SOIL FERTILITY RESEARCH IN SUGARCANE IN 2000

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SUMMARY

Four field experiments were conducted in 2000 to test the effects of rates of fertilizers on the yield components of current sugarcane varieties.

Fall- and spring-applied NPK fertilizer rates were tested at cycle intervals of fallow- planted cane on Commerce soil. In first stubble cane, various starter fertilizer rates increased the average cane yield with the exception of 45-0-45. This may indicate a greater need for P in starter fertilizer than other elements. In sixth stubble from succession planted LCP 85-384, 90-90-90 starter fertilizer significantly increased sugar yield, as did the N and NPK applied in the spring. A 160-40-80 NPK spring rate increased the average sugar yields of first stubble CP 70-321 by 8.6% over 160-0-0 averaged across starter fertilizers. Compared to other starter fertilizers, the application of 45-45-45 tended to reduce cane and sugar yield of HoCP 85-845.

OBJECTIVES

This research was designed to provide information on soil fertility in an effort to help cane growers to produce maximum economic yields and to increase profitability in sugarcane production. This annual progress report is presented to provide the latest available data on certain practices and not as a final recommendation for growers to use all of these practices. Recommendations are based on several years of research data.

RESULTS AND DISCUSSION

Four field experiments were conducted in 2000 to test the effects of rates of fertilization on the yield of fallow and succession planted sugarcane. The fallow cane was planted after a fallow year in a normal cane rotation, and succession cane was planted immediately after harvesting a stubble cane crop and preparing the land for replanting without a fallow year.

Starter Fertilizers in Plantcane and First Stubble of Fallow Planted Cane

An experiment was conducted to test the effects of NPK fertilizer rates applied as a starter fertilizer in the fall at planting time in addition to spring-applied fertilizers in fallow planted cane. The starter fall rates were 0-0-0, 15-45-45, 45-0-45, 45-45-0, 45-45-45, and 30-90-90. Spring rates consisting of 160-0-0 and 160-40-80 were applied over each fall rate. This test on first stubble was planted with CP 70-321 after a fallow year, and the fall treatments were applied in the planting furrow. The spring treatments were applied in the off-bar furrow in plantcane in 2000. The plantcane test was planted with HoCP 85-845 after a fallow year. Treatment applications were the same as in the previous test.

Generally, the yield responses to individual treatments indicated the need for P in the starter fertilizer and P and/or K in the spring application (Table 1). The maximum P and K inputs (30-90-90 plantcane starter, 160-40-80 spring-applied) resulted in a 30% increase in sugar yield vs no starter applied and 160-0-0 spring-applied. The use of 45-45-45 starter fertilizer in plantcane tended to reduce plantcane yields compared to other starter fertilizers (Table 2). The amount of N or nutrient balance (N:K) was higher for this fertilizer and may have been a contributing factor

<u>Starter and Spring Applied Fertilizer in Sixth Stubble Cane from Succession Planted Cane</u>

An experiment was initiated in 1993 and continued in sixth stubble cane in 2000 to test the effects of NPK fertilizer rates applied as a starter fertilizer at planting time in addition to spring applied fertilizers on the yield of succession planted cane. The starter fall rates were 0-0-0, 15-45-45, 45-45-45, and 90-90-90 and the spring rates were 0-0-0, 160-0-0, and 160-40-80. The test was planted with LCP 85-384 in succession immediately after harvesting a cane crop in 1993. The fall treatments were applied in the planting furrows, and the spring treatments were applied in the off-bar furrows in 1994-2000.

The data in Table 3 show that the 90-90-90 starter fertilizer rates applied at planting time in 1993 did have a slight positive effect on the sugar yield of sixth stubble cane in 2000. Moreover, the N and NPK spring rates applied each year significantly increased sugar yield. The increases were due mainly to increases in cane yield brought on by higher stalk numbers. In only one case was the cane and sugar yield response different between 160-0-0 and 160-40-80 treatments.

<u>Rates of Spring Applied N Fertilizer</u>

The effect of N fertilizer rate on yield throughout the crop cycle of LCP 85-384 was significant for the first time beginning with the second stubble crop. Sugar yield increased over 14% when N rate increased from 40 to 120 lb./acre. However, at 160 lb N/acre sugar yields declined over 11% below that found at 120 lb N/acre (Table 4).

Table 1. Effect of fall- and spring-applied fertilizer on the yield of first stubble cane CP 70-321 planted after a fallow year on Commerce soil on the St. Gabriel Research Station, 2000.

Fertilizer applied $N-P_2O_5-K_2O$ Fall	Spring	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
		First Stubble Cane - Fallow Planted					
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
0-0-0	0-0-0	21.5	25.0	1.96	16.4	14.2	4360
	160-0-0	31.7	26.9	2.56	16.9	14.6	6659
	160-40-80	36.9	31.2	2.49	16.9	14.8	7837
15-45-45	0-0-0	21.5	21.5	2.49	16.8	14.6	4500
	160-0-0	34.7	29.6	2.60	17.1	14.9	7437
	160-40-80	39.2	32.6	2.56	17.2	14.7	8258
45-0-45	0-0-0	21.3	26.9	1.80	16.0	14.0	4240
	160-0-0	35.8	33.9	2.16	16.8	14.3	7311
45-45-0	0-0-0	22.9	22.6	2.52	16.9	14.8	4876
	160-0-0	37.3	32.8	2.44	17.4	15.2	8183
	160-40-80	38.0	36.0	2.12	17.0	14.9	8140
45-45-45	0-0-0	23.5	24.7	2.14	16.1	14.1	4712
	160-0-0	37.6	33.3	2.43	17.2	14.5	7796
30-90-90	0-0-0	26.4	24.2	2.39	16.5	14.5	5480
	160-0-0	36.4	33.6	2.45	17.2	14.9	7815
	160-40-80	40.4	33.4	2.66	17.3	14.9	8661
LSD .05 Treatments		3.6	3.5	0.36	0.8	0.7	727
		Mean Effect					
0-0-0		30.0	27.7	2.34	16.7	14.5	6286
15-45-45		31.8	27.9	2.55	17.0	14.7	6731
45-0-45		31.9	31.2	2.19	16.6	14.3	6549
45-45-0		32.7	30.5	2.36	17.1	15.0	7066
45-45-45		33.0	30.2	2.41	16.8	14.5	6871
30-90-90		34.4	30.4	2.50	17.0	14.7	7318
	0-0-0	22.8	24.2	2.22	16.4	14.4	4695
	160-0-0	35.6	31.7	2.44	17.1	14.7	7533
	160-40-80	38.5	33.1	2.52	17.1	14.8	8183
LSD .05 Fall		2.1	2.0	0.21	0.5	0.4	420
LSD .05 Spring		1.5	1.4	0.15	0.3	0.3	297

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1998, and spring fertilizer was applied in the off-bar furrow in the spring of each year.

Table 2. Effect of fall- and spring-applied fertilizer on the yield of plantcane HoCP 85-845 planted after a fallow year on Commerce soil on the St. Gabriel Research Station, 2000.

Fertilizer applied $N-P_2O_5-K_2O$		Plantcane - Fallow Planted					
Fall	Spring	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
0-0-0	0-0-0	29.0	26.1	2.42	16.6	14.2	5888
	120-0-0	38.0	33.6	2.57	15.9	13.1	7034
	120-40-80	37.2	33.9	2.48	15.9	13.2	6939
15-45-45	0-0-0	31.7	28.7	2.35	16.5	13.9	6238
	120-0-0	41.5	32.7	2.81	15.8	13.4	7812
	120-40-80	41.4	32.9	2.71	15.9	13.4	7846
45-45-45	0-0-0	33.1	30.7	2.47	16.5	14.1	6625
	120-0-0	35.2	31.4	2.67	15.7	13.1	6484
	120-40-80	38.5	32.6	2.73	15.3	12.4	6668
30-90-90	0-0-0	30.9	30.5	2.52	16.3	13.9	6088
120-0-0		39.3	31.6	2.71	16.6	14.1	7886
120-40-80		38.0	32.5	2.58	16.1	13.7	7399
LSD .05 Treat.		3.8	2.2	0.37	0.7	0.9	961
				Mean	Effect		
0-0-0		34.7	31.2	2.49	16.1	13.5	6620
15-45-45		38.2	31.4	2.62	16.1	13.5	7299
45-45-45		35.6	31.6	2.62	15.8	13.2	6592
30-90-90		36.1	31.5	2.60	16.4	13.9	7124
0-0-0		31.2	29.0	2.44	16.5	14.0	6209
120-0-0		38.5	32.3	2.69	16.0	13.4	7304
120-40-80		38.8	33.0	2.62	15.8	13.2	7213
LSD .05 Fall		2.2	NS	NS	0.4	0.5	555
LSD .05 Spring		1.9	1.1	0.18	0.3	0.5	481

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1999, and the spring fertilizer was applied in the off-bar furrow in 2000.

Table 3. Effect of fall- and spring-applied fertilizer on the yield of sixth stubble cane LCP 85-384 planted in succession on Commerce soil on the St. Gabriel Research Station, 2000.

Fertilizer applied N-P_2O_5-K_2O Fall	Spring	Sixth Stubble Cane - Succession Planted: Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	lbs/A	T/A	1000/A	lbs.	%	%	lbs/A
0-0-0	0-0-0	19.5	39.4	1.12	16.3	13.6	3761
	160-0-0	25.9	43.8	1.13	16.0	12.9	4681
	160-40-80	24.5	45.6	1.41	16.4	13.7	4744
15-45-45	0-0-0	20.3	42.6	1.07	16.5	14.1	4088
	160-0-0	28.3	44.0	1.83	17.0	14.1	5683
	160-40-80	24.6	45.4	1.00	16.0	13.3	4607
45-45-45	0-0-0	21.2	40.2	0.95	16.8	14.3	4319
	160-0-0	26.1	44.0	1.88	15.8	12.8	4660
	160-40-80	26.9	45.1	1.15	16.8	14.0	5365
90-90-90	0-0-0	19.9	38.7	1.16	16.7	14.2	4031
	160-0-0	26.1	45.3	1.21	16.7	14.0	5213
	160-40-80	28.2	46.2	1.04	17.1	13.6	5454
LSD .05 Treatments		3.0	3.6	0.53	0.5	1.3	826
		Mean Effect					
0-0-0		23.3	42.9	1.23	16.2	13.4	4395
15-45-45		24.4	44.0	1.30	16.5	13.8	4793
45-45-45		24.5	43.1	1.33	16.4	13.7	4781
90-90-90		24.7	43.4	1.13	16.6	13.9	4899
	0-0-0	20.2	40.3	1.08	16.6	14.1	4050
160-0-0		26.6	44.3	1.51	16.4	13.4	5059
	160-40-80	25.9	45.5	1.15	16.4	13.6	5042
LSD .05 Fall		NS	NS	NS	NS	NS	477
LSD .05 Spring		1.5	1.8	0.26	NS	NS	413

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1993, and spring fertilizer was applied in the off-bar furrow each crop year.

Table 4. Effect of nitrogen fertilizer rates on the second stubble yield of LCP 85-384 on the St. Gabriel Research Station, 2000.

Nitrogen Fertilizer	Cane Yield	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A	T/A	lbs.	%	%	lbs/A
40-0-0	34.8	1.94	17.7	15.0	7541
80-0-0	37.1	1.77	18.0	15.2	8162
120-0-0	39.6	1.84	17.5	15.1	8614
160-0-0	36.4	1.51	17.4	14.6	7632
LSD .05 Treat.	NS	NS	NS	NS	989

The nitrogen fertilizer rates were applied to plots in the spring of each crop year.

EFFECT OF POTASSIUM SULFATE VS. POTASSIUM CHLORIDE ON SUGARCANE YIELDS

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SUMMARY

Results in 2000 for plantcane showed that the use of potassium sulfate vs. potassium chloride at three different rates of K2O (70, 140, and 210 lb/A) did not result in statistical (P>0.10) differences for stalk weights, plant population, commercially recoverable sugar (lbs/ton), cane yield or sugar yield for sugarcane variety HoCP 85-845. Potassium application rates did not affect the measured plantcane yield parameters in 2000 using either potassium source. Sulfur application also had no effect on sugarcane yields.

INTRODUCTION

In recent years, sustainable agriculture advocates have convinced some sugarcane producers in Louisiana that potassium chloride is harmful to soil health. These advocates have persuaded sugarcane producers to use potassium sulfate in the place of potassium chloride. Since potassium sulfate is more expensive (per pound of K) than potassium chloride, the sustainable ag advocates have instructed producers to compensate for this by reducing their K application rates. They have further argued that this is justified because "K from potassium sulfate is more available than K from potassium chloride." No research, however, in Louisiana has been done that supports or refutes the contentions about K put forward by sustainable-ag advocates. Consequently, this research was initiated.

OBJECTIVES

To compare potassium sulfate and potassium chloride fertilizer rates in their effects on sugarcane yield parameters, available soil K, and nutrient content of sugarcane at harvest.

MATERIALS AND METHODS

A Baldwin silty clay loam soil very low in K was selected for this study. Soil analysis showed a pH, organic matter, and exchangeable bases of 5.9, 0.67%, and 13.1 meg/100g; and P, Na, K, Mg, and Ca ppm levels of 83 (medium), 42 (very low), 113 (very low), and 406 (very high), and 1865 (low), respectively.

In September of 1999, sugarcane variety HoCP 85-845 (first progeny Kleentek) was planted at three stalks and a lap of two joints on 6-foot-wide rows. The experimental treatments in Table 2 were imposed on the experimental site in May of 2000. All treatments were replicated eight times in a Latin square experimental design. Plots consisted of three 6-foot by 30-foot rows with a 10-foot alley separating the ends of all plots. A blanket application of 120 lb N and 40 lb P2O5/A were added along with the potassium fertilizer. Treatments 2, 4, and 6 used ammonium sulfate as a sulfur source so that S rate would not differ in comparisons between the two K sources. Ammonium nitrate was used as the main N source. After fertilization, the sugarcane rows were hipped up and the cane was grown to maturity using standard cultural practices.

In September of 2000, the number of millable stalks in each sugarcane plot were counted. In December, the experimental plots were harvested with a two-row soldier harvester and weighed with a weigh rig. Ten stalks were randomly selected from each plot to measure average stalk weight and commercially recoverable sugar (CRS). Three additional stalks were also taken from each plot for nutrient analysis to determine the effect of the treatments on nutrient uptake.

RESULTS AND DISCUSSION

Table 1 shows that potassium sources and potassium rates did not affect (P>0.10) any of the sugarcane yield parameters measured for plantcane in 2000. The % coefficient of variation (CVs) for stalk weight, plant population, and CRS were good (below 10%), but those for cane tonnage and sugar yield were a little high.

Table 2 shows how the N, K, S, and Cl rates in the eight treatments were derived. Since K rates from potassium sulfate also included S, this difference was screened out by using ammonium sulfate as part of the nitrogen source (the remaining N was composed of ammonium nitrate). Consequently, each K rate, using both K sources, had the same amount of S (T2 vs. T3, T4 vs. T5, and T6 vs. T7). This resulted in the K sources differing only in Cl rates. Since sustainable ag advocates claim that Cl is bad for the soil and, thereby, decreases crop yields, this gave us a good way to test this claim. Comparison of T1 vs. T3, T5, and T7 (Table 2) are used to determine the effect of potassium sulfate rates on sugarcane yield variables (Table 3). Comparison of T2 vs. T3, T4 vs. T5, and T6 vs. T7 (Table 2) shows the effect of Cl application on sugarcane yields (Table 3), while comparing T8 vs. T4 (Table 2) shows the effect of S application on sugarcane yields (Table 3).

Table 3 shows that the yields obtained with HoCP 85-845 were very respectable given the severe drought experienced in the summer of 2000. The average stalk weights for the variety were very good. In 2000 our plantcane yield variables were not affected by K rates or K sources. We will continue the test in 2001 to see if this changes for first-stubble cane.

Table 1. F-values and statistical parameters for effect of treatments on plantcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
Treatments (T)	7	1.02	1.29	0.71	0.66	0.54
HREP	7	0.97	1.62•	0.12	1.19	0.95
VREP	7	2.01~	2.54*	2.10~	1.27	0.48
RMSE		0.2779	1627	9.796	4.873	1090
% CV		9.15	4.73	4.85	12.05	13.36
Mean		3.038	34,390	201.8	40.45	8160

• ~, and * denote statistical significance at the P# 0.25, 0.10, and 0.05 levels, respectively.

Table 2. Fertilizer treatments used in study.

T#	NH_4NO_3	$(NH_4)_2SO_4$	$(NH_4)_2SO_4$	$K_2(SO_4)$	KCl	Cl	$K_2(SO_4)$	P
	------------lb N/A---------		------------lb S/A----------		K_2O/A	lb Cl/A	lb K_2O/A	lb P_2O_5/A
1	120	0	0	0	0	0	0	40
2	94.9	25.1	28.7	0	70	63.5	0	40
3	120	0	0	28.7	0	0	70	40
4	69.8	50.2	57.4	0	140	127.0	0	40
5	120	0	0	57.4	0	0	140	40
6	44.7	75.3	86.1	0	210	190.5	0	40
7	120	0	0	86.1	0	0	210	40
8	120	0	0	0	140	127.0	0	40

Table 3. Effect of fertilizer on plantcane yield variables.

T#	S	K_2O	Cl	Stalk wt.	Plant pop.	CRS	Cane yield	Sugar yield
	----------------lb/A---------------			lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	0	0	3.06	34.5	206	39.5	8090
2	28.7	70	63.5	2.91	34.8	201	40.3	8110
3	28.7	70	0	2.93	34.1	206	38.9	7990
4	57.4	140	127.0	3.14	34.8	199	41.6	8270
5	57.4	140	0	2.97	34.4	202	39.9	8040
6	86.1	210	190.5	3.19	34.2	201	42.4	8510
7	86.1	210	0	3.02	33.1	198	39.0	7710
8	0	140	127.0	3.08	35.3	204	42.1	8570
LSD 0.10				NS	NS	NS	NS	NS
LSD 0.25				NS	NS	NS	NS	NS

NS denotes statistical non significance at the indicated probability level.

EFFECT OF COPPER AND POTASSIUM FERTILIZATION ON YIELD AND PLANT NUTRIENT STATUS OF SUGARCANE

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SUMMARY

Four rates of potassium chloride (0, 80, 160, and 240 lb K2O/A) were applied to plantcane variety LCP 85-384 on a Jeanerette silt loam soil near Parks, La. Potassium application rates did not affect ($P>0.10$) sugarcane stalk weights, commercially recoverable sugar, cane yield, or sugar yield in 2000.

JUSTIFICATION

Preliminary research (private communication with Therian LaFleur, Chastant Brothers, Inc.) shows that spraying sugarcane foliage with copper sulfate may increase plant potassium levels and result in higher cane yields.

It is generally assumed that sugarcane yields in Louisiana will not respond positively to micronutrient application. However, little research has been done to support this assumption. Also, no formal research in Louisiana has shown whether copper and potassium fertilizer application interact positively to increase cane yields.

OBJECTIVES

Our project will test whether sugarcane yields in Louisiana respond to copper fertilization. The specific objective is to determine the effect of soil-applied potassium chloride and foliar applied copper sulfate on plant nutrient status and sugarcane yield parameters across a cane production cycle.

MATERIALS AND METHODS

Sugarcane variety LCP 85-384 was planted in September 1999 at three stalks and a lap of two joints using first progeny Kleentek seedcane. The experimental design was a Latin square split-plot with four potassium chloride rates as main plots and three copper sulfate rates as sub-plots. All experimental plots consisted of three 6-foot by 50-foot rows, with 10-foot alleys separating the ends of the plots. The sides of each plot were buffered by three border rows. All treatments were replicated four times.

The soil used in the study was a Jeanerette silt loam with an initial analysis of 5.1, 14.8, and 0.66 for pH, sum of bases (meg/100g), and % organic matter; P, Na, Mg, K, and Ca concentrations were 81 (medium), 47 (very low), 500 (very high), 144 (low), and 2027 ppm (low), respectively.

Potassium fertilizer rates (0, 80, 160, and 240 lb K_2O/A) were applied in May 2000 along with a blanket application of N, P_2O_5, and S at 120, 60, and 24 lb/A as ammonium nitrate, polyphosphate, and calcium sulfate, respectively. The cooperating producer (Richard Latiolais) did not wish to apply the copper sulfate treatments in 2000 as planned because of the severe drought.

Plants were sampled for leaf tissue (for nutrient analyses) from all plots in August 2000. Plant populations were not determined in September as originally planned because of severe lodging. All plots were harvested with a two-row soldier harvester in early January 2001 and weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commerciably recoverable sugar.

RESULTS AND DISCUSSION

F-values and statistical parameters for the test are given in Table 1. The results (Tables 1 and 2) show that potassium chloride fertilizer rates did not affect ($P>0.10$) stalk weights, CRS, cane yield, or sugar yield of plantcane in 2000.

Table 1. F-values and statistical parameters for effect of potassium chloride on plantcane yield variables.

Source	Stalk weight	CRS	Cane yield	Sugar yield
main-plots				
Treatments (T)	0.34	2.02•	0.23	0.33
HREP	4.93**	1.47•	1.23	0.99
VREP	0.43	4.41**	4.83**	1.94•
RMSE	0.1924	6.871	2.502	638.9
% CV	9.99	2.83	7.63	8.04
Mean	1.927	242.5	32.80	7949

•, and ** denotes statistical significance at the P# 0.25, and 0.01 levels, respectively.

Table 2. Effect of potassium chloride on plantcane yield variables.

T #'s	K rates	Stalk weight	CRS	Cane yield	Sugar yield
	lb K_2O/A	lb/stalk	lb/T	T/A	lb/A
1	0	1.97	244	33.1	8070
2	80	1.91	245	32.8	8000
3	160	1.94	244	32.3	7870
4	240	1.90	238	33.0	7850
LSD 0.10		NS[%]	NS	NS	NS
LSD 0.25		NS	3	NS	NS

[%]NS denotes that the LSD was not significantly different at the indicated probability level.

EFFECT OF GIBBERELLIC ACID ON SUGARCANE YIELDS[1]

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SUMMARY

Application of gibberellic acid (0.5, 1.0 and 2.0 qt/A three times during the growing season) to sugarcane variety LCP 85-384 did not significantly ($P<0.10$) affect sugar yields across three years. However, application of gibberellic acid did increase ($P<0.10$) commercially recoverable sugar in the cane at harvest.

INTRODUCTION

Anecdotal data from Florida indicate that gibberellic acid may increase sugarcane yields. Some cane producers have expressed interest in using gibberellic acid in Louisiana. Our research was initiated to determine whether gibberellic acid can be used to increase sugarcane yields in Louisiana.

PROCEDURES

A gibberellic acid (SUL-15) study was initiated in the spring of 1998 using second progeny Kleentek variety LCP 85-384 plantcane. The six treatments used in the study are given in Table 2. The gibberellic acid rates used were 0.5 qt/A (0.5x), 1.0 qt/A (1.0x), and 2.0 qt/A (2.0x). The SUL-15 treatments were applied in 10 gallon/A of water along with a surfactant (1.5 pt of 820 surfactant per 100 gallons of water) using a high-clearance sprayer. The first application of SUL-15 was sprayed directly over the top of the cane, and the second and third applications were sprayed over the top and to the sides of the cane. In 1999 the study was continued on the 1998 research plots with first-stubble cane using the application dates shown in Table 2. Because of lodged cane, treatments 4 and 6 did not receive gibberellic acid in 1999 at the third application date (August 24).

The soil used in the study was a Baldwin silty clay loam with a pH of 4.5 and a soil analysis of 248, 30, 202, 2233, and 505 ppm, respectively, for P, Na, K, Ca, and Mg. The study used a 6x6 Latin square design with six replications. Experimental plots consisted of three 5-foot10-inch by 50-foot rows with a 10-foot alley at the ends of the plots. All plots were separated on both sides by three 5-foot 10-inch by 50-foot border rows.

[1]Research was partially supported by PRO-CHEM Chemical Company.

The cane was grown to maturity each year using recommended fertilizer rates and standard cultural practices. All plots were harvested with a two-row soldier harvester and weighed with a weigh rig. A 10-stalk sample was randomly taken at harvest from each plot each year to determine stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane. Plant height was also determined for this 10-stalk sample in 1998 and 1999. Plant populations were determined before harvest each year.

RESULTS AND DISCUSSION

Table 1 shows that the gibberellic acid treatments used in the study (Table 2) did not significantly (P>0.10) affect the measured yield variables, except commercially recoverable sugar. There was, however, a trend toward significance (P<0.25) for effect of treatments on sugar yield. Harvest year affected all of the measured variables (Table 1) in the study, and the year x treatment interaction was not significant (P>0.10) for any of the variables. Yields in 1999 with first-stubble were very good (Table 3) and were higher than for plantcane in 1998, or second stubble in 2000.

Table 3 shows that treatments 5 and 6 had significantly (P<0.10) higher CRS values (averaged across the three years) than the check (T1), demonstrating that application of the 0.5x and 2.0x gibberellic acid rates (Table 2) increased the sugar concentration of the stalks.

Table 1. F-values and statistical parameters for effect of gibberellic acid treatments and harvest years on sugarcane yield variables.

Source	df	Stalk weight	Plant pop.	Plant§ height	CRS	Cane yield	Sugar yield
<u>main-plots</u>							
Treatments (T)	5	1.41	0.88	0.77	2.31$^{\sim}$	0.97	1.56$^{\bullet}$
HREP	5	0.23	1.38	3.60*	7.75**	2.31$^{\sim}$	4.69**
VREP	5	2.86*	2.79*	1.45$^{\bullet}$	0.38	5.93**	6.04**
<u>sub-plots</u>							
Years (Y)	2	127.38****	313.72****	56.58****	307.75****	19.51****	84.54****
TxY	5	0.47	1.11	1.55$^{\bullet}$	0.52	0.54	0.41
RMSE for main-plots		0.2005	4499	0.3275	7.454	3.620	825.6
% CV “ ” “		10.25	8.92	3.66	3.44	8.72	9.17
RMSE for sub-plots		0.2289	4563	0.3735	11.66	4.088	1028
% CV “ ” “		11.71	9.04	4.18	5.38	9.84	11.42
Mean		1.956	50450	8.944	216.9	41.53	9004

§Plant height was not measured for the 2000 crop.

$^{\bullet}$, $^{\sim}$, *, **, and **** denotes statistical significance at the P# 0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Gibberellic acid rates and timing for three years.

T#	For 1998[*]	For 1999	For 2000
1	SUL-15 not applied		
2	1.0x SUL-15 applied on: 4/9	5/7	4/6
3	1.0x SUL-15 applied on: 4/9, 5/22	5/7, 6/24	4/6, 5/31
4	1.0x SUL-15 applied on: 4/9, 5/22, 7/6	5/7, 6/24, 7/24[~]	4/6, 5/31, 7/21
5	0.5x SUL-15 applied on: 4/9, 5/22, 7/6	5/7, 6/24, 7/24	4/6, 5/31, 7/21
6	2.0x SUL-15 applied on: 4/9,5/22, 7/6	5/7, 6/24, 7/24[~]	4/6, 5/31, 7/21

[*] The 0.5x, 1.0x, and 2.0x rates denote gibberellic acid rates of 0.5, 1.0, and 2.0 qt/A, respectively, for each of the indicated dates.
[~] The August 24 application was not applied on these two treatments because the cane was lodged.

Table 3. Effect of gibberellic acid treatments on sugarcane yield variables averaged across harvest years.

T#	Stalk weight	Plant pop.	Plant[a] height	CRS	Cane yield	Sugar yield
	lb/stalk	1000/A	ft.	lb/T	T/A	lb/A
1	1.92	50.4	8.94	213	41.0	8750
2	1.96	51.5	8.90	216	41.6	8980
3	2.01	49.8	8.86	216	42.2	9120
4	2.03	49.4	9.03	216	40.7	8800
5	1.91	49.7	8.87	220	40.9	8960
6	1.90	51.8	9.06	220	42.8	9420
LSD 0.10	NS	NS	NS	4	NS	NS
LSD 0.25	NS	NS	NS	3	NS	330

[a]Plant height are based on 1998 and 1999; treatments were not measured for plant height in 2000.
NS denotes that the treatments did not affect the indicated yield variables at the designated significance levels.

Table 4. Effect of harvest year on sugarcane yield parameters averaged across gibberellic acid treatments.

Year	Stalk weight	Plant pop.	Plant[a] height	CRS	Cane yield	Sugar yield
	lb/stalk	1000/A	ft.	lb/T	T/A	lb/A
1998	1.94	50.7	8.61	227	38.1	8,660
1999	2.39	36.8	9.28	245	43.9	10,720
2000	1.53	63.8	-	179	42.6	7,630
LSD 0.10	0.09	1.8	0.15	5	1.6	400
LSD 0.25	0.06	1.2	0.10	3	1.1	280

[a]Plant heights at harvest were not made in 2000.

EFFECT OF NITROGEN FERTILIZER RATES AND LIME STABILIZED SEWAGE SLUDGE ON LCP 85-384 PLANTCANE YIELDS

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SUMMARY

Applying 10 and 20 tons/acre (dry weight basis) of lime-treated sewage sludge under cane at planting reduced ($P<0.10$) LCP 85-384 plantcane sugar and cane yields in 2000. Nitrogen application increased ($P<0.10$) cane yields, but did not affect sugar yields. There was a significant ($P<0.10$) sludge x nitrogen interaction for commercially recoverable sugar (CRS).

INTRODUCTION

Past research has shown that composted municipal waste can be safely and effectively used to grow sugarcane. However, municipalities in the Sugar Belt of Louisiana do not produce composted municipal waste. Consequently, if municipal waste is to be used, it will necessarily occur in the form of sewage sludge. At present, lime stabilized (class B) sewage sludge can be used in sugarcane production only with a special permit. Such a permit was obtained by the Iberia Research Station and the City of New Iberia for a sewage sludge x nitrogen fertilizer study in Iberia Parish.

OBJECTIVE

To determine the effect of nitrogen fertilizer rates and lime stabilized sewage sludge rates and placement on sugarcane yields.

MATERIALS AND METHODS

A Baldwin silty clay soil near Olivier was selected as the test site. The experimental design was a Latin square, split-plot with four replications. Experimental plots consisted of three 5-foot 10-inch by 30-foot rows with a 10-foot alley at the ends of each plot. All experimental plots were separated by three border rows that were fertilized according to recommended rates for plantcane. Main-plot treatments consisted of four different class B lime stabilized sewage sludge rates and application methods (Table 2). One main-plot did not receive sludge; a second had 10 T/A (dry weight basis) of sludge broadcast over rows and incorporated into the soil; and the third and fourth main plots received 10 and 20 T/A, respectively, of sewage sludge applied to opened rows immediately before planting first progeny Kleentek variety LCP 85-384 at three stalks and a lap of two joints in September of 1999.

Nitrogen fertilizer rates (0, 50, 100, and 150 lb N/A as ammonium nitrate) served as the split plots. All experimental plots received a blanket application of P2 O5, K2O, and S at 40, 120, and 24 lb/A as polyphosphate, potassium chloride, and gypsum, respectively. Fertilizer was applied to the plots in May of 2000.

Cane was grown until mid-November using standard cultural practices, and plant populations were taken in September from all plots. The experiment was harvested with a two row soldier harvester, and all plots were weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane.

RESULTS AND DISCUSSION

Table 1 shows that sewage treatments had a significant ($P<0.10$) effect on stalk weights, cane yield, and sugar yield, while nitrogen fertilizer rates only affected cane yield. There also was a significant sludge x nitrogen interaction for CRS.

The relatively low coefficient of variations for CRS, cane yield, and sugar yield indicate that the experimental design did a good job of removing variability from the study.

Table 2 shows that the 10-under and 20-under sludge treatments significantly ($P<0.10$) decreased stalk weight, and cane and sugar yield compared to the check. The 10-mix treatment also decreased cane yield. The reason for the decrease in yield with sludge application may be related to the sensitivity of LCP 85-384 to overfertilization with nitrogen. Previous research with starter fertilizer on fallow cane shows that applying more that 15 lb N/A in the furrow with cane at planting can reduce sugar yields.

Table 3 shows that increasing nitrogen fertilizer to 50 lb/A and beyond increased ($P<0.10$) cane tonnage, but did not significantly affect the other yield variables.

Table 4 shows the significant ($P<0.10$) interactive effect of sludge and N rates on commercially recoverable sugar. Nitrogen fertilizer decreased CRS (T4 vs. T1) in the absence of sludge, decreased it (T7 vs. T5) and increased it (T8 vs. T7) with the 10-mixed treatment, increased it (T10 vs. T9) and decreased it (T12 vs. T10) with the 10-under treatments, and had no effect with the 20-under sludge treatment.

Conversely, applying sludge reduced ($P<0.10$) CRS in the absence of nitrogen fertilizer (T9 vs. T1), had no effect at the 50 and 100 lb N rates, and increased it (T8 vs. T4) and decreased it (T12 vs. T8) at the 150 lb N rate.

Table 1. F-values and statistical parameters for effect of sewage sludge and nitrogen application rates on LCP 85-384 plantcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main plots</u>						
Sewage (S)	3	6.06*	2.13•	0.56	7.75*	3.79~
HREP	3	2.28•	0.82	1.91•	5.93 *	2.83•
VREP	3	3.32~	1.07	3.89~	1.89•	2.09•
<u>sub-plots</u>						
Nitrogen (N)	3	1.13	0.92	0.88	2.62~	1.27
SxN	9	1.48•	1.74•	2.05~	1.25	1.32
RMSE for main plots		0.1770	4976	9.762	1.620	549.3
% CV for main plots		11.34	10.23	4.27	4.79	7.10
RMSE for sub-plots		0.1764	3686	8.234	1.785	517.7
% CV for main plots		11.30	7.58	3.60	5.28	6.69
Mean		1.561	48,620	228.6	33.82	7732

•, ~, and * denote statistical significance at the P#0.25, 0.10, and 0.05 levels, respectively.

Table 2. Effect of sewage sludge rates and placement on sugarcane yield variables averaged across N rates.

Sewage sludge	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.70	46.1	230	35.3	8110
10 - mixed	1.60	49.5	231	34.0	7740
10 - under	1.49	50.2	226	33.3	7550
20 - under	1.46	48.7	228	32.7	7530
LSD 0.10	0.12	NS	NS	1.1	380
LSD 0.25	0.08	2.2	NS	0.7	250

NS denotes statistical nonsignificance at the indicated P level.

Table 3. Effect of nitrogen fertilizer rates on sugarcane yield variables averaged across sewage sludge treatments.

N-rate	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
lb N/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.57	47.8	230	32.8	7520
50	1.62	47.9	231	34.0	7850
100	1.55	49.2	226	34.2	7750
150	1.51	49.5	228	34.3	7810
LSD 0.10	NS	NS	NS	1.1	NS
LSD 0.25	NS	NS	NS	0.8	NS

NS denotes statistical nonsignificance at the indicated P level.

Table 4. Effect of nitrogen fertilizer rates and sewage sludge treatments on plantcane yield variables.

T#'s	Sewage sludge	N-rate	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
	T/A	lb/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	0	1.69	44.5	236	33.4	7870
2	0	50	1.73	44.8	230	36.7	8470
3	0	100	1.81	44.3	230	35.4	8150
4	0	150	1.56	50.6	222	35.8	7930
5	10-mixed	0	1.58	49.1	230	34.4	7930
6	10-mixed	50	1.74	47.2	227	33.0	7480
7	10-mixed	100	1.38	50.9	219	34.3	7530
8	10-mixed	150	1.69	50.9	236	34.1	8050
9	10-under	0	1.52	52.3	222	31.6	7040
10	10-under	50	1.55	49.6	235	33.6	7880
11	10-under	100	1.50	50.9	226	33.1	7500
12	10-under	150	1.39	48.1	223	34.8	7770
13	20-under	0	1.49	45.4	230	31.6	7250
14	20-under	50	1.46	50.0	231	32.8	7570
15	20-under	100	1.49	50.6	231	33.9	7830
16	20-under	150	1.40	48.6	230	32.5	7480
LSD 0.10 for N within sludge			NA	NA	10	NA	NA
LSD 0.25 " " " "			0.15	3.1	7	NA	NA
LSD 0.10 for sludge within N			NA	NA	13	NA	NA
LSD 0.25 " " " "			0.16	4.5	9	NA	NA

NA denotes that the LSD is nonapplicable because the sludge x N interaction was not significant at the indicated probability level.

EFFECT OF HIGH GYPSUM APPLICATION RATES ON PLANTCANE YIELDS FOR A HEAVY-TEXTURED SOIL

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SUMMARY

Applying up to 20 tons/acre of by-product gypsum to an Alligator clay soil did not significantly affect HoCP91-555 plantcane sugar yields in 2000. However, applying gypsum did result in lower (P<0.10) commercially recoverable sugar.

INTRODUCTION

Research in Louisiana shows that application of high amounts of gypsum (5-10 T/A) can result in significant (12%) yield responses on heavy-textured soils in stubble crops. There is also a school of thought that says "optimum crop yields cannot be obtained on heavy-textured soils unless the Ca/Mg ratio of soil (based on % cation exchange capacity) is close to 7:1." We conducted our study to test this theory and to determine the effect of gypsum application rates on crop yields and soil moisture and physical properties.

MATERIALS AND METHODS

An Alligator clay soil was selected for use in this study. Initial soil analysis (3385 and 630 ppm Ca and Mg, respectively, with a CEC of 21.2) indicated that it would require 17.3 T/A of gypsum to bring the Ca/Mg ratio (based on % CEC) up to the desired 7:1 value. To achieve this goal 0, 1.5, 5, 10, 15, and 20 T/A of gypsum were broadcast applied to experimental plots on August 23, 1999, and incorporated into the soil. Prior to incorporation the 1.5 T/A gypsum treatment also received 1.5 T/A of by-product lime and 15 gallon/A of a liquid biological solution. In May of 2000 this treatment also received 1 T/A of bagasse compost.

A 6x6 Latin square experimental design was used in the experiment. All treatments were replicated six times. Plots consisted of three 5-foot 10inch by 40-foot rows with a 10-foot alley at the ends of all plots. All plots were separated by three border rows on each side that did not receive gypsum. The experiment was planted in September 1999 with first progeny Kleentek variety HoCP 91-555 at four stalks and a lap of two joints.

Cane was grown to maturity using standard cultural practices. Plant populations were determined in September. The test was harvested in early December using a two-row soldier harvester, and plots were weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane.

RESULTS AND DISCUSSION

Table 1 shows that the experimental treatments did not affect (P>0.10) stalk weight, plant population, cane yield or sugar yield in 2000. The treatments did, however, affect CRS (Table1) as is shown by the lower (P<0.10) CRS values for all treatments receiving gypsum (Table 2). Furthermore, treatments receiving 10, 15, and 20 T/A of gypsum (T #'s 3, 4, and 5) had lower CRS values than Treatment Numbers 6 and 2, which received only 1.5 and 5.0 T/A of gypsum, respectively.

Our experiment was meant to test the effect of gypsum on soil moisture and physical properties, and their influence on crop yields. The severe drought in the summer of 2000 was not the ideal time to test this. Hopefully, the 2001, 2002, and 2003 crop years will provide "normal" moisture years so that a "fair" test can be conducted.

Table 1. Effect of gypsum rates on F-values and statistical parameters of plantcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
Treatments (T)	5	0.63	0.83	6.42***	0.70	1.59$^{\bullet}$
HREP	5	1.29	0.86	0.43	4.00*	3.68*
VREP	5	2.11$^{\bullet}$	12.86****	11.06****	1.16	6.98***
RMSE		0.1680	2474	7.983	1.752	417.6
% CV		10.92	5.42	4.17	5.39	6.71
Mean		1.539	45,650	191.4	32.48	6220

$^{\bullet}$, *, ***, and ****denote statistical significance at the P#0.25, 0.05, 0.001, and 0.0001 levels, respectively.

Table 2. Effect of gypsum treatments on plantcane yield variables.

T#	Gypsum	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
	T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	1.53	45.3	206	31.6	6530
2	5.0	1.47	45.8	195	33.1	6430
3	10.0	1.51	45.0	185	32.4	6000
4	15.0	1.58	45.3	185	33.1	6140
5	20.0	1.53	47.4	184	32.8	6030
6	1.5[+]	1.62	45.0	194	32.0	6190
LSD 0.10		NS	NS	8	NS	NS
LSD 0.25		NS	NS	5	NS	290

[%]This treatment also received 1.5 T/A of Domino by-product lime when the gypsum was applied, 15 G/A (on 8/23/99) of liquid biologicals, and 1 T/A of USL compost in April 2000.

EFFECT OF INORGANIC FERTILIZER AND FISH[2] EMULSION ON SUGARCANE YIELDS

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SUMMARY

Highest ($P<0.10$) LCP 85-384 sugar yields across two years were obtained where 75 lb N/A and 5 gallon/A of fish emulsion were sidedressed in the spring. Spring-applied fertilizer and fish emulsion treatments, however, did not affect ($P>0.10$) stalk weights, plant population, or commercially recoverable sugar. Fall-applied fish emulsion did not significantly ($P>0.10$) affect the sugarcane yield variables.

INTRODUCTION

Liquid fish emulsion is a by-product of the fish industry. This material is rich in nutrients and, therefore, should have value as a fertilizer in the growing of sugarcane. To date, little research has been conducted to determine whether fish emulsion has economic value in sugarcane culture.

OBJECTIVES

1) Determine the effect on sugarcane yields of placing various fish emulsion rates under cane at planting.

2) Determine the effect of fish emulsion on inorganic fertilizer requirements.

3) Determine if using fish emulsion in sugarcane production can increase the number of ratoon crops obtained from one planting.

MATERIALS AND METHODS

In September 1998 Kleentek variety LCP 85-384 sugarcane was planted at three stalks and a lap of two joints for a fish emulsion by inorganic fertilizer rate study. The experiment used a Latin square, split-plot design with four replications. Main plots consisted of the four spring-applied inorganic fertilizer and fish emulsion rates shown in Table 2. Split-plots consisted of the four fall-applied fish emulsion rates shown in Table 3. The fall-applied fish emulsion rates were applied to opened rows under cane at planting. The spring-applied fertilizer and fish emulsion rates were applied to the inner off bar of each row receiving that particular treatment (Table 2) in April of 1999 and 2000.

Experimental sub-plots consisted of three 6-foot by 40-foot rows with a 10-foot alley separating the ends of the plots. The sugarcane plots were grown to maturity using standard cultural practices.

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[2]Research was partially supported by Omega Protein, Inc.

Plant populations for each sub-plot were determined in October of each year. The study was harvested each year using a two-row soldier harvester, and the plots were weighed with a weigh rig. Ten stalks were randomly selected from each sub-plot for determination of commercially recoverable sugar (CRS) and average stalk weight.

RESULTS AND DISCUSSION

Table 1 shows that the spring-applied fertilizer and fish emulsion rates significantly ($P<0.10$) affected cane and sugar yields of LCP 85-384 across the two years. However, the fall-applied fish emulsion rates did not affect the five yield parameters measured. The spring by fall interaction was not significant ($P<0.10$) for any of the five yield variables (Table 1), though there was a trend ($P<0.25$) toward significance for stalk weight. The low % coefficient of variations (less than 10) for CRS, cane yield and sugar yield show that the statistical design did a good job of keeping the variability in the study low.

Table 2 shows that the 0.75x fertilizer and 5 G/A spring-applied fish emulsion treatment had the highest ($P<0.10$) sugar yields across the two years. Further increasing the fertilizer rate from 0.75x to 1.0x (increasing nitrogen from 75 lb/A to 100 lb/A and not adding fish emulsion) resulted in reduced ($P<0.10$) sugar yields. Likewise, decreasing the fertilizer rate from 0.75x to 0.5x (reducing nitrogen fertilizer from 75 lb/A to 50 lb/A) resulted in reduced sugar yields.

Table 1 shows that the year x spring, year x fall, and year x spring x fall interactions were not significant ($P>0.10$) for cane or sugar yield. There was a trend ($P<0.25$), however, toward significance for the year x spring x fall interaction for sugar (Table 3).

Table 1. F-values and statistical parameters for effect of inorganic fertilizer and fish emulsion on LCP 85-384 yield variables for two years.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
main-plots						
Spring (S)	3	1.42	0.81	0.16	14.68**	34.63**
HREP	3	0.35	1.27	3.83$^{\sim}$	12.84**	11.90**
VREP	3	8.82*	1.33	11.93**	15.15**	70.95**
sub-plots						
Fall (F)	3	0.50	1.03	1.18	0.80	0.17
SxF	9	1.77$^{\bullet}$	0.98	1.32	1.07	0.97
sub-sub-plots						
Years (Y)	1	112.20**	128.68**	583.71**	0.03	512.80**
YxS	3	4.82**	3.95*	0.18	0.11	0.54
YxF	3	0.47	0.58	0.44	0.20	0.96
YxSxF	9	0.50	0.96	1.10	0.97	1.72$^{\bullet}$
RMSE for main-plots		0.2922	8058	9.646	2.067	273.60
% CV for main-plots		13.14	15.76	5.01	4.70	3.24
RMSE for sub-plots		0.1806	5725	10.34	3.219	781.4
% CV for sub-plots		8.12	11.20	5.37	7.33	9.26
RMSE for sub-sub-plots		0.2225	5146	14.02	3.552	653.1
% CV for sub-sub-plots		10.01	10.06	7.29	8.08	7.74
Mean		2.224	51,140	192.4	43.94	8436

$^{\bullet}$, $^{\sim}$, *, and ** denotes statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Effect of spring fertilizer and fish emulsion rates on sugar yields for two years.

Fertilizer app. in spring	Fish emulsion app. in spring	Plant cane	First stubble	Total
	G/A	---------------------lb/A--------------------		
0x	0	9,390	6,750	16,140
0.5x	5	9,700	7,120	16,820
0.75x	5	10,210	7,310	17,520
1.0x	0	9,750	7,250	17,000
LSD 0.10		190	190	270
LSD 0.25		130	130	180

Table 3. Effect of spring fertilizer and fish emulsion and fall fish emulsion rates on sugar yields for two years.

T#	Spring fert.	Fish emulsion appl. in spring	Fish emulsion appl. in fall	Plant cane	First stubble
		G/A	G/A	--------------lb/A--------------	
1	0.0x	0	0	9,040	6,720
2	0.0x	0	25	9,960	6,650
3	0.0x	0	50	9,320	6,660
4	0.0x	0	100	9,250	6,970
5	0.5x	5	0	10,060	7,220
6	0.5x	5	25	10,200	7,180
7	0.5x	5	50	9,800	6,590
8	0.5x	5	100	8,850	7,370
9	0.75x	5	0	10,390	7,110
10	0.75x	5	25	9,840	6,920
11	0.75x	5	50	10,030	7,580
12	0.75x	5	100	10,590	7,640
13	1.0x	0	0	9,520	7,550
14	1.0x	0	25	9,700	7,690
15	1.0x	0	50	10,000	6,800
16	1.0x	0	100	9,760	6,970
LSD 0.25 for effect of spring fertilizer treatments				250	250

LSD 0.25 for effect of fall fish treatments	660	660

EFFECT OF NITROGEN FERTILIZER RATES, A[1] NITROGEN STABILIZATION PACKAGE, AND VARIETIES ON SUGARCANE YIELDS

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SUMMARY

Results showed that sugarcane variety LCP 85-384 yielded higher (P#0.10) than varieties CP 70-321 and HoCP 85-845 across four nitrogen fertilizer rates (60, 100, 140, and 180 lb/A) and two years. Also, adding urea nitrogen (that contained a nitrogen stabilization package) to row furrows of HoCP 85-845 in December-January resulted in sugar yields as high as where nitrogen was applied the following April.

INTRODUCTION

In recent years, there has been a dramatic increase in the acreage planted to sugarcane variety LCP 85-384. However, it is not clear whether this variety needs more or less nitrogen fertilizer compared to other sugarcane varieties. To address this question adequately, LCP 85-384 needs to be compared with other recommended sugarcane varieties in a nitrogen fertilizer test.

Also, because of market conditions, urea can be purchased 10-15% cheaper in the fall and winter than in the spring and summer. If inorganic nitrogen fertilizer could be stabilized to prevent urea volatilization, denitrification, and the leaching of nitrate, urea could be applied to sugarcane in the fall and winter when the cost of nitrogen is lower. Applying a nitrogen stabilization package (calcium chloride, and a urease and nitrification inhibitor, supplied by Stoller Enterprises, Inc.) to liquid urea should reduce nitrogen losses from the above causes. Also, applying the liquid urea and nitrogen stabilization package in the furrow between the sugarcane rows in the fall or winter may help improve soil water drainage through the effect of calcium and ammonia (derived from the applied urea) in improving the permeability of the soil to water movement.

OBJECTIVES

1) To determine the effect of spring-applied nitrogen fertilizer rates and sugarcane varieties on sugarcane yield.

2) To determine the effect of winter-applied nitrogen, with a nitrogen stabilization package, on sugarcane yields.

PROCEDURES

Kleentek sugarcane varieties CP 70-321, LCP 85-384, and HoCP 85-845 were planted in early October 1998 at three stalks and a lap of two joints. Experimental plots consisted of three 6-

[1]Research was partially supported by Stoller Enterprises, Inc.

foot by 30-foot rows, with a 10-foot alley at the ends of each plot. The experimental design used was a Latin square, split plot with four replications. Nitrogen rates (Table 2) were main plots, and varieties and nitrogen timing (Table 3) were the split plots. Spring nitrogen (urea) was applied to the inner off bar of each row in the split-plot and did not receive the nitrogen stabilization package (which contained calcium chloride and a urease and nitrification inhibitor). Treatments receiving winter fertilizer had their nitrogen (urea) applied in mid-December or January in a 1-inch band in the furrow between the rows. The two inner furrows of each three row split plot received all the nitrogen for the three rows.

The test was harvested each year with a two-row soldier harvester, and the split-plots were weighed with a weigh rig. Ten stalks were randomly taken from each split plot to determine stalk weight and commercially recoverable sugar (CRS). All split plots were rated for lodging prior to harvest.

RESULTS AND DISCUSSION

Table 1 shows that nitrogen rates affected (P#0.10) cane and sugar yields. Nitrogen rates also interacted with harvest years to affect cane and sugar yields. Sugarcane varieties and nitrogen timing (spring vs. winter) affected all the measured variables, as did harvest years.

Table 2 shows that the 100 lb N/A rate had lower cane and sugar yields than the lower (60 lb N/A) and higher (140 and 180 lb N/A) nitrogen rates. This is hard to explain.

Table 3 shows that applying nitrogen stabilized urea (which contained calcium chloride and a urease and nitrification inhibitor) to variety HoCP 85-845 in the winter vs. the spring resulted in higher (P#0.10) cane yields and stalk weights, but did not significantly affect sugar yields. Variety LCP 85-384 also had higher cane and sugar yields and more lodging than varieties CP70-321 and HoCP 85-845 (Table 3).

Table 4 shows the interactive effect (P#0.05) of nitrogen fertilizer rates with harvest years on sugar yield. Sugar yields tended to decrease with increased nitrogen application to plantcane (1999), while first stubble sugar tended to increase.

Table 1. F-values and statistical parameters for effect of spring-winter-variety x N treatments and harvest years on sugarcane yield variables.

Source	df	Stalk weight	CRS	Cane yield	Sugar Yield	Lodging
main plots						
Nitrogen (N)	3	2.07$^{\bullet}$	0.09	5.46*	6.44*	1.31
HREP	3	19.07****	3.73$^{\sim}$	2.27$^{\bullet}$	0.34	2.22$^{\bullet}$
VREP	3	4.33$^{\sim}$	0.87	2.39$^{\bullet}$	1.04	4.38$^{\sim}$
sub-plots						
Spring-winter-variety	3	16.04**	23.01**	15.22**	16.78**	2.57$^{\sim}$
N x SWV	9	0.45	0.92	0.84	0.49	0.62
sub-sub-plots						
Year (Y)	1	25.17**	409.30**	139.91**	18.67**	183.90**
N x Y	3	0.35	0.95	4.53**	3.13*	0.17
SWV x Y	3	3.18*	0.85	0.03	0.59	5.07**
N x SWV x Y	9	0.59	0.91	0.79	0.71	0.82
RMSE for main plots		0.1650	12.81	4.092	707.3	0.6595
% CV for main plots		7.40	6.56	9.36	8.50	25.97
RMSE for sub-plots		0.2694	11.99	4.073	899.7	0.7977
% CV for main plots		12.08	6.14	9.32	10.81	31.42
RMSE for sub-sub-plots		0.3304	15.57	3.640	990.1	0.7235
% CV for sub-sub-plots		14.81	7.98	8.33	11.90	28.49
Mean		2.231	195.2	43.72	8323	2.539

$^{\bullet}$, $^{\sim}$, *, and ** denote statistical significant at the P<0.25, 0.10, 0.05, and 0.01 levels, respectively.

Table 2. Effect of nitrogen fertilizer rates on sugarcane yield variables across spring-winter-variety treatments and harvest years.

Nitrogen	Stalk weight	CRS	Cane yield	Sugar yield	Lodging[+]
lb N/A	lb/stalk	lb/T	T/A	lb/A	
60	2.29	196	44.0	8,380	2.38
100	2.23	195	41.3	7,860	2.50
140	2.21	195	45.4	8,660	2.60
180	2.20	195	44.3	8,400	2.69
LSD 0.10	NS	NS	2.0	350	NS
LSD 0.25	0.05	NS	1.3	230	NS

[+]Lodging was rated on a 1-5 scale, where 1 had all plants erect and 5 had all plants lodged.

Table 3. Effect of spring-winter-variety treatments on sugarcane yield variables across nitrogen rates and harvest years.

Variety	Fertilizer applied in	Stalk weight	CRS	Cane yield	Sugar yield	Lodging
		lb/stalk	lb/T	T/A	lb/A	
CP 70-321	Spring (S)	2.45	204	39.7	7,800	2.41
LCP 85-384	S	2.01	204	46.8	9,370	2.88
HoCP 85-845	S	2.15	188	42.9	7,930	2.47
HoCP 85-845	Winter (W)	2.30	185	44.9	8,170	2.41
LSD 0.10		0.14	7	1.6	430	0.30

LSD 0.25	0.10	5	1.1	3

Table 4. Effect of nitrogen fertilizer rates and harvest years on sugar yields averaged across spring-winter variety treatments.

	Harvest year	
N-rate	1999	2000
lb N/A	-------------------lb/A-----------------	
60	9390	7550
100	8450	7310
140	8960	8370
180	8410	8390
LSD 0.10	500	500
LSD 0.25	330	330

EFFECT OF COMBINE RESIDUE MANAGEMENT[1] AND A NITROGEN STABILIZATION PACKAGE ON FIRST STUBBLE SUGARCANE YIELDS

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SUMMARY

Research across a two-year residue management study shows that spraying combine trash (in late January each year) with 60 lb N/A as nitrogen stabilized urea (containing a urease and nitrification inhibitor), and applying the remaining urea (30 or 60 lb N/A) in the spring, resulted in a sugar yield as good as where the trash was burned (in January) and all the urea nitrogen (120 lb N/A) was applied in the spring. Also, applying 90 lb N/A as urea treated with a urease inhibitor (Agrotain) in the spring resulted in a sugar yield as high as where 120 lb N/A as untreated urea was applied in the spring.

INTRODUCTION

Approximately 85% of the sugarcane acreage in Louisiana is now harvested with combine harvesters. Much of this cane is harvested green chopped, which results in a residue blanket on the soil surface that can reduce sugar yields (500 to 1000 lb/A) for the following crop if it is not removed or burned. Removing the residue blanket from the row tops and placing it in the furrow can cause cultivation problems the following spring. Many producers burn the residue blanket after harvest, which may result in allergy problems for the public. Burning the residue also results in loss of nitrogen and organic matter that could improve soil fertility and soil manageability if the residue blanket were not destroyed.

At present, the sugarcane combine residue blanket is more of a liability than an asset. The research in this study seeks to determine if there is a way to manage the residue blanket so that it becomes an asset instead of a liability.

OBJECTIVES

1) Compare the effect of burning combine harvest residue vs. spraying it with liquid super urea (which contains a urease and nitrification inhibitor) on sugar yields.

2) Determine if applying super urea to the trash blanket can reduce the nitrogen fertilizer requirements of sugarcane.

[1]Research was partially supported by IMC Global Operations, Inc.

MATERIALS AND METHODS

In late January 1999 and 2000, the six treatments in Table 2 were imposed on a Baldwin silty clay soil where LCP 85-384 plantcane and first stubble had been harvested with a combine in mid-January. The treatments were replicated six times in a 6x6 Latin square design. Experimental plots consisted of three 6-foot by 50-foot rows with 10-foot alleys at the ends of each plot. Three border rows also separated each plot on both sides of the plot. Treatments 1, 2, and 6 had their plots burned in late January each year, and treatment 4 and 5 plots had 60 lb N/A as super urea (stabilized with both a urease and nitrification inhibitor) sprayed on the residue blanket in late January. In April of 1999 and 2000 treatments 1-5 received spring urea nitrogen (Table 2) sprinkled by hand on the row tops. Treatment 6 urea (which contained Agrotain urease inhibitor) also was sprinkled on the row tops at the same time. All plots received a blanket application of 40 lb/A of P_2O_5 (as polyphosphate) and 120 lb/A of K_2O (as potassium chloride).

The first stubble and second stubble cane crops were grown to maturity using standard cultural practices. Cane tonnage in each experimental plot was estimated by harvesting 10 feet from the middle row of each plot. Five stalks were randomly selected from the 10-foot section to estimate commercially recoverable sugar (CRS) and average stalk weights. Three stalks also were taken to analyze for nutrient uptake.

RESULTS AND DISCUSSION

Table 1 shows that the trash management and fertilizer treatments (Table 2) did not significantly (P>0.10) affect cane and sugar yields across the two crop years. The treatments did affect (P<0.10) stalk weights, and there was a trend (P<0.25) toward an effect for CRS.

The % coefficient of variations for main plots and sub-plots of stalk weight, cane yield, and sugar yield were large, which indicates that variability was brought into the study by using only a 10-foot section of the center row from each plot to estimate the yield variables.

Table 2 shows the effect of the trash and fertilizer treatments on the four measured yield variables. Sugar yields for Treatments 4 and 5 (which had nitrogen stabilized liquid urea sprayed on the trash blanket in January each year after harvest) were as good as for Treatment 1 where the trash blanket was burned and urea was applied to row tops in April each year. This indicates that spraying the trash blanket in the winter with N-stabilized urea may be an alternative to burning.

The results also show that applying 90 lb N/A as agrotain treated urea in April each year, to cane rows that had their trash blanket burned the previous January (Treatment 6), yielded as well as Treatment 1 where the trash had been burned and 120 lb N/A as untreated urea was added.

Table 2 shows that the stalk weights for Treatment 4 were significantly (P<0.10) larger than for Treatments 1,5, and 6.

Table 1. F-values and statistical parameters for effect of harvest years and residue and fertilizer management on LCP 85-384 yield variables.

Source	df	Stalk weight	CRS	Cane yield	Sugar Yield
<u>main plots</u>					
Treatments (T)	5	3.35*	1.94$^{\bullet}$	0.81	0.58
HREP	5	1.15	0.67	2.19$^{\sim}$	2.40$^{\sim}$
VREP	5	2.08$^{\sim}$	1.17	0.31	1.03
<u>sub-plots</u>					
Years (Y)	1	69.19****	485.89****	67.38****	194.20****
T x Y	5	1.20	0.29	0.55	0.50
RMSE for main plots		0.2383	12.58	6.838	1443
% CV for main plots		13.81	6.68	19.15	20.19
RMSE for sub-plots		0.3083	17.31	7.342	1800
% CV for sub-plots		17.86	9.195	20.56	25.53
Mean		1.726	188.2	35.70	7048

$^{\bullet}$, $^{\sim}$, *, and ****, denote statistical significance at the P#0.25, 0.10, 0.05, and 0.0001 levels, respectively.

Table 2 . Effect of urea treatments and residue management on LCP 85-384 yield variables across two years.

T#	Residue blanket	Urea source	Urea applied to rows in	Urea N. rate	Stalk weight	CRS	Cane yield	Sugar yield
				lb/A	lb/stalk	lb/T	T/A	lb/A
1	burned in winter	untreated urea	spring	120	1.69	181	37.3	7,090
2	burned in winter	untreated urea	spring	90	1.81	189	33.4	6,630
3	not burned	untreated urea	spring	120	1.76	188	34.5	6,690
4	not burned	Super U	winter spring	60 60	1.91	193	35.7	7,220
5	not burned	Super U	winter spring	60 30	1.55	194	35.2	7,220
6	burned in winter	Agrotain	spring	90	1.65	185	38.1	7,430
LSD 0.10					0.17	NS[a]	NS	NS
LSD 0.25					0.12	6	NS	NS

[a]NS denotes that the means of the indicated variable was not statistically different at the indicated significance levels.

EFFECT OF WINTER FERTILIZATION AND A NITROGEN[1] STABILIZATION PACKAGE ON SUGARCANE YIELDS

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SUMMARY

Our results show across a three-year study that applying nitrogen stabilized urea in the winter resulted in a cane and sugar yield as good as where the N-stabilized urea was added in the spring.

INTRODUCTION

Sugarcane in Louisiana is usually fertilized in April or May. However, urea is 10-15% cheaper when it is purchased in the fall or winter. Also, because of the high amounts of clay in most of Louisiana's sugarcane soils, water is frequently trapped in the furrow between sugarcane rows after harvest (especially when sugarcane is harvested under wet conditions so that the fields are rutted up and drainage ways are not reopened).

If liquid urea could be stabilized (by using a urease inhibitor) and mixed with liquid calcium chloride it may be possible to add nitrogen between the sugarcane rows (in the furrow) in a narrow (one inch) band in the winter after harvest. This could improve water drainage through the effect of calcium and ammonium (derived from the applied urea) in improving the permeability of the soil to water movement so that sugarcane yields are increased.

OBJECTIVES

1) To determine the effect of nitrogen-stabilized liquid urea on sugarcane yields when applied in the winter after sugarcane harvest.

2) To determine the effect of nitrogen fertilizer rates on sugarcane yields.

PROCEDURES

In late September of 1997, a sugarcane study was initiated at the Iberia Research Station on a Baldwin silty clay soil. The experiment consisted of eight treatments (Table 2) replicated eight times in an 8x8 Latin square design. Experimental plots consisted of three 5-foot10-inch by 50-foot rows with 10-foot alleys at the end of each plot.

The experiment was planted with second progeny Kleentek variety CP 70-321 at three stalks and a lap of two joints. Experimental treatments 7 and 8 had 1 ton per acre of gypsum applied under cane at planting. Treatments 3 and 6 had their N-hib Ca and liquid urea mixed together immediately before they were added to the two furrows between the three rows (all the nitrogen for

[1]Research was partially supported by Stoller Enterprises, Inc; N-hib Ca is one of their products.

the three rows was added to the two inner furrows) in each plot in December of 1997 and 1998 and January of 2000. Treatments 1, 2, 4, 5, 7, and 8 had their liquid urea and N-hib Ca mixed and applied to the inner off bar of each of the three rows in each plot in May of 1998, 1999 and 2000. A blanket application of polyphosphate and muriate of potash was applied to the outer off bar of all sugarcane rows in the study at 60 and 90 lb per acre of P_2O_5 and K_2O, respectively, all three years.

Plant populations were determined in September each year. Cane was grown to maturity each year using standard cultural practices and was harvested at maturity with a two-row soldier harvester. Each experimental plot was weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane.

RESULTS AND DISCUSSION

Table 1 shows that the fertilizer treatments (Table 2) affected (P<0.10) CRS and cane yield. There was also a trend (P<0.25) toward significance for sugar yield. Harvest year affected all the measured yield variables except cane yield, and there was a tend (P<0.25) toward significance for the treatment x year interaction for cane and sugar yield (Table 1).

Table 2 shows the effect of the eight fertilizer and gypsum treatments on sugarcane yield variables averaged across three years. Increasing nitrogen application from 120 to 180 lb N/A (T1 vs. T4) did not significantly (P>0.10) affect CRS or cane yield. Applying 120 lb N/A of N stabilized urea in the winter vs. the spring (T3 vs. T2) increased (P<0.10) cane yield, but did not affect CRS. However, applying 180 lb N/A as N stabilized urea in the winter vs. the spring (T6 vs. T5) had no effect on CRS or cane yield.

Table 2 also shows that increasing N and Ca applied in the spring (T5 vs. T2) increased (P<0.10) cane yields but decreased CRS. Applying 40 lb Ca/A to the 120 lb N/A rate that had received gypsum at planting (T8 vs. T7) resulted in reduced CRS. Table 2 also shows that adding gypsum under cane at planting increased cane yields and decreased CRS where the N-stabilization package was used (T8 vs. T2), but had no effect where the stabilization package was not used (T7 vs. T1).

While the gypsum and fertilizer treatments did not significantly (P>0.10) affect sugar yield (Table 2), there was a trend (P<0.25) toward significance (Table 1). Table 2 shows that there was a trend (P<0.25) toward higher sugar yields where: 120 lb N/A of nitrogen was added in the winter vs. spring (T3 vs. T2); nitrogen rates were increased from 120 to 180 lb N/A (T4 vs. T1), and higher N and Ca rates were added in the spring with the N stabilization package (T5 vs. T2). Conversely, there was a trend (P<0.25) toward lower sugar yields where: the N-stabilization package was added to 120 lb N/A of spring-applied N (T2 vs. T1), and where the N stabilization package was added to the 120 lb/A N rate that received gypsum (T8 vs. T7). Table 3 shows the interactive (P<0.25) effect of treatments and harvest years on sugar yield.

Table 1. F-values and statistical parameters for effect of experimental treatments and harvest years on sugarcane yield variables.

Source	df	Stalk wt.	Plant pop.	CRS	Cane yield	Sugar yield
<u>main plots</u>						
Treatments(T)	7	1.02	1.20	2.07$^{\sim}$	2.31*	1.56$^{\bullet}$
HREP	7	0.84	1.62$^{\bullet}$	0.36	1.42$^{\bullet}$	2.14$^{\sim}$
VREP	7	5.65**	1.54$^{\bullet}$	4.51**	4.91*	3.86*
<u>sub-plots</u>						
Years (Y)	2	3.20*	246.58****	210.62****	1.31	44.85****
TxY	7	1.18	0.70	0.85	1.46$^{\bullet}$	1.49$^{\bullet}$
RMSE for main plots		0.2892	2248	9.738	2.982	550.7
%C/V “ ” “		12.30	6.42	5.33	8.24	8.35
RMSE for sub-plots		0.2790	2487	12.63	3.916	928.7
%CV “ ” “		11.86	7.10	6.92	10.83	14.07
Mean		2.352	35,020	182.6	36.17	6600

$^{\bullet}$, $^{\sim}$, *, **, and **** denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.0001 levels, respectively.

Table 2. Effect of urea and N-hib Ca fertilizer treatments on sugarcane yield variables averaged across three years.

T#	Urea	N-hib Ca	Fert. applied in	Gypsum applied	Stalk wt.	Plant pop.	CRS	Cane yield	Sugar yield
	lb N/A	lb Ca/A		T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	120	0	Spring	0	2.34	35.3	184	35.6	6560
2	120	40	Spring	0	2.27	35.1	184	34.4	6340
3	120	40	Winter	0	2.39	34.7	183	35.9	6580
4	180	0	Spring	0	2.40	34.5	187	36.3	6750
5	180	60	Spring	0	2.25	35.8	179	37.2	6650
6	180	60	Winter	0	2.36	35.6	179	37.3	6700
7	120	0	Spring	1.0	2.40	34.8	184	36.5	6730
8	120	40	Spring	1.0	2.41	34.4	179	36.1	6470
LSD 0.10					NS	NS	5	1.5	NS
LSD 0.25					NS	NS	3	1.0	190

Table 3. Effect of urea and N-hib Ca fertilizer treatments on sugar yields for three years.

T#'s	Urea	N-hib CA	Fert. appl. in	Gypsum applied	Plant cane	First stubble	Second stubble	Total
	lb N/A	lb Ca/A		T/A	--------------------lb/A----------------------			
1)	120	0	Spring	0	6870	6950	5,850	19,670
2)	120	40	Spring	0	6510	7070	5,450	19,030
3)	120	40	Winter	0	6300	7930	5,500	19,740
4)	180	0	Spring	0	6580	7390	6,290	20,260
5)	180	60	Spring	0	6410	7430	6,120	19,960
6)	180	60	Winter	0	7310	7300	5,490	20,100
7)	120	0	Spring	1.0	7500	7080	5,620	20,200
8)	120	40	Spring	1.0	6560	7140	5,720	19,420
LSD 0.10					NS	NS	NS[%]	NS
LSD 0.25					320	320	320	560

%NS denotes that treatments did not affect (P#0.10) the indicated yield variables.

EFFECT OF POWER PERK ON PLANTCANE YIELD VARIABLES AND SOIL PENETRATION RESISTANCE

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SUMMARY

Application rates and different methods of application of a soil conditioner (Power Perk) did not significantly ($P<0.10$) affect sugarcane yield variables in 2000 under drought conditions. However, broadcasting 20 gallons/acre of Power Perk on sugarcane rows immediately after planting did significantly ($P<0.10$) reduce soil penetrometer resistance at one of two sampling dates.

Further research is needed to determine whether Power Perk can increase sugarcane yields through decreased soil penetration resistance and improved water drainage.

INTRODUCTION

Power Perk is a liquid product produced by OrganiCal Inc. and is registered as an agricultural mineral and soil conditioner. This product has a pH of approximately 0.4 and is meant to be diluted at least 1:20 with water before application. It is used on construction sites and golf courses as a soil conditioner to correct and/or increase water percolation in clay and saline/sodic soils. Promoters of this product claim that it will reduce the expansion index of clay soils so water can percolate through it and, thereby, reduce resistance to root growth. Since the heavy-textured soils used to grow sugarcane in south Louisiana are known to have drainage problems, we decided to test this product.

OBJECTIVES

To determine the effect of Power Perk on:

1) Soil water concentration and soil penetration resistance.
2) Sugarcane yields across a four-year cane cycle.

MATERIALS AND METHODS

An Alligator clay soil was selected for use in the study. First progeny Kleentek variety HoCP 91-555 was planted at three stalks and a lap of two joints in September of 1999. The experiment used a 6x6 Latin square design with six replications. Experimental plots consisted of three 5-foot 10-inch by 40-foot rows, with a 10-foot alley at the ends of the plots. All treatment plots were separated from adjacent treatments by three border rows.

Experimental treatments (Table 2) were applied immediately after planting. The Power Perk was diluted 1:10 with water before application. Treatments 2-4 were applied as a broadcast spray (from furrow-to-furrow). Treatments 5 and 6 had their Power Perk applied two ways: half in a narrow (1-inch) band (in the furrow between the rows) and the other half in a 4-inch band on the row top.

Cane was grown to maturity using standard cultural practices, and plant populations were determined for each plot in September. The experiment was harvested with a two-row soldier harvester and weighed with a weigh rig. A 10-stalk sample was taken from each plot to determine average stalk weight and commercially recoverable sugar (CRS) per ton of harvested cane. Soil penetrometer resistance was measured on July 14 and August 4 on all plots.

RESULTS AND DISCUSSION

Tables 1 and 2 show that the Power Perk treatments (Table 2) did not significantly ($P > 0.10$) affect plantcane yield variables in 2000. The coefficient of variations for CRS, cane yield, and sugar yield were all below 10%, showing that the variability in the study had been kept to an acceptable level. The severe drought experienced in the summer of 2000 was probably responsible for the relatively low yields produced (Table 2).

Table 3 shows that there was a significant ($P < 0.10$) treatment by sampling date interaction for soil penetrometer resistance. Table 4 shows that broadcast applying 20 G/A of Power Perk reduced soil resistance to the penetrometer by 122 lb per square inch at the July 14 sampling. These results are promising and indicate that the Power Perk was working to reduce soil penetration resistance. Further research is needed to determine the effect of Power Perk on soil properties and sugarcane growth.

Table 1. F-values and statistical parameters for effect of Power Perk application rates and placement on plantcane yield variables.

Source	df	Stalk weight	Plant population	CRS	Cane yield	Sugar yield
Treatments (T)	5	1.06	$1.84^{\bullet}$	0.37	1.34	$1.85^{\bullet}$
HREP	5	$2.29^{\sim}$	0.63	0.43	5.16^{**}	4.19^{*}
VREP	5	1.23	$1.96^{\bullet}$	0.87	3.03^{*}	4.60^{**}
RMSE		0.1615	8202	8.354	2.579	516.3
% CV		10.30	16.48	4.142	7.79	7.74
Mean		1.568	49,770	201.7	33.11	6668

$^{\bullet}$, $^{\sim}$, *, **, and ***denote statistical significance at the P#0.25, 0.10, 0.05, 0.01, and 0.001 levels, respectively.

Table 2. Effect of Power Perk rates and placement on plantcane yield variables.

T#	Power Perk	Stalk weight	Plant population	CRS	Cane yield	Sugar yield
	G/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0 - furrow to furrow	1.57	50.9	204	33.4	6840
2	10 - “ ” “	1.64	57.6	201	33.5	6740
3	20 - “ ” “	1.63	49.2	203	34.2	6950
4	30 - “ ” “	1.51	44.1	198	31.3	6190
5	5 in furrow +5 over row top	1.60	46.9	202	31.7	6390
6	10 in furrow + 10 over row top	1.47	49.8	201	35.3	7020
LSD 0.10		NS	NS	NS	NS	NS
LSD 0.25		NS	5.6	NS	NS	370

NS denotes nonsignificance at the indicated P level.

Table 3. F-values and statistical parameters for effect of Power Perk application rates and placement on soil penetrometer resistance.

Source	df	Penetration
main-plots		
Treatments (T)	5	0.84
HREP	5	1.65•
VREP	5	12.07***
sub-plots		
Date (D)	1	57.10****
TxD	5	2.20~
RMSE for main-plots		79.90
% CV " " "		12.85
RMSE for sub-plots		56.61
% CV " " "		9.11
Mean		621.7

•, ~, ***, and **** denotes statistical significance at the P# 0.25, 0.10, 0.001, and 0.0001 levels, respectively.

Table 4. Effect of Power Perk treatments and sampling date on soil penetrometer resistance.

T#	Power Perk	Sampling date	
		July 14	August 4
	G/A	---------lb/in.^{2}----------	
1	0 - furrow to furrow	628	681
2	10 - " " "	582	652
3	20 - " " "	506	671
4	30 - " " "	568	675
5	5 in furrow +5 over row top	547	698
6	10 in furrow + 10 over row top	598	657
LSD 0.10 for treatment within sampling date		78	78

LSD 0.25	“	”	“	”	“	54	54

NS denotes nonsignificance at the indicated P level.

EFFECT OF NITROGEN FERTILIZER AND BAGASSE[1] -COMPOST ON SUGARCANE YIELDS ACROSS TWO YEARS

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SUMMARY

Highest cane and sugar yields averaged across plant and first stubble cane were obtained at the 50 lb N/A rate for variety LCP 85-384. Increasing N rates to 100 and 150 lb N/A did not result in higher cane and sugar yields. Applying 4.6 tons/acre of bagasse compost in opened rows under cane at planting resulted in the highest cane ($P<0.10$) and sugar ($P<0.25$) yields.

INTRODUCTION

Past research in Louisiana has shown that using compost in growing sugarcane can result in significant increases in sugar yield. This research also showed that the yield response from compost was over and beyond that obtained from commercial inorganic fertilizer. Sugar mills in Louisiana produce an excess of bagasse that could be used to make compost for growing sugarcane.

OBJECTIVES

1) To determine if compost made from sugarcane bagasse can be used as a soil amendment and organic fertilizer to increase sugarcane yields.

2) To determine if use of compost can decrease sugarcane's inorganic nitrogen (N) fertilizer requirements.

PROCEDURES

Kleentek variety LCP 85-384 was planted for a N by compost study in late September 1998. All treatments were replicated four times in a Latin square, split-plot design on a Baldwin silty clay soil. Nitrogen fertilizer rates (from ammonium nitrate) were main plots, and compost rates (dry weight basis) were the split plots. The compost was obtained from the LSU Agricultural Center and was made from sugarcane bagasse and sudan grass.

Nitrogen fertilizer rates were applied in May of 1999 and 2000 to the inner off bar of the rows receiving nitrogen. Compost rates were placed in open rows before the cane was planted at three stalks and a lap of two joints. All sub-plots consisted of three 6-foot x 40-foot rows, with a 10-foot alley separating the ends of the sub-plots. Cane was grown to maturity each year using standard cultural practices.

[1]Research was partially supported by the American Sugar Cane League.

Plant populations were determined in September each year before harvest for each sub-plot. The plots were harvested with a two-row soldier harvest and weighed with a weigh rig. Ten stalks were randomly selected from each sub-plot to determine average stalk weight and commercially recoverable sugar (CRS).

RESULTS AND DISCUSSION

Table 1 shows that nitrogen fertilizer rates had a significant (P<0.10) effect on cane and sugar yields. Compost rates also affected (P<0.10) cane yields and stalk weights, and there was a trend (P<0.25) toward significance for sugar yields, CRS, and the nitrogen x compost interaction for all five yield variables (Table 1). Harvest year affected (P<0.10) five yield variable and there was a trend (P<0.25) toward significance for the nitrogen x year interaction for CRS, cane yield, and sugar yield.

Table 2 shows that highest cane and sugar yields were obtained at the 50 lb N/A rate, which produced significantly (P<0.10) higher yields than the O N rate, but not the 100 and 150 lb N/A rates. There was, however, a trend (P<0.25) toward higher sugar yields for the 50 lb N/A rate compared to the 100 and 150 lb N/A rate.

Table 3 shows that the 4.6 T/A compost rate resulted in the highest (P<0.10) cane yields and stalk weights. This compost rate also trended (P<0.25) toward higher sugar yields and lower CRS values. The trend toward lower CRS values continued at the 9.2 T/A compost rate. The lower cane yields with the 9.2 T/A compost rate could have been caused by excess nitrogen since applying more than 15 lb N/A under cane at planting has been shown to reduce cane yields.

Table 4 shows the interactive (P<0.25) effect of compost and fertilizer rates on the five measured yield variables, while Table 5 shows the interactive (P<0.25) effect of N x harvest year on CRS, cane yield, and sugar yield.

Table 1. F-values and statistical parameters for effect of nitrogen fertilizer, compost, and harvest years on sugarcane yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield
<u>main plots</u>						
Nitrogen (N)	3	2.19$^{\bullet}$	1.15	0.09	5.76*	5.98*
HREP	3	8.10**	0.90	1.42	2.10$^{\bullet}$	0.57
VREP	3	28.54**	0.16	2.67$^{\bullet}$	2.14$^{\bullet}$	5.86*
<u>sub-plots</u>						
Compost (C)	2	3.71*	0.52	1.77$^{\bullet}$	3.17$^{\sim}$	2.48$^{\bullet}$
N x C	6	1.86$^{\bullet}$	1.86$^{\bullet}$	1.85$^{\bullet}$	1.47$^{\bullet}$	1.95$^{\bullet}$
<u>sub-sub-plots</u>						
Year (Y)	1	107.33**	380.41**	393.46**	29.65**	18.75**
N x Y	3	1.21	0.59	1.79$^{\bullet}$	1.57$^{\bullet}$	2.06$^{\bullet}$
C x Y	2	0.44	0.72	1.12	0.74	0.79
N x C x Y	6	0.43	0.66	0.98	0.56	0.76
RMSE for main plots		0.1115	6611	15.63	4.423	883.0
% CV for main plots		6.25	13.22	7.56	10.15	9.84
RMSE for sub-plots		0.1584	4407	10.09	4.155	1058
% CV for sub-plots		8.88	8.81	4.88	9.53	11.80
RMSE for sub-sub-plots		0.2156	4443	10.33	3.881	993.1
% CV for sub-sub-plots		12.09	8.88	4.99	8.90	11.07
Mean		1.784	50,010	206.8	43.59	8973

$^{\bullet}$, $^{\sim}$, *, and ** denotes statistical significance at the P#0.25, 0.10, 0.05, and 0.01 levels, respectively.

Table 2. Effect of nitrogen fertilizer rates on sugarcane yield variables averaged across compost rates and harvest years.

N-rates	Stalk weight	Plant population	CRS	Cane yield	Sugar yield
lb N/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.76	48.0	208	40.5	8400
50	1.83	50.2	209	45.5	9450
100	1.79	49.6	206	43.8	8990
150	1.76	52.5	205	44.6	9060
LSD 0.10	NS	NS	NS	2.5	500
LSD 0.25	0.04	NS	NS	1.7	330

NS denotes statistical non significance at the indicated P level.

Table 3. Effect of compost application rates on sugarcane yield variables averaged across nitrogen rates and harvest years.

Compost rates	Stalk weight	Plant population	CRS	Cane yield	Sugar yield
T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	1.78	50.2	210	42.8	8920
4.6	1.85	50.2	207	45.1	9300
9.2	1.72	49.7	203	42.8	8700
LSD 0.10	0.07	NS	NS	1.8	NS
LSD 0.25	0.05	NS	3	1.2	320

Table 4. Effect of nitrogen and compost rates on sugarcane yield variables averaged across harvest years.

N-rates	Compost rates	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
lb N/A	T/A	lb/stalk	1000/A	lb/T	T/A	lb/A
0	0	1.77	49.9	211	42.0	8840
0	4.6	1.71	49.4	207	42.0	8680
0	9.2	1.79	44.6	205	37.6	7680
50	0	1.84	48.1	208	43.9	9060
50	4.6	1.86	51.6	213	47.0	9920
50	9.2	1.81	50.9	206	45.6	9360
100	0	1.76	50.2	215	43.1	9210
100	4.6	1.93	47.8	201	43.7	8740
100	9.2	1.65	50.9	201	44.5	9020
150	0	1.75	52.4	204	42.4	8550
150	4.6	1.89	52.0	208	48.1	9930
150	9.2	1.63	52.9	202	43.8	8780
LSD 0.10 for N within compost		NS	NS	NS	NS	NS
LSD 0.25 “ ” “ ”		0.07	4.3	10	2.9	570
LSD 0.10 for compost within N		NS	NS	NS	NS	NS
LSD 0.25 “ ” “ ”		0.10	2.6	6	2.5	640

Table 5. Effect of nitrogen rates and harvest years on sugarcane yield variables averaged across compost rates.

N-rates	Harvest year	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
lb N/A		lb/stalk	1000/A	lb/T	T/A	lb/A
0	1999	2.02	39.4	233	39.6	9230
0	2000	1.49	56.5	182	41.4	7570
50	1999	2.12	40.8	231	43.1	9930
50	2000	1.55	59.6	187	47.9	8960
100	1999	2.03	40.9	228	41.5	9440
100	2000	1.56	57.5	186	45.9	8570
150	1999	1.95	41.5	224	40.3	9020
150	2000	1.60	61.6	188	48.2	9100
LSD 0.10 for N within year		NA	NA	NS	NS	NS
LSD 0.25 " " " "		NA	NA	7	2.3	470
LSD 0.10 for year within N		NA	NA	NS	NS	NS
LSD 0.25 " " " "		NA	NA	5	1.9	480

NA denotes that the LSD is not applicable because the N x Y interaction was not significant at the designated P level for the indicated variable.

EFFECT OF CARPRAMID ON FERTILIZER USE EFFICIENCY AND[1] PLANTCANE YIELDS ON HEAVY- AND LIGHT-TEXTURED SOILS

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SUMMARY

Adding 1, 2, and 3 quarts/A of Carpramid to liquid fertilizer did not significantly (P>0.10) increase plantcane sugar yields for sugarcane variety LCP 85-384 grown on a heavy- or light-textured soil. However, applying liquid fertilizer (120, 40, 80, and 10 lb/A of N, P_2O_5, K_2O, and S, respectively) also did not increase plantcane sugar yields over where fertilizer was not added. This demonstrates that fertilizer did not limit plantcane yields on either soil type. Consequently, it was not a good year to test the effect of Carpramid on fertilizer use efficiency. A better test of Carpramid should occur this coming year with first stubble cane where fertilizer is usually deficient.

INTRODUCTION

University trials have demonstrated that fluid fertilizers in combination with a biodegradable polymer (carpramid) affect growth and production of corn, wheat, and cotton. This increase in production is thought to be related to increased nutrient uptake efficiency, which has been associated with increased root branching and root hair development.

To date, carpramid has not been tested in controlled studies in Louisiana with sugarcane. Consequently, our objective is to: determine the effect of carpramid application rates on fertilizer use efficiency and sugarcane yields.

MATERIALS AND METHODS

In May of 2000 the fertilizer plus Carpramid rates in Table 2 (for a Baldwin silty clay soil) and Table 4 (for a Jeanerette silt loam soil) were added at each experimental site (Olivier and Parks, respectively). The Carpramid was added to the liquid fertilizer (120, 40, 80, and 10 lb/A of N, P_2O_5, K_2O, and S, respectively) immediately before being applied to the insides of each row in the experimental plot.

The experiment used a Latin square experimental design with seven replications. Plots consisted of three 6-foot by 30-foot rows, with 10-foot alleys at the ends of the plots.

The studies were grown to maturity using standard cultural practices. Plant populations were made at Olivier on the heavy-textured soil in September. However, because of extreme lodging, plant populations were not taken at Parks on the light-textured soil.

[1]Research was partially supported by a grant from the Donlar Corporation.

The test at Olivier was harvested in mid November, and the one at Parks was harvested in early January. Experimental plots at both sites were harvested with a two-row soldier harvester and weighed with a weigh rig. Ten-stalk samples were taken from each plot at both experimental sites for determination of commercially recoverable sugar and average stalk weight.

RESULTS AND DISCUSSION

Tables 1 and 3 show that the experimental treatments did not significantly affect the plantcane yield variables at either test site in 2000. There was, however, a trend ($P<0.25$) toward significance for the effect of treatments on CRS and stalk weights at the Parks site for the Jeanerette silt loam soil (Table 3). The % coefficient of variations for the yield variables at both sites were very low (Tables 1 and 3), indicating that the experimental design did a good job of removing variability from the studies.

Results from Tables 2 and 4 show the yield data from the two test sites. The extreme drought experienced in the summer of 2000 most likely reduced cane and sugar yield at both test sites. Since liquid fertilizer rates (0, 0.5x, and 1.0x) did not affect ($P>0.25$) cane or sugar yields in 2000, it was not a good year to test the effect of Carpramid on fertilizer use efficiency. A more valid test of this product should occur with first stubble cane in the 2001 crop year.

Table 1. F-values and statistical parameters for effect of treatments on LCP 85-384 plantcane yield variables on a heavy-textured soil.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
Treatments	6	0.32	0.79	0.76	0.55	0.26
HREP	6	0.64	0.63	2.86*	5.13***	3.56**
VREP	6	2.73*	1.18	5.64***	12.98****	6.65****
RMSE		0.1887	3585	8.003	1.854	442.1
%CV		10.83	8.155	3.54	6.17	6.521
Mean		1.742	43,960	226.2	30.05	6780

*, **, ***, and **** denote statistical significance at the P#0.05, 0.01, 0.001, and 0.0001 levels, respectively.

Table 2. Effect of treatments on plantcane yield variables for a heavy-textured soil.

T#'s	Liq.[%] fert.	Liq.[P] Carp.	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield
		Qt/A	lb/stalk	1000/A	lb/T	T/A	lb/A
1	0	0	1.82	41.8	230	29.1	6670
2	0.5x	0	1.69	44.4	222	30.6	6780
3	1.0x	0	1.74	44.4	226	30.1	6800
4	0.5x	1	1.73	43.4	229	30.3	6910
5	0.5x	2	1.72	44.8	227	29.7	6740
6	0.5x	3	1.76	45.5	224	30.0	6700
7	1.0x	2	1.73	43.5	227	30.5	6860
LSD 0.10			NS	NS	NS	NS	NS
LSD 0.25			NS	NS	NS	NS	NS

[%] The 1.0x fertilizer rate was 120, 40, 80 and 10 lb/A, respectively, for N, P_2O_5, K_2O, and S.
[3] The liquid carpramid rates were added to the liquid fertilizer immediately before being applied to the soil.

Table 3. F-values and statistical parameters for effect of treatments on LCP 85-384 plantcane yield variables on a light-textured soil.

Source	df	Stalk weight	CRS	Cane yield	Sugar yield
Treatments	6	1.90•	1.73•	0.65	1.24
HREP	6	4.50**	2.94*	2.87*	1.21
VREP	6	2.96*	0.58	3.87**	3.11
RMSE		0.1453	5.066	1.465	379.9
%CV		7.40	2.30	4.14	4.87
Mean		1.963	220	35.4	7800

•, *, and ** denote statistical significance at the P#0.25, 0.05, and 0.01 levels, respectively.

Table 4. Effect of treatments on plantcane yield variables for a light-textured soil.

T#'s	Liq.[%] fert.	Liq.[P] Carp.	Stalk weight	CRS	Cane yield	Sugar yield
		Qt/A	lb/stalk	lb/T	T/A	lb/A
1	0	0	1.95	219	35.8	7840
2	0.5x	0	1.97	221	34.8	7700
3	1.0x	0	1.87	219	35.5	7760
4	0.5x	1	2.02	222	35.5	7890
5	0.5x	2	1.91	216	35.0	7560
6	0.5x	3	2.10	224	36.1	8070
7	1.0x	2	1.92	221	35.3	7800
LSD 0.10			NS	NS	NS	NS
LSD 0.25			0.09	3	NS	NS

[%] The 1.0x fertilizer rate was 120, 40, 80, and 10 lb/A, respectively, for N, P_2O_5, K_2O, and S.
[3] The liquid carpramid rates were added to the liquid fertilizer immediately before being applied to the soil.

EFFECT OF UREA NITROGEN RATES[1], A NITROGEN STABILIZATION PACKAGE, AND WINTER VS. SPRING NITROGEN FERTILIZATION ON SUGARCANE YIELDS

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SUMMARY

Highest sugar yields across two harvest years (plant and first stubble cane) were obtained at 140 lb N/A using sugarcane variety LCP 85-384. Increasing nitrogen rates from 140 to 180 lb N/A reduced ($P<0.10$) average sugar yields across the two years by 780 lb/A. Results also showed that applying N-stabilized urea in a narrow 0.75-inch band to sugarcane furrows in the winter resulted in a trend ($P<0.25$) toward higher sugar yields and reduced soil moisture compared to where liquid urea was applied in the spring.

INTRODUCTION

Research conducted at the Iberia Research Station shows that adding liquid calcium chloride (plus a urease inhibitor, supplied by Stoller Enterprises, Inc.) to liquid urea in a spring nitrogen fertilization program increased (P#0.10) sugar yields by 2630 lb/A (11.6%) and reduced nitrogen fertilizer requirements (by 60 lb N/A each year) across a four-year study.

Because of market conditions, urea can be purchased 10-15% cheaper in the fall and winter than in the spring and summer. If inorganic nitrogen fertilizer could be stabilized to prevent urea volatilization, denitrification, and the leaching of nitrate, urea could be applied to sugarcane in the fall and winter when the cost of nitrogen is lower. Applying a nitrogen stabilization package (calcium chloride, and a urease and nitrification inhibitor) to liquid urea should reduce nitrogen losses from the above causes. Also, applying the liquid urea and nitrogen stabilization package in the furrow between the sugarcane rows in the fall or winter may help improve soil drainage through the effect of calcium and ammonium (derived from the applied urea) in improving the permeability of the soil to water movement.

OBJECTIVE

1) To determine the effect of spring and winter nitrogen fertilizer rates and a spring- vs. winter-applied nitrogen stabilization package (calcium chloride plus a urease and nitrification inhibitor) on soil water drainage and sugarcane yields.

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[1] Research was partially supported by Stoller Enterprises, Inc.

MATERIALS AND METHODS

Kleentek variety LCP 85-384 sugarcane was planted in late September 1998 at three stalks and a lap of two joints. All treatments in the study were replicated four times in a Latin square, split-plot design. Nitrogen (liquid urea) fertilizer rates were main plots, and winter vs. spring nitrogen application and the check vs. nitrogen stabilization package (calcium chloride plus a urease and nitrification inhibitor) were the split plots. Winter nitrogen was applied in December 1998 and January 2000 in a 0.75-inch band to the two furrows between the three sugarcane rows in each plot. Spring nitrogen was applied in April of 1998 and 1999 to the inside of three 6-foot by 30-foot rows, with a 10-foot alley between plots. Soil samples were taken down to 6 inches perpendicular to the sides of the sugarcane rows on July 14 and September 1 of 2000 and used to determine soil moisture.

The test was grown to maturity each year using standard cultural practices. Plant populations and cane lodging were determined prior to harvest. The study was harvested with a two-row soldier harvester, and each plot was weighed with a weigh rig. Ten stalks were randomly taken from each plot to determine average stalk weights and commercially recoverable sugar (CRS).

RESULTS AND DISCUSSION

Table 1 shows that nitrogen fertilizer rates had a significant ($P<0.10$) effect on cane and sugar yields. The winter-spring-Ca treatments did not significantly affect any of the variables measured, though there was a trend ($P<0.25$) toward significance for sugar yield and lodging.

Table 2 shows that the highest sugar yield was obtained at 140 lb N/A, which was significantly higher than at 60 or 180 lb N/A.

Table 3 shows that the winter-spring-N stabilization package treatments did not significantly ($P>0.10$) affect sugar yields. However, there was a trend ($P<0.25$) toward significantly higher sugar yields where the N-stabilization package was used with winter-applied nitrogen and where N-stabilized urea was added in the winter vs. the spring. This trend toward higher sugar yields could be an indication that the N-stabilized urea applied in the winter may have been increasing yields through improved soil water drainage.

Table 4 shows that stalk weights, CRS, lodging and sugar yields were larger in 1999, while cane tonnage and plant populations were higher in 2000.

Table 5 shows that nitrogen rates and winter-spring-N stabilization treatments did not significantly ($P>0.10$) affect soil moisture measurements in 2000. There was, however, a trend ($P<0.25$) toward significance with the WS Ca treatments. This is reflected in Table 6 where the nitrogen applied to the row furrows in the winter had lower ($P<0.25$) soil moisture levels than where nitrogen was applied in the off-bar in the spring. This trend toward decreased soil water may be a reflection of the ability of the winter-applied nitrogen (in a narrow 0.75 band) to reduce excess water (during the winter), that may have been responsible for the trend toward higher sugar yields for the winter plus N-stabilized urea treatment (Table

3).

Table 1. Effect of nitrogen fertilizer, fertilizer timing and a nitrogen stabilization package, and harvest year on F-values and statistical parameters for variety LCP 85-384 yield variables.

Source	df	Stalk weight	Plant pop.	CRS	Cane yield	Sugar Yield	Lodging
main plots							
Nitrogen (N)	3	0.91	1.27	0.46	14.00**	13.02**	2.35•
HREP	3	0.38	1.65	2.01•	4.78*	3.88~	1.30
VREP	3	3.11•	0.48	46.52**	65.96**	27.87**	5.30*
sub-plots							
winter-spring-Ca(WSCa)	3	0.04	0.27	0.48	1.16	1.67•	1.75•
N x WSCa	9	1.06	0.32	0.24	1.25	0.90	1.64•
sub-sub-plots							
Year (Y)	1	118.25**	24.01**	796.38**	55.99**	67.69**	708.51**
N x Y	3	0.84	5.39**	0.05	2.75~	1.25	0.31
WSCa x Y	3	0.42	0.35	0.39	0.03	0.10	0.60
N x WSCa x Y	9	0.61	0.81	0.36	2.17*	1.21	0.97
RMSE for main plots		0.3066	6,093	6.544	2.373	544.4	0.4895
% CV for main plots		16.26	10.37	3.16	5.38	6.02	15.21
RMSE for sub-plots		0.1771	4,422	12.39	4.897	1055	0.5667
% CV for main plots		9.39	7.52	5.97	11.11	11.67	17.60
RMSE for sub-sub-plots		0.1979	3,898	12.55	4.030	1124	0.6575
% CV for sub-sub-plots		10.49	6.63	6.05	9.14	12.43	20.43

Mean	1.886	58,770	207.4	44.09	9,041	3.219

•, ~, *, and ** denote significance at the P<0.25, 0.10, 0.05, and 0.01 levels, respectively.

Table 2 . Effect of nitrogen fertilizer rates on LCP 85-384 yield variables across harvest years and spring-winter treatments.

Nitrogen	Stalk weight	Plant population	CRS	Cane yield	Sugar yield	Lodging[%]
lb N/A	lb/stalk	1000/A	lb/T	T/A	lb/A	
60	1.81	55.1	207	43.3	8,900	3.16
100	1.91	60.2	207	45.4	9,240	3.06
140	1.93	59.8	209	45.5	9,410	3.34
180	1.89	59.9	207	42.2	8,630	3.31
LSD 0.10	NS	NS	NS	1.2	270	NS
LSD 0.25	NS	NS	NS	0.8	170	0.16

[%]Lodging was rated on a 1-5 scale, where 1 had all plants erect and 5 had all plants lodged.

Table 3. Effect of spring vs. winter fertilization and a nitrogen stabilization package on LCP 85-384 yield variables across nitrogen rates and harvest years.

Time of N App	N Stab. Package	Stalk weight	Plant pop.	CRS	Cane yield	Sugar yield	Lodging
		lb/stalk	1000/A	lb/T	T/A	lb/A	
Winter (W)	No	1.89	58.2	206	43.1	8,790	3.31
W	Yes	1.88	58.8	210	45.3	9,380	3.03
Spring (S)	No	1.89	58.2	207	44.0	8,970	3.22
S	Yes	1.88	59.9	207	44.0	9,010	3.31
LSD 0.10		NS	NS	NS	NS	NS	NS
LSD 0.25		NS	NS	NS	NS	310	0.17

Table 4. Effect of harvest year on sugarcane yield variables averaged across N fertilizer rates and fertilizer timing, and a nitrogen stabilization package.

Harvest year	Stalk weight	Plant population	CRS	Cane yield	Sugar yield	Lodging
	lb/stalk	1000/A	lb/T	T/A	lb/A	
1999	2.08	55.3	239	41.4	9880	4.77
2000	1.70	60.5	176	46.8	8220	1.67
LSD 0.10	0.06	1.5	4	1.2	330	0.19
LSD 0.25	0.04	1.0	3	0.8	230	0.14

Table 5. F-values and statistical parameters for effect of treatments and time of sampling on soil moisture for first stubble cane.

Source	df	Soil Moisture
main plots		
Nitrogen (N)	3	0.48•
HREP	3	1.78•
VREP	3	1.29
sub-plots		
WSCa	3	1.42•
N x WSCa	9	0.86
sub-sub plots		
Date (D)	1	86.95****
N x T	3	0.88
WSCA x T	3	0.57
N x WSCA x T	9	1.14
RMSE for main plots		3.086
%CV " " "		19.08
RMSE for sub-plots		2.398
%CV " " "		14.83
RMSE for sub-sub-plots		2.414
%CV " " "		14.93
Mean		16.17

•, and **** denote statistical significance at the P#0.25, and 0.0001 levels, respectively.

Table 6. Effect of fertilizer treatments and sampling time on soil-row moisture averaged across nitrogen fertilizer treatments for sugarcane variety LCP 85-384 first stubble.

Time of N App	Calcium~ chloride	Soil moisture at sampling time		
		7/14	9/1	Mean
		---------------------%-----------------		
Winter (W)	No	18.1	13.5	15.8
W	Yes	18.0	13.6	15.8
Spring (S)	No	18.4	15.3	16.8
S	Yes	18.2	14.4	16.3
LSD 0.10 for effect of treatments within dates				NS
LSD 0.25 " " " " " "				0.7
Mean		18.2	14.2	

~The nitrogen stabilization package contained calcium chloride and a urease and nitrification inhibitor.

THE EFFECT OF NITROGEN RATES ON LCP 85-384[1]

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SUMMARY

One field experiment was conducted in 2000 at Rebecca Plantation, Schriever, La. to test the effects of three rates of nitrogen fertilization (single dose rates of 140 and180 lbs and a split application of 140 + 40 lbs N/A as 32% liquid N), on yields of tons cane per acre (TC/A), estimated theoretical recoverable sugar per ton cane (TRS/TC), and estimated theoretical recoverable sugar per acre (TRS/A) for the sugarcane variety LCP 85-384 in the third-stubble crop. There were no differences in yields of TC/A, TRS/TC, or TRS/A for any of the three treatments. In this experiment, maximum sugarcane yields were obtained with 140 lbs N/A. There was apparently no advantage to increasing the amount of N/A to 180 lbs, either as a single dose or as a split application of 140 and 40 lbs.

INTRODUCTION

Nitrogen is used in fairly large amounts by sugarcane. Nitrogen is supplied to the plant by fertilizers, residual nitrogen in the soil, decomposition of organic matter, and atmospheric sources of nitrogen. Nitrogen rates in sugarcane are based on soil type [whether the soil is light (sandy) or heavy (clayey)], stand age (plant cane vs. stubble cane), and whether the cane stand is strong (high population) or weak (low population). For light-textured soils, the current recommended rates for stubble cane range from 120-140 lbs N/A for strong stands to 100-120 lbs N/A for weak stands. For heavy textured soils, the rate is 140-160 lbs N/A for strong stands to 120-140 lbs N/A for weak stands.

The recommended time for nitrogen application is April 1-30, but nitrogen applications made in May generally yield almost as well as those made in April. Nitrogen applied earlier than April 1 can be lost because of leaching and de-nitrification and can stimulate early weed growth.

Split application of nitrogen may be beneficial under certain situations. These include high tonnage cane free of weeds and with weather conditions which lead to nitrogen loss, such as excessive rainfall. If nitrogen is to be split, apply two-thirds of the recommended rate in early April and the remainder at lay-by (middle of May to first of June).

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In recent years, it has been speculated that the sugarcane variety LCP 85-384 tends to respond to nitrogen at the lower end of the recommended rate in both the plantcane and the first stubble crops, whereas it tends to respond to nitrogen at the upper end of the recommended rate for older stubble crops. However, little or no data are available on the effect of timing or split application of nitrogen on the yield of TC/A, TRS/TC, or TRS/A for LCP 85-384.

OBJECTIVES

1) To determine the effect of nitrogen fertilizer rates on sugarcane yields on a light- textured soil.

2) To determine the effect of split application of nitrogen fertilizer on sugarcane yields.

PROCEDURES

The experiment consisted of three nitrogen treatments (single dose rates of 140 and180 lbs N/A and a split application of 140 + 40 lbs N/A) replicated four times on a Commerce silty loam in a randomized complete block design. Experimental plots consisted of six rows (36 feet wide by approximately 750 feet long). (The length of each row was measured at harvest for accuracy in determining cane yield). The field chosen for the experiment was planted in 1996 with disease-free progeny of the sugarcane variety LCP 85-384. A blanket application of phosphorus and potassium was applied in the spring according to soil test. The nitrogen (32% liquid) for the single dose treatments and the initial dose of the split application was knifed in by ground rig on April 11, 2000. The second nitrogen application (32% liquid) for the split application was dribbled to either side of the cane drill by a high boy on May 16, 2000.

Cane was grown to maturity using standard cultural practices. The experiment was harvested on December 14, 2000, using a cane combine and a weigh wagon using hydraulic load cells. The fan speed of the combine was set at 1,000 rpm and its forward speed was approximately 3 mph. Yield of cane per acre (tons/acre) for each plot was estimated by harvesting and weighing all the cane on the 3rd and 5th row of each plot. Tons/acre for each row was calculated by multiplying the harvested weight by the area harvested adjusted to an acre basis. The two data sub-sets were then averaged to obtain the ton/acre for each plot. Two, 15 whole-stalk sub-samples were removed from each of the harvested rows. The yield of theoretical recoverable sugar per ton cane (TRS/TC) for each sub-sample was derived using the core/press method of analyses. The analyses for the two sub-samples were then averaged to determine the TRS/TC for each plot. The yield of estimated theoretical recoverable sugar per acre (TRS/A) for each plot was the product of TC/A and TRS/TC. Analysis of variance was performed for each yield component.

RESULTS AND DISCUSSION

Table 1 shows the effects of nitrogen fertilizer rates and split application of nitrogen on yields of TC/A, TRS/TC, and TRS/A. There were no differences in yields amongst treatments for any of the yield components measured. There was apparently no benefit from increasing nitrogen fertilizer rates above the 140 lb N/A, which is currently recommended for a strong stand on a light textured soil for all varieties. Apparently, the recommended fertilizer rate for LCP 85-384 also falls within these parameters. However, since there was no fertilizer rate lower than the 140 lbs N/A, it is not known whether the yields obtained in this experiment can be maintained at nitrogen rates lower than 140 lbs N/A for LCP 85-384.

Further, there was no obvious benefit from splitting the nitrogen application for LCP 85-384 although there was a trend toward higher yield of TC/A with the split application of 180 lbs N/A when compared to the single dose rate of 140 lbs N/A. However, weather conditions in 2000 were very dry, which might have negated any significant benefit from the split application.

REFERENCES

Funderburg, E.R. and W.F. Faw. 1995. Sugarcane Fertilization. Publication 2473. LSU AgCenter, LCES, Baton Rouge, LA

Table 1. Effect of nitrogen fertilizer rates and split application of nitrogen on yields of cane per acre (TC/A), estimated theoretical recoverable sugar per ton cane (TRS/TC), and estimated theoretical recoverable sugar per acre (TRS/A)[1].

Fertilizer Rate (lbs/A)	TC/A (tons)	TRS/TC (lbs)	TRS/A (lbs)
140	34.1	227	7,741
180	35.4	221	7,823
140+40 (Split)	35.7	228	8,140
LSD (.05)	NS	NS	NS

[1] Sugarcane variety, LCP 85-384; N applied as 32% liquid on April 11 (single dose rates and first application of split) and May 16 (second application of split), 2000; harvested, Dec.14, 2000.