# SUGARCANE RESPONSES TO N FERTILIZER APPLICATION ON CLAY SOILS

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## ABSTRACT

Sugarcane fertilization practices have been developed for the Rio Grande Valley of Texas based on numerous studies; however, few have been conducted on clay soils. Nitrogen has been found to be the primary nutrient needed, and responses to N fertilization have been limited in the plant-cane crop and increase incrementally in succeeding ratoons to its highest level in the second and following ratoons. This study was conducted to evaluate the effect of rate and timing of N fertilizer application on sugarcane growth, and to determine optimum fertilization practices for sugarcane yield on clay soils. As in previous studies, responses to N application did not occur in the plant cane crop, but were observed in the first through third ratoons. Increasing rate of N application improved stalk population, stalk growth rate, leaf area index, cane yield and sugar yield. Early N application resulted in depletion of available N before full growth potential had been reached, possibly to microbial immobilization or leaching. Late fertilizer application caused a loss of early growth, an effect that was mostly, but not entirely, compensated for by later growth. Soil $NO_3^-$-N levels varied little even though yield responses to N fertilization indicated that there were some dramatic differences in soil N availability and residual levels. Increasing N application had detrimental effects on sugarcane juice quality, but the magnitude of the effects were small compared to increasing cane growth responses, therefore sugar yield continued to increase as N application increased. Early fertilizer application resulted in lower sugar yield due to lower cane yield, while late fertilizer application resulted in lower sugar yields due to lower juice quality rather than any loss in growth. Nitrogen fertilizer application to sugarcane on clay soils in subtropical South Texas is not required on plant cane crops, and should be at least at or above the level of 224 kg $ha^{-1}$ used in this study in ratoon crops. Timing of a single application should be in March or April, or split into 2-3 applications on clay soils.

# YIELD COMPONENTS OF SUGARCANE SUBJECTED TO FLOOD AT PLANTING[1]

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## ABSTRACT

In the Everglades of Florida, sugarcane (*Saccharum* spp.) fields occasionally are flooded by unseasonably heavy rains that may occur soon after planting. This can lead to extensive stand reduction and the need to replant, but is dependent on cultivar and the timing of the flood relative to planting. The purpose of this experiment was to evaluate flood tolerance and changes in yield components of major Florida sugarcane cultivars when subjected to flooding soon after planting. The experiment was run for two crop years, with four cultivars planted at three dates 18 d apart in a field bisected by a levee. Three days after the last planting, one half of the field was flooded for 10 d. At harvest, millable stalk populations were reduced 6 to 26% in plant cane and 10 to 21% in the ratoon crop. Cane and sugar yields were reduced by flooding in all cultivars for both the plant-cane and ratoon crops. Flooding 18 d after planting was the most injurious to the germinating cane, but the slower germinating cultivar, CP 72-1210, suffered less loss than other clones. It appeared dormant cane could tolerate flooding much better than cane in active stages of germination and emergence. Sucrose concentration and stalk weight were not reduced by flooding. Stand losses due to flood lasted through both crop years, indicating sugarcane has limited capacity to overcome losses incurred at planting.

[1]Florida Agric. Exp. Sta. Jour. Series No. R-04788.

# CHROMOSOME TRANSMISSION AND MEIOTIC BEHAVIOR IN VARIOUS SUGARCANE CROSSES

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## ABSTRACT

Elite (commercial or near-commercial) sugarcane (*Saccharum*) is a tri-species hybrid derived from *S. officinarum* (2*n*=80), *S. robustum* (2*n*=60,80), and *S. spontaneum* (2*n*=40-128). Elite clones are crossed with these and other species for germplasm enhancement and cultivar development. Some cross combinations in *Saccharum* yield 2*n*+*n* progeny, but it has not been conclusively determined whether elite clones produce 2*n* gametes. Chromosome transmission was studied in 47 $F_1$, $F_2$, and $BC_1$ progeny derived in most cases from elite x exotic crosses. Hybrids of sugarcane x *Miscanthidium violaceum* or *Miscanthus sinensis* appeared to be from *n*+2*n* chromosome transmission. Hybrids of sugarcane x *Miscanthus japonicus, S. robustum, S. spontaneum,* and $F_2$ and $BC_1$ progeny appeared derived from *n*+*n* transmission. Hybrids from the exotic crosses *S. officinarum* x *S. robustum*, *S. officinarum* x *S. spontaneum, S. sinense* x *Erianthus elephantinus*, and *S. spontaneum* x *S. officinarum* appeared derived from *n*+*n* transmission. Chromosome pairing was regular in progeny of Louisiana Purple (*S. officinarum*, 2*n* = 80) x Molokai 5829 (*S. robustum* 2*n* = 80), but all other clones had univalents, trivalents, or quadrivalents. About 26% of microsporocytes in a hybrid from NCo 310 x *Miscanthidium violaceum* were multiploid, but it is unclear whether these form functional diploid or polyploid microspores. Progeny analysis suggested that elite sugarcane clones produced only *n* megaspores.

# PREDICTING MARKET SURVIVAL OF SUGARCANE CULTIVARS

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## ABSTRACT

Sugarcane in Florida is grown in the northern Everglades adjacent to Lake Okeechobee. Since 1931, thirty-three principal cultivars have occupied greater than 1% of the acreage for at least one year. This paper describes how market diversity varies from year to year, predicts cultivar longevity based on factors measured soon after release (within 6 years), and examines how sugarcane cultivars can be rated based on their survival. Market longevity is a measure of the cultivar's value. Factors that influence cultivar decline in the market include decreases in vigor and yield, increase in disease susceptibility, reaction to newly-introduced diseases, and improvement in yield of newly-released cultivars. However, because these factors often cannot be identified soon after a cultivar's release and may change due to edaphic or environmental conditions throughout the cultivar's market life, they are difficult to use for predicting how long the cultivar will remain in the market. This paper describes a cultivar survival analysis method using readily available market information that enable direct comparisons of historic and current cultivars.

# TOLERANCE OF SUGARCANE CULTIVARS TO THE HERBICIDES ASULAM AND TERBACIL

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## ABSTRACT

Recently-released Louisiana sugarcane cultivars (*Saccharum* interspecific hybrids) LCP 82-89, LHo 83-153, HoCP 85-845, LCP 85-384, and LCP 86-454 were compared with older cultivars CP 72-370 and CP 74-383 or CP 70-321 for tolerance to asulam (ASULOX) postemergence (June application) and nondirected soil treatments of terbacil (SINBAR), either when applied only in the plant-cane crop or in both the plant-cane and following ratoon crops. The relative tolerance to certain herbicides becomes an important characteristic of a cultivar. The magnitude of the response of individual cultivars to asulam and terbacil, as measured by cane and sugar yield, varied among experiments, but none of the newer cultivars were consistently less tolerant than CP 72-370, which is known to be relatively sensitive to both herbicides. Asulam caused some reduction in cane yield of both newer and older cultivars, usually in the range of 5% to 10%, which probably was influenced by the June application since earlier spring applications are known to be generally less phytotoxic. Terbacil also reduced cane yields, usually in the range of 5% to 12%, but much larger reductions occurred occasionally in plant-cane experiments on silty loam soils having relatively low organic matter (1.3% to 1.6%) and/or clay (10% to 14%), thus low adsorptive capacity. However, the newer cultivar LHo 83-153 had relatively good tolerance to terbacil on the same type of soil, being much more tolerant than older cultivar CP70-321, and generally appeared to be one of the most herbicide-tolerant cultivars. The study indicated that careful management will be needed when using asulam and terbacil on most of the newer cultivars, similar to practices now being used with CP 72-370.

# POSSIBLE INTERACTION BETWEEN SUGARCANE RUST AND RATOON STUNTING DISEASE

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## ABSTRACT

The severity of sugarcane rust, caused by *Puccinia melanocephala* has increased in specific fields on cultivars that were formerly classified as rust resistant. Since these cutivars are also susceptible to ratoon stunting disease that is caused by *Clavibacter xyli subsp. xyli* the possiblity of an interaction between the two diseases was evaluated. The effects on biomass production of sugarcane infected with ratoon stunting disease, or rust, and simultaneously with both their pathogens were determined in experiments conducted at Canal Point, Florida in 1993 and 1994. Biomass production of cultivars, CL 61-620 and CP 72-1210, was significantly reduced by *C. x. xyli* alone and by simultaneous infection with both pathogens. The isolate of *P. melanocephala* used in this study caused extensive pustule development on CP 72-1210 but little or no pustule development on CL 61-620. *P. melanocephala* significantly reduced biomass production of cultivar CP 72-1210 but not CL 61-620. A significant statistical-interaction for biomass was not detected between the two diseases. A significant statistical-interaction was detected using estimates of the top visible dewlap leaf area infected and rust severity ratings for CP 72-1210 in analysis of combined experiments from 1993 and 1994. Its biological importance is questionable because of small differences in rust symptoms and inconsistencies between experiments. Therefore, no evidence was found of a meaningful statistical interaction regarding the effects of sugarcane rust and ratoon stunting disease.

# SURFACE RUNOFF CONTAMINATION AS AFFECTED BY SUGARCANE MANAGEMENT PRACTICES

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## ABSTRACT

An experiment was conducted at St. Gabriel, Louisiana, to quantify the movement of soil, plant nutrients, and herbicides in surface runoff from sugarcane plots under three different management practices. These data were needed to determine the effectiveness of best management practices (BMPs) on reducing non-point source pollutants from sugarcane fields. Experimental plots were located on a Commerce silt loam (Aeric Fluvaquent, fine-silty, mixed, non-acid, thermic) soil. Three treatments (high, standard, and low management practices) replicated twice were imposed on the plots. The high management treatment consisted of 180, 80, and 120 lbs/ac of N, $K_2O$, and $P_2O_5$, respectively, with herbicides (atrazine and metribuzin) applied full broadcast. The standard management treatment consisted of 120, 40, and 80 lbs/ac of N, $K_2O$, and $P_2O_5$, respectively with herbicides applied in a 36-inch band over the row. This is the cultural practice recommended by the Louisiana Cooperative Extension Service. The low management treatment consisted of 60, 0, and 0 lbs/ac of N, $K_2O$, and $P_2O_5$, respectively with herbicides applied in a 24-inch band over the row. Average soil losses differed only slightly among the three treatments with 7.74, 7.72, and 8.04 tons/ac measured from high, standard, and low management practices, respectively. Total nitrogen loss from the high management practice was 20.8 lbs/ac which was 109% more than the 9.9 lbs/ac measured from the low management treatment. Total phosphorous losses were about the same among treatments with 13.3, 12.3, and 11.3 lbs/ac measured from the high, standard, and low management practices, respectively. Total potassium losses were similar for the high (89.9 lbs/ac) and standard (93.1 lbs/ac) management treatments. These losses were 29% higher than 70.8 lbs/ac measured from the low management treatment. Herbicide losses also varied among treatments. Atrazine losses were 2.24, 0.82, and 0.48 oz/ac from the high, standard and low management treatments, respectively. Sencor losses were 1.12, 0.65, and 0.18 oz/ac from the high, standard and low management treatments, respectively.

# RATOON STUNTING DISEASE IN FLORIDA SUGARCANE FIELDS: RELATIONSHIP BETWEEN DISEASE INCIDENCE AND CULTIVAR RESISTANCE

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## ABSTRACT

The incidence of ratoon stunting disease (RSD), caused by *Clavibacter xyli subsp. xyli* Davis et al. (1984), varied in commercial sugarcane fields that lacked a RSD control program. RSD incidences in sugarcane fields varied by cultivar resistance as determined by the number of colonized vascular bundles (CVB). Resistant cultivars had a low incidence of RSD and also had a low number of CVB. Susceptible cultivars, CP 70-1133 and CP 72-1210, had an incidence of greater than 90% stalks infected and averaged more than 6 CVB per 1 cm diameter standard stalk sample. In contrast, resistant cultivars, CL 73-239 and CP 72-2086, had 2.7 and 1.4% stalks infected in the fields surveyed and averaged less than 0.5 CVB per stalk. Since these cultivars have been grown for several years without a RSD control program, resistance appears to have limited the spread of the disease.