012. Once a stool of sugarcane was chosen for cutting, 10 consecutive 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 28, 2011 to February 28, 2012
First-ratoon crop	November 1, 2011 to February 15, 2012
Second-ratoon crop	September 26, 2011 to November 4, 2011

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 commercial recoverable yield of 96° sucrose, in kg per metric ton of cane, (kg sucrose per ton of cane: KS/T) which was determined as a measure of sucrose content. The KS/T of juice extracted from milled sugarcane is calculated with a formula that uses measurements of the juice Brix (soluble solids) and optical rotation (Arceneaux 1935). Brix is read by a hydrometer and is measured as g kg^{-1} and the optical rotation is read on a polarimeter and is measured as ^{o}Z (International Sugar Scale). The fiber percentage of each clone was used to calculate commercial recoverable sucrose which is referred to in this report as KS/T (Legendre 1992). The values of theoretical recoverable yield determined by the Legendre (1992) method were multiplied by 0.86 to estimate the commercial recoverable yield in a Florida sugarcane mill. Brix and optical rotation were usually estimated by near infrared reflectance spectroscopy (NIRS); Brix and optical rotation were measured for samples with unacceptable NIRS calibrations by refractometer and polarimeter, respectively.

Using 2-stalk samples collected from border rows, an average of 14, 18, 12, 9, 20, 16, 17, and 14 fiber samples were calculated for the clones of the CP 04, CP 05, CP 06, CP 07, CPCL 95, CPCL 02, CPCL 05, and CPCL 06 series, respectively. Leaves were stripped from these stalks, which were then processed through a Dedini Cane Disintegrator Model-D-2500-II (Dedini Indústrias de Base Piracicaba, Brazil). After being processed through the Dedini, about 400 g of shredded material were collected and weighed. Juice was extracted from the shredded material by pressing it at 138 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 July 6 and August 31, 2011. Cane yields, in metric tons per hectare, (tons cane per hectare: TC/H) were calculated by multiplying stalk weights by number of stalks. Theoretical yields of sucrose (in metric tons per hectare: TS/H) were calculated by multiplying TC/H by KS/T and dividing by 1,000.

To assess freeze tolerance, stage 4 clones were subjected to freezing temperatures in three 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 -8 ^{o}C at the testing site during winter months, which exposes the clones to harsher freeze temperatures than normally found in south Florida. Clones of the CP 04, CPCL 02, and CPCL 95 series were planted on February 25, 2009, and clones of the CP 05, CP 06, CPCL 02, CPCL 05, and CPCL 06 series were planted on October 26, 2012. All tests were planted as randomized-complete-block experiments with four replications in single-row plots 2.4 m long and 3.0 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-stalk samples were collected from the first-ratoon crop (CP 04, CPCL 95, and CPCL 02 series) on December 10 and 17, 2010, and on January 10 and 27, 2011. Samples were collected from the CP 05, CP 06, CPCL 05, and CPCL 06 series in the plant-cane crop on November 9 and 30, 2011, January 6 and 25, 2012, and February 9, 2012. Freeze-tolerance rankings for all three experiments were based on KS/T declines of clones across sampling dates. The final rating for each clone, on a scale of 1-5, was based on a comparison of its KS/T values with those of CP 89-2143. CP 89-2143 was rated as 4 with ratings of 5 and 3 denoting excellent and good freeze tolerance, respectively. In addition, actual KS/T values were considered in the ratings. Thus, a clone could have the highest rate of decline (an indication of poor freeze tolerance) and still have a good ranking for freeze tolerance if its KS/T started high and remained high.

Prior to their advancement to stage 4, CP clones were evaluated in separate tests by artificial inoculation for susceptibility to brown rust, orange rust, sugarcane smut, sugarcane mosaic virus, leaf scald, ratoon stunting, and eye spot. Since being advanced to stage 4, 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 4.

Statistical analyses of the stage 4 experiments were based on a mixed model using SAS software (SAS version 9.3, 2008; 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. Although location was a random effect, 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 parents, increase status, 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 07 series in plant-cane experiments at locations with muck soils, and tables 6-7 contain the results for plant-cane experiments of clones from these series at locations with sand soils. Table 8 contains the results of one plant-cane experiment of clones from the CP 06 and CPCL 06 series, and tables 9-11 and tables 12-13 contain results of clones from these two series in first-ratoon experiments on muck and sand soils, respectively. Table 14 contains the results of the genotypes from the CP 05, CPCL 02, and CPCL 05 series first-ratoon experiments on muck soils, tables 15-17 contain the results of clones from these three series in second-ratoon experiments on muck soils, and table 18 contains results of clones from these three series in second-ratoon experiments on sand soils. Table 19 contains the results of clones from the CP 04, CPCL 95, and CPCL 02 series from the final two second-ratoon experiments for this group of clones. Table 20 gives freeze-tolerance ratings for clones of the CP 04, CP 05, CP 06, CPCL 95, CPCL 02, CPCL 05, and CPCL 06 series. Table 21 gives the dates that stalks were counted in each stage 4 experiment reported on here.

Plant-Cane Crop, CP 07 Series on Muck Soils

When averaged across all five locations, no new CP 07 clone yielded significantly more TS/H (metric tons of sucrose per hectare) than CP 89-2143 (tables 5). Only CP 07-2331 yielded significantly more TC/H (metric tons of cane per hectare) than CP 89-2143 (table 2). However, four new clones—CP 07-2460, CP 07-2320, CP 07-1746, and CP 07-2490—had a significantly higher preharvest KS/T (theoretical recoverable yield of 96^{o} sucrose in kg per metric ton of cane) value than that of CP 89-2143 (table 3), and of these four clones, CP 07-2320 also had a significantly higher KS/T than CP 89-2143 at harvest (table 4).

Sugarcane in Florida is propagated by planting stem sections (referred to as seed cane) from which axiliary buds emerge. In 2012, the Florida Sugar Cane League, Inc., began increasing seed cane of CP 07-1606, CP 07-1746, and CP 07-2320 (table 1). CP 07-1606 had high yields of TC/H and harvest KS/T, but these yields were not significantly different from those of CP 89-2143 (tables 2 and 4). Although the TS/H yield of CP 07-1606 was not significantly higher than that of CP 89-2143, it was significantly higher than the TS/H yields of 10 of the other 15 genotypes in this experiment, including CP 78-1628 and CP 72-2086 (table 5). Of these three promising genotypes, the only current disease concerns were that CP 07-1746 was susceptible to orange rust and CP 07-2320 was susceptible to smut. The fiber contents of CP 07-1606, CP 07-1746, and CP 07-2320 were 10.09, 10.74, and 8.66 percent, respectively.

Plant-Cane Crop, CP 07 Series on Sand Soils

When averaged across all three locations with sand soils, two new CP 07 genotypes—CP 07-2137 and CP 07-2320—had significantly more TC/H, KS/T, and TS/H than CP 78-1628 (tables 5-6). The mean TS/H yield of CP 07-2137 was significantly higher than the mean TS/H yields of 11 of the other 15 clones in this test (table 7). Also, at Lykes, the TS/H yield of CP 07-2137 was significantly higher than that of all other genotypes tested. In addition to its high yields on the sand soils, CP 07-2320 also had promising yields in the trials on muck soils (tables 2-5) as did CP 07-1606 which had significantly higher KS/T and TS/H than CP 78-1628 on the sand soils (tables 6-7).

Three other new CP 07 genotypes—CP 07-1527, CP 07-1746, and CP 07-2301—had significantly greater mean yields of TC/H and TS/H than CP 78-1628 (table 7) on the sand soils. Plantings of seed cane of all six of these previously mentioned CP 07 genotypes—CP 07-1527, CP 07-1606, CP 07-1746, CP 07-2137, CP 07-2301, and CP 07-2320—are being increased for potential release. In addition, the Florida Sugar Cane League, Inc., is also increasing seed cane of CP 07-2262 and CP 07-2547 for potential release on sand soils (table 1). The TC/H, KS/T, and TS/H yields of both of these CP 07 genotypes did not differ significantly from those of CP 78-1628 (tables 6-7).

CP 07-1527, CP 07-1606, CP 07-2262, and CP 07-2547 are not susceptible to any of the major diseases present in Florida (table 1). However, there is concern that CP 07-1606 may become susceptible to mosaic and that CP 07-2262 and CP 07-2547 may become susceptible to smut. CP 07-2137, CP 07-2301, and CP 07-2320 are susceptible to smut, and CP 07-1746 is susceptible to orange rust. In addition, CP 07-2301 is susceptible to ratoon stunting, and there is concern that CP 07-2137 and CP 07-2320 may become susceptible to mosaic. Fiber percentages for these new genotypes range from 8.66 (CP 07-2320) to 11.47 percent (CP 07-2262).

The Canal Point breeding program has been intensifying efforts to identify improved cultivars for sand soils (Glaz and Kang 2008; del Blanco et al. 2010). One important component of this process is to find improved parents for breeding for this purpose. Among these eight genotypes being increased by the Florida Sugar Cane League, Inc., for potential release, there were six parents for which previous research suggested they should be tried in crosses aimed at developing genotypes with high yields on sand soils. CP 89-1509 (Tai et al. 2000), the male parent of CP 07-1606, and CP 84-1591 (Shine et al. 1996), the female parent of CP 07-1746, were released for sand soils in Florida but not planted commercially in large amounts. The female parent of CP 07-2137 and CP 01-2547, CP 01-2390, was the highest yielding genotype for sand soils in this series of reports, but was not released due to its susceptibility to smut (Glaz et al. 2008). The male parent of CP 07-2137, CP 84-1198 (Glaz et al. 1994), was grown as a commercial cultivar for more than a decade in moderate amounts on muck and sand soils in Florida. Finally, CL 88-4730, the female parent of CP 07-2301, is a proprietary commercial cultivar used widely by the United States Sugar Corporation on sand soils.

Plant-Cane Crop, CP 06 and CPCL 06 Series on Muck Soils

Glaz et al. (2013) reported results from five locations with muck soils and three locations with sand soils from tests of the CP 06 and CPCL 06 series in the plant-cane crop. This year, plant-cane results for these clones are available from Eastgate (table 8). In this test, CPCL 06-3432 was the only genotype that had significantly higher yields of TS/H than CP 89-2143. The TC/H yield of CPCL 06-3432 at Eastgate was also significantly higher than that of CP 89-2143 at Eastgate. Because CPCL 06-3432 had low yields in the plant-cane experiments last year on muck and sand soils (Glaz et al. 2013), seed cane of this genotype is not being increased for potential release (table 1). It had very poor tolerance to freezing temperatures, and it is susceptible to smut (tables 1 and 20). However, damaging freezes are not likely at locations with Torry muck soil like Eastgate that are close to the temperature modifying influences of Lake Okeechobee.

First-Ratoon Crop, CP 06 and CPCL 06 Series on Muck Soils

When averaged across all five farms with muck soils in the first-ratoon crop, six new clones—CP 06-2874, CP 06-2400, CP 06-2042, CP 06-2170, CP 06-2713, and CPCL 06-3272—yielded significantly more TC/H and TS/H than CP 89-2143 (tables 9 and 11). No genotype in this group had a KS/T value that was significantly higher than that of CP 89-2143 (table 10). However, CP 06-2400, CP 06-2170, CP 06-2713, and CPCL 06-3272 had values of KS/T that were significantly lower than the KS/T of CP 89-2143. Due to these low KS/T values and disease susceptibilities, seed cane of CP 06-2042 (leaf scald), CP 06-2170 (brown rust), and CPCL 06-3272 (leaf scald) are not being increased for potential release (table 1).

The Florida Sugar Cane League, Inc., is increasing seed cane of CP 06-2874 for potential commercial production on muck and sand soils, and it is increasing seed cane of CP 06-2400 and CP 06-2713 for potential commercial production on muck soils (table 1). Last year as plant cane averaged across the five locations with muck soils, CP 06-2874 and CP 06-2400 had higher yields of TS/H than CP 89-2143 whereas the TS/H mean yields of CP 06-2713 and CP 89-2143 were similar (Glaz et al. 2013). CP 06-2874 is susceptible to orange rust and mosaic and CP 06-2400 and CP 06-2713 are not susceptible to any major diseases of sugarcane in Florida (table 1). These three new CP 06 genotypes had fiber percentages between 10.10 and 10.25 percent. CP 06-2400 has good tolerance to freezing temperatures and CP 06-2713 and CP 06-2874 have moderate freeze tolerance (table 20).

First-Ratoon Crop, CP 06 and CPCL 06 Series on Sand Soils

Three clones in this group—CP 06-2874, CP 06-2274, and CP 06-2042—had significantly higher mean yields of KS/T, TC/H, and TS/H than CP 78-1628 (tables 12-13). Also, CP 06-2397 had mean TC/H and TS/H yields that were significantly higher than those of CP 78-1628 (table 13). However, seed cane of CP 06-2397 is not being increased for commercial production because its mean KS/T value was significantly less than that of CP 78-1628 (table 12) and it was susceptible to leaf scald (table 1).

Plantings of seed cane CP 06-2274 and CP 06-2042 are also not being increased for commercial production due to disease concerns. CP 06-2274 was susceptible to smut and CP 06-2042 was susceptible to orange rust and leaf scald (table 1). Seed cane of CP 06-2874 is being increased by the Florida Sugar Cane League, Inc., for potential commercial production on muck and sand soils. Its average TS/H yield across the three locations with sand soil as plant cane last year was numerically lower, but not significantly different than that of CP 78-1628 (Glaz et al. 2013). CP 06-2397 was susceptible to leaf scald and had a fiber content of 11.55 percent (table 1) and moderate freeze tolerance (table 20).

First-Ratoon Crop, CP 05, CPCL 02, and CPCL 05 Series on Muck Soils

The most recent report in this series contained information for the CP 05, CPCL 02, and CPCL 05 clones in the first-ratoon crop at five locations with muck soils and three locations with sand soils, and in the plant-cane crop at Eastgate and Okeelanta (Glaz et al. 2013). In addition, Glaz et al. (2011) reported on results of these clones from the plant-cane crop on muck and sand soils. This year, in the combined yields of the first-ratoon crop at Okeelanta and Eastgate, CPCL 05-1201 and CP 05-1526 had significantly higher yields of TC/H and TS/H than CP 89-2143 (table 14). However, each of these new genotypes also had significantly less KS/T than CP 89-2143. CPCL 05-1201 was particularly outstanding in the successively planted experiment at Okeelanta where it had significantly more TC/H than any clone in the test. Last year as plant cane in the successively planted test at Okeelanta, CPCL 05-1201 had similar results with significantly higher TC/H yields than all other genotypes except CP 05-1526 (Glaz et al. 2013).

Second-Ratoon Crop, CP 05, CPCL 02, and CPCL 05 Series on Muck Soils

Plant-cane yields of these clones were first reported by Glaz et al. (2011). Later, Glaz et al. (2013) reported on plant-cane yields at two additional muck locations and first-ratoon yields of these clones on muck and sand soils. CPCL 02-6848 had high yields in both of these reports and those high yields were repeated this year as second ratoon. CPCL 02-6848 was the only clone in this group with significantly higher yields of TC/H (table 15) and TS/H (table 17) than CP 89-2143. In addition, CPCL 02-6848 had significantly higher TC/H and TS/H yields than any other clone in these second-ratoon tests. The KS/T yields of CPCL 02-6848 and CP 89-2143 did not differ significantly (table 16). CPCL 02-6848 has been released for commercial production and is recommended for growers with muck and sand soils (table 1). The major disease concern regarding CPCL 02-6848 is its susceptibility to orange rust. Also of concern is that it may become susceptible to mosaic and its high fiber content of 13.05 percent. CPCL 02-6848 had poor tolerance to freezing temperatures (table 20).

Three other clones from this group were also released for muck soils in Florida—CP 05-1526 (was also released for sand soils), CPCL 05-1102, and CPCL 05-1201 (table 1). Although CPCL 05-1201 and CP 05-1526 had similar TC/H yields, the TC/H yield of CPCL 05-1201 was significantly higher than that of CPCL 05-1102 (table 15). All three new clones and CP 89-2143 had similar values of KS/T and TS/H (tables 16-17). CPCL 05-1102 had significantly higher yields of TS/H than CP 89-2143 at Duda, and CPCL 05-1201 and CP 05-1526 had significantly higher yields of TS/H than CP 89-2143 at Okeelanta (table 17). CP 05-1526, CPCL 05-1102, and CPCL 05-1201 were not susceptible to any of the major diseases of sugarcane (table 1). The fiber contents of CP 05-1526 (11.52%), CPCL 02-1102 (10.17%), and CPCL 02-1201 (10.26%) were acceptable for Florida. The freeze tolerance rating of CP 05-1526 was moderately lower than that of CP 89-2143, and CP 89-2143, CPCL 05-1102, and CPCL 05-1201 had similar ratings for freeze tolerance (table 20).

Second-Ratoon Crop, CP 05, CPCL 02, and CPCL 05 Series on Sand Soils

These clones were planted at three locations with sand soils and were first reported on as plant-cane yields by Glaz et al. (2011), and then Glaz et al. (2013) reported on them as first ratoon. As second ratoon in these tests, CPCL 02-6848 yielded significantly more mean TC/H and TS/H than CP 78-1628 (table 18). CPCL 02-6848 also had significantly greater yields of TC/H and TS/H than CP 78-1628 at each of the three locations with sand soils—Hilliard, Townsite, and Lykes. The mean KS/T values of CPCL 02-6848 and CP 78-1628 were similar. As mentioned in the previous section, CPCL 02-6848 is being released for sand and muck soils (table 1).

CP 05-1526 is also being released for sand and muck soils, as mentioned in the previous section (table 1). This new clone and CP 78-1628 had similar yields of TC/H, KS/T, and TS/H (table 18). CP 05-1526 also yielded significantly more TS/H than CP 78-1628 at Townsite. CPCL 05-1791, which had high mean yields of TC/H, KS/T, and TS/H that were similar to those of CP 78-1628, is being released for sand soils only (table 1). Like the clones mentioned previously in this section, the TS/H yield of CPCL 05-1791 at Townsite was significantly higher than that of CP 78-1628 (table 18). CPCL 05-1791 has a fiber content of 12.28 percent, and while CPCL 05-1791 is not susceptible, there are concerns about its reactions to brown rust and leaf scald (table 1). CPCL 05-1791 had poor freeze tolerance compared with the freeze tolerance of CP 89-2143 (table 20).

Second-Ratoon Crop, CP 04, CPCL 95, and CPCL 02 Series on Muck Soils

When combined across the successively planted experiment at Okeelanta and the fallow planted test at Eastgate, in the second-ratoon crop, no new clone had significantly greater TC/H, KS/T, or TS/H than CP 89-2143 (table 19).

In September 2011, CPCL 02-0926 (Glynn et al. 2013), CPCL 95-2287 (Davidson et al. 2013), and CPCL 02-1295 (Gilbert et al. 2013) were released for commercial production in Florida (table 1). Based on yields of the 3 years prior to September 2011, CPCL 02-0926 and CPCL 02-1295 were recommended for muck and sand soils, whereas CPCL 95-2287 was recommended for muck soils only. In their final year of testing this year as second ratoon, CPCL 02-0926, CPCL 95-2287, and CP 89-2143 had similar TS/H yields (table 19). However, the mean TS/H yield of CPCL 02-1295 was significantly lower than the TS/H yields of CPCL 02-0926, CPCL 95-2287, and CP 89-2143. The susceptibility of CPCL 02-0926 to mosaic was undetermined and CPCL 02-1295 was susceptible to leaf scald (table 1). Otherwise, these three new cultivars were not susceptible to any of the major sugarcane diseases. The fiber contents of CPCL 02-0926, CPCL 95-2287, and CPCL 02-1295 were 10.44, 11.45, and 11.30 percent, respectively. CPCL 02-0926, CPCL 02-1295, and CP 89-2143 had similar reactions to freezing temperatures, and there was no information on the reaction of CPCL 95-2287 to freezing temperatures (table 20).

Summary

This is the fifth report in this long series in which clones in the plant-cane tests were advanced independently to stage 4 locations with muck and sand soils. There were seven genotypes common to all tests on muck and sand soils of the CP 07 series reported on for the first time this year in stage 4. These tests had six additional genotypes planted on muck soils and six other genotypes planted on sand soils. For genotypes in this report for the second year from the CP 06 and CPCL 06 series, there were eight genotypes common to all tests. Similarly, there were eight genotypes common to all tests from the CP 05, CPCL 02, and CPCL 05 series; and the tests containing the CP 04, CPCL 95, and CPCL 02 series.

Clones from the CP 07 series were tested in the plant-cane crop at five locations with muck soils and at three locations with sand soils. Plantings of seed cane of CP 07-1606, CP 07-1746, and CP 07-2320 are being expanded on both muck and sand soils by the Florida Sugar Cane League, Inc., for potential commercial release in Florida. In addition, plantings of CP 07-1527, CP 07-2137, CP 07-2262, CP 07-2301, and CP 07-2547 are being expanded on sand soils only. No genotype from this group is being expanded for potential release on muck soils only. Of these clones, only CP 07-1606, CP 07-2262, and CP 07-1527 are not susceptible to a major disease. CP 07-2547 is susceptible to ratoon stunting. CP 07-1746 is susceptible to orange rust. CP 07-2320, CP 07-2137, and CP 07-2301 are susceptible to smut. In addition, CP 07-2301 is susceptible to ratoon stunting.

Clones from the CP 06 and CPCL 06 series were reported on from plant-cane tests at two locations with muck soils and from first-ratoon tests at five locations with muck soils and three locations with sand soils. Plantings of seed cane of CP 06-2874 are being expanded on both muck and sand soils by the Florida Sugar Cane League, Inc., for potential commercial release in Florida. In addition, plantings of CP 06-2400 and CP 06-2713 are being expanded on muck soils only. No genotype from this group is being expanded for potential release on sand soils only. Except for CP 06-2874, which is susceptible to mosaic and orange rust, none of these promising clones has been rated as susceptible to any of the major sugarcane diseases prevalent in Florida.

Clone performance from the CP 05, CPCL 02, and CPCL 05 series was summarized based on tests in the plant-cane crop at two locations with muck soils in 1 year, and at five locations with muck soils and three locations with sand soils the prior year. Yields from these clones are also reported from the first-ratoon crop (at two locations with muck soils) from 1 year and at eight locations the previous year (from five locations with muck soils and three locations with sand soils); and in this report, from tests in the second-ratoon crop at five locations with muck soils and three locations with sand soils. CP 05-1526 and CPCL 02-6848 have been jointly released by the USDA-ARS, the University of Florida, and the Florida Sugar Cane League, Inc., for muck and sand soils; CPCL 05-1102 and CPCL 05-1201 have been released for muck soils only; and CPCL 05-1791 has been released for sand soils only in Florida. CP 05-1526, CPCL 05-1102, and CPCL 05-1201 are not susceptible to any major disease of sugarcane prevalent in Florida. There are concerns that CPCL 05-1791 may soon become susceptible to brown rust and leaf scald. CPCL 02-6848 is susceptible to orange rust and there is concern that it may become susceptible to mosaic.

Stage 4 testing of the CP 04, CPCL 02, and CPCL 95 series was completed this year with two second-ratoon experiments on muck soil. Previous testing of these clones included 2 years and 10 locations as plant cane, 2 years and 10 locations as first ratoon, and 1 year and 8 locations as second ratoon. The USDA-ARS, the University of Florida, and the Florida Sugar Cane League, Inc., jointly released CPCL 02-0926 (Glynn et al. 2013) and CPCL 02-1295 (Gilbert et al. 2013) for commercial production on both muck and sand soils in Florida and CPCL 95-2287 (Davidson et al. 2013) for commercial production on sand soils in Florida. There are no major disease concerns regarding CPCL 95-2287. Although it is not susceptible, there is concern regarding the resistance of CPCL 02-0926 to mosaic, and CPCL 02-1295 is susceptible to leaf scald.

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Tables

Notes (tables 2-21):

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, 42 new CP sugarcane clones, and 21 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	L	S	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 04-1252	CP 97-2068	CP 97-1362	None	12.43	L	R	R	S	R	L
CP 04-1321	CP 96-1252	01 P04	Muck	9.31	L	L	L	S	R	L
CP 04-1367	CP 97-2068	CP 94-1607	None	13.24	R	L	L	L	R	R
CP 04-1426	CP 95-1712	CP 84-1198	None	12.75	L	R	S	L	L	R
CP 04-1619	CP 95-1569	CP 84-1198	None	10.45	R	R	L	R	R	R
CP 05-1466	CP 98-1497	02 P08	None	8.96	R	R	U	S	S	R
CP 05-1526	CP 98-1029	CP 88-1162	Commercial	11.52	R	R	R	R	R	R
CP 05-1740	US 99-1055	US 02-1027	None	11.45	S	R	R	R	R	R
CP 06-2042	CP 96-1252	01P04	None	10.96	R	R	S	S	R	L
CP 06-2164	CP 89-1509	CP 88-1762	None	11.39	L	R	R	L	L	S
CP 06-2170	L 00-273	02 P24	None	10.27	R	S	R	R	R	S
CP 06-2274	CP 99-1896	CP 94-2203	None	9.14	S	R	R	L	R	R
CP 06-2317	CP 00-2188	03 P23	None	11.69	L	R	R	L	L	R
CP 06-2335	NG 51-144	03 P23	None	8.98	S	R	S	S	R	L
CP 06-2397	CP 99-1896	03 P29	None	11.55	R	R	R	S	R	S
CP 06-2400	CP 94-1100	03 P29	Muck	10.24	R	R	R	L	R	L
CP 06-2664	CP 01-2365	CP 96-1252	None	10.68	L	L	R	L	L	R
CP 06-2713	CP 84-1591	CP 92-1167	Muck	10.13	R	L	R	L	R	R
CP 06-2874	CP 94-2203	CP 84-1198	All	10.13	L	R	S	L	S	R
CP 06-2897	CP 94-2095	CP 84-1591	None	11.01	S	L	L	R	S	L
CP 06-3025	CP 92-1167	CP 92-1167	None	10.51	L	R	R	S	R	R
CP 06-3040	CP 89-1509	CP 95-1039	None	11.07	R	R	L	R	R	R
CP 06-3098	Unknown	Unknown	None	10.55	L	R	R	L	R	R
CP 07-1278	CL 95-5255	04 P16	None	9.59	S	R	R	U	R	L
CP 07-1527	CP 01-1564	HoCP 01-517	Sand	9.74	R	R	R	R	R	R
CP 07-1533	CP 01-1564	HoCP 01-517	None	12.09	L	S	R	L	R	R
CP 07-1606	CP 02-2065	CP 89-1509	All	10.09	R	R	R	R	U	L
CP 07-1618	CL 02-8021	CP 89-1509	None	12.57	R	R	S	L	R	R
CP 07-1685	CP 02-2065	CP 97-1777	None	14.68	R	R	R	R	R	S
CP 07-1746	CP 84-1591	CP 80-1743	All	10.74	R	R	S	R	R	R
CP 07-1824	CP 02-2065	07 P05	None	11.84	U	R	S	R	R	R
CP 07-2137	CP 01-2390	CP 84-1198	Sand	11.09	S	R	R	R	U	R
CP 07-2262	CP 02-2985	12 P05	Sand	11.47	U	R	R	R	R	L

Table 1. Parentage, fiber content, increase status, and ratings of susceptibility to smut, rust, leaf scald, mosaic, and ratoon stunting for CP 72-2086, CP 78-1628, CP 89-2143, 42 new CP sugarcane clones, and 21 new CPCL sugarcane clones

	Parentage				Rating*					
Clone	Female	Male	Increase status[H]	Percent fiber	Smut	Rust Brown	Rust Orange	Leaf scald	Mosaic	Ratoon stunting[I]
CP 07-2301	CL 88-4730	CP 96-1865	Sand	10.48	S	R	R	R	R	S
CP 07-2320	CP 02-2065	CP 96-1865	All	8.66	S	R	R	R	U	R
CP 07-2331	CP 02-2065	CP 98-1417	None	9.91	S	R	S	R	R	S
CP 07-2460	CP 00-1830	CL 88-2747	None	11.75	R	U	R	R	R	R
CP 07-2490	CP 98-1865	CP 97-1989	None	9.62	R	R	U	R	R	S
CP 07-2521	CP 01-2390	CP 00-1630	None	12.29	S	S	R	U	R	L
CP 07-2542	CP 01-2390	CP 00-1630	None	11.47	R	R	R	U	R	R
CP 07-2547	CP 01-2390	CP 00-1630	Sand	11.20	U	R	R	R	R	S
CP 07-2552	CP 01-2390	CP 00-1630	None	12.49	R	R	R	S	R	R
CPCL 95-2287	CL 78-1120	CL 78-1600	Commercial	11.45	R	L	L	L	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	Commercial	10.44	R	R	R	L	U	L
CPCL 02-1295	CP 88-1762	CL 91-1637	Commercial	11.30	R	R	L	S	R	R
CPCL 02-2273	CP 89-2143	CL 88-4730	None	11.54	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	L	S	S	R	S	L
CPCL 02-6225	CL 88-4730	Poly 01-6	None	10.37	R	U	R	U	R	R
CPCL 02-6848	CL 92-2533	Poly 01-9	Commercial	13.05	R	S	R	R	U	R
CPCL 02-7190	CP 89-2143	CL 88-4730	None	10.38	R	R	R	R	U	R
CPCL 02-7610	CL 90-4500	CL 88-4730	None	11.82	L	R	U	U	R	L
CPCL 02-8001	Unknown	Unknown	None	10.19	U	U	R	R	R	L
CPCL 02-8071	CL 92-5431	LCP 85-0384	None	12.78	R	R	R	R	R	R
CPCL 05-1102	CL 89-5189	CL 88-4730	Commercial	10.17	R	R	R	R	R	L
CPCL 05-1201	CL 87-2882	CL 93-2679	Commercial	10.26	R	R	R	R	R	R
CPCL 05-1300	CL 87-2882	CL 85-3715	None	13.20	R	R	R	R	R	R
CPCL 05-1791	CP 96-1252	CL 90-4725	Commercial	12.28	L	U	R	U	R	R
CPCL 06-3272	CL 87-1630	LCP 85-0384	None	10.00	R	R	R	S	R	R
CPCL 06-3332	CL 90-5017	CP 88-1762	None	9.89	S	R	R	S	R	R
CPCL 06-3432	CP 88-1762	CL 94-4150	None	10.66	S	R	R	R	R	R

* 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, Mix 98c, and Poly 00-3 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 in 1998 crossing season at United States Sugar Corp., and in Poly 00-3, female parent (CL 86-4340) exposed to pollen from many clones in 2000 crossing season at United States Sugar Corp.; and therefore, male parents of CP 04-1258, CPCL 99-2574, and CPCL 01-0271 unknown. Similar explanations for CP 04-1321, CP 05-1466, CPCL 00-0129, CPCL 01-0271, CPCL 01-0271, CPCL 02-6225, CPCL 02-6848.

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

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck			Pahokee muck	
Clone	Duda 1/25/12	Knight 12/28/11	Okeelanta 1/11/12	Wedgworth 1/31/12	SFI 1/31/12	Mean yield, all farms
CP 07-2331	201.47	214.32	205.20*	222.86*	234.02*	215.54*
CP 07-1685	221.65*	234.05*	182.53	214.54*	205.77*	211.71
CP 07-1533	215.85*	204.10	189.92	221.22*	214.87*	209.19
CP 07-1606	200.45	228.18*	188.43	241.82*	186.35	209.12
CP 07-1746	204.92	135.28	193.70	229.75*	225.42*	197.81
CP 07-1824	194.63	217.07	177.62	209.03	186.65	197.00
CP 07-2320	224.33*	192.14	178.60	193.77	170.07	191.78
CP 07-2490	214.00*	184.87	176.29	198.04	179.83	190.61
CP 78-1628	186.91	200.20	170.43	196.18	188.39	188.42
CP 89-2143	183.14	196.93	179.05	189.98	185.21	186.86
CP 72-2086	198.44	172.99	172.84	177.98	189.64	182.38
CP 07-2460	185.23	187.82	178.88	189.68	167.02	181.73
CP 07-1618	173.18	150.73	187.18	201.89	177.64	178.12
CP 07-2521	198.70	169.89	172.47	178.86	163.98	176.78
CP 07-1278	180.46	101.21	171.48	212.42*	209.06*	174.93
CP 07-2552	183.09	48.27	156.36	215.10*	202.24	161.01
Mean	197.90	177.38	180.06	205.82	192.89	190.81
LSD (p = 0.1)†	29.75	28.62	16.87	21.92	24.59	25.55
CV (%)	13.07	14.03	9.74	11.08	11.08	31.04

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of sugar yield = 12.05 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, Lauderhill muck, and Pahokee muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck			Pahokee muck	
Clone	Duda 10/3/11	Okeelanta 10/11/11	Knight 10/13/11	Wedgworth 10/27/11	SFI 10/27/11	Mean yield, all farms
CP 07-2460	97.0	113.4*	118.0	112.1*	106.5	109.4*
CP 07-2320	92.2	117.7*	102.7	111.7*	116.5*	108.2*
CP 07-1746	92.9	112.2*	102.9	112.6*	117.0*	107.5*
CP 07-2490	101.8	104.0*	114.1	107.4	106.3	106.7*
CP 07-1278	88.6	109.2*	112.0	108.3	101.2	103.9
CP 07-1618	88.1	105.2*	103.7	105.1	108.9	102.2
CP 07-1824	87.4	99.4	107.7	105.7	101.7	100.4
CP 89-2143	94.4	93.6	104.4	102.6	106.3	100.3
CP 07-2521	88.3	106.5*	96.4	103.8	105.5	100.1
CP 72-2086	84.2	97.8	104.2	102.2	103.5	98.4
CP 07-2552	90.9	99.3	100.5	100.3	95.7	97.3
CP 07-2331	81.7	101.1	99.9	98.0	89.7	94.1
CP 78-1628	82.9	98.6	94.7	92.3	87.7	91.2
CP 07-1533	77.1	81.4	89.0	101.2	106.1	90.9
CP 07-1606	74.2	88.3	89.8	93.4	101.0	89.3
CP 07-1685	73.0	86.7	72.2	93.2	84.9	82.0
Mean	87.2	100.9	100.7	103.1	102.4	98.9
LSD ($p = 0.1$)†	12.8	8.1	14.2	7.4	8.2	5.7
CV (%)	8.4	4.6	8.1	4.1	4.6	7.7

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

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck			Pahokee muck	
Clone	Duda 1/25/12	Knight 12/28/11	Okeelanta 1/11/12	Wedgworth 1/31/12	SFI 1/31/12	Mean yield, all farms
CP 07-2320	129.7*	131.5	146.4	130.7*	132.0*	134.1*
CP 07-1746	125.7	120.5	152.1	127.0	131.1	131.3
CP 07-1606	124.9	122.0	139.5	126.4	131.5*	128.9
CP 89-2143	122.1	122.7	145.6	123.5	125.6	127.9
CP 07-1278	123.0	124.9	144.4	125.1	118.7	127.2
CP 72-2086	123.3	120.9	145.0	119.1	126.4	126.9
CP 07-1533	117.5	120.2	147.7	121.7	125.3	126.5
CP 07-2460	119.4	122.8	135.2	122.9	122.6	124.6
CP 78-1628	119.2	119.1	134.6	122.4	120.9	123.2
CP 07-2552	120.7	109.5	141.1	123.2	119.1	122.7
CP 07-2521	119.5	116.4	137.0	117.7	121.8	122.5
CP 07-1618	115.3	115.1	138.0	118.8	119.9	121.4
CP 07-1824	114.4	117.5	124.1	118.9	121.3	119.2
CP 07-2490	116.2	115.7	129.7	116.9	116.1	118.9
CP 07-2331	113.0	118.1	123.6	115.7	119.8	118.0
CP 07-1685	104.8	103.3	114.7	106.3	106.5	107.1
Mean	119.3	118.8	137.4	121.0	122.4	123.8
LSD (p = 0.1)†	4.5	6.0	7.2	4.4	4.0	3.8
CV (%)	3.9	5.3	5.5	3.7	3.4	7.2

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of sugar yield = 6.2 KS/T a t p = 0.10.

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

	Mean yield by soil type, farm, and sampling date					
	Dania muck	Lauderhill muck			Pahokee muck	
Clone	Duda 1/25/12	Knight 12/28/11	Okeelanta 1/11/12	Wedgworth 1/31/12	SFI 1/31/12	Mean yield, all farms
CP 07-1606	25.015	27.828	26.364	30.590*	24.468	26.867
CP 07-1533	25.517	24.432	27.872	27.062	26.870*	26.350
CP 07-1746	25.728	16.327	29.373*	29.265*	29.560	26.051
CP 07-2320	29.142*	25.258	26.078	25.322	22.455	25.651
CP 07-2331	22.752	25.565	25.563	25.786	28.032*	25.537
CP 89-2143	22.370	24.268	25.928	23.553	23.262	23.876
CP 07-1824	22.280	25.537	22.057	24.828	22.623	23.465
CP 78-1628	22.382	23.837	22.980	24.068	22.778	23.209
CP 72-2086	24.485	21.000	25.053	21.222	24.030	23.158
CP 07-2460	22.057	23.118	24.177	23.315	20.495	22.632
CP 07-2490	24.882	21.348	22.732	23.147	20.913	22.604
CP 07-1685	23.150	24.208	20.885	22.755	21.892	22.578
CP 07-1278	22.157	12.663	24.457	26.573	24.842	22.138
CP 07-2521	23.747	19.792	23.660	21.067	20.022	21.657
CP 07-1618	19.918	17.373	25.597	23.985	21.317	21.638
CP 07-2552	22.090	5.328	22.030	26.493	24.163	20.021
Mean	23.604	21.118	24.675	24.939	23.068	23.590
LSD ($p = 0.1$)†	3.149	3.298	2.843	2.936	2.652	3.262
CV (%)	13.875	16.240	11.980	12.241	11.683	32.056

* Significantly greater than CP 89-2143 at $p = 0.10$ based on *t* test.
† *LSD* for location means of sugar yield = TS/H 1.640 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, Pompano fine sand, and Margate sand

Clone	Preharvest yield by soil type, farm, and sampling date				Harvest yield by soil type, farm, and sampling date			
	Pompano fine sand	Malabar sand	Margate sand	Mean yield, all farms	Pompano fine sand	Malabar sand	Margate sand	Mean yield, all farms
	Lykes 2/6/2012	Hilliard 2/7/2012	Townsite 2/28/2012		Lykes 2/6/2012	Hilliard 2/7/2012	Townsite 2/28/2012	
CP 07-2320	119.2*	114.7	122.2*	118.8*	131.1	149.0*	146.4*	142.1*
CP 07-1606	106.2	115.4*	107.7	109.8	133.5	144.4*	144.2*	140.7*
CP 07-2137	106.4	111.4	124.4*	114.1*	134.6	143.0*	143.8*	140.5*
CP 89-2143	108.8*	114.6	117.6	113.7*	131.8	141.1	144.3*	139.1*
CP 07-1746	115.5*	117.8*	114.8	116.0*	131.6	137.3	136.9	135.1
CP 78-1628	99.9	109.2	108.2	105.8	130.4	138.4	136.3	134.9
CP 07-2552	105.2	110.6	122.8*	112.9*	128.5	139.0	136.7	134.8
CP 07-2262	103.9	109.7	115.6	109.7	124.9	141.4	138.0	134.7
CP 72-2086	110.6*	114.9	120.7*	115.4*	128.8	135.7	139.6*	134.7
CP 07-2547	101.4	104.8	113.4	106.5	127.3	137.6	138.2	134.4
CP 07-1824	113.9*	117.3*	115.5	115.6*	123.8	138.8	138.3	133.6
CP 07-2301	108.5*	116.2*	121.0*	115.2*	125.1	137.6	135.3	132.7
CP 07-1618	110.4*	111.7	113.9	112.0*	124.7	134.2	133.9	130.9
CP 07-2542	105.5	103.1	115.0	107.9	123.9	133.5	134.8	130.7
CP 07-1527	97.3	109.2	108.1	104.8	113.6	135.6	135.5	128.2
CP 07-1685	98.5	98.6	99.8	98.9	109.2	121.0	119.7	116.6
Mean	106.9	111.2	115.0	111.1	126.4	138.0	137.6	134.0
LSD (p = 0.1)†	6.6	6.2	11.5	4.3	4.4	3.9	3.2	3.4
CV (%)	3.5	3.2	5.7	4.9	3.6	3.0	2.4	4.5

* Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.
† *LSD* for location means of preharvest sugar yield = 3.1 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, Pompano fine sand, and Margate sand

	Cane yield by soil type, farm, and sampling date				Sugar yield by soil type, farm, and sampling date			
	Pompano fine sand	Malabar sand	Margate sand		Pompano fine sand	Malabar sand	Margate sand	
Clone	Lykes 2/6/2012	Hilliard 2/7/2012	Townsite 2/28/2012	Mean yield, all farms	Lykes 2/6/2012	Hilliard 2/7/2012	Townsite 2/28/2012	Mean yield, all farms
CP 07-2137	207.03*	195.81*	183.89	195.58*	27.842*	27.982*	26.430*	27.418*
CP 07-2320	176.31	189.53*	179.18	182.02*	23.162	28.290*	26.176*	25.944*
CP 07-1527	169.11	206.77*	214.66*	196.85*	19.048	27.985*	29.090*	25.374*
CP 07-1606	158.83	195.38*	180.65	178.29	21.202	28.252*	26.055*	25.169*
CP 07-1746	181.74	181.05*	193.28*	185.44*	23.931	24.843	26.452*	25.071*
CP 07-2301	158.83	193.33*	199.97*	184.04*	19.900	26.545*	26.915*	24.453*
CP 07-2547	177.48	177.14*	186.47*	180.37	22.610	24.333	25.763*	24.236
CP 89-2143	172.58	176.55*	166.09	171.74	22.753	24.973*	23.938	23.888
CP 07-2262	178.70	172.54*	178.84	176.69	22.297	24.373	24.692	23.787
CP 07-2552	138.38	171.15	175.92	161.82	17.740	23.812	23.985	21.846
CP 72-2086	166.92	176.46*	143.81	162.40	21.502	23.920	20.087	21.836
CP 07-1618	162.87	151.25	183.99	166.04	20.305	20.298	24.657	21.753
CP 78-1628	167.15	153.47	163.05	160.90	21.669	21.233	22.220	21.649
CP 07-1824	167.60	147.21	162.49	159.10	20.743	20.413	22.427	21.194
CP 07-1685	180.31	146.44	195.70*	173.94	19.615	17.732	23.603	20.294
CP 07-2542	153.02	158.34	153.32	154.89	18.928	21.202	20.652	20.261
Mean	169.80	174.53	178.83	174.38	21.453	24.137	24.571	23.386
LSD (p = 0.1)†	20.23	25.40	22.96	20.04	2.573	3.576	3.181	2.804
CV (%)	12.38	15.13	13.35	20.32	12.469	17.331	13.462	21.190

* Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 10.84 TC/H and of sugar yield = 1.393 TS/H at p = 0.10.

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

	Cane yield (TC/H)	Sugar yield (KS/T)		Sugar yield (TS/H)
		Pre-Harvest	Harvest	
	Torry muck	Torry muck	Torry muck	Torry muck
Clone	**Eastgate 2/13/2012**	**Eastgate 10/13/2011**	**Eastgate 2/13/2012**	**Eastgate 2/13/2012**
CPCL 06-3432	329.71*	104.6	121.8	40.167*
CP 06-2042	310.60	102.4	121.6	37.737
CP 06-2400	327.85*	101.5	112.7	37.042
CP 06-2664	311.96*	96.0	118.1	36.617
CP 06-2874	284.35	106.0	124.3	35.333
CPCL 06-3272	303.94	106.4	115.0	34.905
CP 06-2897	289.49	115.4	119.0	34.313
CP 06-2335	262.86	123.2*	129.5	34.242
CP 06-2170	285.21	112.0	120.2	34.240
CP 06-2713	285.80	109.7	118.0	33.678
CP 89-2143	265.17	111.5	126.4	33.608
CP 78-1628	273.68	116.4*	122.6	33.462
CP 72-2086	247.49	101.9	130.7	32.240
CPCL 06-3332	245.95	111.3	128.6	31.690
CP 06-3040	209.36	111.9	121.2	25.510
CP 06-2164	164.50	98.9	112.0	18.415
Mean	274.87	108.1	121.3	33.325
LSD (p = 0.1)†	46.36	4.8	4.4	5.526
CV (%)	17.54	4.4	3.8	17.243

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

Table 9. 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	
Clone	**Duda 1/11/2012**	**Knight 12/27/2011**	**Wedgworth 1/18/2012**	**Okeelanta 1/19/2012**	**SFI 11/13/2011**	**Mean yield, all farms**
CP 06-2400	227.22*	198.73*	178.41*	194.66*	164.89	192.67*
CP 06-2874	199.31*	150.48	196.65*	185.82*	194.95*	185.44*
CP 06-2042	217.71*	163.46*	191.05*	163.87*	168.62	180.94*
CP 78-1628	193.00*	165.42*	164.75*	165.48*	186.29*	174.99*
CP 06-2713	187.70	183.69*	179.28*	147.30*	172.34	174.74*
CP 06-2170	190.72*	148.72	175.68*	155.70*	176.08	169.38*
CPCL 06-3272	220.51*	150.40	172.87*	148.10*	148.48	168.07*
CPCL 06-3432	199.82*	164.97*	160.06*	157.55*	147.52	165.98*
CP 06-2897	184.42	160.47*	161.72*	145.14*	155.95	161.54*
CP 06-2664	185.61	126.95	135.36	152.20*	188.53*	157.73*
CP 06-3040	182.49	149.30	151.25	146.64*	154.62	156.86
CP 06-2335	180.56	134.08	157.56*	142.13	152.94	153.45
CPCL 06-3332	168.91	135.93	162.95*	137.57	150.06	151.39
CP 06-2164	174.97	127.62	143.08	147.93*	158.49	150.42
CP 89-2143	163.01	122.07	138.01	127.46	157.65	141.64
CP 72-2086	162.21	81.73*	90.26	148.65*	154.76	127.52
Mean	189.89	147.75	159.93	154.14	164.51	163.30
LSD (p = 0.1)†	27.44	29.14	19.20	15.25	18.85	15.50
CV (%)	15.03	20.51	12.49	10.29	11.92	22.00

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 9.52 TC/H at p = 0.10.

Table 10. 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	
Clone	Duda 1/11/2012	Knight 12/27/2011	Wedgworth 1/18/2012	Okeelanta 1/19/2012	SFI 11/13/2011	Mean yield, all farms
CP 06-2335	129.34	124.09	129.61	133.31*	132.23	129.72
CPCL 06-3332	131.62	124.21	133.50*	131.07	128.17	129.70
CP 89-2143	128.83	125.97	128.82	128.41	130.29	128.46
CP 06-2874	130.59	122.24	130.49	129.19	127.78	128.06
CP 78-1628	129.38	127.12	126.21	127.63	123.16	126.70
CP 06-2042	129.14	117.94	125.13	124.04	131.74	125.60
CP 06-2170	125.92	113.03	131.27	128.92	125.34	124.89
CP 72-2086	129.64	121.79	128.39	115.95	124.02	123.96
CP 06-3040	123.13	116.55	118.01	127.98	124.00	121.93
CP 06-2897	124.41	116.33	118.48	126.52	123.27	121.80
CP 06-2664	121.54	121.28	121.79	123.22	120.89	121.74
CP 06-2713	119.27	116.36	125.62	121.94	119.68	120.66
CPCL 06-3432	123.93	115.01	122.19	121.91	119.94	120.60
CPCL 06-3272	119.96	114.40	120.42*	127.22	120.36	120.47
CP 06-2400	121.86	112.54	119.18	121.55	117.78	118.63
CP 06-2164	112.60	101.33	113.38	102.58	108.13	107.60
Mean	125.07	118.14	124.53	124.47	123.55	123.16
LSD (p = 0.1)†	4.46	4.62	3.26	3.84	4.50	3.36
CV (%)	3.71	4.07	2.72	3.21	3.79	6.32

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 2.11 KS/T at p = 0.10.

Table 11. 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	
Clone	Duda 1/11/2012	Knight 12/27/2011	Wedgworth 1/18/2012	Okeelanta 1/19/2012	SFI 11/13/2011	Mean yield, all farms
CP 06-2874	26.027*	18.363	25.635*	24.012*	24.885*	23.784*
CP 06-2400	27.677*	22.473*	21.230*	23.632*	19.370	22.874*
CP 06-2042	28.145*	19.298*	23.898*	20.307*	22.168	22.763*
CP 78-1628	24.965*	21.012*	20.783*	21.140*	22.905*	22.161*
CP 06-2170	24.035	16.805	23.067*	20.105*	22.083	21.219*
CP 06-2713	22.405	21.477*	22.537*	17.963	20.712	21.134*
CPCL 06-3272	26.465*	17.188	20.805*	18.825*	17.848	20.226*
CPCL 06-3432	24.793*	19.068	19.578	19.263*	17.688	20.078
CP 06-2335	23.347	16.705	20.417*	18.953*	20.218	19.928
CP 06-2897	22.972	18.715	19.135	18.357	19.252	19.686
CPCL 06-3332	22.092	16.913	21.772*	18.003	19.195	19.651
CP 06-2664	22.570	15.363	16.518	18.755*	22.727	19.187
CP 06-3040	22.360	17.450	17.878	18.762*	19.125	19.115
CP 89-2143	20.890	15.442	17.773	16.413	20.510	18.206
CP 06-2164	19.763	12.962	16.218	15.118	16.998	16.212
CP 72-2086	21.028	10.015	11.602	17.223	19.183	15.810
Mean	23.721	17.453	19.928	19.177	20.304	20.127
LSD (p = 0.1)†	3.507	3.675	2.484	1.969	2.385	1.879
CV (%)	15.382	21.893	12.971	10.678	12.215	21.674

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 1.230 TS/H at p = 0.10.

Table 12. Yields of harvest theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from first-ratoon cane on Pompano fine sand and Margate sand

	Sugar yield by soil type, farm, and sampling date			
	Margate sand		Pompano fine sand	
Clone	Hilliard 11/1/2011	Townsite 2/15/2012	Lykes 1/25/2012	Mean yield, all farms
CP 06-2335	116.5*	149.5*	140.0	135.2*
CP 06-2874	119.6*	140.8	135.3	131.9*
CP 06-2042	116.6*	141.1	136.5	131.4*
CP 06-2274	118.3*	140.1	135.1	131.2*
CP 89-2143	113.9*	141.0	137.6	130.8*
CP 06-3025	116.6*	141.4	134.3	130.8*
CP 06-3098	116.3*	138.7	135.3	130.1*
CP 06-2897	115.3*	140.3	134.0	129.9*
CP 78-1628	107.0	141.6	137.1	128.6
CP 72-2086	105.7	139.9	136.5	127.4
CPCL 06-3432	107.7	136.6	134.1	126.1
CP 06-2397	109.4	133.2	132.2	125.0
CPCL 06-3272	110.2	134.7	129.7	124.9
CP 06-2664	101.4	129.8	127.6	119.6
CP 06-2400	102.6	129.5	120.4	117.5
CP 06-2317	95.4	127.8	119.1	114.1
Mean	110.8	137.9	132.8	127.1
LSD (p = 0.1)†	3.8	3.5	3.2	1.3
CV (%)	3.3	2.6	2.5	2.8

* Significantly greater than CP 78-1628 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield of sugar yield = 1.4 KS/T at p = 0.10.

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

	Cane yield by soil type, farm, and sampling date				Sugar yield by soil type, farm, and sampling date			
	Margate Sand	Pompano fine sand		Mean yield all farms	Margate sand	Pompano fine sand		Mean yield all farms
Clone	**Hilliard 11/1/2011**	**Townsite 2/15/2012**	**Lykes 1/25/2012**		**Hilliard 11/1/2011**	**Townsite 2/15/2012**	**Lykes 1/25/2012**	
CP 06-2874	134.72*	143.43*	188.65*	155.60*	16.083*	20.110*	25.507*	20.567*
CP 06-2274	119.62*	138.77*	174.58*	144.32*	14.148*	19.425*	23.592*	19.055*
CP 06-2042	107.44*	128.79*	156.14	130.79	12.512*	18.162	21.292	17.322*
CP 89-2143	100.52	135.56*	142.74	126.27	11.523*	19.087*	19.633	16.748
CPCL 06-3272	122.50*	138.70*	135.99	132.40*	13.540*	18.693*	17.717	16.650
CP 06-2664	116.64*	122.69	157.87	132.40*	11.835*	15.872	20.147	15.951
CP 06-2897	106.20*	117.43	140.70	121.44	12.237*	16.490	18.872	15.866
CP 06-2400	119.43*	126.00	148.93	131.45*	12.263*	16.335	17.935	15.511
CPCL 06-3432	93.80	129.15*	137.87	120.27	10.172	17.673	18.490	15.445
CP 06-3025	96.41	125.13	128.42	116.65	11.233*	17.700	17.245	15.393
CP 78-1628	88.30	110.23	145.90	114.97	9.487	15.691	19.985	15.073
CP 06-3098	97.24	119.80	105.82	107.62	11.310*	16.630	14.372	14.104
CP 72-2086	88.37	119.27	108.04	105.23	9.362	16.695	14.797	13.618
CP 06-2335	69.22	81.59	120.40	91.03	8.120	12.123	16.865	12.462
CP 06-2317	85.61	77.28	95.18	86.02	8.188	9.870	11.420	9.826
Mean	103.94	123.28	141.77	123.05	11.553	16.982	18.864	15.806
LSD (p = 0.1)†	14.44	18.55	20.71	16.08	1.668	2.564	2.810	2.188
CV (%)	14.45	15.64	15.19	23.10	15.017	15.696	15.494	24.472

* Significantly greater than CP 78-1628 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 10.36 TC/H and of sugar yield = 1.409 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		
	Dania muck	Torry muck		Dania muck	Torry muck		Dania muck	Torry muck	
Clone	Okeelanta 12/7/2011	Eastgate 1/3/2012	Mean yield, both farms	Okeelanta 12/7/2011	Eastgate 1/3/2012	Mean yield, both farms	Okeelanta 12/7/2011	Eastgate 1/3/2012	Mean yield, both farms
CPCL 05-1201	205.29*	204.79*	205.04*	125.7	123.8	124.8	25.825*	25.367	25.596*
CP 05-1526	175.63*	224.21*	199.92*	125.4	122.1	123.7	22.053*	27.313	24.683*
CP 78-1628	150.35	202.93*	176.64	131.5	125.8	128.6	19.792*	25.513	22.653
CPCL 05-1102	142.64	188.86	165.75	130.8	134.2	132.5	18.647	25.370	22.008
CPCL 02-6848	170.56*	184.53	177.54	128.2	120.3	124.2	21.838*	22.168	22.003
CP 05-1740	142.84	202.17*	172.51	129.8	126.1	127.9	18.527	25.465	21.996
CPCL 05-1791	158.14*	184.17	171.16	128.6	121.9	125.2	20.308*	22.450	21.379
CP 89-2143	128.31	180.45	154.38	131.1	132.8	132.0	16.850	23.948	20.399
CPCL 02-7610	125.32	181.22	153.27	128.7	126.6	127.7	16.108	23.013	19.561
CPCL 02-6225	141.12	155.40	148.26	129.4	130.2	129.8	18.290	20.233	19.262
CPCL 02-7190	136.28	152.40	144.34	127.9	127.4	127.6	17.395	19.435	18.415
CPCL 02-8001	115.24	150.57	132.91	133.0	139.1*	136.1	15.358	20.995	18.177
CPCL 05-1300	112.51	194.73	153.62	117.3	117.7	117.5	13.203	22.937	18.070
CP 05-1466	117.16	134.75	125.95	128.0	130.0	129.0	14.997	17.545	16.271
CPCL 02-8071	92.55	138.87	115.71	129.3	126.1	127.7	11.990	17.468	14.729
CP 72-2086	93.82	112.27	103.04	128.7	131.8	130.3	12.063	14.817	13.440
Mean	174.52	137.98	156.25	128.3	127.2	127.8	17.703	22.127	19.915
LSD (p = 0.1)†	29.33	18.16	27.55	2.9	2.9	4.9	2.347	3.841	3.536
CV (%)	17.48	13.69	24.63	2.3	2.4	5.3	13.785	18.054	24.806

* Significantly greater than CP 89 2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 11.28 TC/H of sugar yield = 0.9 KS/T, and of sugar yield = 1.502 TS/H at p = 0.10.

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

	Mean yield by soil type, farm, and sampling date					
	Dania muck		Lauderhill muck		Pahokee muck	
Clone	**Duda 10/3/2011**	**Okeelanta 10/11/2011**	**Knight 10/24/2011**	**SFI 10/26/2011**	**Wedgworth 10/25/2011**	**Mean yield, all farms**
CPCL 02-6848	143.53*	165.27*	113.02*	142.30*	145.27*	141.88*
CPCL 05-1201	102.30	163.82*	64.68	121.40	117.27	114.34
CPCL 02-7610	65.57	146.64*	117.22*	109.14	120.32	111.39
CP 05-1526	94.99	147.95*	92.36	125.25	92.45	110.55
CP 05-1740	99.76	147.81*	39.59	102.93	107.19	104.28
CP 78-1628	97.08	123.61	63.81	108.41	122.73	103.13
CP 89-2143	94.72	111.20	76.55	116.07	111.84	102.07
CPCL 05-1102	120.20*	130.41*	76.61	88.07	72.35	97.51
CP 05-1466	96.02	108.52	63.93	95.02	90.99	91.03
CPCL 02-7190	67.35	116.80	68.37	100.69	87.80	88.20
CPCL 05-1791	80.34	127.21	56.01	92.09	72.43	85.73
CPCL 02-6225	68.56	113.58	30.29	80.15	78.08	74.44
CP 72-2086	101.32	97.47	29.05	73.70	68.23	73.95
CPCL 02-8001	32.96	119.38	68.21	71.85	80.93	73.92
CPCL 05-1300	63.76	129.10*	28.37	61.53	69.53	70.46
CPCL 02-8071	34.28	64.43	9.00	32.47	35.60	34.92
Mean	85.17	125.82	62.32	95.07	92.06	92.36
LSD (p = 0.1)†	23.82	17.38	21.28	22.22	23.57	15.74
CV (%)	29.09	14.37	35.41	24.30	26.62	39.52

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 14.64 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 Lauderhill muck, Dania muck, and Pahokee muck

	Mean yield by soil type, farm, and sampling date					
	Dania muck		Lauderhill muck		Pahokee muck	
Clone	Duda 10/3/2011	Okeelanta 10/11/2011	Knight 10/24/2011	SFI 10/26/2011	Wedgworth 10/25/2011	Mean yield, all farms
CPCL 02-7190	115.59*	138.06*	108.57	137.96*	110.48	122.13
CPCL 05-1201	110.06	119.08	108.50	127.95	111.33	115.39
CP 89-2143	103.96	122.11	107.03	129.26	111.99	114.87
CPCL 02-8071	114.46*	116.92	100.94	130.80	104.55	113.53
CP 05-1526	100.65	121.69	100.60	126.76	116.96	113.33
CPCL 02-6848	107.33	123.07	101.60	120.73	113.75	113.30
CPCL 05-1102	108.63	121.58	99.51	131.96	104.36	113.21
CPCL 02-8001	99.88	123.32	101.79	124.89	115.64	113.15
CPCL 02-7610	95.87	119.52	104.21	126.55	112.79	111.79
CPCL 05-1791	99.46	126.31	107.12	119.57	105.28	111.48
CP 78-1628	100.34	114.36	101.39	129.72	110.25	111.21
CP 72-2086	104.91	123.35	96.74	128.19	101.32	110.90
CP 05-1740	95.67	117.11	100.64	118.32	105.68	107.14
CP 05-1466	88.73	113.96	100.12	124.38	108.10	106.98
CPCL 05-1300	102.60	119.01	91.16	116.48	100.44	105.94
CPCL 02-6225	91.57	114.52	94.28	121.58	100.05	104.37
Mean	102.48	120.87	101.51	125.94	108.31	111.80
LSD (p = 0.1)†	9.00	5.88	5.66	7.42	5.36	11.72
CV (%)	9.13	5.06	5.79	6.13	5.15	18.53

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 5.40 KS/T at p = 0.10.

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

	Mean yield by soil type, farm, and sampling date					
	Dania muck		Lauderhill muck		Pahokee muck	
Clone	Duda 10/3/2011	Okeelanta 10/11/2011	Knight 10/24/2011	SFI 10/26/2011	Wedgworth 10/25/2011	Mean yield, all farms
CPCL 02-6848	15.397*	20.352*	11.538*	17.313	16.573*	16.235*
CPCL 05-1201	11.020	19.602*	7.101	15.552	12.814	13.275
CPCL 02-7610	6.390	17.615*	12.087*	13.872	13.667	12.692
CP 05-1526	9.513	17.973*	9.209	15.893	10.832	12.691
CP 89-2143	9.798	13.580	8.317	15.045	12.587	11.865
CP 78-1628	9.765	14.172	6.293	14.003	13.770	11.601
CP 05-1740	9.565	17.298*	3.856	12.157	11.398	11.312
CPCL 05-1102	12.995*	15.862	7.677	11.617	7.675	11.172
CPCL 02-7190	7.703	16.107*	7.380	13.875	9.673	10.948
CPCL 05-1791	7.903	16.200*	5.955	11.268	7.835	9.845
CP 05-1466	8.430	12.362	6.328	11.813	9.977	9.784
CPCL 02-8001	3.255	14.760	7.099	8.918	9.323	8.584
CP 72-2086	10.618	12.002	2.815	9.523	6.983	8.388
CPCL 02-6225	6.270	13.007	2.915	9.732	7.855	7.985
CPCL 05-1300	6.368	15.372	2.580	7.243	7.100	7.733
CPCL 02-8071	3.708	7.548	0.848	4.245	3.657	3.970
Mean	8.669	15.238	6.375	12.004	10.107	10.505
LSD (p = 0.1)†	2.443	2.311	2.310	2.931	2.746	1.852
CV (%)	29.304	15.775	37.570	25.393	28.248	40.868

* Significantly greater than CP 89-2143 at p = 0.10 based on t test.
† *LSD* for location means of cane yield = 1.739 TS/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 on Margate 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			
	Margate sand		Pompano fine sand	Mean	Margate sand		Pompano fine sand	Mean	Margate sand		Pompano fine sand	Mean
Clone	Hilliard 9/26/2011	Townsite 9/26/2011	Lykes 10/6/2011	yield, all farms	Hilliard 9/26/2011	Townsite 9/26/2011	Lykes 10/6/2011	yield, all farms	Hilliard 9/26/2011	Townsite 9/26/2011	Lykes 10/6/2011	yield, all farms
CPCL 02-6848	80.90*	107.57*	125.66*	104.71*	115.7	91.5	107.6	104.9	9.345*	10.027*	13.497*	10.956*
CPCL 05-1791	63.39	90.71*	116.20*	90.10	123.7	95.2	110.0	109.5	8.207	8.622*	12.737	9.858
CP 05-1526	67.82*	95.15*	101.71	88.23	115.8	93.2	102.2	103.7	7.820	8.878*	10.467	9.055
CPCL 02-7500	48.21	103.60*	107.24	86.35	107.6	101.0	105.1	104.6	5.157	10.425*	11.315	8.966
CP 89-2143	55.93	81.33	95.54	77.60	127.1	92.2	107.5	108.8	7.867	7.673	10.300	8.599
CPCL 05-1201	13.89	103.63*	110.31	75.94	116.7	104.2*	112.1	111.6	1.756	10.788*	12.350	8.381
CPCL 05-1009	76.51*	70.00	110.48	85.66	106.1	82.4	90.9	93.1	8.120	5.815	10.053	7.996
CPCL 02-7610	68.71*	58.47	100.38	75.85	116.2	89.5	105.9	103.9	7.940	5.315	10.693	7.983
CPCL 02-7080	61.31	66.66	64.01	63.99	168.5*	96.9	104.2	123.2*	10.028*	6.418	6.628	7.692
CP 78-1628	53.73	61.49	98.04	71.08	117.9	96.6	108.2	107.5	6.345	5.970	10.692	7.669
CP 05-1679	63.73*	51.99	75.21	63.64	122.1	104.9*	118.0*	115.0	7.927	5.473	8.878	7.426
CP 05-1740	58.08	60.10	85.29	67.83	116.6	99.0	107.6	107.7	6.763	5.975	9.152	7.297
CPCL 02-7386	44.18	65.05	101.54	70.26	118.9	86.5	95.9	100.2	5.223	5.702	9.740	6.891
CP 72-2086	35.95	56.83	80.20	57.66	119.9	88.2	108.7	105.8	4.614	5.000	8.755	6.133
CPCL 02-8072	42.48	33.07	74.62	50.05	126.1	105.7*	112.5	114.7	5.353	3.473	8.413	5.747
CPCL 02-8001	24.88	39.11	65.91	43.30	124.4	92.1	114.6*	110.3	3.095	3.665	7.488	4.749
Mean	53.73	71.55	94.52	73.27	121.4	94.9	106.9	107.8	6.598	6.826	10.072	7.837
LSD ($p = 0.1$)†	9.81	20.92	17.80	20.73	28.1	5.5	5.8	11.7	1.954	2.026	2.070	2.469
CV (%)	18.98	30.41	19.59	50.01	24.1	6.0	5.6	19.2	30.774	30.873	21.376	55.683

* Significantly greater than CP 78-1628 at $p = 0.10$ based on *t* test.
† *LSD* for location means of cane yield = 10.87 TC/H of sugar yield = 5.4 KS/T, and of sugar yield = 1.197 TS/H at p = 0.10.

Table 19. 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 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		
	Torry muck	Dania muck		Torry muck	Dania muck		Torry muck	Dania muck	
Clone	Eastgate 10/14/2011	Okeelanta 11/4/2011	Mean yield, both farms	Eastgate 10/14/2011	Okeelanta 11/4/2011	Mean yield, both farms	Eastgate 10/14/2011	Okeelanta 11/4/2011	Mean yield, both farms
CPCL 02-0926	202.55*	101.24	151.89	104.1	120.3	112.2	21.110	12.270	16.690
CP 89-2143	171.86	111.23	141.55	110.3	126.2	118.3	18.923	14.047	16.485
CP 04-1367	212.90*	94.57	153.73	101.5	112.7	107.1	21.608*	10.617	16.113
CP 78-1628	186.49	105.38	145.93	101.2	121.0	111.1	18.855	12.783	15.819
CPCL 02-0843	187.27	100.32	143.80	98.1	115.0	106.6	18.337	11.617	14.977
CPCL 95-2287	167.81	90.26	129.03	106.9	120.0	113.4	17.837	10.880	14.358
CP 04-1426	180.46	93.60	137.03	101.6	110.2	105.9	18.305	10.353	14.329
CPCL 02-2913	153.61	86.58	120.09	113.8	126.4	120.1	17.488	10.932	14.210
CPCL 02-2975	137.41	99.42	118.42	109.2	126.7	118.0	14.960	12.555	13.758
CPCL 02-0908	135.28	95.74	115.51	100.3	130.9*	115.6	13.645	12.512	13.078
CPCL 02-1295	171.78	86.68	129.23	89.3	116.9	103.1	15.398	10.137	12.768
CP 04-1619	144.29	82.68	113.48	107.8	118.6	113.2	15.505	9.817	12.661
CP 04-1252	139.03	55.54	97.29	103.1	115.5	109.3	14.355	6.350	10.353
CP 72-2086	121.78	59.57	90.67	97.3	119.6	108.5	11.938	7.178	9.558
CPCL 02-2273	130.67	52.65	91.66	99.1	117.5	108.3	12.665	6.127	9.396
CP 04-1321	124.09	32.65	78.37	117.4	128.1	122.8	14.600	4.183	9.392
Mean	160.46	84.26	122.35	103.8	120.4	112.1	16.596	10.147	13.371
LSD (p = 0.1)†	23.47	23.11	25.94	7.7	4.1	7.6	2.596	2.852	3.188
CV (%)	15.21	28.53	29.62	7.7	3.6	9.5	16.268	29.231	33.311

* Significantly greater than CP 89-2143 at p = 0.10 based on *t* test.
† *LSD* for location means of cane yield = 11.99 TC/H of sugar yield = 2.3 KS/T, and of sugar yield = 1.320 TS/H at p = 0.10.

Table 20. Ratings of clones in stage 4 by series, of damage to juice quality by freezing temperatures[†]

CP 06 and CPCL 06 Series		CP 05, CPCL 02, and CPCL 05 Series		CP 04, CPCL 95, and CPCL 02 Series	
Clone	**Rating**	**Clone**	**Rating**	**Clone**	**Rating**
CP 72-2086	3.0	CP 72-2086	3.0	CP 72-2086	3.0
CP 78-1628	4.0	CP 78-1628	4.0	CP 78-1628	4.0
CP 89-2143	4.0	CP 89-2143	4.0	CP 89-2143	4.0
CP 06-2042	3.0	CP 05-1466	3.0	CP 04-1252	2.0
CP 06-2164	3.0	CP 05-1526	3.0	CP 04-1258	4.0
CP 06-2170	3.5	CP 05-1679	3.0	CP 04-1321	4.0
CP 06-2274	2.0	CP 05-1740	3.5	CP 04-1367	4.0
CP 06-2317	1.0	CPCL 02-6225	1.0	CP 04-1374	4.0
CP 06-2335	3.0	CPCL 02-6848	2.0	CP 04-1426	3.0
CP 06-2397	3.0	CPCL 02-7080	4.0	CP 04-1566	4.0
CP 06-2400	4.0	CPCL 02-7190	4.0	CP 04-1619	4.0
CP 06-2664	4.0	CPCL 02-7386	3.0	CP 04-1844	4.5
CP 06-2713	3.0	CPCL 02-7500	3.0	CP 04-1935	3.0
CP 06-2874	3.0	CPCL 02-7610	3.0	CPCL 95-2287	---
CP 06-2897	2.0	CPCL 02-8001	3.0	CPCL 02-0843	3.0
CP 06-3025	2.0	CPCL 02-8071	2.0	CPCL 02-0908	5.0
CP 06-3040	3.0	CPCL 02-8072	2.0	CPCL 02-0926	4.0
CP 06-3098	5.0	CPCL 05-1009	3.0	CPCL 02-1295	4.0
CPCL 06-3272	3.0	CPCL 05-1102	4.0	CPCL 02-2273	4.0
CPCL 06-3332	2.0	CPCL 05-1201	4.0	CPCL 02-2913	3.0
CPCL 06-3432	1.0	CPCL 05-1300	2.0	CPCL 02-2975	3.0

[†] Freeze tolerance ratings: 5 = excellent; better than CP89-2143; 4 = good; as good as CP89-2143; 3 = moderate; lower tolerance than 2143; 2 = poor; 1 = very poor.

Table 21. Dates of stalk counts of 29 plant-cane, first-ratoon, and second-ratoon experiments

		Crop	
Location	**Plant cane**	**First ratoon**	**Second ratoon**
Duda	07/13/11	07/28/11	08/17/11
Eastgate	07/06/11	07/15/11	08/15/11
Hilliard	07/25/11	08/09/11	08/26/11
Knight	07/09/11	08/03/11	08/23/11
Lykes	07/14/11	08/11/11	08/31/11
Okeelanta	07/21/11	07/29/11	08/19/11
Okeelanta (successive)	---	08/01/11	08/24/11
SFI	07/26/11	07/27/11	08/16/11
Townsite	07/18/11	08/05/11	08/30/11
Wedgworth	07/11/11	08/02/11	08/22/11

Appendix. USDA-ARS Sugarcane Field Station Cooperative Cultivar Development Program for Muck and Sand Soils

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	50,000-75,000 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 (by inoculation)
Year 4	Stage II (Second clonal trial)	1,200-1,600 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 and 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 ha	—	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)

* 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).