BILLET PLANTING RESEARCH

J. W. Hoy and C. F. Savario
Department of Plant Pathology and Crop Physiology

Research continued to develop methods to maximize the chances of success with billet (stalk section) planting. During 2013, results were obtained from field experiments conducted at the Sugar Research Station at St. Gabriel evaluating the potential for Syngenta seed-treatment chemicals to improve stand establishment and yield in billet plantings, and experiments were conducted to evaluate the Syngenta Plene® planting system. In addition, an on-farm experiment was conducted comparing billets cut with a harvester modified to minimize physical damage to billets cut with an un-modified harvester and with machine-cut whole stalks. Results from a field experiment comparing billet and whole stalk planting of sugarcane and energy cane varieties is reported separately.

Chemical seed treatments from Syngenta for use in Plene, a new single-bud planting system being developed for Brazil, are still under evaluation to determine whether they can increase yields obtained from billet plantings in Louisiana. Experiment treatments include a combination of three fungicides, an insecticide and nematicide combination, all pesticides combined, non-treated billets, and whole stalks. The pesticides were applied using different methods, including dip, in furrow spray, and planter mounted sprayer.

Second ratoon yields were obtained in an experiment with HoCP 96-540, L 99-226, and L 99-233 (Table 1). Chemicals were applied as a dip treatment. The only significant differences were detected for total sugar yield of L 99-233. The all chemicals combined, fungicide combination, and insecticide/nematicide treatments each increased sugar yield compared to non-treated billets. The all chemicals combined treatment also increased yield compared to the whole stalk planting. Overall, the planting of non-treated billets in this experiment did not result in lower yields compared to the industry standard, whole stalk planting. The all chemicals combined treatment increased yield compared to non-treated billets and whole stalks for one variety in plant cane and one variety in second ratoon.

First ratoon results were obtained in a field experiment with HoCP 96-540 and L 03-371 (Table 2). The tonnage and total sugar yield differences that were detected in plant cane were no longer evident in first ratoon. Earlier experiments evaluated only dip application of the chemical treatments to billets. Dip application provides complete coverage of the treated billets, but it may be difficult to achieve commercially. Therefore, different chemical application methods were compared in this experiment. All chemical treatments contained the insecticide and three fungicides combined. Dip application, an in-furrow spray, and a planter mounted spray application were compared to non-treated billets and whole stalks for L 99-226. For L 03-371, the comparison was limited to non-treated billets, in-furrow spray, and planter spray. A dye was added to the chemical treatments to provide a visual assessment of coverage. The dip-application provided complete coverage as expected. The in-furrow spray was applied at a high, 50 gallon per acre broadcast application rate on a 36 inch band. It provided near total coverage of the upper surfaces of billets in the planting furrow, but there was little or no coverage of the undersides of billets. However, it provided some soil application of the chemicals. The planter spray was applied at a 15 gallon per acre broadcast rate from eight nozzles, four each on the upper and lower sides of both ends of the billet alignment panels below the drum.

Table 1. Effect of Syngenta chemical treatments on cane tonnage and total sugar yield for three varieties, HoCP 96-540, L 99-226, and L 99-233, in 2011 plant cane, 2012 first ratoon, and 2013 second ratoon in a field experiment at the Sugar Research Station.

	Plant cane		First ratoon		Second ratoon	
Variety and treatment	Tons cane/A[1]	Sugar/A (lbs.)[1]	Tons cane/A[1]	Sugar/A (lbs.)[1]	Tons cane/A[1]	Sugar/A (lbs.)[1]
HoCP 96-540						
Non-treated billets	34.7 b	7,390 b	36.8 a	8,670 a	30.3 a	5,832 a
Insecticide + nematicide	49.1 ab	9,949 ab	42.1 a	9,850 a	33.7 a	6,715 a
Fungicide combination	41.9 b	8,638 b	41.5 a	9,780 a	29.7 a	5,874 a
All chemicals combined	59.3 a	12,579 a	44.7 a	10,433 a	37.7 a	7,361 a
Whole stalk	44.2 b	9,545 ab	44.0 a	10,066 a	37.3 a	7,048 a
L 99-226						
Non-treated billets	42.3 a	9,153 a	37.2 a	8,853 a	26.5 a	5,445 a
Insecticide + nematicide	36.1 a	7,247 a	40.4 a	9,607 a	29.3 a	5,956 a
Fungicide combination	49.7 a	10,351 a	35.7 a	8,693 a	24.7 a	5,051 a
All chemicals combined	41.7 a	9,120 a	41.7 a	9,939 a	28.5 a	6,071 a
Whole stalk	41.9 a	8,592 a	34.9 a	8,540 a	30.0 a	6,103 a
L 99-233						
Non-treated billets	29.8 a	6,282 ab	38.3 ab	8,192 ab	32.0 a	4,682 c
Insecticide + nematicide	25.7 a	5,151 b	32.8 b	7,054 b	32.0 a	6,467 ab
Fungicide combination	28.5 a	5,854 ab	42.9 a	9,121 ab	32.5 a	6,281 ab
All chemicals combined	33.8 a	7,170 ab	39.6 ab	8,573 ab	40.0 a	7,254 a
Whole stalk	38.7 a	7,957 a	42.3 a	9,635 a	32.0 a	5,383 bc

[1]Values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05). A = acre.

A plant cane experiment compared the effects of Syngenta seed treatment chemicals on billets and whole stalks of two varieties, HoCP 96-540 and L 03-371 in a field experiment at the Sugar Research Station during 2013 (Table 3). There was very little environmental stress on the planting, and only a few differences were detected among the treatments. In HoCP 96-540, sugar per ton of cane and total sugar yields were higher for treated billets than for treated whole stalks. In L 03-371, sugar per ton was higher for treated whole stalks than for non-treated billets.

A field experiment comparing planting of the Syngenta Plene single-node cuttings treated with all of the pesticides combined to plantings of 3-4 bud billets with and without the combined chemical treatment and whole stalks was conducted at the Sugar Research Station and on a commercial farm. The commercial farm experiment was conducted by Dr. R. Viator and Dr. P. White with the USDA-ARS Sugarcane Research Unit. Three varieties, HoCP 96-540, L 99-226, and L 01-299 were included in the experiment. The Plene were planted in a single line at a rate of 10 per m of row – the recommended rate. The 3-4 bud billets and whole stalks were planted with three running stalks in the furrow – a higher planting rate than for the Plene. The 3-4 bud billets were planted with a 1.6 to 2.1 x higher rate of buds per m of row, and the whole stalk plantings had a 2.7 to 3.9 x higher rate. The Sugar Research field was planted at the beginning of the planting season in early August, while the commercial farm site was delayed by rain. The Sugar Research Station planting received timely rains and experienced a mild winter.

Table 2. Effects of Syngenta chemical treatments on yield components for three varieties, HoCP 96-540, L 99-226, and L 99-233, in 2011 plant cane and 2012 first ratoon.

Variety and treatment	Tons cane/acre[1] Plant cane	Sugar/acre (lbs.)[1] Plant cane	Tons cane/acre[1] First ratoon	Sugar/acre (lbs.)[1] First ratoon
L 99-226				
Non-treated billets	39.8 b	9,519 b	23.5 a	4,871 a
In-furrow spray	40.6 b	9,693 b	22.6 a	4,617 a
Planter spray	40.8 b	9,805 b	26.7 a	5,393 a
Dip	49.3 a	12,187 a	25.8 a	5,173 a
Whole stalk	42.6 b	10,341 b	25.4 a	5,171 a
L 03-371				
Non-treated billets	34.5 b	8,347 b	28.1 a	5,732 a
In-furrow spray	46.7 a	11,170 a	35.6 a	7,414 a
Planter spray	39.9 ab	9,297 b	29.2 a	5,741 a

[1]Values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05).

Table 3. Comparison of plant cane yield components for HoCP 96-540 and L 03-371 in plantings of billets and whole stalks with and without treatment with Syngenta seed-treatment chemicals in a field experiment at the Sugar Research Station during 2013.

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
HoCP 96-540				
Non-treated billets	2.3 a	230 ab	31.5 a	7,217 ab
Treated billets	2.1 a	235 a	35.0 a	8,233 a
Non-treated whole stalks	2.1 a	229 ab	34.1 a	7,820 ab
Treated whole stalks	2.2 a	225 b	31.3 a	7,033 b
L 03-371				
Non-treated billets	2.6 a	210 b	28.7 a	6,050 a
Treated billets	2.7 a	220 ab	29.7 a	6,536 a
Non-treated whole stalks	2.8 a	228 a	28.3 a	6,448 a
Treated whole stalks	2.8 a	226 ab	31.6 a	7,128 a

[1]Values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05).

The germination rates of the Plene were determined for each variety in the greenhouse by planting 200 cuttings and counting emerged shoots after 2 weeks. The germination rates were estimated in the field from the primary shoot counts at 17 days after planting. The respective germination percentages for the greenhouse and field were 68 and 68% for HoCP 96-540, 79 and 63% for L 99-226, and 61 and 46% for L 01-299.

Primary shoot counts varied among treatments within varieties and at 17 and 30 days after planting (Table 4). The Plene had higher shoot populations compared to both billet treatments and whole stalks for two varieties, HoCP 96-540 and L 01-299, at 17 days after planting, and the billets had higher populations than the whole stalk planting. Treated billets had a higher population than Plene of HoCP 96-540 by 30 days after planting, and treated billets and whole stalks had higher populations than Plene for L 99-226. The results for millable stalks also varied among treatments in different varieties (Table 3). The whole stalk planting had a higher number of millable stalks than Plene for HoCP 96-540, Plene had a higher population than non-treated billets for L 99-226, and whole stalks had a higher population than non-treated billets for L 01-299.

Table 4. Comparison of plant cane primary shoot and stalk populations for HoCP 96-540, L 99-226 and L 01-299 in plantings of Plene, 3-4 bud billets with and without treatment with Syngenta seed-treatment chemicals, and whole stalks in a field experiment conducted at the Sugar Research Station during 2013.

Variety and treatment	Primary shoots/acre at 17 days[1]	Primary shoots/acre at 30 days[1]	Millable stalks per acre[1]
HoCP 96-540			
Plene	15,129 a	18,705 b	51,741 b
Non-treated billets	11,866 b	20,711 ab	54,182 ab
Treated billets	10,948 b	21,653 a	53,070 ab
Whole stalks	8,217 c	21,629 ab	56,695 a
L 99-226			
Plene	14,017 ab	17,352 c	44,056 a
Non-treated billets	13,388 b	18,947 bc	40,624 b
Treated billets	15,443 ab	21,364 ab	41,688 ab
Whole stalks	16,579 a	24,167 a	42,558 ab
L 01-299			
Plene	10,078 a	17,352 a	56,719 ab
Non-treated billets	5,172 b	17,400 a	53,747 b
Treated billets	4,906 b	17,666 a	56,163 ab
Whole stalks	2,103 c	18,318 a	60,852 a

[1]Values for comparisons within a variety and column followed by the same letter were not significantly different (P=0.05).

Plant cane yield results varied among varieties in the Sugar Research Station experiment (Table 5). The only difference detected for HoCP 96-540 was that stalk weight was higher for Plene compared to whole stalks. For L 99-226, cane tonnage of Plene was higher than for whole stalks and non-treated billets, and tonnage for treated billets was higher than for non-treated billets. For L 01-299, sugar per ton of cane was higher for treated billets than for non-treated billets. Plene and treated billets had higher total sugar yield than non-treated billets.

Results for the paired site on the commercial farm that encountered more environmental stress were different than for the Sugar Research Station site (Table 6). No differences were detected among treatments for HoCP 96-540. Total sugar yield was higher for treated billets and whole stalks than Plene and non-treated billets for L 99-226. Tons of cane was higher for non-treated and treated billets than Plene for L 01-299. Total sugar yield was higher for non-treated billets than whole stalks and Plene, and treated billets had higher yield than Plene.

Table 5. Comparison of plant cane yield components for HoCP 96-540, L 99-226 and L 01-299 in plantings of Plene, 3-4 bud billets with and without treatment with Syngenta seed-treatment chemicals, and whole stalks in a field experiment at the Sugar Research Station during 2013.

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
HoCP 96-540				
Plene	2.6 a	227 a	53.5 a	12,127 a
Non-treated billets	2.3 ab	224 a	52.1 a	11,649 a
Treated billets	2.4 ab	226 a	56.5 a	12,847 a
Whole stalks	2.1 b	223 a	55.8 a	12,504 a
L 99-226				
Plene	2.9 a	235 a	51.6 a	12,125 a
Non-treated billets	2.8 a	222 a	38.1 c	8,545 b
Treated billets	2.6 a	223 a	46.8 ab	10,363 ab
Whole stalks	3.0 a	239 a	40.7 bc	9,715 b
L 01-299				
Plene	2.0 a	214 ab	62.1 a	13,301 a
Non-treated billets	2.1 a	210 b	53.7 a	11,308 b
Treated billets	1.9 a	219 a	61.4 a	13,447 a
Whole stalks	1.9 a	211 ab	62.3 a	13,148 ab

[1]Values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05).

The seed treatment chemicals continue to show the potential to increase stand establishment and stalk populations in billet plantings. The results suggest that the most consistent benefit comes from application of all of the pesticides combined. The results with the Syngenta seed-treatment chemicals are promising, and the research will be continued.

A second experiment was planted to determine whether modifications to a chopper harvester to minimize physical damage to billets cut for planting would reduce damage to buds and the internode rind and whether planting higher quality billets could improve stand establishment and yield. Two Deere 3520 mechanical sugarcane harvesters were used to cut billets. One contained a modification package that rubberized all surfaces/edges that come into contact with cane being cut, single-blade cutters for cutting long billets, and a solid elevator floor. Billets cut with both harvesters were planted with a slat mechanical planter. Billet characteristics and damage were assessed for each harvester before and after mechanical planting. In this experiment, an application of the combination of Syngenta insecticide and three fungicides sprayed over the cane planted in the furrow before covering was included for comparison. A final treatment included only for comparison of billet characteristics (billets not actually planted in the experiment) was the operation of the mechanical planter with a high drum speed with billets cut with the modified harvester. One variety, HoCP 96-540 was planted in the experiment.

Table 6. Comparison of plant cane yield components for three varieties, HoCP 96-540, L 99-226 and L 01-299, in plantings of Plene, 3-4 bud billets with and without treatment with Syngenta seed-treatment chemicals, and whole stalks in a field experiment conducted on a commercial farm during 2013.[1]

Variety and treatment	Sugar/ton cane (lbs.) [2]	Tons cane/acre [2]	Sugar/acre (lbs.) [2]
HoCP 96-540			
Plene	216 a	40.7 a	8,780 a
Non-treated billets	217 a	42.2 a	9,120 a
Treated billets	213 a	42.8 a	9,120 a
Whole stalks	209 a	37.9 a	7,920 a
L 99-226			
Plene	228 a	38.4 a	8,650 b
Non-treated billets	225 a	36.9 a	8,230 b
Treated billets	227 a	44.2 a	10,000 a
Whole stalks	233 a	43.5 a	10,100 a
L 01-299			
Plene	210 a	41.8 b	8,740 c
Non-treated billets	218 a	54.1 a	11,800 a
Treated billets	217 a	51.9 a	11,200 ab
Whole stalks	212 a	46.7 ab	9,880 bc

[1]Cooperative paired experiment conducted by Dr. R. Viator and Dr. P. White with the USDA-ARS Sugarcane Research Unit.
[2]Values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05).

Billet lengths were similar when cut with each harvester, but the length of billets cut with each harvester was shorter after mechanical planting reflecting some billet breakage (Table 7). In addition, the number of buds per billet was lower after planting for the non-modified harvester. The number of damaged buds per billet was lowest for the modified harvester/before planter treatment. The slow drum speed on the planter did not result in increased bud damage, but the high drum speed resulted in damage similar to the non-modified harvester. The planting operation did not result in increased damage for billets cut with the non-modified harvester. A similar pattern was observed for internode damage.

Billet plantings suffer more compared to whole stalk plantings from any problem associated with planting. However, good conditions for planting and rainfall after planting can result comparable yields between billet and whole stalk plantings even with varieties that have poor tolerance of billet planting. In the 2013 experiment, little environmental stress occurred following planting and during the winter. As a result, no differences were detected in plant cane yield components among treatments (Table 8).

Table 7. Comparison of characteristics and physical damage for billets cut by non-modified and modified chopper harvesters before and after passing through a slat mechanical planter during September, 2013.

Treatment	Billet length[1]	Bud number[1]	Damaged bud number[1]	Damaged internode number[1]
Non-modified harvester Before planter	19.1 a	2.86 a	0.58 ab	0.96 a
Non-modified harvester After planter	17.6 b	2.48 b	0.56 ab	0.72 ab
Modified harvester Before planter	19.2 a	2.72 ab	0.34 c	0.32 c
Modified harvester After planter – fast speed	17.1 b	2.52 b	0.62 a	0.82 ab
Modified harvester After planter – slow speed	17.2 b	2.66 ab	0.34 bc	0.54 bc

[1]Values for comparisons within a column followed the same letter were not significantly different (*P*=0.05).

Table 8. Comparison of plant cane yield components for billets cut by non-modified and modified chopper harvesters and whole stalks with and without Syngenta seed treatment chemical application in a field experiment during 2013.

Treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
Non-modified harvester Non-treated	2.0 a	218 a	43.4 a	9,478 a
Non-modified harvester Treated	1.9 a	222 a	46.3 a	10,268 a
Modified harvester Non-treated	2.1 a	228 a	45.7 a	10,430 a
Modified harvester Treated	2.1 a	223 a	45,2	10,068 a
Whole stalk Non-treated	2.1 a	219 a	43.8 a	9,593 a
Whole stalk Treated	2.0 a	227 a	47.0 a	10,665 a

[1]Values for comparisons within a column followed the same letter were not significantly different (*P*=0.05).

MANAGING DAMAGING FREEZE EVENTS IN LOUISIANA SUGARCANE

B. Legendre[1], H. Birkett[1], K. Gravois[2], Herman Waguespack[3], M. Duet[4], E. Dufrene[4], W. Jackson[3], B. Ball[3] and Jeanie Stein[1]

[1]Audubon Sugar Institute, LSU Agricultural Center, St. Gabriel, LA.
[2]Sugar Research Station, LSU AgCenter, St. Gabriel, LA
[3]American Sugar Cane League, Thibodaux, LA
[4]USDA-ARS, Sugarcane Research Unit, Houma, LA

Exposure of sugarcane to damaging frosts occurs in approximately 25% of the sugarcane producing countries of the world, but is most frequent on the mainland of the United States, especially in the state of Louisiana. The frequent winter freezes that occur in the sugarcane areas of Louisiana have forced the industry to adapt to a short growing season (about 7 months) and a short milling season (about 3 months). The nature and extent of damage to sugarcane by a freeze depends on the intensity and duration of the freeze, and the weather conditions after the freeze can control or accelerate deterioration. A series of damaging freezes occurred in Louisiana from November 26-30, 2013 where the low temperatures ranged from -2.2˚C (28˚F) in the southern area of the sugarcane belt to -4.4˚C (24˚F) in the northern area of the belt with the line of demarcation being roughly the areas north and south of the I-10 corridor. The duration of the freeze event below I-10 was approximately 6-10 hours, whereas, the duration north of I-10 was greater than 10 hours. At this point in the harvest, approximately 60% of the 14-million ton Louisiana crop had been processed by the state's 11 factories. Immediately following the November freeze events personnel from the LSU AgCenter, the American Sugar Cane League and the USDA-ARS Sugarcane Research Unit did field inspections of the damage to the crop by the freeze. Visual ratings were taken for all commercial and some candidate varieties for both leaf and stalk cold tolerance in the field.

In the southern area there was minimal damage to the stalk with only the apical meristem or terminal bud affected. However, in the more northern areas, the freeze events affected the entire stalk. With approximately 40% of the crop still remaining in the field and to study the reaction of commercial and candidate varieties to these early freeze events, the Outfield Variety Test at Alma Plantation, Lakeland, LA, located in the northern area above I-10 and US Highway 190, was chosen for the study. The test included the commercial varieties, HoCP 96-540, L 01-283, L 01-299, L 03-371 and HoCP 04-838, and the candidate varieties, Ho 07-613, L 09-112, HoCP 09-804 and Ho 09-840. Ten-stalk samples were hand-cut at ground level but not stripped or topped from each of three replications for the first of three sampling dates, Dec. 12, 19 and 26, 2013. Another set of samples was cut on Jan. 3, 2014 but this time the samples were hand stripped and tops were removed approximately 30 cm (12 in) below the apical meristem (terminal bud). All samples were immediately transported, weighed and processed at the Sugar Research Station at St. Gabriel using the press method of analyses. Juice samples were analyzed for Brix by refractometer and sucrose by polarimetry and bagasse (residue) samples were analyzed for moisture (by drying). The Brix, sucrose, purity and fiber content of the cane were then calculated from these analyses after which the estimated yield of theoretical recoverable sugar per ton of cane (TRS/TC) was calculated. Juice samples were also analyzed for pH, titratable acidity, total polysaccharides and mannitol. Further, results were compared to actual factory data for daily core juice pH, crusher juice polysaccharides, syrup purities, C massecuite viscosities and sugar yield from Alma Plantation (Lakeland, LA) and syrup purities and sugar yield from the Leighton factory located at Thibodaux, LA (in the southern area below I-10).

Immediately following the field assessment, the LSU AgCenter issued best management practices (BMP) to be used in reducing the impact of the freeze events on sugar yield. Those BMPs stressed the need to deliver high quality cane to the factories free of mud, deteriorated tops and leaves and other trash. The BMP's indicated that growers and processors should not panic as the industry had experienced freeze events of this magnitude many times before. Since areas of higher elevation tend to be warmer, the BMPs recommended that growers should harvest fields with lower elevation first. Also, growers were informed that varieties with poor stalk cold tolerance, i.e., L99-226, L99-233 and L03-371, should be harvested first. Other items

Fig. 1. Stalk cold tolerance of Louisiana sugarcane varieties following a freeze event.

Reaction of Louisiana Sugarcane Varieties to Freezing Conditions [1]

Resistant	Intermediate	Susceptible
HoCP 04-838* (9)	LCP 85-384 (29)	L 99-226 (59)
	HoCP 96-540 (24)	L 99-233 (70)
	L 97-128 (23)	L 03-371 (61)
	HoCP 00-950† (50)	TucCP 77-42** (64)
	L 01-283 (34)	
	L 01-299 (36)	

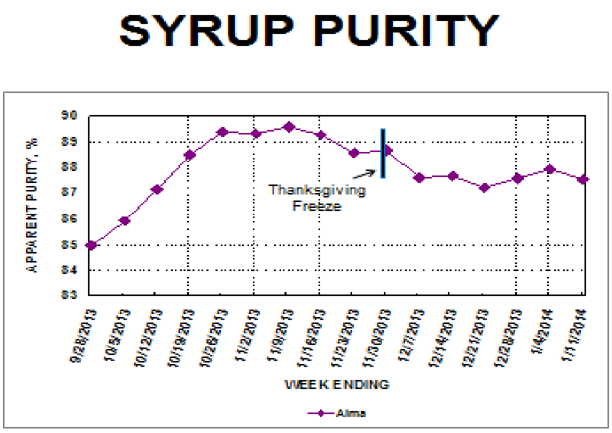
[1] Number in parenthesis weighted average of five parameters: sucrose, purity, TRS, ph and titratable acidity. Smaller the number the better the rating for stalk cold tolerance. Rating also a measure of deterioration as measured by dextran concentration.

* Candidate varieties; ** Argentine commercial variety; † Intermediate to Susceptible

discussed in the BMPs included standing vs. down cane, topping height and whether or not one should burn. It also warned of overnight sleeper loads that could lead to increased deterioration.

Data from the Outfield Test at Alma indicated that most of the parameters measured for the samples with tops and leaves, i.e., pH, titratable acidity, total polysaccharides, TRS/TC, remained relatively stable (unchanged) over the sampling period although it became increasingly impossible to clarify juice samples in the lab with aluminum chloride on the Dec. 26 sampling date. The Alma factory data, however, showed that the core lab juice pH, syrup purity and sugar yield started a slow decline over the same period. On the other hand, total polysaccharides in the crusher juice and C-massecuite viscosity at Alma showed significant declines after the freeze events with the BMPs in place. For the Leighton factory operating south of I-10, syrup purities and sugar yield actually continued to rise in spite of the freeze events and a wet harvest. In general, ambient temperatures following the freeze events were cooler than normal although there was one record daily high temperature of 29˚C (84˚F) on Dec. 5. With the BMPs in place, the Alma factory experienced no difficulties in the boiling house without any indication of c-axis elongation of sugar crystals even with the last strike of the 2013-2014, which was processed

Fig. 3. Syrup purity for Alma Plantation during the 2013-2014 crop harvest before and after the freeze events of Nov. 28-30, 2013.



on Jan. 6. It is interesting to note that on the final sampling date of the Outfield Test, Jan. 3, where tops and leaves were removed, there was no problem in clarifying juice samples in the lab at the Sugar Research Station while at the same time there was a significant reduction in juice pH and total polysaccharides and higher TRS/TC for all varieties in the test from the previous sampling date, Dec 26. All other parameters remained the same as the Dec. 26 sampling dates when all tops and leaves were not removed. These data showed that the BMPs implemented at the time of the freeze proved to be an effective tool in mitigating the effects of the freeze events of the magnitude that occurred on Nov. 28-30 and that factories could continue to operate with minimal problems in the boiling house so long as the frozen tops and leaves were removed. Even with these BMPs in place, however, it appears that the freeze events of Nov. 28-30 reduced overall state sugar yields by approximately 5.0 kg/tonne (10 lbs/ton) and by removing the top 30

Fig. 4. Syrup purity for Leighton Factory during the 2013-14 crop harvest before and after the freeze events of Nov. 20-30, 2013.

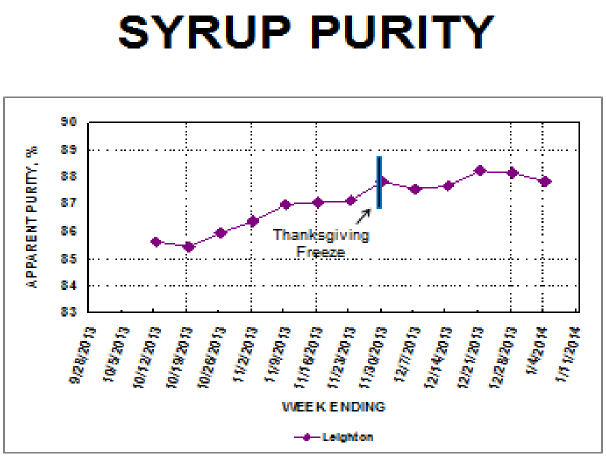
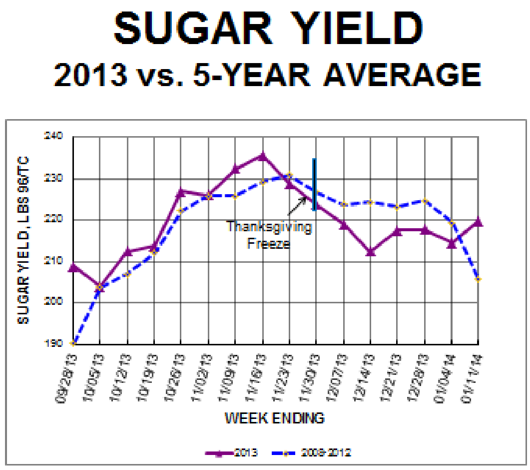


Fig. 5. Photo of normal sugar crystals with no c-axis elongation taken on the last day of the 2013-14 crop harvest at Alma Plantation on Jan. 6.

cm (10 in) of the stalk, field yields were reduced by approximately 6.75 tonnes/ha (3 tons/ac) such that the overall loss in sugar yield per hectare for the 2013-2014 crop amounted to about 33.6 kg/ha (30 lbs/ac).

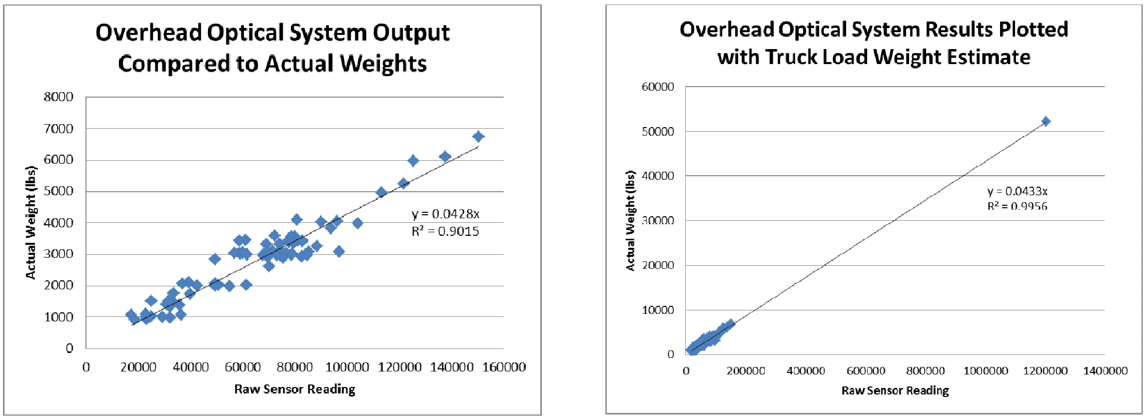
Fig. 6. Sugar yield for the 2013-14 crop harvest vs. five year average.



DEVELOPMENT OF TECHNOLOGIES TO ESTIMATE SUGARCANE YIELDS AND THE AMOUNT OF PLANTED MATERIAL IN ROWS

Randy R. Price
Dean Lee Alexandria - Central Research Station

Several yield monitors were developed and tested to indicate sugarcane yield and the load out weight of trucks. These monitors included an overhead optical method and a weight plate system. The overhead optical yield monitor was designed and tested on a John Deere 3510 harvester cutting green cane. This monitor provided very good results (Figure 1-A) creating a linear calibration line between raw sensor data and actual weigh wagon weights. The R^2 for this line was 0.90 with a standard deviation of 10%. This error rate (Figure 2) is somewhat high, but multiple weights averaged together over typical mapping areas (i.e. – 1 acre or so) should produce concise values. Also, a truck size weight was tested and yielded data that corresponded well to the initial calibration line (Figure 1-B). The error rate for this load was 1.5% missing the actual weight by 777 lbs (51,443 lbs versus 52,220 lbs). This result is very promising and the unit seemed to stay on calibration over the several days tested. Still, some additional work is needed to test the unit in different cane varieties and fields over long time periods.



(A) (B)

Figure 1: Result for overhead optical yield monitor and results plotted with truck load out weight (B).

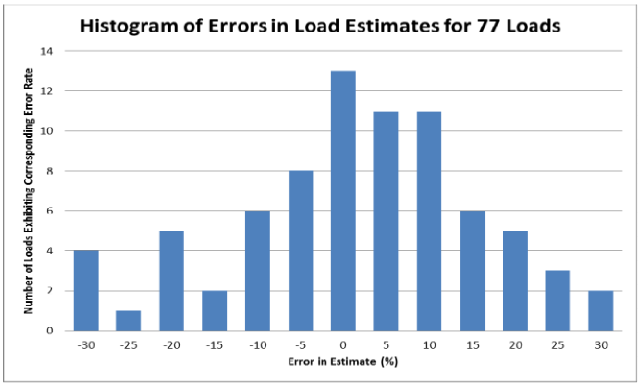


Figure 2: Error rate for overhead optical yield monitor

A weight plate system was also designed and mounted in the floor of the elevator of two 3500 series combines. These units produced promising results (Figure 3) but exhibited a float in the zeroing (tare) of the unit that caused periodic changes in calibration. Investigations into this phenomenon lead to three main causes, either (1) mud collection on the supporting frame causing a slow, long term drift, (2) billets becoming stuck in the lateral groove of the plate, or (3) billets collecting on the outside frame members of the weigh plate from the return chains. All of

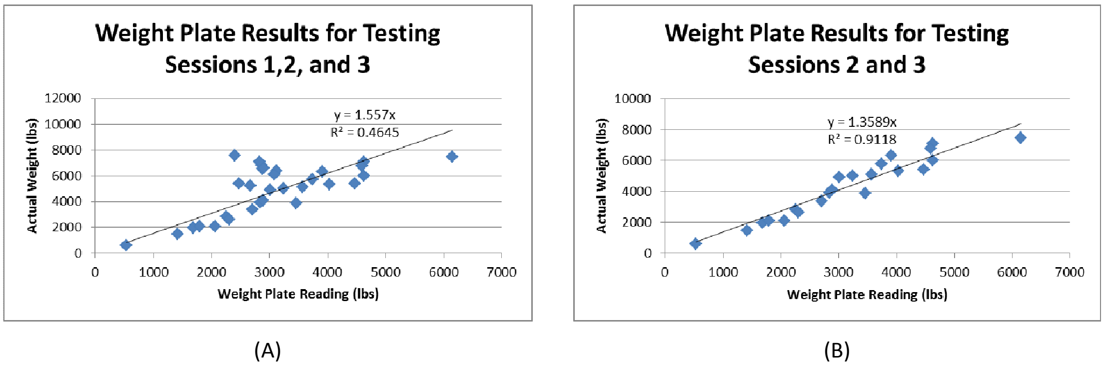


Figure 3: Weight plate results.

these effects caused either a temporary or constant change in the zero point that lead to short and long term drift. Still, short term readings over a 3 hour time period were quite good (Figure 3-B) yielding a linear calibration line with an R^2 between 0.89 and 0.98. The variance for Figure 2-B was 5.4% on 22 weigh wagon tests over a 4 to 5 hour time period. Future designs will need to address the changing tare problem with a better plate design.

<u>Planter Research</u>: A Greenseeker sensor was used on freshly planted fields to determine the amount of cane planted in the row. This data (Figure 4) indicated a linear relationship with material planted, but showed high variances on any one particular reading. Variances in the readings were caused by either excessive leaves on the plants, pilling, and sensor height variations. The billets created a slightly better curve than the whole stalk (probably because of reduction in the leaf matter and clumps in the material). Even though the variances are high, an

accurate prediction of the amount of cane in row may be possible if multiple readings are averaged together to create an “averaged reading” per row.

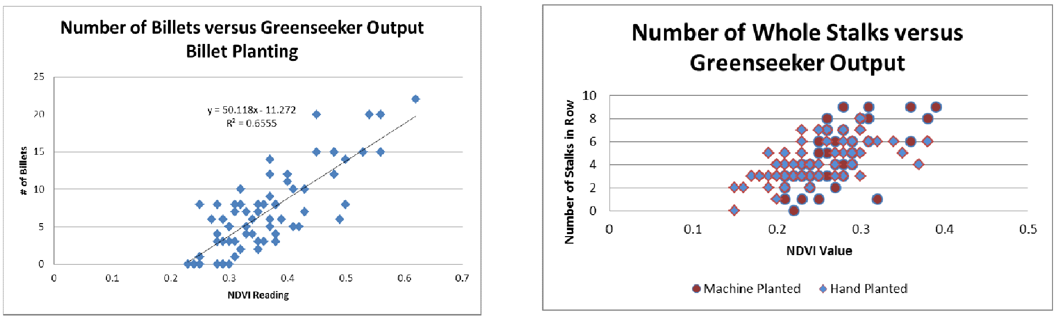


Figure 4: Results of Greenseeker NDVI value to amount of cane in planting

LARGE SCALE RIPENER EVALUATION

Albert Orgeron[1], Benjamin Legendre[2], Jim Griffin[3], and Kenneth Gravois[4]
[1]St. James Parish LCES, [2]Audubon Sugar Institute, [3]School of Plant, Environmental and Soil Sciences, [4]LCES

At the onset of the sugarcane harvest season in mid-September in Louisiana, sugarcane maturity in terms of sucrose accumulation is at its lowest and increases as the season progresses through natural ripening. Application of ripening agents target biochemical processes within the sugarcane plant, resulting in a redistribution of fixed carbon and a shifting of resources into sucrose storage. Use of chemical ripening agents to improve early season sucrose concentration is of critical importance to Louisiana sugarcane processors through improve efficiency and increased daily mill capacity.

Glyphosate has been used as a ripener in Louisiana since 1980 and has become a valuable component of sugarcane production systems. In recent years, however, sugarcane producers have become increasingly concerned with the possible deleterious effects of glyphosate ripener on subsequent ratoon crops; mainly, retardation of regrowth, leaf chlorosis, and reduced shoot population. Furthermore, there is interest in evaluating alternatives to glyphosate for use in sugarcane production programs.

In 2012, the United States Environmental Protection Agency (EPA) granted registration of trinexapac-ethyl (Moddus 2EC®) as a sugarcane ripener. The label states that sugarcane should be harvested 28 to 60 days after trinexapac-ethyl application. For glyphosate sugarcane should be harvested 21 to 49 days after application. Trinexapac-ethyl has been an effective ripener in Brazil and Australia. Unlike glyphosate, trinexapac-ethyl is classified as a plant growth regulator targeting gibberellin biosynthesis.

A replicated, large scale study was conducted on a second stubble field of HoCP 96-540 at Blackberry Farms in Vacherie. Aerial application of Moddus (19 oz/A) was applied on August 19, 2013, and Roundup PowerMax (5.3 oz/A) on September 17, 2013. Plots were harvested October 15, 2013, resulting in a ripener treatment duration of 57 days for Moddus and 28 days for Roundup PowerMax. Cane was harvested by combine and scale weights were obtained from Lafourche Sugar Factory. Core sample analyses for obtaining the yield of theoretical recoverable sugar per ton of cane (TRS) were obtained from both front and rear compartments of all trucks that were part of the experiment. Moddus minimally increased TRS by 4.5% above the nontreated control, whereas, a moderate increase of 10.0 % in TRS was observed for sugarcane treated Roundup PowerMax (Table 1). The 2013, TRS findings are consistent with the 2012 large scale ripener study, where Moddus increased TRS by 4.9 % and Roundup PowerMax increased TRS by 10.2%. In 2013, sugarcane yield and sugar yield was not statically impacted regardless of ripener treatment. This greatly differs from the 2012 report in which cane treated Moddus had higher sugarcane and sugar yields than the control.

Table 1. Large scale field experiment means comparing the efficacy of the ripeners Roundup PowerMax and Moddus to nontreated second stubble HoCP 96-540 at Blackberry Farms, Vacherie, LA in 2013.

Ripener Treatment	TRS lb/ton	% TRS Increase	Sugarcane Yield Tons/A	Sugar Yield lb/A	% Fiber
Nontreated	172.0 b		35.1 a	6036 a	18.9 a
Moddus (19 oz./ac)	179.8 ab	4.5	33.4 a	5989 a	20.6 a
PowerMax (5.3 oz./ac)	189.2 a	10.0	33.6 a	6349 a	20.5 a