SOIL FERTILITY RESEARCH IN SUGARCANE IN 2007

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Summary

Two experiments were conducted in 2007 to test the effect of different N rates on the yield and yield components of current sugarcane varieties. Spring application of N at rates of 0, 40, 80 and 120 lbs N ac^{-1} to LCP85-384, HoCP96-540 and L99-226 had no effect on plantcane yield. However, 40 and 80 lbs N ac^{-1} resulted in significantly higher sugar yield when compared with 120 lbs N ac^{-1} application rate. Stubble cane yield of LCP85-384, Ho95-988, and L97-128 showed response to spring N fertilization. Linear-plateau models estimated N rates that ranged from 42 to 80 lbs N ac^{-1} for optimum cane and sugar yield of these varieties. Two trials were also conducted to determine the effect of fertilizer adjuvant. Applications of Trimat, PGR and foliar NPK in addition with normal fertilization did not result in significant increases in the first-stubble cane and sugar yield of Ho95-988 and L97-128. Similarly, application of Helena Chemical products on top on standard practices did not result in significant increases in second-stubble cane and sugar yield of L97-128.

Objectives

This research was designed to provide information on soil fertility in an effort to help cane growers produce maximum economic yields and 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

<u>Rates of spring applied N fertilizer</u>

An experiment was conducted to determine the effect of spring applied N fertilizer on the yield and yield components of plant-cane of three cane varieties on a Commerce silt loam. The varieties tested were LCP85-384, HoCP96-540 and L99-226. Nitrogen fertilizer applied in spring consisted of 0, 40, 80 and 120 lbs N ac^{-1}. The results reported in Table 1 show there were significant differences in cane and sugar yield across varieties. Sugarcane variety HoCP96-540 obtained the highest cane (43.3 tons ac^{-1}) and sugar (9832 lbs ac-^{1}) yield. On the other hand, N rate had no effect on cane yield. Plots that received 40 and 80 lbs N ac^{-1} rates have numerically higher sucrose, 16.5 and 16.6% respectively, and have significantly higher sugar yield when compared with sugarcane plots that received 120 lbs N ac^{-1}. The variety by N rate interaction effect on yield and yield components was not significant.

An experiment was continued to determine the effect of spring applied N fertilizer on the yield of second-stubble in three cane varieties on a Commerce silt loam soil. The varieties tested were LCP85-384, Ho95-988, and L97-128. Spring N rates consisting of 0, 40, 80, and 120 lbs N ac^{-1} were applied in the off-bar furrow each year. The results are reported in Table 2. The variety x N rate interaction effect on cane and sugar yield was significant ($P<0.05$). Cane yields were the same with 80 and 120 lbs N ac^{-1} application rates for Ho 95-988. With application rates from 40 to 120 lbs N ac^{-1}, LCP85-384 cane yields were statistically the same. L97-128 cane yield linearly increased with increasing N rate. There were no differences in sugar yields of Ho95-988 and LCP85-384 with N application rates from 40 to 120 lbs N ac^{-1} while L97-128 obtained the highest sugar yield with 120 lb N ac^{-1} application rate. Using non-linear regression analysis (PROC NONLIN) in SAS procedure, spring applied-N fertilizer rates for maximum cane and sugar yield were estimated. The linear-plateau model ($P<0.05$) recommended that the optimum fertilizer application rates were 42, 78 and 80 lbs N ac^{-1} to attain maximum cane yields of LCP85-384, L97-128 and Ho95-988, respectively. For optimal sugar yield, N application rates of 56, 74 and 76 lbs ac^{-1} were recommended by the linear-plateau model ($P<0.05$) for LCP85-385, Ho95-988, and L97-128, respectively.

Fertilizer Adjuvant:

An experiment was continued to test Amino Grow products Trimat, PGR, and foliar NPK on the first stubble yield of two varieties on a Cancienne silty clay loam soil. The varieties tested were Ho95-988 and L97-128. The fall treatments consisted of control (no application), Trimat (1 quart ac^{-1}), and Trimat with PGR (1 pint ac^{-1}) while the spring treatments consisted of control, Trimat, and PGR with foliar NPK (2 quarts ac^{-1}). The fall treatments were applied once at planting (September 2005). The spring Trimat was applied with normal spring N fertilizer in April 2007. The PGR and foliar NPK was applied to the leaves in April and June of 2007. There was no variety x treatment interaction effect on measured variables. Table 3 shows the variety and adjuvant effects on yield and yield components of two cane varieties. First stubble yield of sugarcane showed no response to fertilizer adjuvant applications.

An experiment was continued with Helena Chemical products on the second stubble yield of L97-128. Benefit of standard fertility practices was not increased with foliar application of these fertilizer adjuvants. Results presented in Table 4 show that there were no differences in cane and sugar yields of standard fertility practices from the plots that received foliar treatments.

ACKNOWLEDGEMENTS

The authors wish to express appreciation for the financial support of the American Sugar Cane League, Helena Chemical Company, and Aminogrow Corporation.

Table 1. Effect of spring nitrogen rates on the plantcane yield and yield components of three cane varieties on a Commerce silt loam, Sugar Research Station, 2007.

Treatment		Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
		ton ac^{-1}	1000 ac^{-1}	lb	%	lb ac^{-1}
Variety	HoCP96-540	43	38	2.45	16	9835
	L99-226	39	31	2.94	17	9426
	LCP85-384	33	39	2.09	16	7542
	Pr>F	*********	*********	*********	*********	*********
	SED	***0.79***	***0.77***	***0.065***	***0.17***	***182***
N Rate, lb ac^{-1}	0	39	36	2.58	16.2	8982
	40	38	37	2.38	16.5	9050
	80	39	36	2.48	16.6	9173
	120	38	36	2.53	16.0	8529
	Pr>F	***NS***	***NS***	***NS***	***NS***	*******
	SED	***0.84***	***0.86***	***0.075***	***0.19***	***196***

The nitrogen fertilizer was applied in the off-bar furrow in the spring of each year.
NS – not significant, *** and * significant at 0.0001 and 0.05 level of confidence, respectively.
SED – Standard error of the difference between two equally replicated means.

Table 2. Effect of spring nitrogen rates on the second stubble yield of three cane varieties on a Commerce silt loam, Sugar Research Station, 2007.

Variety	Nitrogen Rate	Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
	lb ac^{-1}	ton ac^{-1}	1000 ac^{-1}	lb	%	lb ac^{-1}
Ho95-988	0	28	28	2.23	16.0	6366
	40	31	30	2.17	16.5	7222
	80	34	31	2.36	15.8	7803
	120	34	31	2.16	16.8	8112
	Pr>F	***	***NS***	***NS***	***NS***	***
	SED	***0.42***	***1.04***	***0.11***	***0.33***	***131***
L97-128	0	22	25	1.97	16.0	5025
	40	28	31	2.01	16.1	6359
	80	30	29	2.31	15.7	6754
	120	36	32	2.28	16.3	8363
	Pr>F	***	**	*	***NS***	***
	SED	***0.68***	***0.83***	***0.08***	***0.26***	***170***
LCP85-384	0	25	32	1.73	15.0	5265
	40	31	40	1.59	14.9	6609
	80	32	36	1.82	15.8	7108
	120	31	36	1.85	16.1	7169
	Pr>F	*	**	***NS***	*	*
	SED	***1.04***	***0.75***	***0.12***	***0.22***	***246***

The nitrogen fertilizer was applied in the off-bar furrow in the spring of each year.
The variety x N rate interaction effect on measured variables was significant.
NS – not significant; ***, **, and * significant at 0.0001, 0.001, and 0.05 level of confidence, respectively.
SED – Standard error of the difference between two equally replicated means.

Table 3. Effect of fertilizer adjuvant on the first stubble yield of two cane varieties on a Cancienne silty clay loam, Sugar Research Station, 2007.

Treatment		Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
		ton ac^{-1}	1000 ac^{-1}	lb	%	lb ac^{-1}
Variety	L97-128	29	28	2.29	15.1	6107
	Ho95-988	34	34	2.19	15.0	7223
	Pr>F	*********	*********	***NS***	***NS***	*********
	LSD (0.05)	***1.4***	***1.9***	***-***	***-***	***376***
Trt No.‡	Fall TRT - Spring TRT					
1	Control - Control	32	31	2.24	15.2	6757
2	T & PGR - T, PGR & F	32	32	2.10	15.0	6698
3	T - T, PGR & F	32	30	2.32	15.0	6633
4	T - Control	31	31	2.30	15.0	6572
	Pr>F	***NS***	***NS***	***NS***	***NS***	***NS***

T – Trimat
PGR – Growth Regulator
F – Foliar NPK
NS – not significant; *** significant at 0.0001 level of confidence.
SED – standard error of the difference between two equally replicated means.
‡ Mean separation procedure using LSD was not conducted because of the absence of treatment effect on measured variables.

Table 4. Effect of Helena Chemical products on the second stubble yield of variety L97-128 on a Commerce soil, Sugar Research Station, 2007.

Helena Product	Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
	ton ac^{-1}	1000 ac^{-1}	lb	%	lb ac^{-1}
Control	32.2	33.1	2.07	14.2	6214
Asset†	29.6	31.0	2.24	13.4	5398
Hydrahume†	32.3	33.1	2.04	13.8	6082
Asset + Hydrahume†	30.0	32.6	2.10	13.7	5540
HM9310§	33.0	33.1	2.16	13.8	6187
HM9827§	32.0	33.3	2.08	13.9	6052
HM0523§	33.0	33.5	2.08	14.7	6699
Asset + Hydrahume + HM0523	31.2	34.8	1.97	14.0	6012
Pr>F	**NS**	**NS**	**NS**	**NS**	**NS**

All plots received 80-0-80 ($N\text{-}P_2O_5\text{-}K_2O$) in spring. Nitrogen was applied as UAN.
†Applied in April at a rate of 8 oz ac^{-1} for Asset and 1 gallon/20 gpa.
§ Foliar application at layby in May and 14 days later at a rate of 1 gallon ac^{-1}.
Note: Mean separation procedure using LSD was not conducted because of the absence of treatment effect on measured variables.

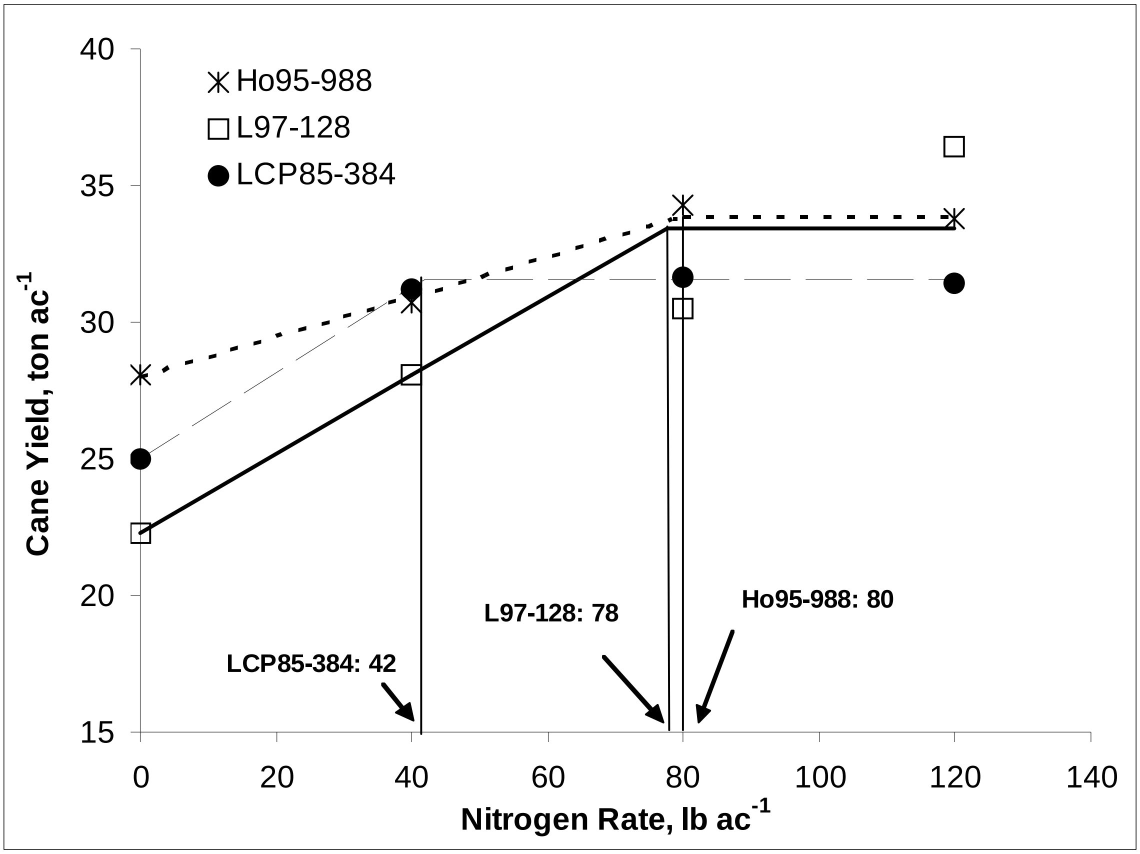

Figure 1. Optimum spring-applied N rates estimated by linear plateau model. The over-all linear plateau models for the three varieties were significant (P<0.05) with the following coefficients of determination (r^2): 0.81, 0.78 and 0.75 for Ho95-988, L97-128 and LCP85-384, respectively. *n* = 4

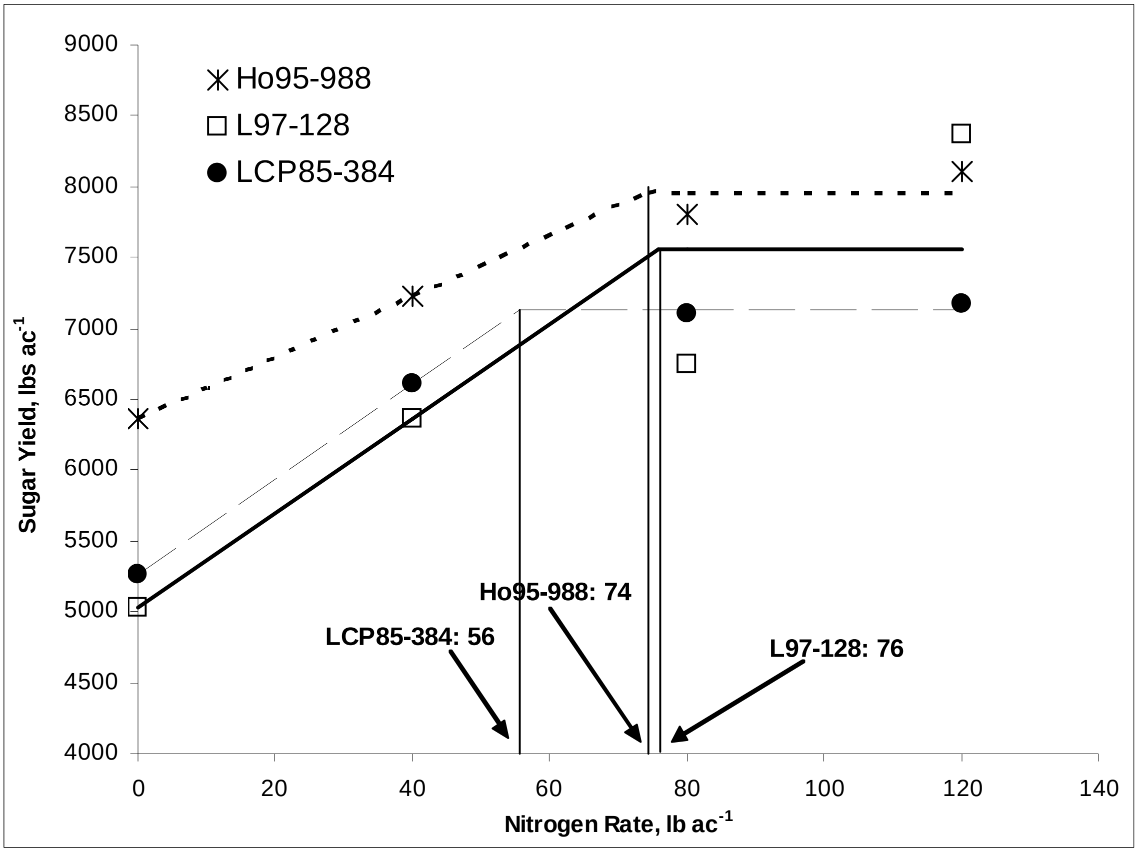

Figure 2. Optimum spring-applied N rates estimated using linear plateau model. The over-all linear plateau models for the three varieties were significant ($P<0.05$) with the following coefficients of determination (r^2): 0.61, 0.71 and 0.80 for Ho95-988, L97-128 and LCP85-384, respectively. $n = 4$

THE EFFECTS OF HELENA CHEMICAL CO. NUTRITIONAL PRODUCTS ON THE CYCLE YIELDS OF LCP 85-384 GROWN ON BALDWIN SILTY CLAY LOAM

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SUMMARY:

Nutritional products marketed by Helena Chemical Co. were evaluated for efficacy on LCP 85-384 for all crops in a cycle. The products were three foliar-applied and two soil-applied plant nutrition compounds. The soil-applied compounds included, a fertilizer additive for increasing root mass (Asset RSXtra) and a blend of organic acids that can be used as a fertilizer additive (Hydra-Hume), while the foliar-applied compounds included two foliar controlled release fertilizer blends (CoRoN formulations) and a foliar potassium source (Kayphol).

All plots received N as UAN 32% in the spring at recommended application rates. The soil-applied compounds were applied in UAN 32% (Asset RSXTra at 8 oz/a and Hydra-Hume at 1:20 gal/a and a combination of Asset RSXTra at 8 oz/a and Hydra-Hume at 1:20 gal/a) and the CoRoN (CoRoN 25-0-0 and CoRoN 10-0-10 0.5% B at 1 gal/a) foliar applications were made at borer application time (mid-July) followed 10-14 days by a second application at the same rates, at which time Kayphol (2 qt/a) was sprayed both alone and in combination with the soil-applied compounds (Asset RSXTra at 8 oz/a, Hydra-Hume at 1:20 gal/a) .

As shown in the table below for treatments averaged over the three crops in the cycle, the application of the foliar-applied, controlled-release N products (CoRoN) produced the highest ($P = .10$) sugar per acre yields, with CoRoN 25-0-0 producing almost a thousand pounds of sugar/a more than the check. Asset RSXTra and Hydra-Hume, either alone or in combination, did not increase yield. Also, the potassium containing material, Kayphol, did not produce yields significantly higher than the control plots which received only UAN 32% at recommend rates.

All treatments produced significantly higher TRS than the check plots, except Asset RSXTra and Hydra-Hume applied alone. Stalk population was indifferent to the application of products, whereas stalk weight (data not shown in the table) appeared to be the component of yield most affected by the nutritional products.

Tissue sampling did not, however, indicate higher leaf nitrogen content (the check plots and the CoRoN plots both average N % of 1.49 for the last crop in the cycle). The Kayphol plots also did not possess elevated potassium levels in leaves compared to the leaves of other treatments (K% for Kayphol and the check averaged 1.71 and 1.78%, respectively).

Table 1. The Effects of Helena Chemical Co. Nutritional Products on Average Cycle Yields of LCP 85-384.

Fertilizer Rate lb/a	Product	Cane yield T/a	Population stalks/a	TRS lb/T	Sugar yield lb/a
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Check	37.8 a	54,800 a	274 b	10,364 b
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Asset RSXtra	36.4 a	49,200 a	276 ab	10,035 b
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Hydra-Hume	37.3 a	52,800 a	277 ab	10,298 b
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Asset + Hydra-Hume	37.8 a	52,300 a	279 a	10,562 ab
PC 120-0-0 1st 120-40-100 2nd 140-0-0	CoRoN 25-0-0	40.3 a	52,000 a	278 a	11,247 a
PC 120-0-0 1st 120-40-100 2nd 140-0-0	CoRoN 10-0-10 0.5%B	38.4 a	48,200 a	279 a	10,743 a
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Kayphol	37.1 a	51,100 a	278 a	10,324 b
PC 120-0-0 1st 120-40-100 2nd 140-0-0	Asset + Hydra-Hume + Kayphol	37.2 a	51,100 a	281 a	10,480 ab

Means within a column followed by the same letter are not significantly different at the P = .10 level

EVALUATION OF MICROBIAL PRODUCTS DESIGNED TO REDUCE SOIL SALINITY

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SUMMARY:

Hurricane Rita deposited significant amounts of sea salt on a considerable acreage of sugarcane in the fall of 2005. Two years later, there is suspicion that a number of fields still contain elevated levels of salinity. One of these fields was chosen to evaluate commercially available products designed to reduce soil salinity. Initial soil salinity readings exceeded the published damage threshold of 1,100 ppm. The two microbial products evaluated were AgBlend® and SoilBuilder® marketed by Advanced Microbial Solutions, who provided financial assistance to conduct the study. An experimental additive was also evaluated in combination with SoilBuilder®. The compounds were sprayed on the shoulders of the sugarcane rows in the spring of the year (May 21, 2007) at the rate of 2 gal/a, with the combination treatment also applied at 2 gal/a for each component. Measurements were taken on stalk population and stalk weight and juice analysis was conducted to calculate theoretical recoverable sugar (TRS). The table below presents data on initial and harvest time soil salinity, TRS and cane and sugar yield per acre.

The products were only marginally effective in lowering soil salinity. In fact harvest time salinity levels were still above the damage threshold for all treatments except the check. It is puzzling because previous results with the products were encouraging. Perhaps the environment necessary for microbial activity to reduce salinity was not favorable, as the application period was relatively dry with little rain falling prior to and subsequent to spraying. Another possible factor is the presence of a high water table, a situation that would sustain high soil salinity with tidal movement.

Effect of Microbial Products on Soil Salinity and the Yield of LCP 85-384.

Treatment	Average initial salinity level in ppm	Average salinity level at harvest in ppm	TRS lb sugar/ton of cane	Cane yield tons/acre	Sugar yield lb/acre
Check	1577	804	186	40.0	7463
AgBlend®	1977	1408	188	37.8	7125
SoilBuilder®	1442	1219	189	44.9	8512
SoilBuilder® + Additive	1539	1419	187	39.1	7244
LSD = .05	NS	NS	NS	NS	NS

RESPONSE OF SUGARCANE TO THE APPLICATION OF A FOLIAR-FERTILIZER RIPENER AND A PLANT HEALTH THERAPY

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SUMMARY:

A sugarcane ripener and a plant health therapy, developed by StollerUSA but not yet recommended for use in Louisiana by the Louisiana Cooperative Extensive Service, were evaluated for efficacy during the 2007 growing season. Ripener™ is a foliar fertilizer designed to assist the ripening of crops where phosphorus and molybdenum are deficient and Sugar Mover™ is a formulation of boron and molybdenum that affects sugar metabolism and movement in plants.

Sugar Mover applications were made on June 12, 2007 (Sugar Mover alone and Sugar Mover + Ripener treatments) and Ripener was applied on August 15, 2007 (Sugar Mover + Ripener and Ripener alone treatments). Plots were hand harvested (10 stalks selected at random) on September 25, 2007 for the determination of stalk weight and juice quality. The treatment to harvest interval for Ripener was 41 days.

The f test for TRS was significant, with the combination treatment of Sugar Mover and Ripener producing higher pounds of sugar per ton than the other three treatments (see table below). Both cane and sugar yields, however, were not affected by the application of the products.

The Effects of StollerUSA Products on the Cane and Sugar Yields of HoCP 96-540.

Treatment and Application Rate	TRS pounds of sugar/ton	Cane Yield tons of cane/a	Sugar Yield pounds of sugar/a
Control	195	35.6	6933
Sugar Mover 4 pt/a	194	36.8	7170
Sugar Mover 4 pt/a + Ripener 1 pt/a	204	36.8	7498
Ripener 1 pt/a	190	35.2	6664
P =	.01	.97	.75
CV % =	2%	15%	16%

RESPONSE OF SUGARCANE VARIETIES L97-128 AND HO95-988 TO POTASSIUM FERTILIZATION

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SUMMARY

Field experiment was conducted in 2007 to determine response of sugarcane varieties of L97-128 and HO95-988 to potassium (K) fertilizer application. The study was carried out in random variety by fertilizer in Sharkey silt clay. Cane yield increased by 17% and 9% whereas sugar yield increased by 23% and 9% respectively for L97-128 and HO95-988 at K rate of 120 lb/A. Based on yield response curve and 95% maximum yield, the optimum rate for K fertilizer was found at 90 lb K2O/A.

INTRODUCTION

Potassium is one of most important major nutrients that crops need for healthy growth. Sugarcane requires more K than other row crops during growth season. The K content of sugarcane shoots increases steadily with time, which suggests also steady K supply. For last few years, new sugarcane varieties have been released and some have gained increasing acres in Louisiana. Fertilization practices for these varieties have not been extensively validated. This study addresses K fertilization for some of these varieties.

OBJECTIVE

This research was designed to obtain fertilization rate for new varieties of L97-128 and HO95-988.

MATERIALS AND METHOD

Field study was conducted on Sharkey silty clay in St Gabriel Research Station. Three rows by 50 feet long plots were established. This experiment was first established in September 2005. Whole stalks of L97-128 and HO95-988 were planted in a variety by fertilizer experimental design. The K fertilizer treatments consists of 0 (check), 60, 120 and 240 lbs/A. Soil pH ranged from 5.5 to 5.9. Soil analysis of composite samples of 0-6 inches before 2007 treatment indicated that the plots contained 201-237 ppm K (low-medium) and 40 ppm P (high) by Mehlich III.. Potassium fertilizer treatments were applied on March 12, 2007. All plots also received 120 lbs N/A. All ground treatments were applied to the inner off-bar of each plot row. All plots also received equal amounts of N at 120 lbs/A. The plots were harvested on October 30, 2007. All treatments were replicated 4 times. The numbers of millable stalks in each sugarcane plot were counted. Ten stalks were randomly selected from each plot to measure average stalk weight and commercially recoverable sugar (CRS).

RESULTS AND DISCUSSION

Results for first stubble of L97-128 and HO-95-988 are shown in Tables 1 and 2. Both varieties responded to fertilizer application. Cane yield increased by 17% and 9% whereas sugar yield increased by with 23% and 9% respectively at K rate of 120 lbs/A. Clearly, L97-128 showed larger response to K application than HO95-988. But the average yield of HO95-988 was slightly higher than L97-128. Yield response curve was characterized as $Y = 0.0002\ X^2 + 0.066X - 28.53$, $R^2 = 0.97$ for L97-128. Based on this polynomial regression equation between yield and fertilizer, the fertilizer rate at 95% maximum yield, a more of economic estimate, was found to be 90 lb/A.

It should be indicated that for the past decade, research with LCP85-384 often has showed little response to K fertilization even when soil test indicated deficiency. Similar situation was also observed with phosphorus fertilization. These results suggests that these new varieties especially L97-128 may have a different nutrient use efficiency. Their interaction with K from soil and fertilizer needs to be further elucidated in order for producers to make better use of K fertilizers.

Table 1. Effect of K fertilizer on L97-128 1st stubble cane grown in Sharkey silt clay.

Treatment	Pop.	Stalk wt.	CRS	Cane yield	Sugar yield
Lbs K_2O/A	1000/A	lbs/stalk	lbs/T	T/A	lbs/A
Check	29.1a	2.15a	208.8a	28.3a	5,899a
60	28.1a	2.59b	208.2a	32.4b	6,738b
120	30.4a	2.33a	218.7a	33.3b	7,278b
240	30.7a	2.37ab	207.2a	33.9b	7,027b
LSD 0.05	NS	0.25	NS	2.6	584

Table 2. Effect of K fertilizer on HO95-988 1st stubble cane grown in Sharkey silty clay.

Treatment	Pop.	Stalk wt.	CRS	Cane yield	Sugar yield
Lb K_2O/A	1000/A	lb/stalk	lb/T	T/A	lb/A
Check	36.2a	1.97a	203.4	33.6a	6,852a
60	32.5b	2.15a	208.7	33.8a	7,032ab
120	37.8a	2.01a	203.5	36.7b	7,458b
240	31.9ab	2.39b	204.3	34.7ab	7,090ab
LSD 0.05	3.2	0.25	NS	2.6	584