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Evaluation of New Canal Point Sugarcane Clones

2002-2003 Harvest Season

Abstract

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Thirty replicated experiments were conducted on 10 farms (representing five organic soils and two sand soils) to evaluate 51 new Canal Point (CP) clones of sugarcane from the CP 98, CP 97, CP 96, CP 95, and CP 94 series. Experiments compared the cane and sugar yields of the new CP 98 clones, complex hybrids of *Saccharum* spp., with yields of CP 72-2086, the fifth most widely grown sugarcane cultivar in Florida. Yields of all other new clones were compared with CP 70-1133, formerly a major commercial sugarcane cultivar on organic soils and now the fourth most widely grown cultivar on sand soils in Florida. Each clone was rated for its susceptibility to diseases and cold temperatures. Based on results of these and previous years' tests, it has been recommended to release CP 96-1252 and CP 96-1602 for commercial production in Florida.

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

Keywords: Histosol, muck soil, organic soil, *Puccinia melanocephala, Saccharum* spp., stability, sugarcane cultivars, sugarcane rust, sugarcane smut, sugarcane yields, sugar yields, *Sporisorium scitaminea*.

While supplies last, single copies of this publication can be obtained at no cost from Barry Glaz, Sugarcane Field Station, 12990 U.S. Highway 441N, Canal Point, FL, 33438; or by e-mail at bglax@saa.ars.usda.gov.

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B. Glaz, P.Y.P. Tai, J.C. Comstock, J.D. Miller, S.J. Edme, R. Gilbert, and J. Davidson

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

The time of year and the duration that a clone yields its highest amount of sugar per unit area is important because the sugarcane harvest season extends from fall to spring. Because sugarcane is commercially grown in plant and ratoon crops, clones are evaluated accordingly. Adaptability to mechanical harvesters is an important trait in Florida. Mechanically harvested stalks are both sent to mills to extract their sugar and used for planting new sugarcane fields.

Information about the stability of a clone's performance aids in selecting clones that will yield well across most environments. Stability measurements also enable identification of clones that will perform well only in some environments. This stability factor is important in our evaluations because of the range of environments for growing sugarcane in Florida. As differences widen for such characteristics as temperature, moisture, and soil, region-specific clones become more desirable because few clones produce high yields in markedly different environments. Glaz et al. (2002a) reported that performance of clones between the final two stages of the selection program at Canal Point was generally stable.

Clones with desired agronomic characteristics also must be productive in the presence of harmful diseases, insects, and weeds. Some pests rapidly develop new, virulent races or strains. Because of these changes in pathogen populations, clonal resistance cannot be considered permanent. The selection team must try not to discard clones that have sufficient resistance or tolerance to pests, but it also must discard clones that are too susceptible to pests to be grown commercially.

The disease that has caused the most difficulty in Florida in selecting resistant sugarcane cultivars has been sugarcane rust, caused by *Puccinia melanocephala* Syd & P. Syd. Florida sugarcane growers and scientists have had the most success in selecting resistant cultivars for sugarcane smut, caused by *Sporisorium scitaminea* Syd and P. Syd. Other diseases they must contend with are leaf scald, caused by *Xanthomonas albilineans* (Ashby) Dow; sugarcane yellow leaf virus, a disease caused by a luteovirus (Lockhart et al. 1996); and sugarcane mosaic strain E. Ratoon stunting, caused by *Leifsonia xyli* subsp. *xyli* Evtsuhenko et al., has probably been the most damaging, though the least visible, sugarcane disease in Florida. A program to improve resistance of CP clones to ratoon stunting is underway (Comstock et al. 2000).

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

Sugarcane growers in Florida rely much more on tolerance than resistance to sugarcane diseases. In the 2002 growing season, 10 cultivars made up 80.1 percent of Florida's sugarcane (Glaz and Vonderwell 2003). Each of these 10 cultivars—CL 61-620, CP 70-1133, CP 72-2086, CP 73-1547, CP 78-1628, CP 80-1743,

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CP 80-1827, CP 84-1198, CP 88-1762, and CP 89-2143—was susceptible to one or more of the following sugarcane diseases: rust, mosaic, leaf scald, smut, or ratoon stunting. Glaz et al. (1986) presented a formula and procedure to help growers distribute their available sugarcane cultivars while considering possible attacks of new pests.

Some growers minimize losses by planting stalks that do not contain the bacteria that causes ratoon stunting. This can be accomplished by planting with stalks that have been treated with hot-water therapy that kills any ratoon stunting present or by using disease-free stalks for planting that were derived from meristem tissue culture.

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

Geneticists at Canal Point are working to incorporate borer resistance into the breeding program by selecting for leaf pubescence (a trait known to promote resistance) in elite sugarcane clones (Sosa 1996). Currently, we know of no commercial sugarcane cultivars with pubescent leaves. In addition, the heritability of resistance to sugarcane borers through means other than leaf pubescence is sufficiently high among commercial quality cultivars that improvements in this characteristic are possible (White et al. 2001).

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

Each year at Canal Point, about 50,000 seedlings are evaluated from crosses derived from a diverse germplasm collection. However, Deren (1995) maintains that the genetic base of U.S. sugarcane breeding programs is too narrow. This year, most of the parental clones in our program originated from Canal Point. In addition, clones used as parents this season came from Louisiana and Texas and from Fiji, New Guinea, and South Africa. Also, we have developed at Canal Point *Saccharum officinarum* and *Saccharum spontaneum* clones and interspecific hybrids of these clones as parents. Several of these clones were also used in the crossing program this year.

About 22 percent of 55,000 seedlings from the seedling stage were advanced to the stage I phase in 2003, where about 12 percent of the 12,000 clones are expected to be advanced to stage II. The 1,500 clones in stage II were visually selected in the seedling and stage I phases. Once selected as seedlings, clones are vegetatively propagated. Because of this vegetative propagation, from this stage on in the selection program each plant (clone) is genetically identical to its precursor, assuming no mutations. From the 1,500 clones in stage II, about 135 were selected for continued testing in replicated experiments. Each of the first three stages—seedling, stage I, and stage II—were evaluated for 1 year in the plant-cane crop at Canal Point. The primary selection criteria for stage II and all subsequent stages are sugar yield (metric tons per hectare), sugar content of cane, cane production, and disease resistance.

The 135 stage III clones are evaluated for 2 years, in the plant-cane and first-ratoon crops, in commercial sugarcane fields at four locations—three with organic soils and one with a sand soil. The 14 most promising clones identified in stage III receive continued testing for 4 more years in the stage IV experiments where they are planted in successive years and evaluated in the plant-cane, first-ratoon, and second-ratoon crops.

Clones that successfully complete these experimental phases undergo 2 to 4 years of evaluation and seed-cane increase by the Florida Sugar Cane League, Inc., before commercial release. Some of the League's evaluation occurs concurrently with the evaluations in stage IV. The Canal Point selection program is summarized in Appendix 1.

Clones with characteristics that may be valuable for sugarcane breeding programs are identified throughout the selection process. Sugarcane geneticists in other programs often request clones from Canal Point. From May 2002 to April 2003, CP clones or seeds were requested from and sent to Australia, Costa Rica, Ecuador, France, Guatemala, Nicaragua, and Pakistan. Alabama, Louisiana, and another location in Florida also received CP clones.

This report summarizes the cane production and sugar yields of the clones in the plant-cane, first-ratoon, and second-ratoon stage IV experiments sampled in Florida's 2002-2003 sugarcane harvest season.

Test Procedures

In 30 experiments, 51 new CP clones were evaluated. In the plant-cane crop, 14 clones of the CP 98 series were evaluated at seven farms, 14 clones of the CP 97 series at four farms, and 1 clone of the CP 97 series at one farm. Fourteen clones of the CP 97 series in the first-ratoon crop were evaluated at 7 farms and 1 extra clone of the CP 97 series was evaluated at 2 farms. At 10 farms, 11 clones of the CP 96 series in the first and second-ratoon crops were evaluated; and at 3 farms, 10 clones of the CP 95 series and 1 clone of the CP 94 series were evaluated in the second-ratoon crop.

CP 72-2086 was the primary reference clone in the plant-cane experiments of the CP 98 series. CP 72-2086 was the second most widely grown cultivar on organic soils and third most widely grown cultivar overall in Florida in 2002 (Glaz and Vonderwell 2003). CP 70-1133 was the primary reference clone in all other experiments. CP 70-1133 was the fourth most widely grown cultivar on sand soils, but only a minor cultivar on organic soils in Florida in 2002 (Glaz and Vonderwell 2003). Overall, CP 70-1133 was the ninth most widely grown sugarcane cultivar in Florida in the 2002-2003 harvest season, but for several years was the most widely grown cultivar in Florida.

The plant-cane experiment at A. Duda and Sons, Inc., (Duda) southeast of Belle Glade was conducted on Dania muck. As described by Rice et al. (2002), Dania muck is the shallowest of the organic soils composed primarily of decomposed sawgrass (*Cladium jamaicense* Crantz) in the Everglades Agricultural Area. The maximum depth to the bedrock in Dania muck is 51 cm. The other organic soils similar to Dania muck are Lauderhill muck (51 to 91 cm to bedrock), Pahokee muck (91 to 130 cm to bedrock), and Terra Ceia muck (more than 130 cm to bedrock).

All experiments at Okeelanta Corporation (Okeelanta) south of South Bay were conducted on Lauderhill muck. Also, the plant-cane and first-ratoon experiments at Knight Management, Inc., (Knight), southwest of 20-Mile Bend and at Sugar Farms Cooperative North—SFI Region S05 (SFI) near 20-Mile Bend in Palm Beach County were conducted on Lauderhill muck. The first-ratoon experiment at Duda was conducted on Lauderhill muck. Additionally, the second-ratoon experiments at Duda, Sugar Farms Cooperative North—Osceola Region S03 (Osceola) east of Canal Point, and Wedgworth Farms, Inc., (Wedgworth) east of Belle Glade were conducted on Lauderhill muck.

The plant-cane and first-ratoon experiments at Wedgworth and the second-ratoon experiment at SFI were conducted on Pahokee muck. The plant-cane and first-ratoon experiments at United States Sugar Corporation—Ritta Sec 35-31 (Ritta) east of Clewiston and the first-ratoon experiment at Osceola were conducted on Terra Ceia muck.

The three experiments at Eastgate Farms, Inc. (Eastgate), north of Belle Glade were on Torry muck. The three experiments at Hilliard Brothers of Florida, Ltd., (Hilliard) west of Clewiston were on Malabar sand. The three experiments at Lykes Brothers, Inc., farm (Lykes) near Moore Haven in Glades County were on Pompano fine sand.

The CP 97 series plant-cane, the CP 96 series first-ratoon, and the CP 95 series second-ratoon experiments at Okeelanta were planted on fields in successive sugarcane rotations. In this rotation in Florida, a new crop of sugarcane is planted within about 2 months of the previous sugarcane harvest. All other experiments were planted in fields that had not been cropped to sugarcane for approximately 1 year. In all experiments, clones were planted with two lines of stalks per furrow in three-row plots arranged in randomized-complete-block designs. All plant-cane experiments and the CP 97 first-ratoon experiments had six replications. All CP 96 experiments had eight replications.

The two inside rows of each plot were 10.7 m long and 3 m wide (0.0032 ha). The distance between rows was l.5 m, and 1.5-m alleys separated the front and back ends of the plots. The outside row of each plot was a border row and was usually the same clone as the inside two rows. An extra 1.5 m of sugarcane protected each row at the front and back of each test.

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

Samples of 10 stalks were cut from unburned cane from all plots in each experiment between Oct. 16, 2002, and Feb. 24, 2003. In all experiments, these samples were cut from the middle row of each plot. In addition, preharvest samples were cut from two replications of 10 plant-cane experiments on Oct. 8, 10, 16, 17, 21, and 22, 2002. Once a stool of sugarcane was chosen for cutting, the next 10 stalks in the row were cut as the 10-stalk sample. The range of sample dates for each crop was as follows:

Plant-cane crop	January 9, 2003, to February 20, 2003
First-ratoon crop	November 1, 2002, to February 13, 2003
Second-ratoon crop	October 22, 2002, to February 19, 2003

After each stalk sample was transported to the Agricultural Research Service's Sugarcane Field Station at Canal Point, FL, for weighing and milling, crusher juice from the milled stalks was analyzed for Brix and pol, and theoretical recoverable yield of 96° sugar (in kg per metric ton of cane: KS/T) was determined as a measure of sugar content. The fiber percentage of each clone was used to calculate theoretical recoverable yield as described by Legendre (1992).

Total millable stalks per plot were counted between June 18 and Oct. 10, 2002. Cane yields (in metric tons of cane per hectare: TC/H) were calculated by multiplying stalk weights by number of stalks. Theoretical yields of sugar (in metric tons per hectare TS/H) were calculated by multiplying TC/H by KS/T and dividing by 1,000.

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

Two separate tests were conducted at Gainesville, Florida to determine cold tolerance of clones from the CP 95 and CP 96 series. These tests were conducted at the Florida Institute of Food and Agricultural Sciences Hague Agronomy Farm. The experiments were planted in randomized complete blocks with six replications. Plots were 1.5 m long and 2.1 m wide. The temperature dropped to below -3.9 °C on Nov. 22-23 and Dec. 18, 20, 21, and 31, 2000. Stalk samples were cut for analyses of sucrose content on Nov. 30, 2000, and Jan. 11, 2001. The juice quality of clones in the CP 97 series was also tested on Jan. 10, Mar. 29, and Dec. 12, 2002, for cold tolerance 4 weeks after 5-hour exposures to -4.4 °C in a walk-in freezer at Canal Point. The clones in the CP 98 series were tested in two separate experiments for cold tolerance: one experiment sampled on Dec. 12, 2002, after 4-hour exposures to -4.4 °C in a walk-in freezer at Canal Point, and the other sampled on Dec. 6, 2002, at the Hague Agronomy Farm immediately following recorded air temperatures between -2.2 °C and -4.4 °C for several hours.

The cold-tolerance rankings were based on deterioration of juice quality after the freeze damage to mature sugarcane stalks. However, the clones at Gainesville had considerable differences in maturity at the time of the freezes and samples. Level of maturity probably affected degree of cold injury and subsequent deterioration of juice quality.

Statistical analyses were based on a mixed model using SAS software (SAS version 9.0, 2003; SAS Institute, Inc. Cary, NC) with clones as fixed effects and locations as random effects. Least squares means were calculated for each clone by location combination and again for each clone over all locations. The source of variation that corresponded to the error term for the effect being tested was used to calculate the least significant difference *(LSD)*. Significant differences were sought at the 10 percent probability, and *LSD* was used in all analyses, regardless of significance of F-ratios, to protect against high type-II error rates (Glaz and Dean 1988). Principal component analyses were used to determine cold-tolerance ratings based on rate of deterioration of juice quality factors such as Brix, sucrose, and purity.

Analyses of clonal stability across locations were done by using procedures recommended by Shukla (1972) at the 10 percent probability level. The higher the Shukla stability estimate, the less stable the clone. Thus, a clone with a low Shukla value would be expected to produce relatively constant yields across locations.

Results and Discussion

Table 1 lists the parentage, percentage of fiber, and reactions to smut, rust, leaf scald, mosaic, and ratoon stunting for each clone included in these experiments. Tables 2-5 contain the results of the CP 98 plant-cane experiments, and tables 6-7 contain the results of the CP 97 plant-cane experiments. Tables 8-10 contain the results of the CP 97 first-ratoon experiments, and tables 11-12 contain the results of the CP 96 first-ratoon experiments. Tables 13-15 contain the results of the CP 96 second-ratoon experiments, and tables 16-17 contain the results of the CP 95 second-ratoon experiments. Table 18 lists cold-tolerance ratings for the clones in the CP 95, CP 96, CP 97, and CP 98 series. Table 19 lists the dates that stalks were counted in each experiment.

Plant-Cane Crop, CP 98 Series

When averaged across all six locations, no new clone yielded significantly more TS/H (metric tons of sugar per hectare) or KS/T (kg sugar per metric ton of cane) than CP 72-2086 (tables 4 and 5). The mean preharvest KS/T yield of CP 98-1569 was significantly higher than that of CP 72-2086, but the mean TC/H (metric tons of cane per hectare) yield of CP 98-1569 was extremely low (tables 2 and 3). The mean TC/H yield of CP 98-1417 was significantly higher than that of CP 72-2086, but its mean KS/T yield was significantly lower. CP 98-1417 was one of four clones that had a higher, but not significantly different, mean TS/H yield than CP 72-2086 (table 5). CP 98-1029, CP 98-1335, and CP 98-1497 had TC/H, KS/T, and TS/H yields similar to those of CP 72-2086 (tables 2, 3, 4, and 5). Yields of TC/H and TS/H at Knight were low because rain caused this field to remain flooded for several days immediately after the experiment was planted (tables 2 and 5). CP 98-1335 had significantly higher yields of TC/H and TS/H than CP 72-2086 and most other clones at Knight.

CP 98-1029, CP 98-1335, CP 98-1417, and CP 72-2086 all had similar stability estimates for TS/H (table 5). However, CP 98-1497 was much less stable. High TS/H yields at SFI and Okeelanta (significantly higher than those of CP 72-2086), and low TSH yields at Lykes (significantly lower than that of CP 72-2086) were the major causes of this instability.

Planting areas of CP 98-1029, CP 98-1335, CP 98-1497, and CP 98-1118 were increased to accumulate sufficient stalks for commercial planting if these clones are released after further testing (table 1). CP 98-1118 had mean TC/H, KS/T, and TS/H yields across locations similar to those of CP 72-2086 (tables 2, 3, 4, and 5). However, CP 98-1118 had low TC/H and TS/H yields at Knight (tables 2 and 5). This suggests that for CP 98-1118 to be a productive cultivar in Florida, its use should be limited to fields that are not prone to flooding during the planting season. CP 98-1118 also had a basic parent, US 87-1006, which is being used because of the cold tolerance it inherited from *Saccharum spontaneum* SES 196.

Of the CP 98 clones that advanced to the increase program, CP 98-1118, CP 98-1335, and CP 98-1497 had reactions acceptable for commercial production to smut, rust, leaf scald, mosaic, and ratoon stunting (table 1). CP 98-1029 had acceptable reactions to all diseases except ratoon stunting. All four of the CP 98 clones were between 9 and 10 percent fiber. Freeze tolerance was excellent for CP 98-1029, but mediocre to poor for CP 98-1118, CP 98-1335, and CP 98-1497 (table 18).

Plant-Cane Crop, CP 97 Series

Last year's report contained the results from seven locations of the CP 97 series plant-cane crop. In those tests, CP 97-1164, CP 97-1387, CP 97-1777, CP 97-1944, CP 97-1979, CP 97-1989, and CP 97-1994 yielded significantly more TS/H than CP 70-1133 (Glaz et al. 2003). This year, results are available from four additional locations (tables 6 and 7). When averaged across all four farms, four new clones—CP 97-1994, CP 97-1979, CP 97-1387, and CP 97-1989—yielded significantly more TS/H than CP 70-1133 (table 7). CP 97-1994 and CP 97-1387 yielded significantly more TC/H and harvest KS/T than CP 70-1133 (tables 6 and 7). CP 97-1994 also had significantly more preharvest KS/T than CP 70-1133 (table 6). CP 97-1979 and CP 97-1989 yielded significantly more TC/H than CP 70-1133 (table 7). The KS/T yields of CP 97-1979 and CP 70-1133 were similar, whereas the harvest KS/T yield of CP 97-1989 was significantly lower than that of CP 70-1133 (table 6).

Planting areas for potential release of CP 97-1387, CP 97-1944, CP 97-1989, CP 97-1994, and CP 97-1777 are now in their second year of expansion (table 1). The mean yields of TC/H and harvest and preharvest KS/T of CP 97-1777 and CP 70-1133 were similar, and the mean yield of TS/H of CP 97-1777 was almost significantly higher than that of CP 70-1133 (tables 6 and 7). There are no disease concerns for CP 97-1387 and CP 97-1994 (table 1). CP 97-1944 and CP 97-1989 are both too susceptible to leaf scald for commercial production, and CP 97-1944 is also susceptible to ratoon stunting. In addition, CP 97-1777 is too susceptible to smut for commercial production. Fiber for four of these five CP 97 series clones ranged between 10 and 11 percent. CP 97-1989 had 12.05 percent fiber. CP 97-1387 and CP 97-1989 ranked fifth and sixth, respectively, among the CP 97 clones for cold tolerance (table 18). CP 97-1777, CP 97-1979, and CP 97-1994 had poor rankings for cold tolerance.

First-Ratoon Crop, CP 97 Series

When averaged across all seven farms, seven new clones—CP 97-1989, CP 97-1994, CP 97-1777, CP 97-1387, CP 97-1979, CP 97-1164, and CP 97-1944—yielded significantly more TS/H than CP 70-1133 (table 10). Of these seven new clones, the Florida Sugar Cane League is increasing plantings of CP 97-1989, CP 97-1994, CP 97-1777, CP 97-1387, and CP 97-1944 for possible commercial release (table 1).

Averaged across all seven locations, the TC/H and KS/T yields of CP 97-1777 and CP 97-1994 were significantly higher than those of CP 70-1133 (tables 8 and 9). The mean TC/H yield of CP 97-1387 was significantly higher than that of CP 70-1133, and the KS/T yield of CP 97-1387 was almost significantly higher than that of CP 70-1133. The TC/H yield of CP 97-1989 was significantly higher than that of every other clone in this test (table 8). However, the KS/T yield of CP 97-1989 was significantly lower than that of most other clones in this test, including CP 70-1133 (table 9). CP 97-1944 had significantly higher KS/T yield than CP 70-1133, and the TC/H yields of the two clones were similar (table 8).

Stability analyses identified the high yields of TC/H, KS/T, and TS/H for CP 97-1994, CP 97-1777, and CP 97-1387 as generally stable across locations (tables 8-10). CP 97-1989 was moderately unstable, caused partially by its low KS/T yields at Knight, Duda, and Osceola (table 9). Last year at these farms, CP 97-1989, CP 97-1994, CP 97-1777, CP 97-1387, and CP 97-1944 had high TS/H yields as plant-cane (Glaz et al. 2003).

First-Ratoon Crop, CP 96 Series

No clone in these tests had significantly higher mean yield of TC/H across locations than CP 70-1133 (table 11). However, CP 96-1252 yielded significantly more TS/H than CP 70-1133 (table 11), and its mean KS/T yield was significantly higher than that of CP 70-1133 (table 12). Relative to the other clones in the group, the KS/T yields of CP 96-1252 were more favorable on the three organic soils than on the sand soil at Hilliard. Last year at these farms, CP 96-1252 also had significantly higher TS/H and KS/T yields than CP 70-1133 as plant-cane (Glaz et al. 2003). With 9.42 percent fiber and no major susceptibility to the important Florida diseases, CP 96-1252 has been recommended for release for commercial production in Florida (table 1).

CP 96-1602 has also been recommended for release for commercial production in Florida (table 1). The mean yield of KS/T of CP 96-1602 across the four locations was significantly higher than the mean KS/T yields of both CP 96-1252 and CP 70-1133 (table 12). The TC/H and TS/H yields of CP 96-1602 were not significantly higher than those of CP 70-1133, but they were similar to the TC/H and TS/H yields of CP 96-1252 (table 11). Last year at these locations, CP 96-1602 had similarly high KS/T yields and higher yields of TC/H and TS/H than CP 70-1133 (Glaz et al. 2003). Fiber of CP 96-1602 was 9.58 percent, and though it was not too susceptible for commercial production to any disease, it had a low level of susceptibility to each major sugarcane disease in Florida—smut, rust, leaf scald, mosaic, and ratoon stunting (table 1).

Second-Ratoon, CP 96 Series

The mean yields of TS/H across all six farms were significantly higher for CP 96-1252 and CP 96-1602 than for CP 70-1133 (table 15). CP 96-1252 also yielded significantly more TC/H than CP 70-1133 and all other clones in this group (table 13). CP 96-1602 yielded significantly more KS/T than CP 70-1133 (tables 14). CP 96-1252 had yields similar to those of CP 70-1133 as plant-cane at these locations, but last year as first-ratoon, CP 96-1252 yielded significantly more TC/H and TS/H than CP 70-1133 (Glaz et al. 2001, Glaz et al. 2002b). CP 96-1602 had similarly high yields at these locations as plant-cane, but last year as first-ratoon, its TS/H yield was not significantly different from that of CP 70-1133 (Glaz et al. 2001, Glaz et al. 2002b).

Second-Ratoon Crop, CP 95 Series

Last year, results for these clones were reported from seven locations in the second-ratoon crop and three locations in the first-ratoon crop (Glaz et al. 2003). This year, information from three locations in the second-ratoon crop completes the stage IV analyses of these clones. CP 95-1569 yielded significantly more TC/H and TS/H than CP 70-1133 (table 16). However, the mean KS/T yields of CP 95-1569 and CP 70-1133 were similar across these three locations (table 17). Based on low KS/T yields in previous years, CP 95-1569 was not released for commercial production in Florida (table 1).

Summary

The CP 98 series was tested for the first time this year at six locations in stage IV. The mean TS/H yields of CP 98-1029, CP 98-1335, CP 98-1497, and CP 98-1118 were similar to the mean TS/H yield of CP 72-2086.

The CP 97 series was tested at four locations in the plant-cane crop and at seven locations in the first-ratoon crop. CP 97-1164, CP 97-1387, CP 97-1777, CP 97-1944, CP 97-1979, CP 97-1989, and CP 97-1994 had high yields of TS/H. CP 97-1387, CP 97-1777, and CP 97-1994 also had high TC/H and KS/T yields in both groups of tests. CP 97-1164, CP 97-1979, and CP 97-1989 had high TC/H yields. CP 97-1989 had low KS/T yields, and CP 97-1944 had high KS/T yields.

The CP 96 series was tested at four locations in the first-ratoon crop and at six locations in the second-ratoon crop. CP 96-1252 and CP 96-1602 have both been recommended for release for commercial production in Florida. Both of these cultivars had high TS/H, TC/H, and KS/T yields as first- and second-ratoon this year. CP 96-1602 had exceptionally high KS/T yields, but its TC/H yields were not as outstanding as those of CP 96-1252.

The CP 95 series was tested at three locations in the second-ratoon crop to complete stage IV testing for this series. CP 95-1569 had high yields of TC/H and TS/H. However, because of its prohibitively low KS/T yields over its four years of testing, CP 95-1569 was not released for commercial production.

References

Comstock, J.C., M.J. Davis, P.Y.P Tai, and J.D. Miller. 2000. Selecting ratoon stunting disease resistant cultivars for the 21st century. *In* Proceedings of the 1998 Inter-American Sugar Cane Seminar, pp. 38-45, The Seminar, Miami, FL.

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

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

Glaz, B., and J. Vonderwell. 2003. Sugarcane variety census: Florida 2002. Sugar Journal 66(2):12-15, 18, 20.

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

Glaz, B., J.C. Comstock, P.Y.P. Tai, et al. 2003. Evaluation of New Canal Point sugarcane clones: 2001-2002 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-161.

Glaz, B., J.C. Comstock, P.Y.P. Tai, et al. 2001. Evaluation of new Canal Point sugarcane clones: 1999-2000 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-157.

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

Glaz, B., J.D. Miller, et al. 2002a. Sugarcane genotype repeatability in replicated selection stages and commercial adoption. Journal American Society of Sugar Cane Technologists 22:73-88.

Glaz, B., P.Y.P. Tai, et al. 2002b. Evaluation of new Canal Point sugarcane clones: 2000-2001 harvest season. U.S. Department of Agriculture, Agricultural Research Service, ARS-159.

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

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

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

Shukla, G.K. 1972. Some statistical aspects of partitioning genotype-environmental components of variability. Heredity 29:237-245.

Sosa, O., Jr. 1995. The west indian cane weevil and the sugarcane rootstalk borer weevil: Likely pests of sugarcane in Florida. Sugar Journal 58(1):27-29.

Sosa, O., Jr. 1996. Breeding for leaf pubescence in sugarcane to control borers. Abstract. Sugar y Azucar 91(6):30

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

White, W.H., J.D. Miller, et al. 2001. Inheritance of sugarcane borer resistance in sugarcane derived from two measures of insect damage. Crop Science 41:1706-1710.

Tables

Notes (tables 2-17):

1. Clonal yields approximated by least squares ($p = 0.10$) within locations.
2. Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
3. *LSD* = least significant difference.
4. *CV* = coefficient of variation.

Table 1. Parentage, fiber content, and ratings of susceptibility to smut, rust, leaf scald, mosaic, and ratoon stunting disease for CP 70-1133, CP 72-2086, and 50 new sugarcane clones

			Rating*				
Clone	Parentage	Percent fiber	Smut	Rust	Leaf Scald	Mosaic	Ratoon stunting
CP 70-1133[†]	67 P 6 CP 56-63[‡]	10.37	L	S	L	R	S
CP 72-2086[†]	CP 62-374 × CP 63-588	8.97	R	R	R	S	R
CP 95-1039	US 90-0017 × 95 P 09	10.22	L	R	R	L	R
CP 95-1376	CP 91-0534 × HoCP 85-845	10.88	R	R	R	S	R
CP 95-1429	CP 89-1945 × 95 P 16	10.88	L	L	R	L	R
CP 95-1446	ROC 12 × 95 P 17	10.26	L	R	L	L	S
CP 95-1569	CP 89-1268 × CP 88-1834	11.74	R	L	L	R	S
CP 95-1570	CP 90-1428 × CP 88-1834	9.81	R	L	L	R	L
CP 95-1712	CP 65-0357 × CP 87-1628	11.36	S	L	L	R	S
CP 95-1726	CP 81-1238 × CP 85-1308	10.70	S	R	L	L	R
CP 95-1834	CP 87-1733 × CP 85-1491	10.00	R	L	R	R	R
CP 95-1913	US 90-1011 × CP 72-2086	12.03	R	R	R	R	R
CP 96-1161	CP 75-1091 × CP 78-1628	10.54	S	S	R	L	R
CP 96-1171	CP 83-1770 × CP 80-1827	8.58	S	L	L	L	L
CP 96-1252[†]	CP 90-1533 × CP 84-1198	9.42	R	L	L	R	R
CP 96-1253	CP 90-1533 × CP 84-1198	8.91	R	R	L	L	L
CP 96-1288	TCP 90-4094 × TCP 90-4121	9.20	L	R	L	S	R
CP 96-1290	TCP 90-4094 × TCP 90-4121	9.48	S	R	L	R	R
CP 96-1300	CP 89-2376 × CP 72-1210	10.71	S	L	S	L	S
CP 96-1350	CP 89-1717 × CP 85-1432	8.78	L	L	L	R	R
CP 96-1602[†]	CP 81-1425 × 94 P 03	9.58	L	L	L	L	L
CP 96-1686	CP 85-1382 × 94 P 05	10.44	R	R	L	R	R
CP 96-1865	Green German × CP 70-1133	12.60	R	S	R	L	S
CP 97-1068	CP 90-1204 × CP 90-1151	11.17	L	R	L	L	S
CP 97-1164	CP 93-1621 × 94 P 03	9.17	R	R	L	R	S
CP 97-1362	CP 91-2234 × CL 72-0321	9.96	L	L	L	R	R
CP 97-1387[§]	CP 90-1533 × CL 61-0620	10.36	L	R	L	L	L
CP 97-1433	CP 90-1497 × 94 P 13	11.87	L	R	S	R	R
CP 97-1777[§]	CP 90-1233 × CP 57-0603	10.01	S	L	L	L	L
CP 97-1804	CP 90-1424 × CP 89-2377	12.19	R	S	S	L	L
CP 97-1850	CP 89-2377 × 94 P 17	10.56	S	R	L	R	L
CP 97-1928	CP 90-1533 × CP 57-0603	11.32	L	R	S	L	R
CP 97-1944[§]	CP 80-1743 × 94 P 15	10.86	R	R	S	L	S

CP 97-1979	CP 75-1091 × CL 61-0620	11.78	R	L	L	L	R
CP 97-1989[§]	CP 75-1091 × CL 61-0620	12.05	R	L	S	L	L
CP 97-1994[§]	CP 89-1945 × CP 70-1133	10.51	R	L	L	R	R
CP 97-2068	CP 90-1204 × CP 90-1436	12.01	S	L	R	R	R
CP 97-2103	ROC 12 × 95 P 14	13.80	U	R	L	R	L
CP 98-1029[§]	CP 91-1980 × CP 94-1952	9.91	R	R	L	R	S
CP 98-1107	HoCP 85-845 × CP 80-1827	9.73	R	L	L	L	R
CP 98-1118[§]	CL 61-0620 × US 87-1006	9.03	R	L	R	L	L
CP 98-1139	CP 90-1151 × HoCP 85-845	8.86	R	R	L	R	R
CP 98-1325	CP 90-1030 × 95 P 08	8.02	R	L	R	L	L
CP 98-1335[§]	TCP 87-3388 × CP 70-1133	9.07	R	R	R	R	L
CP 98-1417	HoCP 85-845 × CP 80-1827	9.53	R	L	L	L	L
CP 98-1457	CP 89-2377 × CP 90-1151	9.11	R	R	R	L	S
CP 98-1481	HoCP 85-845 × CP 88-1836	10.05	R	R	L	R	L
CP 98-1497[§]	CP 91-1238 × CP 87-1628	9.37	R	R	R	L	L
CP 98-1513	CP 90-1424 × CP 87-1628	11.92	R	R	L	L	L
CP 98-1569	CP 80-1827 × 95 P 08	9.91	L	R	R	R	L
CP 98-1725	CP 89-2377 × CP 89-1756	8.33	R	R	R	L	S
CP 98-2047	CP 87-1475 × self	11.08	R	R	L	R	L

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

† Released for commercial production in Florida.

‡ 67 P 6 = 6th polycross made in 1967 crossing season. Female parent (CP 56-63) exposed to pollen from many clones; therefore, male parent of CP 70-1133 unknown. Similar explanations for CP 95-1039, CP 95-1

§ Vegetative planting material currently being increased by Florida Sugar Cane League, Inc. for potential release.

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

	Mean yield by soil type, farm and date*							
	Dania muck	Lauderhill muck			Pahokee muck	Pompano fine sand		
Clone	Duda 2/06/03	Knight 1/09/03	SFI 2/06/03	Okeelanta 2/10/03	Wedgworth 1/30/03	Lykes 1/15/03	Stability†	Mean yield, all farms
CP 98-1417	135.82	106.35	214.42	135.32	197.91	154.95	1446.88	157.61
CP 98-1029	157.36	89.95	197.95	140.34	186.29	152.68	463.11	154.09
CP 98-1335	131.42	129.11	177.86	145.57	184.16	141.26	1853.17	151.56
CP 98-1107	131.61	103.25	169.50	132.50	187.16	160.47	675.37	147.41
CP 98-1497	133.63	81.88	207.22	144.91	195.18	118.04	2789.24	146.81
CP 98-1481	137.50	98.05	177.72	132.40	190.10	144.87	-1.41	146.77
CP 70-1133	132.34	—	178.56	145.68	167.11	140.06	900.67	142.54
CP 98-1139	138.17	89.99	175.67	117.24	192.36	134.20	218.72	141.27
CP 72-2086	144.67	86.33	151.70	119.45	174.71	150.03	711.67	137.81
CP 98-2047	129.28	89.71	131.99	133.01	184.45	156.59	2620.54	137.51
CP 98-1325	157.81	86.44	163.55	121.92	147.30	144.59	1993.71	136.94
CP 98-1725	128.38	91.26	157.91	121.19	177.18	138.66	154.57	135.77
CP 98-1118	150.71	48.24	164.36	122.03	172.47	132.83	1912.73	131.78
CP 98-1513	127.73	56.45	145.45	86.17	175.12	136.77	1521.00	121.28
CP 98-1457	103.68	58.16	155.96	96.77	190.18	99.85	2053.15	117.43
CP 98-1569	145.05	69.11	136.54	80.32	137.33	70.65	4254.31	107.19
Mean	136.57	85.62	169.15	123.43	178.69	136.03	1472.96	138.36
LSD ($p = 0.1$)‡	21.02	31.00	21.86	16.40	21.07	22.97		16.65
CV (%)§	9.24	21.72	7.76	7.98	7.07	10.15		17.30

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of cane yield = 13.10 TC/H at $p = 0.10$.
§ *CV* = coefficient of variation.

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

	Mean yield by soil type, farm, and sampling date*								
	Dania muck	Lauderhill muck				Pahokee muck	Pompano fine sand		
Clone	Duda 10/08/02	Osceola 10/08/02	Okeelanta 10/10/02	Knight 10/17/02	SFI 10/17/02	Wedgworth 10/21/02	Lykes 10/22/02	Stability†	Mean yield, all farms
CP 98-1569	85.1	105.8	100.6	104.8	93.3	115.1	122.6	609.4	103.9
CP 98-1118	102.4	75.6	96.1	85.6	79.2	101.9	121.9	338.9	94.7
CP 98-1139	89.4	85.3	93.5	87.4	84.7	106.0	106.7	99.8	93.3
CP 72-2086	83.0	77.0	89.8	94.4	92.2	103.6	111.9	317.6	93.1
CP 98-1029	84.5	76.7	84.5	79.7	95.5	96.9	119.0	337.6	91.0
CP 98-1497	87.7	71.5	88.0	81.0	79.8	109.2	114.4	280.3	90.2
CP 98-1417	92.3	82.2	89.1	84.0	82.3	93.2	104.5	58.6	89.4
CP 70-1133	92.6	82.1	89.8	–	79.1	85.1	120.2	324.0	89.3
CP 98-1725	95.5	81.2	83.8	68.5	80.4	105.2	98.5	407.3	87.6
CP 98-1481	75.0	74.7	86.1	78.3	77.8	86.2	107.1	174.8	83.6
CP 98-2047	87.9	74.1	81.9	81.8	73.9	92.0	90.8	235.0	83.2
CP 98-1457	78.8	74.1	70.0	65.9	81.2	95.7	110.2	305.7	82.3
CP 98-1335	82.2	79.7	50.6	73.3	79.4	93.5	110.4	963.5	81.3
CP 98-1513	85.5	77.9	80.0	73.7	63.0	86.9	94.4	210.2	79.7
CP 98-1107	85.2	78.3	81.9	64.6	68.5	72.3	97.7	453.4	78.3
CP 98-1325	94.5	69.3	60.9	76.7	62.7	83.5	90.9	623.8	76.9
Mean	87.8	77.3	81.7	78.2	78.6	94.1	106.6	358.7	87.4
LSD ($p = 0.1$)‡	13.9	12.3	33.3	21.3	15.5	12.4	16.1		7.0
CV (%)§	9.1	8.9	22.9	15.2	11.1	7.3	8.6		12.4

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 5.7 KS/T at $p = 0.10$.
§ *CV* = coefficient of variation

Table 4. Harvest yields of theoretical recoverable 96° sugar in kg per metric ton (KS/T) from plant cane on Dania muck, Lauderhill muck, Pahokee muck, and Pompano fine sand

	Mean yield by soil type, farm and date*							
	Dania muck	Lauderhill muck			Pahokee muck	Pompano fine sand		
Clone	Duda 2/06/03	Knight 1/09/03	SFI 2/06/03	Okeelanta 2/10/03	Wedgworth 1/30/03	Lykes 1/15/03	Stability†	Mean yield all farms
CP 98-1569	111.6	121.1	128.1	129.1	128.1	124.3	157.3	123.9
CP 72-2086	112.1	121.1	127.7	124.3	126.1	131.2	124.8	123.7
CP 98-1029	119.7	118.0	124.9	123.5	120.5	130.5	357.4	122.9
CP 98-1497	120.8	112.3	130.7	128.0	120.8	123.5	401.7	122.7
CP 98-1335	123.4	118.6	116.1	123.3	122.1	126.9	162.6	121.7
CP 98-1118	116.7	116.1	122.2	119.0	121.9	129.7	85.3	120.9
CP 70-1133	116.9	–	118.2	116.9	119.0	129.4	132.2	118.8
CP 98-1325	116.7	118.6	118.3	124.4	117.2	126.5	12.6	117.7
CP 98-1725	116.9	111.8	117.9	120.0	110.5	123.7	241.7	116.8
CP 98-1417	111.6	109.9	115.3	118.0	113.0	126.8	16.9	115.8
CP 98-1457	115.3	106.1	118.4	113.8	113.8	122.5	195.1	115.0
CP 98-1139	111.1	110.0	109.6	113.5	120.2	122.7	117.7	114.5
CP 98-1107	121.6	103.0	108.5	104.6	109.7	120.1	306.1	111.3
CP 98-1481	106.7	106.9	112.6	105.3	109.2	122.2	442.0	110.5
CP 98-1513	108.3	102.9	106.1	102.4	108.7	119.6	547.8	108.0
CP 98-2047	105.9	97.6	100.8	109.4	116.3	117.2	16287.2	107.9
Mean	114.7	111.6	117.2	117.2	117.3	124.8	1224.3	117.0
LSD ($p = 0.1$)‡	6.1	7.5	5.7	5.5	6.4	6.9		4.1
CV (%)§	3.2	4.0	2.9	2.8	3.3	3.3		5.7

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 2.0 KS/T at $p = 0.10$.
§ *CV* = coefficient of variation.

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

	Mean yield by soil type, farm and date*							
	Dania muck	Lauderhill muck			Pahokee muck	Pompano fine sand		
Clone	Duda 2/06/03	Knight 1/09/03	SFI 2/06/03	Okeelanta 2/10/03	Wedgworth 1/30/03	Lykes 1/15/0	Stability†	Mean yield, all farms
CP 98-1029	18.811	10.642	24.649	17.273	22.449	19.953	10.340	18.963
CP 98-1335	16.140	15.433	20.868	17.899	22.287	17.988	27.358	18.437
CP 98-1417	15.086	11.671	24.712	15.982	22.400	19.619	19.750	18.265
CP 98-1497	16.085	9.222	27.090	18.498	23.751	14.786	77.597	18.239
CP 72-2086	16.248	10.567	19.378	14.811	22.015	19.708	6.057	17.121
CP 70-1133	15.518	–	21.104	17.031	19.927	18.121	9.075	17.042
CP 98-1107	15.977	10.762	18.206	13.876	20.684	19.245	11.243	16.458
CP 98-1139	15.351	10.659	19.315	13.255	23.083	16.492	8.879	16.359
CP 98-1481	14.610	10.607	19.950	13.919	20.749	17.725	2.373	16.260
CP 98-1325	18.449	8.864	19.321	15.156	17.231	18.275	31.860	16.216
CP 98-1118	17.594	5.783	19.989	14.497	21.045	17.088	22.930	15.999
CP 98-1725	15.081	10.456	18.582	14.575	19.589	17.149	3.520	15.895
CP 98-2047	13.699	8.860	13.342	14.587	21.534	18.262	53.414	15.047
CP 98-1457	11.945	6.288	18.471	11.017	21.687	12.244	25.278	13.609
CP 98-1569	16.171	8.345	17.505	10.372	17.636	8.767	58.825	13.234
CP 98-1513	13.877	5.836	15.416	8.813	19.034	16.366	23.064	13.224
Mean	15.665	9.525	19.868	14.473	20.944	16.987	24.473	16.273
LSD ($p = 0.1$)‡	2.432	3.712	2.679	1.921	2.818	2.996		1.928
CV (%)§	9.323	23.190	8.959	7.969	8.078	10.598		18.119

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 1.619 TS/H at $p = 0.10$.
§ *CV* = coefficient of variation.

Table 6. Yields of preharvest and harvest theoretical recoverable 96° sugar in kg per metric ton (KS/T) from plant cane on Lauderhill muck, Terra Ceia muck, Torry muck, and Malabar sand

	Mean preharvest yield by soil type, farm, and sampling date*					Mean harvest yield by soil type, farm, and sampling date*				
	Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand		Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand	
Clone	Okeelanta 2/5/03	USSC Ritta 2/17/03	Eastgate 2/24/03	Hilliard 1/14/03	Mean yield, all farms	Okeelanta 2/5/03	USSC Ritta 2/17/03	Eastgate 2/24/03	Hilliard 1/14/03	Mean yield, all farms
CP 97-1433	87.1	117.2	111.5	127.0	110.7	127.3	120.7	124.8	141.5	128.6
CP 97-1944	94.7	116.3	99.3	98.7	102.3	126.1	122.4	128.4	136.8	128.4
CP 97-1994	92.9	109.2	106.4	118.3	106.7	125.0	117.4	127.5	137.5	126.8
CP 97-1777	83.5	106.8	102.6	106.7	99.9	121.9	118.3	120.2	139.0	124.9
CP 97-1068	82.3	117.0	101.0	108.5	102.2	129.9	115.8	119.0	129.8	123.6
CP 97-1387	91.5	98.1	81.9	100.2	92.9	125.0	114.5	123.3	131.5	123.6
CP 97-1850	76.9	108.9	85.2	110.4	95.3	118.2	120.9	117.7	127.9	121.2
CP 97-1979	64.1	110.3	100.8	95.8	92.8	116.0	116.9	121.5	126.1	120.1
CP 97-1928	76.9	100.6	100.0	106.7	96.1	118.0	110.3	120.6	130.0	119.7
CP 97-1362	77.4	–	85.3	98.9	90.0	121.8	–	117.0	127.6	119.4
CP 70-1133	93.8	106.7	85.2	98.9	96.2	123.0	101.9	121.8	129.0	118.9
CP 97-1164	81.3	108.2	88.7	120.6	99.7	116.2	103.0	120.5	132.5	118.0
CP 97-1804	81.9	91.6	79.8	106.7	90.0	110.8	105.0	113.1	128.4	114.3
CP 97-1989	65.6	95.2	93.9	90.0	86.2	114.0	106.3	110.8	125.7	114.2
CP 97-2068	73.8	90.3	87.8	88.4	85.1	110.7	106.6	112.9	126.0	114.0
CP 72-2086	87.3	110.7	–	120.3	104.8	128.2	120.2	–	133.6	126.9
CP 97-2103	–	100.6	87.8	–	91.4	–	114.6	117.5	–	120.7
Mean	81.9	105.5	93.6	106.0	96.6	120.7	113.4	119.8	131.4	121.4
LSD ($p = 0.1$)†	18.5	4.6	13.8	21.5	8.6	5.4	4.6	8.4	4.6	4.3
CV (%)‡	12.9	2.6	8.4	11.6	7.6	2.7	2.4	4.2	2.1	5.0

* Means approximated by least squares ($p = 0.10$).

† *LSD* for location means of preharvest yield = 4.6 KS/T and of harvest yield = 2.4 KS/T at $p = 0.10$. Varieties CP 72-2086, CP 97-2103, and CP 97-1362 were not included in the analysis used to calculate *LSD* for location mean.

‡ *CV* = coefficient of variation.

Table 7. Yields of cane and of theoretical recoverable 96° sugar in metric tons per ha (TC/H and TS/H) from plant cane on Lauderhill muck, Terra Ceia muck, Torry muck, and Malabar sand

	Mean cane yield by soil type, farm, and sampling date*					Mean sugar yield by soil type, farm, and sampling date*				
	Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand		Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand	
Clone	Okeelanta 2/5/03	USSC Ritta 2/17/03	Eastgate 2/24/03	Hilliard 1/14/03	Mean yield all farms	Okeelanta 2/5/03	USSC Ritta 2/17/03	Eastgate 2/24/03	Hilliard 1/14/03	Mean yield, all farms
CP 97-1994	144.18	114.48	233.74	166.70	164.78	17.983	13.372	29.784	22.901	21.010
CP 97-1979	148.35	158.58	253.54	123.28	170.94	17.342	18.456	30.763	15.574	20.534
CP 97-1387	144.20	127.42	243.34	145.93	165.22	18.005	14.661	30.024	19.196	20.471
CP 97-1989	151.93	147.77	226.91	170.81	174.35	17.390	15.759	25.462	21.421	20.008
CP 97-1777	136.50	117.82	238.31	131.92	156.14	16.591	14.011	28.909	18.318	19.457
CP 97-1164	134.48	130.00	234.60	140.63	159.93	15.690	13.420	28.010	18.609	18.932
CP 97-1068	116.07	119.63	243.79	118.26	149.44	15.117	13.885	28.864	15.381	18.312
CP 97-1944	112.72	119.13	202.27	116.90	137.76	14.195	14.550	25.996	16.050	17.698
CP 97-1433	132.68	106.55	208.15	102.04	137.36	16.846	12.919	25.944	14.454	17.541
CP 70-1133	134.62	131.77	194.25	122.98	145.90	16.585	13.367	23.670	15.923	17.386
CP 97-1362	117.43	–	230.79	118.28	146.20	14.291	–	26.961	15.247	17.361
CP 97-1850	113.17	104.13	200.87	150.30	142.12	13.326	12.629	23.791	19.181	17.232
CP 97-1928	102.88	122.72	220.51	126.21	143.08	12.136	13.472	26.650	16.427	17.172
CP 97-1804	129.35	100.28	183.93	132.83	136.60	14.291	10.500	20.727	17.060	15.645
CP 97-2068	123.23	124.22	189.05	102.18	134.67	13.663	13.222	21.393	12.918	15.299
CP 72-2086	115.32	103.28	–	105.16	130.88	14.785	12.390	–	14.066	16.471
CP 97-2103	–	127.93	225.18	–	156.09	–	14.654	26.583	–	18.741
Mean	128.57	122.23	220.58	129.65	150.08	15.515	13.829	26.471	17.045	18.192
LSD ($p = 0.1$)†	20.51	23.57	27.87	17.56	17.27	2.620	2.688	3.855	2.429	2.219
CV (%)‡	9.58	11.58	7.42	8.14	15.87	10.138	11.673	8.745	8.556	16.991

* Means approximated by least squares ($p = 0.10$).

† *LSD* for location means of cane yield = 9.82 TC/H and of sugar yield = 1.340 at $p = 0.10$. Varieties CP 72-2086, CP 97-2103, and CP 97-1362 were not included in the analysis used to calculate *LSD* for location mean.

‡ *CV* = coefficient of variation.

Table 8. Yields of cane in metric tons per ha (TC/H) from first-ratoon cane on Lauderhill muck, Pahokee muck, Terra Ceia muck, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date*								
	Lauderhill muck				Pahokee muck	Terra Ceia muck	Pompano fine sand		
Clone	Knight 11/4/02	SFI 12/17/02	Duda 12/18/02	Okeelanta 1/13/03	Wedgworth 1/26/03	Osceola 11/27/02	Lykes 1/6/03	Stability†	Mean yield, all farms
CP 97-1989	208.93	166.46	286.51	174.15	201.46	193.92	130.78	1852.13	194.60
CP 97-1979	197.58	155.35	213.22	169.06	178.38	161.44	119.00	1079.32	170.58
CP 97-1164	173.13	169.98	217.34	142.10	200.60	182.92	105.13	1347.62	170.17
CP 97-1387	187.01	175.46	218.62	146.29	189.36	153.32	111.51	671.67	168.80
CP 97-1994	167.53	171.77	237.66	156.71	176.46	163.53	106.51	214.62	168.60
CP 97-1777	171.40	157.63	218.10	156.30	165.59	171.46	111.34	393.24	164.54
CP 97-1944	166.87	174.13	204.01	138.89	177.14	161.94	109.50	960.89	161.78
CP 97-1804	165.61	158.57	246.66	151.48	166.52	146.20	84.32	1103.90	159.91
CP 97-1928	164.56	148.12	215.22	159.13	165.35	144.70	105.59	356.65	157.52
CP 97-1850	152.08	151.00	228.83	132.26	170.65	150.91	90.14	456.28	153.69
CP 70-1133	146.61	138.79	228.19	132.25	172.36	148.75	101.24	798.51	152.60
CP 97-2068	166.34	141.94	205.20	152.40	160.34	153.79	78.21	528.31	151.17
CP 97-1068	169.04	145.31	201.28	142.64	154.80	141.42	96.36	300.74	150.12
CP 97-1362	165.80	150.39	200.59	145.22	126.99	127.25	86.80	1458.27	143.29
CP 97-1433	136.05	134.75	197.10	122.42	167.30	117.75	59.16	954.72	133.50
CP 72-2086	–	129.93	202.49	138.10	160.44	139.29	–		154.05
CP 97-2103	124.88	–	–	–	–	–	92.98		108.93
Mean	166.46	154.35	220.06	147.46	170.86	153.66	99.28	831.79	159.68
LSD ($p = 0.1$)‡	24.50	21.34	28.16	16.76	18.37	7.88	15.38		10.51
CV (%)§	8.85	8.30	7.68	6.82	6.46	4.18	9.30		15.48

* Means approximated by least squares ($p = 0.10$).

† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.

‡ *LSD* for location means of cane yield = 17.13 TC/H at $p = 0.10$.

§ *CV* = coefficient of variation

Table 9. Yields of theoretical recoverable 96° sugar in kg per metric ton (KS/T) from first-ratoon cane on Lauderhill muck, Pahokee muck, Terra Ceia muck, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date*								
	Lauderhill muck				Pahokee muck	Terra Ceia muck	Pompano fine sand		
Clone	Knight 11/4/02	SFI 12/17/02	Duda 12/18/02	Okeelanta 1/13/03	Wedgworth 1/26/03	Osceola 11/27/02	Lykes 1/6/03	Stability†	Mean yield, all farms
CP 97-1433	106.0	142.4	116.0	132.4	125.9	116.8	140.0	30.1	125.6
CP 97-1777	101.0	135.6	117.1	128.1	121.7	120.1	138.8	31.2	123.2
CP 97-1944	105.0	134.9	111.1	128.8	127.3	118.8	129.3	98.1	122.1
CP 97-1994	101.7	134.4	110.1	131.0	123.2	119.0	134.0	23.4	121.9
CP 97-1928	99.1	131.0	112.6	129.7	120.2	113.5	131.8	8.0	119.7
CP 97-1387	94.0	134.1	113.1	123.4	114.3	117.3	135.4	89.3	118.8
CP 97-1164	99.7	133.9	105.7	129.2	109.1	110.7	138.8	191.4	118.2
CP 97-1068	99.0	127.4	114.2	125.8	117.9	115.8	126.4	69.3	118.1
CP 97-1850	88.5	128.1	108.8	125.2	121.8	115.6	131.6	124.7	117.1
CP 97-1979	103.9	128.9	105.7	123.9	116.8	113.6	126.6	97.1	117.0
CP 97-1362	91.5	133.7	115.2	128.3	109.4	110.2	130.8	151.9	117.0
CP 70-1133	93.2	135.0	107.7	126.5	114.8	108.1	126.0	58.0	115.9
CP 97-2068	96.5	128.5	110.2	120.8	113.2	110.2	124.4	37.0	114.8
CP 97-1804	89.7	122.3	101.8	117.1	111.8	102.2	122.9	10.7	109.7
CP 97-1989	90.5	121.3	97.3	120.3	113.9	98.0	125.1	112.7	109.5
CP 72-2086	–	140.2	113.2	132.7	126.9	122.8	–		127.2
CP 97-2103	86.9	–	–	–	–	–	122.7		104.8
Mean	96.6	132.0	110.0	126.4	118.0	113.3	130.3	75.5	118.5
LSD ($p = 0.1$)‡	7.0	5.6	6.9	6.2	6.6	7.9	7.8		3.1
CV (%)§	4.3	2.6	3.8	1.8	3.4	4.2	3.6		5.9

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 3.8 KS/T at $p = 0.10$.
§ *CV* = coefficient of variation

Table 10. Yields of theoretical recoverable 96° sugar in metric tons per ha (TS/H) from first-ratoon cane on Lauderhill muck, Pahokee muck, Terra Ceia muck, and Pompano fine sand

	Mean yield by soil type, farm, and sampling date*								
	Lauderhill muck				Pahokee muck	Terra Ceia muck	Pompano fine sand		
Clone	Knight 11/4/02	SFI 12/17/02	Duda 12/18/02	Okeelanta 1/13/03	Wedgworth 1/26/03	Osceola 11/27/02	Lykes 1/6/03	Stability†	Mean yield, all farms
CP 97-1989	18.974	20.173	27.988	20.958	22.991	19.025	16.372	11.620	20.926
CP 97-1994	17.088	23.064	26.116	20.505	21.760	19.401	14.257	2.247	20.313
CP 97-1777	17.387	21.383	25.442	19.998	20.122	20.645	15.505	7.264	20.069
CP 97-1387	17.563	23.674	24.880	18.098	21.845	18.011	15.040	8.996	19.873
CP 97-1979	20.468	20.035	22.603	20.923	20.881	18.286	15.104	23.218	19.757
CP 97-1164	17.219	22.756	22.816	18.368	21.955	20.274	14.636	14.627	19.717
CP 97-1944	17.489	23.466	22.668	17.878	22.560	19.299	14.189	18.008	19.650
CP 97-1928	16.228	19.405	24.262	20.668	19.841	16.384	13.993	7.453	18.683
CP 97-1850	13.448	19.320	24.851	16.542	20.780	17.540	11.860	12.519	17.763
CP 97-1068	16.749	18.492	23.004	17.982	18.287	16.371	12.172	2.937	17.580
CP 70-1133	13.645	18.730	24.667	16.760	19.794	16.042	12.767	7.853	17.487
CP 97-1804	14.860	19.449	25.127	17.714	18.629	14.924	10.362	8.939	17.295
CP 97-2068	15.996	18.211	22.649	18.440	18.135	16.955	9.736	8.397	17.160
CP 97-1362	15.231	19.946	22.985	18.666	14.012	14.170	11.334	28.009	16.620
CP 97-1433	14.378	19.216	22.867	16.195	21.036	13.758	8.273	21.732	16.532
CP 72-2086	–	18.241	22.917	18.355	20.363	17.115	–		19.398
CP 97-2103	10.787	–	–	–	–	–	11.505		11.146
Mean	16.094	20.348	24.115	18.628	20.187	17.387	12.944	12.255	18.676
LSD (p = 0.1)‡	2.530	3.060	3.442	2.256	2.754	2.574	2.268		1.274
CV (%)§	9.441	9.052	8.571	7.271	8.192	8.897	10.530		17.213

* Means approximated by least squares (p = 0.10).
† Stability for each clone is calculated at p = 0.10 by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 2.195 TS/H at p = 0.10.
§ *CV* = coefficient of variation

Table 11. Yields of cane and of theoretical recoverable 96° sugar in metric tons per ha (TC/H and TS/H) from first ratoon cane on Lauderhill muck, Terra Ceia muck, Torry muck, and Malabar sand

	Mean cane yield by soil type, farm, and sampling date*					Mean sugar yield by soil type, farm, and sampling date*				
	Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand		Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand	
Clone	Okeelanta 1/22/03	USSC Ritta 2/17/03	Eastgate 2/13/03	Hilliard 1/7/03	Mean yield, all farms	Okeelanta 1/22/03	USSC Ritta 2/17/03	Eastgate 2/13/03	Hilliard 1/7/03	Mean yield, all farms
CP 96-1252	130.28	142.32	135.20	120.22	132.00	17.176	18.174	17.329	14.739	16.854
CP 96-1602	123.65	89.02	173.78	120.36	126.70	16.388	11.802	22.639	16.048	16.719
CP 96-1171	106.88	103.00	161.37	117.52	122.19	14.041	13.555	20.858	14.995	15.862
CP 96-1350	115.28	111.88	139.64	93.11	114.98	13.961	14.678	17.419	12.151	14.552
CP 70-1133	117.72	116.65	123.86	100.58	114.70	14.532	13.533	15.228	12.639	13.983
CP 96-1288	88.91	108.25	141.57	83.69	105.60	11.713	13.690	18.193	11.178	13.693
CP 96-1686	69.93	97.17	151.93	90.78	102.45	9.373	13.447	19.625	12.104	13.637
CP 96-1865	103.29	97.63	133.43	80.42	103.69	13.377	11.585	16.823	10.231	13.004
CP 96-1161	79.23	95.52	135.71	104.09	103.64	10.157	11.581	16.383	13.017	12.784
CP 96-1253	99.26	104.05	114.43	75.42	98.29	12.590	13.206	14.726	9.900	12.605
CP 96-1300	75.10	82.58	77.95	130.14	91.44	9.745	10.676	9.935	16.978	11.834
CP 96-1290	96.42	82.00	135.66	67.44	95.38	12.310	9.640	17.118	8.158	11.807
Mean	100.50	102.51	135.38	98.65	109.26	12.947	12.964	17.190	12.678	13.945
LSD ($p = 0.1$)†	14.92	30.54	29.90	14.11	21.84	1.996	3.896	3.684	2.044	2.794
CV (%)‡	8.92	17.85	13.22	8.56	22.98	9.258	18.008	12.867	9.692	23.24

* Means approximated by least squares ($p = 0.10$).
† *LSD* for location means of cane yield = 10.09 TC/H and of sugar yield = 1.284 at $p = 0.10$.
‡ *CV* = coefficient of variation.

Table 12. Theoretical recoverable yields of 96° sugar in kg per metric ton of cane (KS/T) from first-ratoon cane on Lauderhill muck, Terra Ceia muck, Torry muck, and Malabar sand

	Mean yield by soil type, farm, and sampling date*				
	Lauderhill muck	Terra Ceia muck	Torry muck	Malabar sand	
Clone	Okeelanta 1/22/03	USSC Ritta 2/17/03	Eastgate 2/13/03	Hilliard 1/7/03	Mean yield, all farms
CP 96-1686	133.5	136.0	129.5	133.5	133.1
CP 96-1602	132.4	133.2	130.5	133.3	132.4
CP 96-1171	131.6	131.6	130.2	127.3	130.2
CP 96-1288	131.8	126.6	128.0	133.0	129.8
CP 96-1300	129.4	128.8	126.4	130.7	128.8
CP 96-1253	126.6	126.7	129.1	131.2	128.4
CP 96-1252	132.1	128.9	127.5	125.1	128.4
CP 96-1350	121.3	131.4	125.5	130.7	127.2
CP 96-1865	129.5	119.1	126.6	127.8	125.7
CP 96-1161	128.6	120.1	121.0	125.9	123.9
CP 96-1290	127.4	117.8	127.1	121.5	123.5
CP 70-1133	123.3	116.3	124.5	125.1	122.3
Mean	129.0	126.4	127.2	128.8	127.8
LSD ($p = 0.1$)†	5.5	4.1	6.5	9.8	3.8
CV (%)‡	2.5	1.9	3.1	4.6	7.0

* Means approximated by least squares ($p = 0.10$).
† *LSD* for location means of sugar yield = 2.6 KS/T at $p = 0.10$.
‡ *CV* = coefficient of variation.

Table 13. Yields of cane in metric tons per ha (TC/H) from second-ratoon cane on Lauderhill muck, Pahokee muck, and Pompano fine sand

	Mean yield by soil type, farm and date*							
	Lauderhill muck				Pahokee muck	Pompano fine sand		
Clone	Osceola 10/26/02	Okeelanta 10/31/02	Duda 11/5/02	Wedgworth 12/6/02	SFI 10/29/02	Lykes 10/22/02	Stability†	Mean yield, all farms
CP 96-1252	177.74	158.34	159.76	174.92	156.44	119.23	411.19	157.74
CP 96-1171	114.81	132.59	155.13	161.37	116.27	131.29	4507.02	135.24
CP 96-1602	133.60	132.13	–	165.42	128.93	105.29	7079.53	133.07
CP 70-1133	130.85	120.33	142.64	160.18	127.14	91.52	203.52	128.78
CP 96-1865	152.46	126.36	143.88	145.08	124.68	61.53	1625.56	125.66
CP 96-1300	148.17	131.19	123.84	123.02	130.14	81.84	2026.92	123.03
CP 96-1350	142.59	121.64	140.55	141.63	116.84	61.77	902.89	120.84
CP 96-1161	142.23	103.80	148.55	134.83	127.92	65.43	2005.03	120.46
CP 96-1290	95.31	143.27	130.69	155.80	121.56	75.39	3156.99	120.33
CP 96-1253	121.64	114.15	129.50	134.97	99.63	73.02	16.19	112.15
CP 96-1288	115.49	116.40	142.16	130.48	85.01	64.53	1447.25	109.01
CP 96-1686	104.15	99.80	141.79	136.36	103.04	64.30	1119.27	108.24
Mean	131.59	125.00	141.68	147.01	119.80	82.93	2041.78	124.64
LSD ($p = 0.1$)‡	16.83	19.39	17.12	18.42	19.35	14.63		15.42
CV (%)§	7.68	9.32	6.15	7.53	9.70	10.60		18.19

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of cane yield = 9.65 TC/H at $p = 0.10$.
§ *CV* = coefficient of variation.

Table 14. Yields of theoretical recoverable 96° sugar in kg per metric ton of cane (KS/T) from second-ratoon cane on Lauderhill muck, Pahokee muck, and Pompano fine sand

	Mean yield by soil type, farm and date*							
	Lauderhill muck				Pahokee muck	Pompano fine sand		
Clone	Osceola 10/26/02	Okeelanta 10/31/02	Duda 11/5/02	Wedgworth 12/6/02	SFI 10/29/02	Lykes 10/22/02	Stability†	Mean yield, all farms
CP 96-1602	115.1	140.9	–	124.6	130.3	111.1	37.6	124.4
CP 96-1253	105.1	141.6	113.4	118.3	127.4	113.4	245.8	119.9
CP 96-1686	128.0	134.1	84.4	124.9	140.5	100.2	2035.0	118.7
CP 96-1350	108.9	140.0	107.6	117.7	130.6	95.9	111.5	116.8
CP 96-1252	101.6	135.3	116.7	120.5	124.6	99.4	300.5	116.3
CP 96-1171	107.2	135.7	111.2	117.8	115.6	108.2	305.9	116.0
CP 96-1288	102.7	128.0	109.4	116.2	119.9	104.4	183.3	113.4
CP 96-1865	108.2	130.8	103.0	108.7	128.4	92.8	191.6	112.0
CP 70-1133	98.3	129.5	104.3	115.9	123.1	92.8	88.0	110.6
CP 96-1161	101.6	130.8	98.7	109.4	123.9	95.3	21.2	110.0
CP 96-1300	100.5	130.3	99.0	113.4	111.5	99.2	123.6	109.0
CP 96-1290	102.8	133.7	97.3	111.3	115.2	90.3	86.3	108.4
Mean	106.7	134.2	104.1	116.6	124.2	100.2	310.9	114.3
LSD ($p = 0.1$)‡	11.0	10.3	6.9	4.8	9.4	14.2		6.0
CV (%)§	6.2	4.6	4.0	2.5	4.6	8.5		10.5

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 3.2 KS/T at $p = 0.10$.
§ *CV* = coefficient of variation.

Table 15. Yields of theoretical recoverable 96° sugar in metric tons per ha (TS/H) from second-ratoon cane on Lauderhill muck, Pahokee muck, and Pompano fine sand

	Mean yield by soil type, farm and date*							
	Lauderhill muck				Pahokee muck	Pompano fine sand		
Clone	Osceola 10/26/02	Okeelanta 10/31/02	Duda 11/5/02	Wedgworth 12/6/02	SFI 10/29/02	Lykes 10/22/02	Stability†	Mean yield, all farms
CP 96-1252	18.236	21.652	18.712	21.015	19.442	12.071	1.117	18.521
CP 96-1602	15.355	18.605	–	20.637	16.917	11.961	99.520	16.695
CP 96-1171	12.313	17.854	17.276	19.004	13.374	14.242	74.383	15.677
CP 70-1133	13.028	15.576	14.875	18.468	15.895	8.487	7.446	14.388
CP 96-1350	15.552	16.908	15.240	16.628	15.263	5.907	16.163	14.250
CP 96-1865	16.569	16.516	14.751	15.690	15.911	5.876	28.606	14.219
CP 96-1300	14.843	17.213	12.415	14.005	14.451	8.108	18.466	13.506
CP 96-1253	12.720	16.114	14.741	15.972	12.779	8.234	4.552	13.427
CP 96-1161	14.570	13.755	14.720	14.757	15.930	6.320	27.458	13.342
CP 96-1290	9.767	19.060	12.744	17.412	13.964	6.701	42.353	13.275
CP 96-1686	13.336	13.379	11.689	17.002	14.415	6.377	13.913	12.700
CP 96-1288	11.832	14.928	15.584	15.143	10.230	6.812	31.044	12.422
Mean	14.010	16.797	14.795	17.144	14.881	8.425	30.418	14.342
LSD ($p = 0.1$)‡	2.539	2.864	2.648	2.250	2.632	2.078		1.878
CV (%)§	10.885	10.239	11.105	7.891	10.624	14.811		21.114

* Means approximated by least squares ($p = 0.10$).
† Stability for each clone is calculated at $p = 0.10$ by Shukla's stability-variance parameter.
‡ *LSD* for location means of sugar yield = 1.246 TS/H at $p = 0.10$.
§ *CV* = coefficient of variation.

Table 16. Yields of cane and of theoretical recoverable 96° sugar in metric tons per ha (TC/H and TS/H) from second-ratoon cane on Lauderhill muck, Torry muck, and Malabar sand

	Mean cane yield by soil type, farm, and sampling date*				Mean sugar yield by soil type, farm, and sampling date*			
	Lauderhill muck	Torry muck	Malabar sand		Lauderhill muck	Torry muck	Malabar sand	
Clone	Okeelanta 11/12/02	Eastgate 2/19/03	Hilliard 10/16/02	Mean yield, all farms	Okeelanta 11/12/02	Eastgate 2/19/03	Hilliard 10/16/02	Mean yield, all farms
CP 95-1569	122.94	224.72	91.21	146.29	14.329	29.354	10.667	18.116
CP 95-1712	126.75	192.87	66.38	128.67	14.514	24.835	6.958	15.436
CP 95-1570	119.71	186.31	61.40	122.48	14.928	23.895	6.645	15.156
CP 94-2203	105.66	189.48	49.38	114.84	13.336	25.915	4.937	14.729
CP 95-1913	109.11	181.88	63.95	118.31	12.422	22.987	6.669	14.026
CP 70-1133	108.89	150.76	80.13	113.26	13.974	18.693	8.915	13.861
CP 95-1429	91.07	159.06	63.70	104.61	11.706	20.882	7.834	13.474
CP 95-1726	106.24	141.86	52.77	100.29	13.891	18.927	6.300	13.039
CP 95-1446	99.02	152.41	55.66	102.36	12.819	20.036	6.004	12.953
CP 95-1834	88.84	137.60	45.91	90.78	11.533	17.854	5.385	11.590
CP 95-1039	117.32	98.04	59.12	91.49	14.551	13.461	6.620	11.544
CP 95-1376	95.93	120.74	31.13	82.60	12.315	15.931	3.349	10.532
Mean	107.62	161.31	60.06	109.67	13.360	21.064	6.690	13.705
LSD ($p = 0.1$)†	14.03	22.29	15.54	25.40	1.843	2.919	1.853	3.522
CV (%)‡	7.83	8.30	15.54	19.35	8.287	13.123	16.631	19.694

* Means approximated by least squares ($p = 0.10$).
† *LSD* for location means of cane yield = 12.33 TC/H and of sugar yield = 1.587 at $p = 0.10$.
‡ *CV* = coefficient of variation.

Table 17. Theoretical recoverable yields of 96° sugar in kg per metric ton of cane (KS/T) from second-ratoon cane on Lauderhill muck, Torry muck, Malabar sand

	Mean yield by soil type, farm, and sampling date*			
	Lauderhill muck	Torry muck	Malabar sand	
Clone	Okeelanta 11/12/02	Eastgate 2/19/03	Hilliard 10/16/02	Mean yield, all farms
CP 95-1726	131.1	133.7	119.8	128.2
CP 95-1429	128.7	131.2	121.9	127.3
CP 95-1834	129.6	130.5	115.6	125.2
CP 95-1039	124.2	137.8	111.2	124.4
CP 95-1446	129.6	131.3	108.4	123.1
CP 95-1376	128.5	132.0	108.0	122.8
CP 95-1569	116.4	130.7	116.6	121.2
CP 70-1133	127.6	124.2	111.6	121.1
CP 94-2203	126.5	136.6	99.5	120.9
CP 95-1570	122.6	128.7	107.1	119.5
CP 95-1712	114.2	128.5	105.2	116.0
CP 95-1913	114.3	125.6	104.8	114.9
Mean	124.4	130.9	110.8	122.1
LSD ($p = 0.1$)†	5.7	4.2	6.5	6.9
CV (%)‡	2.8	1.9	3.5	5.5

* Means approximated by least squares ($p = 0.10$).
† *LSD* for location means of cane yield = 1.3 KS/T at $p = 0.10$.
‡ *CV* = coefficient of variation.

Table 18. Rankings* of clones by CP series of damage to juice quality by cold temperatures

CP 95 series†	Rank	CP 96 series†	Rank	CP 97 series†	Rank	CP 98 series†	Rank
CP 70-1133	6	CP 70-1133	3	CP 70-1133	8	CP 70-1133	12
CP 94-2203‡	10	CP 72-2086	9	CP 72-2086	13	CP 72-2086	3
CP 95-1039	1	CP 96-1161	4	CP 97-1068	3	CP 98-1029	4
CP 95-1376	12	CP 96-1171	13	CP 97-1164	15	CP 98-1107	11
CP 95-1429	9	CP 96-1252	7	CP 97-1362	4	CP 98-1118	10
CP 95-1446	3	CP 96-1253	1	CP 97-1387	5	CP 98-1139	8
CP 95-1569	8	CP 96-1288	10	CP 97-1433§	–	CP 98-1325	6
CP 95-1570	7	CP 96-1290	12	CP 97-1777	9	CP 98-1335	14
CP 95-1712	2	CP 96-1300	2	CP 97-1804	2	CP 98-1417	9
CP 95-1726	5	CP 96-1350	5	CP 97-1850	7	CP 98-1457	7
CP 95-1834	4	CP 96-1602	11	CP 97-1928	11	CP 98-1481	13
CP 95-1913	11	CP 96-1686	8	CP 97-1944	1	CP 98-1497	16
		CP 96-1865	6	CP 97-1979	12	CP 98-1513	1
				CP 97-1989	6	CP 98-1569	15
				CP 97-1994	10	CP 98-1725	5
				CP 97-2068	16	CP 98-2047	2
				CP 97-2103	14		

* The lower the numerical ranking, the better the cold tolerance.

† CP 95 series cold tolerance rankings are from the 2000-2001 harvest season.
CP 96 series cold tolerance rankings are an average of rankings from the 2000-2001 harvest season and the 2001-2002 harvest season. Clones with the same average rank were differentiated by juice purity.
CP 97 and CP 98 series cold tolerance rankings were based on few samples because of growth chamber malfunction.

‡ CP 94-2203 was tested with the clones in the CP 95 series.

§ CP 97-1433 was omitted from the study because of insufficient seedcane.

Table 19. Dates of stalk counts of 11 plant-cane, 11 first-ratoon, and 10 second-ratoon experiments

	Crop		
Location	Plant cane	First ratoon	Second ratoon
Duda	10/03/02	07/19/02	07/30/02
Eastgate	06/19/02	07/23/02	07/24/02
Hilliard	07/18/02	08/29/02	09/06/02
Knight	07/22/02	08/13/02	08/14/02
Lykes	07/17/02	09/04/02	09/05/02
Okeelanta	10/02/02	08/15/02	08/16/02
Okeelanta (successive)	10/04/02	08/19/02	08/21/02
Osceola	09/06/02	08/08/02	08/09/02
USSC Ritta*	02/26/03	02/25/03	–
SFI	09/27/02	08/26/02	08/27/02
Wedgworth	09/23/02	08/01/02	08/02/02

* Whole plot weights were taken in lieu of plot counts at USSC Ritta location.

Appendix 1. Sugarcane Field Station Cultivar Development Program

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 seed	–	–	Germination tests of seed (bulk of seed stored in freezers)	Field progeny tests planted by family	–
Year 2	Seedlings (single stool stage) Seedlings start in the greenhouse from true seed of the previous year	80,000-100,000 individual plants	Transplants spaced 12 in. apart in paired rows on 5-ft. center	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 resistance against rust, 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 stage	Permanent CP-series number assigned	Eight stalks planted for agronomic evaluation, one for RSD screening (inoculation)
Year 4	Stage II (Second clonal trial)	1,000-1,500 clones including five checks	Unreplicated 2-row plots 15 ft. long on 5-ft. row spacing	12 months	Yield estimates based on stalk number, average stalk weight, and sucrose analysis; freedom from diseases	Family evaluation for resistance to RSD and eye spot (by inoculation) and to LS, YLS, and dry top rot (by natural infection)	Eight 8-stalk bundles cut for seed; 2 stalks used for RSD screening
Year 5-6	Stage III (Regulated test; first stage planted in commercial fields)	135 clones including 2 checks† per location	Four 2-replicate tests (3 organic and 1 sand sites) 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 leaf scald, 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 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 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 increased at 9 Stage IV locations (7 muck and 2 sand)
Soil program	Investigates soil microbial activities and plant nutrient availabilities that influence cane and sugar yields						

* LS: leaf scald; RSD: ratoon stunting; 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).