BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet planting. During 2004, results were obtained from billet planting experiments conducted at the St. Gabriel Research Station at St. Gabriel, La. The experiments included LCP 85-384 first and second stubble experiments comparing billet date and rate of planting and an experiment in second stubble comparing billet and whole stalk planting in HoCP 85-845 and HoCP 91-555.

Yield differences were detected in first stubble of the date of planting test planted in 2002 (Table 1). An early August planting date was not included in this experiment. Instead, a late planting date during mid-October was included. As in plant-cane, the mid-August planting date produced the highest yield, and the October planting date produced the lowest yield. Yield differences were not detected in plant-cane or first stubble of the date of planting test planted in 2001 (Table 2), but in second stubble, the yield of the August 23 planting date was significantly higher than the yield obtained from the August 28 planting date.

In first stubble of the rate of billet planting experiment planted in 2002, stalk population was lower, as in plant-cane, for the one and three billet planting rates for both planting dates. However, this was partially offset by a higher stalk weight (data not shown). The tonnage and sugar per acre yields from the August planting date were lowest for the one and 12 stalk planting rates (Table 3). The highest yield was obtained from the three stalk planting rate. There was no consistent pattern evident in second stubble of the rate of planting experiment planted in 2001 (Table 4). The lowest yields were obtained from the three billet planting rate for the August date and the 12 billet planting rate for the September date.

HoCP 85-845 and HoCP 91-555 responded well to billet planting in plant-cane and first stubble. In second stubble, numerical differences in favor of the whole stalk plantings were evident, but the differences were not significant due to variability in the results (Table 5).

The results obtained during 2004 were similar to those from experiments in previous years. A planting date outside the traditional planting period (in this case, an October planting date) produced lower yield through a 3-year crop cycle. Stubble yields were generally similar for billet plantings made from mid-August to late-September. Low billet planting rates produced reduced stalk populations and lower yields in plant-cane, but there was no consistent pattern to yields in the stubble crops. As long as large gaps do not occur in the plant-cane stand, the stubbling ability of LCP 85-384 provides some ability to recover during the subsequent stubble crops.

It is not certain whether future varieties will respond the same way as LCP 85-384. Previous research showed that varieties vary in tolerance to billet planting. Early results with HoCP 91-555 and HoCP 85-845 are promising. Experimental varieties being considered for

release to the industry will need to be evaluated for billet planting tolerance. Therefore, seven varieties, LCP 85-384, Ho 95-988, HoCP 96-540, L 97-128, L 99-226, L 99-233, and L 00-266, were planted during Fall 2004 in replicated experiments comparing billet and whole stalk planting at the St. Gabriel Research Station.

It is very important to do a good job planting billets. Billets are more sensitive than whole stalks to any planting problem. The research results from this and previous years suggest that practices to maximize the chance of success with billet planting include: providing a well prepared seed-bed, planting long (20-24 inch) billets with a low level of physical damage, planting at a high rate (more than three running billets in the furrow), covering with a uniform layer of no more than 3 inches of packed soil, and providing good drainage and careful weed control.

Table 1. Effect of date of planting on 2003 plant-cane and 2004 first stubble yields of billet planted LCP 85-384 at the St. Gabriel Research Station.

	Tons cane per acre		Sugar per acre (lbs.)	
Date of planting	Plant-cane	First stubble	Plant-cane	First stubble
August 18	36.9 a	32.2 a	7116 a	5888
August 27	34.1 ab	28.1 ab	6534 ab	5466
September 13	32.3 b	30.6 ab	6285 b	5569
October 18	26.8 c	26.3 b	5072 c	4921

Average values for the different yield components followed by the same letter were not significantly different (P = 0.05).

Table 2. Effect of date of planting on 2002 plant, 2003 first stubble, and 2004 second stubble yields of billet planted LCP 85-384 at the St. Gabriel Research Station.

	Tons cane per acre			Sugar per acre (lbs.)		
Date of planting	Plant-cane	1st stubble	2nd stubble	Plant-cane	1st stubble	2nd stubble
August 23	44.0	30.5	35.5 a	8943	5192	6489 a
August 28	42.1	29.3	29.7 b	8496	5259	5203 b
September 17	46.0	31.2	32.5 ab	9199	5323	5657 ab
September 28	45.4	31.5	33.7 ab	8854	5351	5882 ab

Average values for the different yield components followed by the same letter were not significantly different (P = 0.05).

Table 3. Effect of rate of planting on 2003 plant-cane and 2004 first stubble yields of LCP 85-384 planted as billets at five rates on two dates at the St. Gabriel Research Station.

	Tons cane per acre				Sugar per acre (lbs)			
	Aug 15		Sep 16		Aug 15		Sep 16	
Rate	Plant-cane	1st stubble	Plant-cane	1st stubble	Plant-cane	1st stubble	Plant-cane	1st stubble
1 billet	36.6 b	33.1 b	33.8 c	36.7	7074 b	7037 b	6421 c	7782 ab
3 billets	41.2 ab	38.0 ab	45.1 ab	43.8	8034 ab	7790 ab	8508 b	9332 a
6 billets	45.4 a	42.3 a	43.6 b	39.0	8811 ab	8554 a	8616 b	8357 ab
9 billets	46.1 a	41.5 a	46.6 ab	36.6	9275 a	8243 ab	9133 ab	7492 b
12 billets	45.3 a	33.6 b	53.0 a	37.4	9172 ab	7046 b	10854 a	7952 ab

Average values for different yield components within a date of planting followed by the same letter were not significantly different among the different planting rates (P = 0.05).

Table 4. Effect of rate of planting on 2002 plant-cane, 2003 first stubble, and 2004 second stubble yields of LCP 85-384 planted as billets at five rates on two dates.

	Plant-cane sugar per acre		First stubble sugar per acre		Second stubble sugar/acre	
Rate	Aug 23	Sep 17	Aug 23	Sep 17	Aug 23	Sep 17
1 billet	6734 b	6442 c	5787 ab	6051	5821 ab	5522 b
3 billets	8355 a	6913 bc	5489 b	6136	5377 b	5963 ab
6 billets	8773 a	8747 a	6454 a	6027	5990 ab	5937 ab
9 billets	8656 a	8068 abc	6083 ab	6105	6176 ab	6817 a
12 billets	9525 a	8383 ab	5895 ab	5682	6480 a	5379 b

Average values for tons of cane per acre within a column (crop cycle year and date) followed by the same letter were not significantly different (P = 0.05).

Table 5. Comparison of yields obtained from 2002 plant-cane, 2003 first stubble, and 2004 second stubble for two varieties, HoCP 91-555 and HoCP 85-845, planted as billets and whole stalks at the St. Gabriel Research Station.

Variety	Treatment	Tons cane/acre 2002	Tons cane/acre 2003	Tons cane/acre 2004	Sugar/acre (lbs.) 2002	Sugar/acre (lbs.) 2003	Sugar/acre (lbs.) 2004
HoCP 91-555	Billet	49.4	34.4	30.0	8786	6923	6898
	Whole stalk	43.5	33.8	36.2	7519	7003	8515
HoCP 85-845	Billet	39.1	36.2	30.9	7901	6839	6847
	Whole stalk	35.8	39.2	32.5	7037	7469	7048

Yields were not significantly different (P = 0.05).

CULTURAL PRACTICES RESEARCH IN SUGARCANE IN 2004

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In cooperation with
St. Gabriel Research Station and
USDA, ARS, MSA Soil and Water Research, Baton Rouge, LA

SUMMARY

Field experiments were conducted in 2004 to test the effects of management practices on yield and yield components of sugarcane.

The residual effect of previous harvest date on yields of a second stubble crop was most negative when plant-cane and first stubble harvests were in October. The variety HoCP91-555 yielded better with later first stubble harvests than later plant-cane harvests. LCP85-384 yields were less affected. The depth of soil cover over billets and apparent quality of seed material (plant cane vs stubble cane) of LCP85-384 interacted only slightly for cane and sugar yield response. Yields were lower at a cover depth of 4 to 5 in. Best yields across planting sources occurred at a cover depth of 3 to 4 in. Cane and sugar yield of third stubble LCP85-384 following burning the previous harvest=s residue was not significantly different than any other residue management program, including leaving the residue undisturbed and untreated. Soil quality after 3 years of maintaining these residue management treatments was only slightly changed among them. Base CEC was slightly higher where residue was maintained. Bulk density, water-filled pore space %, and soil respiration varied among treatments. Reducing residue particle size resulted in higher soil respiration rates, especially when soil incorporated. Yields in that study averaged higher when residue particles were reduced in size ± soil incorporated and averaged lowest when residue was left undisturbed.

OBJECTIVES

This research is designed to provide information on cultural practices in an effort to help cane growers produce maximum economic yields and thereby a more profitable production system. 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

Harvest Date on Subsequent Yields

It is well established that later harvest of sugarcane often results in higher natural sugar yield. Date of harvest for plant-cane crops and stubble crops also can affect subsequent stubble yields. HoCP91 -555 was affected by time of stubble harvest even if plant-cane was harvested late. Except for October harvests of previous crops (plant cane and 1st stubble), LCP85-384 was not affected by date of harvest of the previous crop. The data indicate ‘555’ is more sensitive to

previous harvest effects than ‘384’, but both are limited when plant-cane is harvested early (Figs. 1, 2)

Residue Management

Yields and residue.

We did not find a significant difference in residue from Jan. 2004 to March 2005 for residue plots amended with UAN, stabilized urea, or molasses compared to the untreated check. Yield ranged from 20.3 to 22.2 T/ac., whole-stalk sample CRS ranged from 178 to 185.6 lbs/T and Lbs sugar/ac. ranged from 3673 to 3836. There were no statistically significant differences (data not presented).

Soil quality factor response under residue management practices.

These data were collected on a Commerce series, but somewhat heavy soil at the end of the third year of this experiment. The effects on soil chemistry were minimal. Cations and therefore base CEC was statistically different among treatments (Table 1), but probably not enough to be of biological importance. Soil physical properties also changed slightly among treatments, but only incorporating residue or treating it with 60 lb N as UAN during winter months resulted in statistically lower bulk density. Soil strength and percent water stable aggregates were little changed and were in the acceptable range for all treatments (Table 2). Soil respiration measurements were not different when absolutely compared (Table 3). When adjusting to a constant temperature (25^{o} C) and /or % water-filled pore space (60%), results were generally to significantly higher under the residue blanket. This indicated that although the blanket offers increased substrate for degradation, it also has a bigger insulating effect and water trapping/holding characteristic that slowed the degradation process from achieving its potential. Volumetric moisture content and % water free pore space varied because of residue treatment and rainfall (Figs 3, 4). Bulk density differences also played a role in these results by affecting the pore space percentage. In conclusion, results of 3 years of continued residue management treatments on a heavy soil had minimal effects on soil quality.

Residue size reduction and other treatments on soil respiration of a light-textured soil.

This study was initiated in the winter of 2004. There were eight treatments; Burn, Sweep, residue untreated, residue + 30oz/ a surfactant, residue incorporated, residue reduced in size, residue reduced + 30oz/ a surfactant, and residue reduced and incorporated. Soil respiration data, based on three measurements taken in March 2004, indicate residue reduced and incorporated resulted in a significant decomposition rate compared to other treatments (Fig 5). Yields were statistically equivalent among all treatments, but the trend indicated highest average yields were obtained when residue particle size was reduced (Fig. 6).

Depth of Cover and Seed Source

We found a cover depth of 4-5 in. to be optimal in 2003. That depth resulted in numerically to significantly lower yields in 2004 compared to a cover depth of 3-4 in. (Figs 7, 8). As would be expected, seed source did not exacerbate the response as much this year as in the planting year.

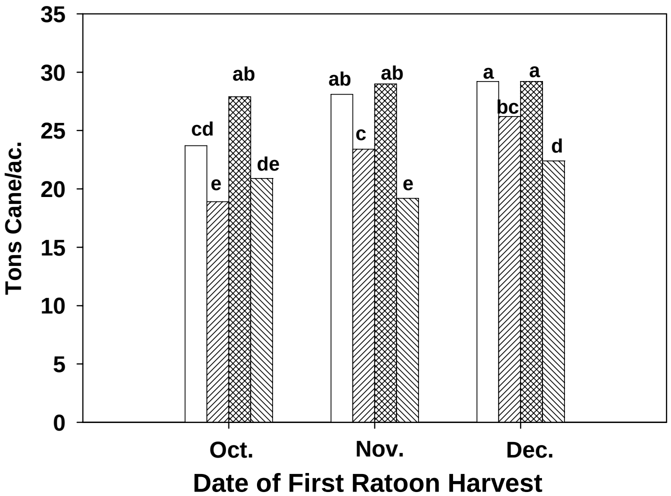

Fig. 1. The effect of harvest date and previous
harvest date on second ratoon cane yield of two varieties.
Bars with the same letter are NS at *P≤0.05*.

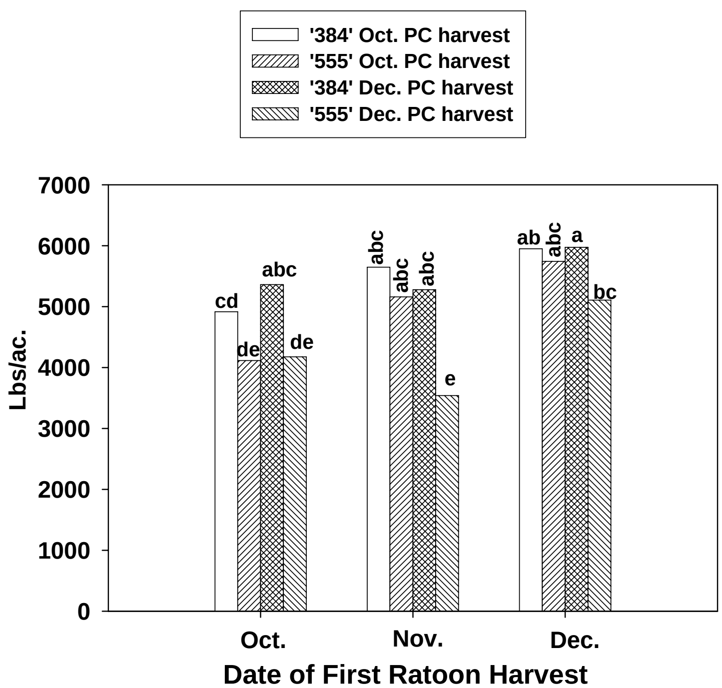

Fig. 2. The effect of harvest date and previous
harvest date on second ratoon sugar yield of two varieties
Bars with the same letter are NS at *P≤0.05*.

Table 1. The effect of sugarcane harvest residue management practices on soil nutrient status after three years. Numbers in a given column followed by the same letter or no letter are not statistically (95% chance) different.

Treatment	Org. Matter	pH	P	Ca	Mg	K	Na	Base CEC
	% dm		---------------	---------------	----- ug/g----	---------------	---------------	-meq/100g--
Burn	2.00	5.89	191	2576c	729c	264b	51	19.8b
Untreated	2.08	5.83	184	2845ab	814a	294a	51	21.9a
Swept	2.04	5.88	187	2875ab	808a	284ab	52	22.0a
Molasses	2.12	5.77	200	2734abc	793abc	275ab	50	21.1ab
UAN	2.01	5.89	196	2947a	829a	296a	51	22.5a
SuperU	1.99	5.82	186	2803abc	798abc	282ab	51	21.5ab
Till	1.93	5.90	189	2682bc	793abc	280ab	53	20.9ab
Rem.w/oBurn	1.99	5.68	193	2564c	732bc	268b	50	19.7b

Table 2. The effect of sugarcane harvest residue management practices on soil quality factors after three years.

Treatment	Bulk Density	Soil Strength Top 3/9/04	Soil Strength Side 3/9/04	Soil Strength Top 3/23/04	Soil Strength Side 3/23/04	Water Stable Aggregates
	-------g/cc-------	--	PSI	----------------------------------		----% >250 m----
Burn	1.21ab	36.4a	30.2	45.7	44	74.3
Untreated	1.27ab	29.6abc	27.6	42.0	42.7	82.1
Swept	1.33a	34.4ab	22.6	41.7	43.4	81.8
Molasses	1.17ab	32.0abc	28.3	42.5	39.3	76.4
UAN	0.99c	29.5abc	24.2	39.9	47.4	80.9
SuperU	1.20ab	33.8ab	22.2	43.8	45.9	73.6
Till	1.10bc	24.2c	34.7	35.7	41.0	76.9
Rem. w/o Burn	1.24ab	26.8bc	27.9	43.8	44.5	75.0

Numbers in a given column followed by the same letter or no letter are not statistically (95% chance) different.

Table 3. The effect of sugarcane harvest residue management practices after three years on soil respiration/biological activity. Average of two measurements.

Treatment	Soil respiration Absolute†	Soil respiration Adj. 25†	Soil respiration Adj. 25/60†
	-------------------------------------	--------Lbs CO_2-C/ac/day-------	-------------------------------------
Burn	13.9	14.3bc	18.1
Untreated	12.5	18.2abc	24.6
Swept	11.0	11.5c	17.4
Molasses	17.5	24.6a	28.8
UAN	15.7	22.0ab	27.8
SuperU	12.5	18.1abc	25.0
Till	19.9	24.5a	27.4
Rem. w/o Burn	10.7	11.5bc	16.9

Numbers in a given column followed by the same letter or no letter are not statistically (95% chance) different.

† Absolute= unadjusted measurements in the field; Adj.25= measurements adjusted to 25C; Adj. 25/60= measurements adjusted to 25C and 60% WFPS. The absolute measurement reflects what is occurring under field conditions, which may differ among treatments. Adjusted measurements reflect the potential activity if major controlling factors were equal.

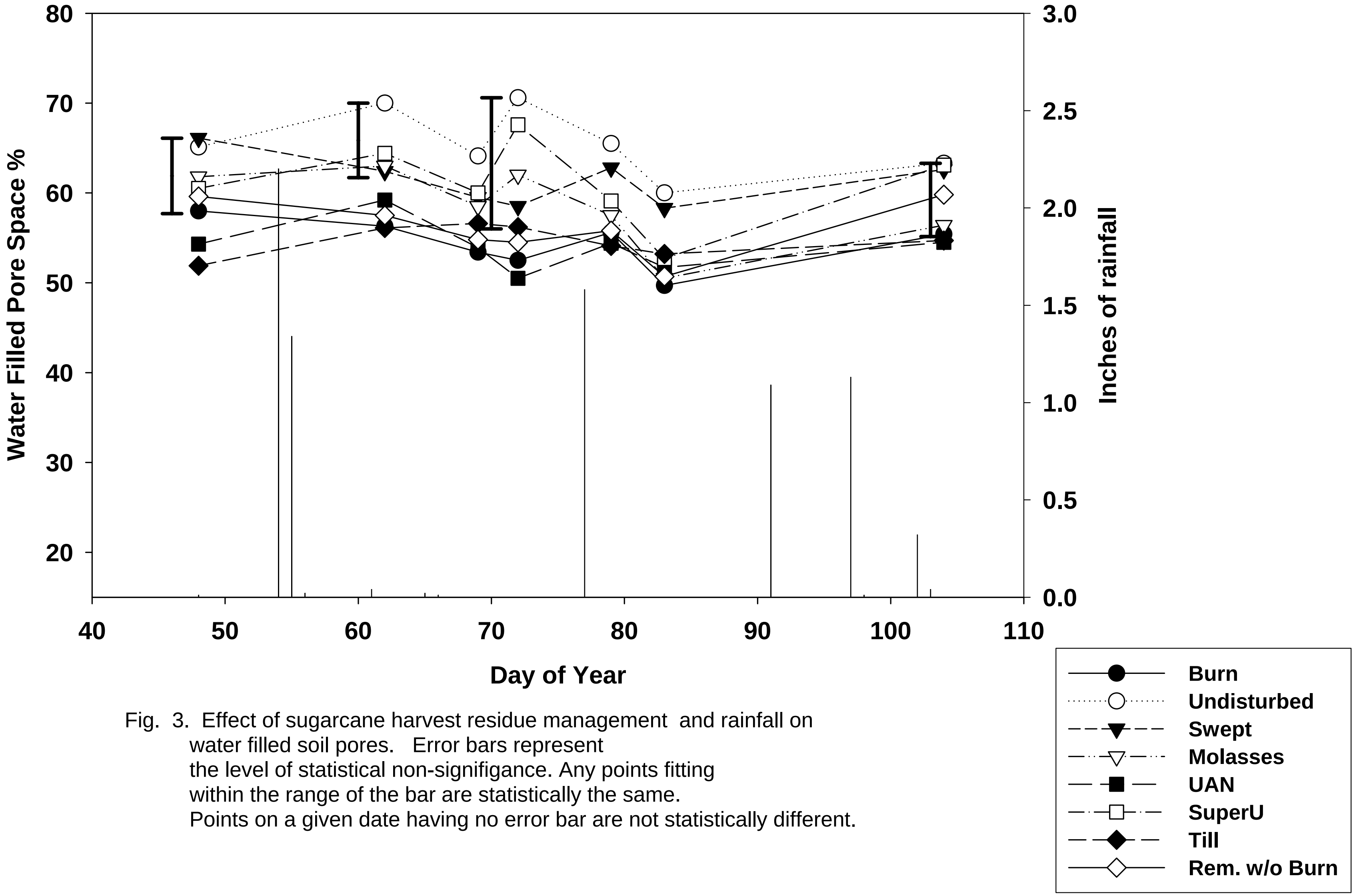

Fig. 3. Effect of sugarcane harvest residue management and rainfall on water filled soil pores. Error bars represent the level of statistical non-signifigance. Any points fitting within the range of the bar are statistically the same. Points on a given date having no error bar are not statistically different.

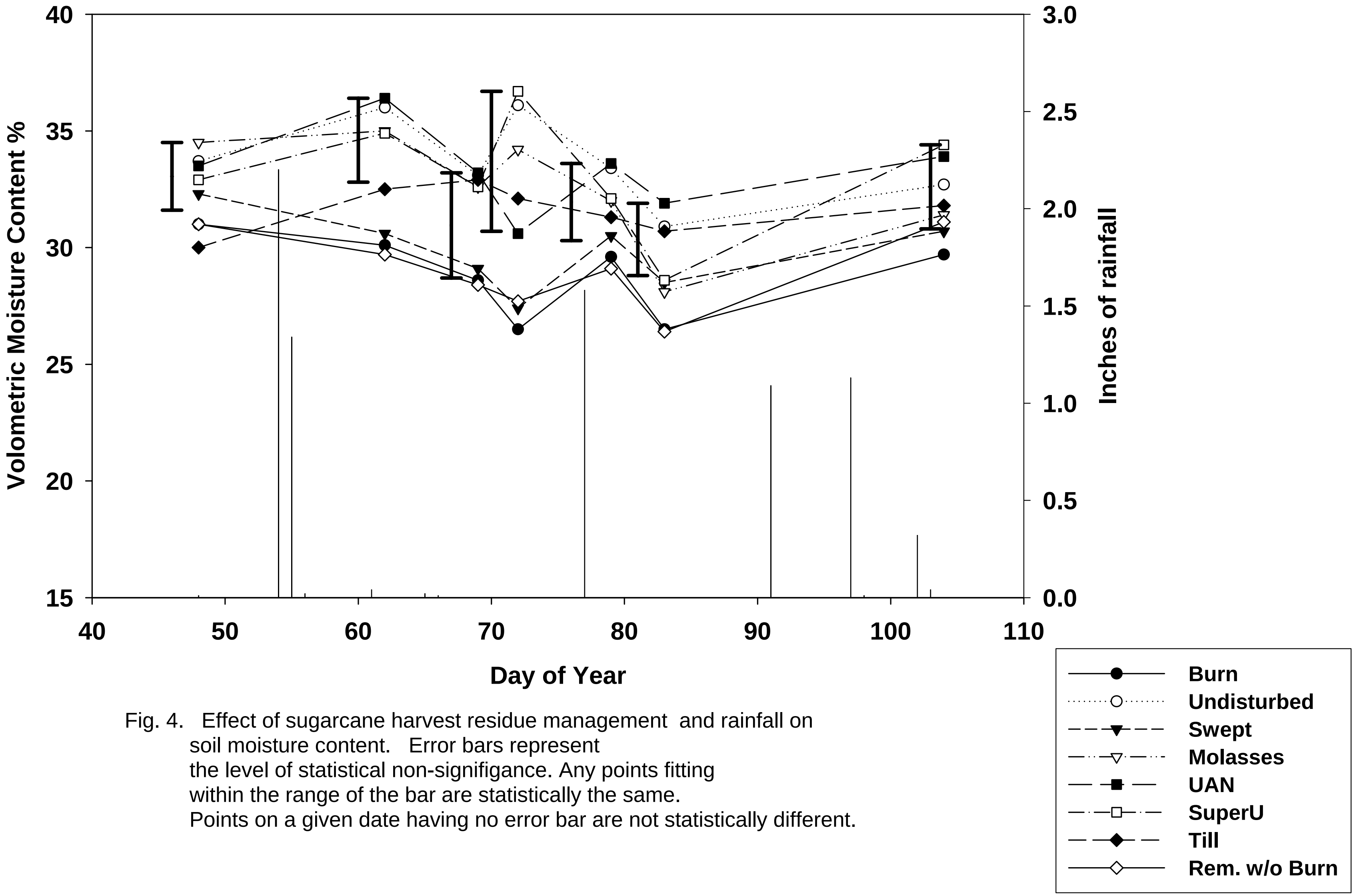

Fig. 4. Effect of sugarcane harvest residue management and rainfall on soil moisture content. Error bars represent the level of statistical non-signifigance. Any points fitting within the range of the bar are statistically the same. Points on a given date having no error bar are not statistically different.

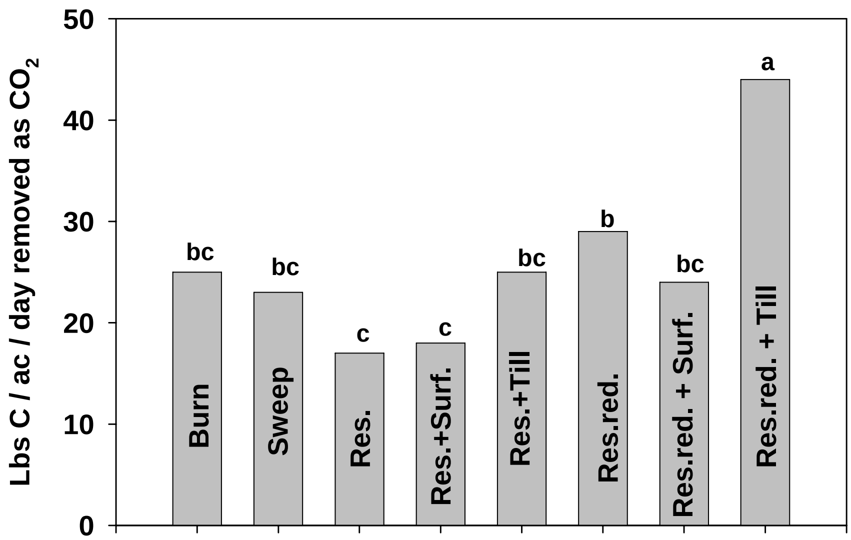

Fig. 5. Reducing residue size increased the amount of decomposition (Carbon removed/ac/day) especially when soil incorporated.

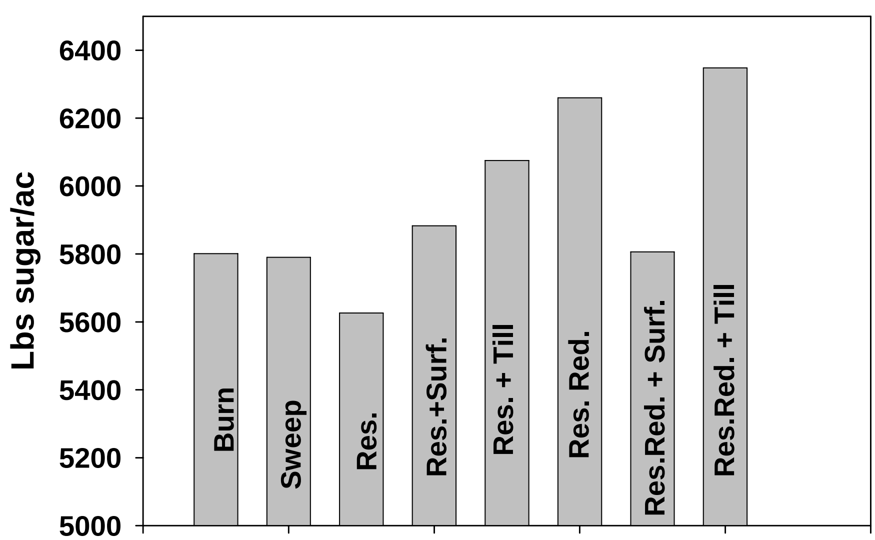

Fig. 6. Reduction of Residue Particle Size resulted in higher average yields (not statistically different).

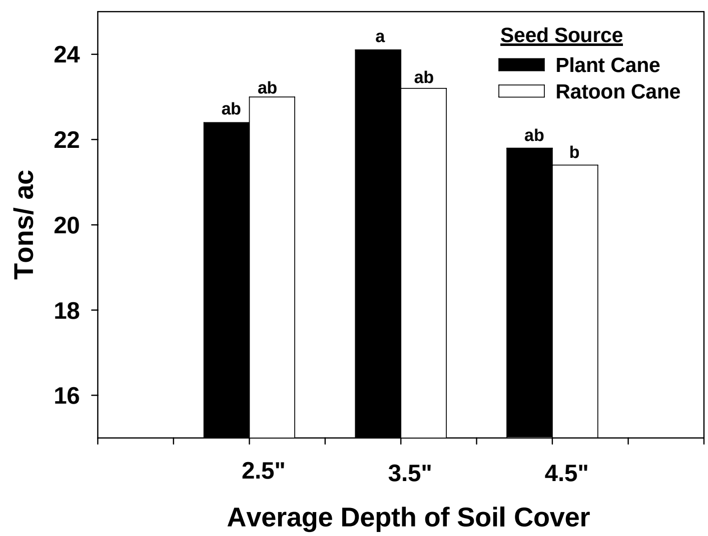

Fig. 7. The effect of depth of soil cover and planting seed source on cane yield of 1st stubble LCP85-384 on light soil

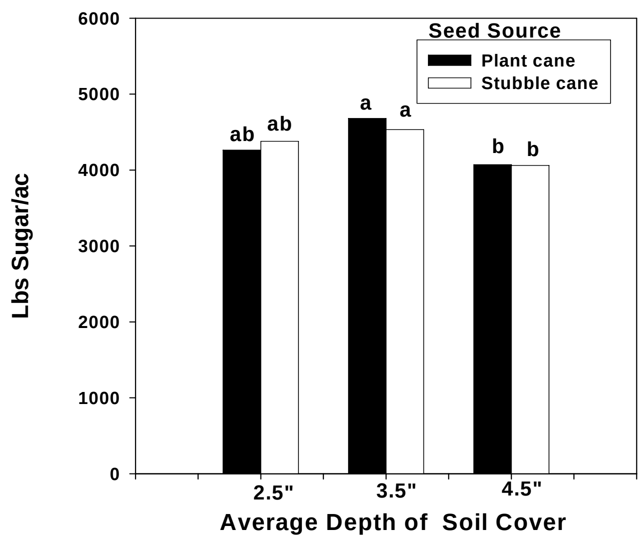

Fig. 8. The effect of seed source and depth of soil cover on sugar yield of LCP85-384. Bars with the same letter are NS at *P≤0.05.*

LONG-TERM COMBINE-TRASH STUDY

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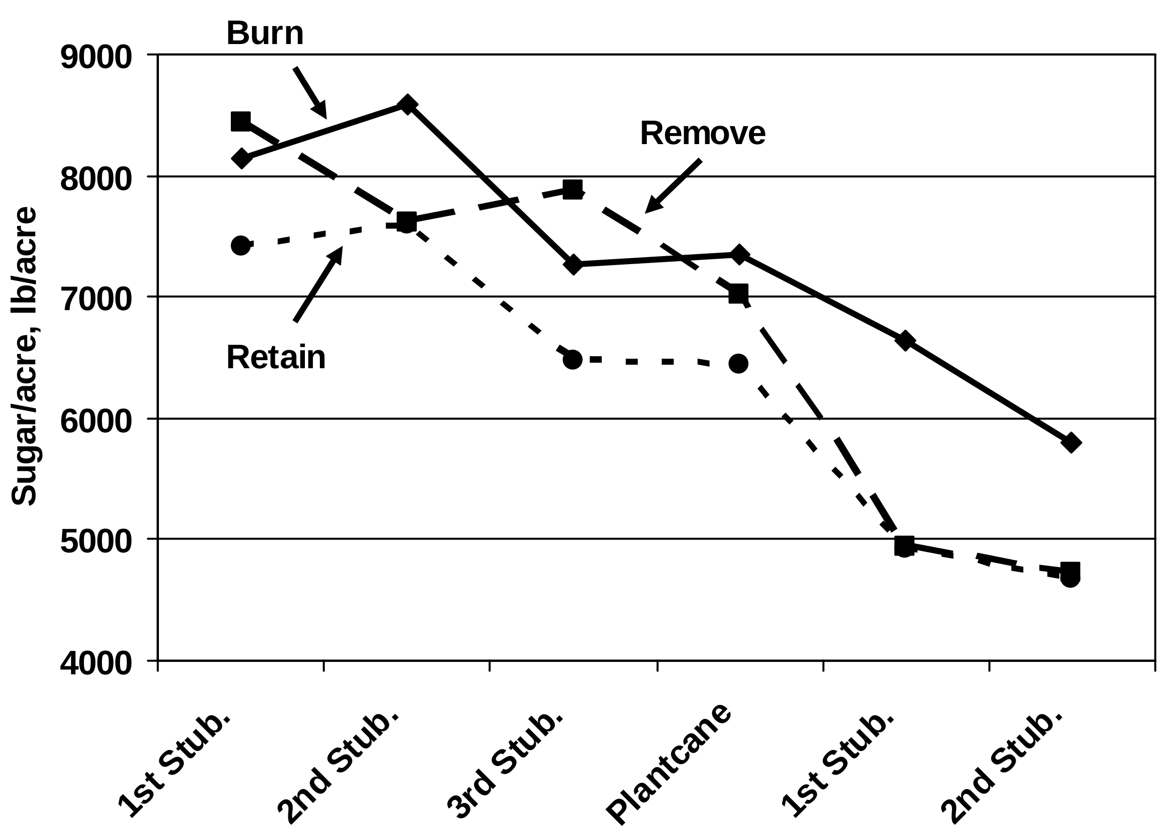
SUMMARY

Second stubble of the second cane cycle of a long-term study of the effects of combine-trash management was harvested in 2004. Of particular interest are the changes in soil fertility over time and the effects of residue management on successive crop cycles (plant-cane through final stubble). Cycle two second stubble yields were 5,791, 4,722 and 4,680 pounds of sugar/acre for the standing burn, physical trash removal from row tops and full trash retention treatments, respectively. Their ranking is consistent with treatment effects for the previous harvests (averages of all crops in both cycles for the three treatments are 7,294, 6,771 and 6,257 pounds of sugar/acre (P=.01), respectively). Sugar per acre trend lines for the six crops across two cycles of production clearly show that retained residue lowers productivity on the average and that burning the crop standing prior to harvest produces the highest yields consistently.



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