BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet (stalk section) planting. During 2014, 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 an experiment was continued to evaluate the Syngenta Plene® planting system. A planting method test comparing two billet planters and whole stalk hand planting was established at the Sugar Research Station, and physical damage to billets caused by different planters was assessed. 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 combinations of three fungicides (azoxystrobin, fludioxonil, and mefenoxam), an insecticide (thiamethoxam), all pesticides combined, non-treated billets, and whole stalks. The pesticides were applied using different methods, including dip, in furrow spray, and a planter mounted sprayer.

Second ratoon results were obtained in a field experiment with HoCP 96-540 and L 03-371 evaluating application methods for all the seed treatment chemicals combined (Table 1). The tonnage and total sugar yield differences that were detected in plant cane were no longer evident in first or second 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 (Cruiser at 1% formulated product) and three fungicides combined (Dynasty at 1% formulated product). 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.

An experiment in first ratoon compared the effects of Syngenta seed treatment chemicals applied as an in-furrow spray at planting to billets and whole stalks of two varieties, HoCP 96-540 and L 03-371 (Table 2). All chemical treatments contained the insecticide (Cruiser at 5.5 oz/acre formulated product) and three fungicides combined (Dynasty at 16.8 oz/acre formulated product) and applied with an 11.6 gal/acre broadcast rate. There was very little environmental stress on the planting, and only a few differences were detected among the treatments in plant cane. In first ratoon, HoCP 96-540 total sugar yield was higher for treated whole stalks compared to treated billets and non-treated whole stalks. For L 03-371, cane tonnage and total sugar yield were higher for treated billets compared to non-treated whole stalks.

Table 1. Effects of Syngenta chemical treatments on cane tonnage and total sugar yield for L 99-226 and L 03-371 in 2012 plant cane, 2013 first ratoon, and 2014 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]
L 99-226						
Non-treated billets	39.8 b	9,519 b	23.5 a	4,871 a	27.8 a	5,152 a
In-furrow spray	40.6 b	9,693 b	22.6 a	4,617 a	32.3 a	6,114 a
Planter spray	40.8 b	9,805 b	26.7 a	5,393 a	29.1 a	5,920 a
Dip	49.3 a	12,187 a	25.8 a	5,173 a	34.2 a	5,633 a
Whole stalk	42.6 b	10,341 b	25.4 a	5,171 a	31.4 a	5,878 a
L 03-371						
Non-treated billets	34.5 b	8,347 b	28.1 a	5,732 a	34.8 a	6,652 a
In-furrow spray	46.7 a	11,170 a	35.6 a	7,414 a	36.9 a	7,203 a
Planter spray	39.9 ab	9,297 b	29.2 a	5,741 a	36.4 a	7,523 a

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

Table 2. Effects of combined Syngenta chemical treatment on billet and whole stalk planting yield components for HoCP 96-540 and L 03-371 in 2013 plant cane and 2014 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
HoCP 96-540				
Non-treated billets	31.5 a	7,217 ab	33.2 a	6,115 ab
Treated billets	35.0 a	8,233 a	28.4 a	5,474 b
Non-treated whole stalks	34.1 a	7,820 ab	28.5 a	5,231 b
Treated whole stalks	31.3 a	7,033 b	34.1 a	6,563 a
L 03-371				
Non-treated billets	28.7 a	6,050 a	26.4 ab	4,963 ab
Treated billets	29.7 a	6,536 a	31.0 a	5,821 a
Non-treated whole stalks	28.3 a	6,448 a	22.9 b	4,248 b
Treated whole stalks	31.6 a	7,128 a	27.9 ab	5,266 ab

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

First ratoon yields were determined for a field experiment at the Sugar Research Station 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. All chemical treatments contained the insecticide (Cruiser at 5.5 0z/acre formulated product) and three fungicides combined (Dynasty at 16.8 oz/acre formulated product) and applied as an in-furrow spray with a 15 gal/acre broadcast rate. Three varieties, HoCP 96-540, L 99-226, and L 01-299 were included in the experiment. In first ratoon, some differences were detected between treatments in total sugar yield for L 99-226 and L 01-299 (Table 3). Sugar yield of L 99-226 was higher for treated Plene and treated 3-4 bud billets compared to non-treated billets, and yield of L 01-299 was higher for treated billets compared to non-treated billets. Yield of treated billets was similar to whole stalk planting for all three varieties.

Table 3. Comparison of 2013 plant cane and 2014 first ratoon 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 at the Sugar Research Station.

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
HoCP 96-540				
Plene	53.5 a	12,127 a	54.1 a	6,152 a
Non-treated billets	52.1 a	11,649 a	55.5 a	6,719 a
Treated billets	56.5 a	12,847 a	49.6 a	5,499 a
Whole stalks	55.8 a	12,504 a	57.1 a	6,582 a
L 99-226				
Plene	51.6 a	12,125 a	62.3 a	7,672 a
Non-treated billets	38.1 c	8,545 b	55.1 a	6,252 b
Treated billets	46.8 ab	10,363 ab	59.4 a	7,167 a
Whole stalks	40.7 bc	9,715 b	59.1 a	6,836 ab
L 01-299				
Plene	62.1 a	13,301 a	65.0 a	6,718 b
Non-treated billets	53.7 a	11,308 b	61.6 a	7,465 ab
Treated billets	61.4 a	13,447 a	64.9 a	8,263 a
Whole stalks	62.3 a	13,148 ab	65.4 a	8,502 ab

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

Stand establishment and plant cane yield components were determined for a field experiment comparing HoCP 96-540 non-treated billets and whole stalks with billets treated with different combinations of Syngenta seed treatment chemicals applied as either a dip or an in-furrow spray. The treatments were: non-treated 3-4 bud billets, non-treated whole stalks, Uniform (28.2% azoxystrobin and 10.9% mefenoxam) 1% dip, Uniform in-furrow spray at 20 oz/acre at 15 gal/acre broadcast rate, Dynasty (6.64% azoxystrobin, 1.11% fludioxonil, and 3.32% mefenoxam) 1% dip, Dynasty in-furrow spray at 20 oz/acre at 15 gal/acre broadcast rate, Cruiser (47.6% thiamethoxam) in-furrow spray at 20 oz/acre at 15 gal/acre broadcast rate, Uniform + Cruiser dip, and Uniform + Cruiser in-furrow spray.

Differences were detected among treatments for initial fall shoot populations, spring shoot populations, and millable stalk populations (Table 4). Initial shoot populations during the fall were higher for the Uniform and Uniform + Cruiser dip treatments compared to non-treated billets. The following spring after a stressful winter, shoot populations were higher for whole stalks and the Uniform and Uniform + Cruiser dip treatments compared to non-treated billets. Millable stalk counts were higher for whole stalks and Uniform, Dynasty, Cruiser, and Uniform + Cruiser dip treatments compared to non-treated billets, while the shoot population for the Uniform in-furrow spray was lower.

Table 4. Comparison of plant cane fall shoot, spring shoot, and millable stalk populations for HoCP 96-540 billets with and without treatment with different combinations of Syngenta seed-treatment chemicals and whole stalks in a field experiment conducted at the Sugar Research Station during 2014.

Treatment	Fall shoots/acre[1]	Spring shoot population/acre[1]	Millable stalks per acre[1]
Non-treated billets	17,323 cde	12,583 cd	36,145 d
Non-treated whole stalks	13,385 e	25,166 a	43,047 b
Billets Uniform dip treatment	26,560 ab	21,785 ab	44,336 ab
Billets Uniform in-furrow spray	14,953 de	9,028 d	32,730 e
Billets Dynasty dip treatment	21,053 bcd	17,289 bc	41,967 bc
Billets Dynasty in-furrow spray	17,463 cde	11,293 d	35,936 de
Billets Cruiser dip treatment	22,587 bc	16,661 c	42,001 bc
Billets Cruiser in-furrow spray	19,868 cd	13,315 cd	39,178 cd
Billets Uniform + Cruiser dip treatment	30,708 a	22,691 a	47,334 a
Billets Uniform + Cruiser in-furrow spray	14,849 de	9,342 d	36,146 d

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

Treatments affected cane tonnage and total sugar/acre yields but not stalk weight or sugar yield per ton of cane (Table 5). Cane tonnage was higher for whole stalks and the Uniform, Cruiser, and Uniform + Cruiser dip treatments compared to non-treated billets, while all the in-furrow spray treatments did not result in higher tonnage. The Uniform + Cruiser dip treatment had higher cane tonnage than the whole stalk planting. Total sugar yield was higher for whole stalk and Uniform, Cruiser, and Uniform + Cruiser dip treatments compared to non-treated billets, while the Dynasty dip and all in-furrow spray treatments had similar yields to non-treated billets.

Table 5. Comparison of plant cane yield components for HoCP 96-540 billets with and without treatment with different combinations of Syngenta seed-treatment chemicals and whole stalks in a field experiment at the Sugar Research Station during 2014.

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
Non-treated billets	2.49 ab	205 a	39.3 ef	6,099 cd
Non-treated whole stalks	2.69 a	209 a	47.2 bc	7,475 ab
Billets Uniform dip treatment	2.67 a	205 a	46.7 bcd	7,211 ab
Billets Uniform in-furrow spray	2.50 ab	199 a	36.6 f	5,477 d
Billets Dynasty dip treatment	2.39 b	202 a	44.3 cde	6,715 bc
Billets Dynasty in-furrow spray	2.60 ab	194 a	41.1 def	5,930 cd
Billets Cruiser dip treatment	2.63 ab	202 a	52.3 ab	7,972 a
Billets Cruiser in-furrow spray	2.58 ab	201 a	43.4 cde	6,567 bc
Billets Uniform + Cruiser dip treatment	2.53 ab	201 a	53.6 a	8,065 a
Billets Uniform + Cruiser in-furrow spray	2.62 ab	198 a	36.1 f	5,370 d

[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 that result in increased cane tonnage and total sugar yield. The results suggest that the most consistent benefit comes from dip application of all of the pesticides combined. The results with the Syngenta seed-treatment chemicals are promising, and the research will be continued.

Physical damage to billets causes loss of buds and rind damage provides starting points for stalk rot. Previous effort has demonstrated that harvester modifications can minimize physical damage. However, mechanical planting then can cause additional damage to billets. During the 2014 planting season, billet damage caused by four types of planters was determined. Billet damage was evaluated for four mechanical planters: a new American Sugar Cane League (ASCL) planter that plants billets in two drills along 6-foot-center rows, a standard single-row drum billet planter, a Louviere planter at Rivet Farms that plants billets in two drills along 8-foot-center rows, and a new proto-type single-row billet planter imported from Costa Rica. The new planters all carry billets over the top of an elevator rather than billets passing under a drum. Damage was compared for mechanically harvested billets before and after passage through the various planters. Billet damage caused by the ASCL and drum planter was compared at the Sugar Research Station. Comparisons were made for billet characteristics, including length, number of buds, number of damaged buds per billet, number of damaged internodes per billet, and the percentage of undamaged billets.

All of the planters caused additional damage to billets (Table 6). Billet breakage was reflected in a reduction in average billet length after passage through the planter. Comparisons of the ASCL and conventional drum planter suggested that over-the-top delivery of the billets resulted in less damage. The variety and the condition of the seedcane source were other factors that might have affected the damage caused by the harvester and planter. The Louviere double-drill planter at the Rivet's caused little or no damage to L 01-299 billets but considerable damage to HoCP 96-540 billets. The degree of lodging may have been a factor. A later cutting of HoCP 96-540 billets at the Sugar Research Station after lodging of the seedcane had greater damage. Similarly, harvest and after planter damage was high for billets of L 99-226 cut from lodged seedcane.

Conversion from 6-foot-center to 8-foot-center rows on at Rivet Farms offered the opportunity to monitor and compare stand establishment and yield produced from double-drill billet and whole stalk plantings of multiple varieties planted from late August to mid-September. As expected, billet plantings produced higher initial shoot populations compared to whole stalk plantings during the fall with earlier plantings producing more shoots than late plantings (Table 7). These fields will be followed through to at least millable stalk populations during 2015.

With multiple factors imperiling conventional whole stalk hand and machine planting, research to develop methods to make billet planting more reliable will continue to be a high priority. The ability to plant high quality billets with minimal damage is needed. Chemical protection against stalk rot damage would be desirable. Subsequent research will focus on lower more affordable rates and an effective spray delivery system. The double-drill planting method needs evaluation to determine whether it can increase billet planting yield with the same amount of seedcane and without any additional inputs.

Table 6. Billet characteristics and damage before and after four planters assessed during 2014 planting season.								
Planter[1]	Before/after planter[2]	Variety	Date/location[3]	Average length (inches)[4]	Buds/ billet[4]	Damaged buds[4]	Damaged internodes[4]	Undamaged billets
2-drill ASCL	Before	L 01-299	8/1 Levert	20.9	2.9	0.5	0.3	52%
2-drill ASCL	After	L 01-299	8/1 Levert	20.1	2.5*	0.5	0.5	58%
2-drill ASCL	Before	HoCP 04-838	8/26 St. Gab	24.1	3.4	0.2	0.8	44%
2-drill ASCL	After	HoCP 04-838	8/26 St. Gab	20.2*	3.3	0.4*	0.7	32%
Drum	After	HoCP 04-838	8/26 St. Gab	18.9*	3.1	0.6*	0.8	26%
2-drill ASCL	Before	HoCP 96-540	8/26 St. Gab	23.0	3.1	0.1	0.4	64%
2-drill ASCL	After	HoCP 96-540	8/26 St. Gab	20.9*	2.8	0.1	0.3	64%
Drum	After	HoCP 96-540	8/26 St. Gab	21.5	2.9	0.1	0.4	49%
2-drill ASCL	After	HoCP 96-540	9/10 St. Gab	21.3	2.9	0.2	1.1*	23%
2-drill Rivet (8-ft-center)	Before	L 01-299	9/23 Rivet	22.4	3.0	0.2	0.6	40%
2-drill Rivet (8-ft-center)	After	L 01-299	9/23 Rivet	20.9	2.9	0.3	0.8*	38%
2-drill Rivet (8-ft-center)	Before	HoCP 96-540	9/23 Rivet	21.0	2.8	0.1	0.4	56%
2-drill Rivet (8-ft-center)	After	HoCP 96-540	9/23 Rivet	20.4	2.8	0.4*	0.8**	35%
Costa Rica	Before	L 99-226	9/24 Allen	24.7	3.8	0.4	0.8	32%
Costa Rica	After	L 99-226	9/24 Allen	21.4*	3.1*	0.6	1.1	22%

[1]Billet damage was evaluated for four mechanical planters: American Sugar Cane League (ASCL) planter that plants billets in two drills along 6-foot-center rows, standard drum billet planter, Louviere planter at Rivet Farms that plants billets in two drills along 8-foot-center rows, and a new proto-type billet planter imported from Costa Rica.

Table 7. Fall shoot populations compared in billet and whole stalk plantings on 8-foot-center rows planted at Rivet Farms during 2014.

Location	Block	Planting date	Variety	Seedcane	Right drill 15 ft shoot count	Left drill 15 ft shoot count	Both drills shoot count
Surprise	14	8/22	HoCP 00-950	Billet	107	136	243
				Whole	86	98	184
Holiday	16	8/25	L 01-283	Billet	147	105	252
				Whole	92	85	177
Holiday	15	9/7	HoCP 04-838	Billet	153	139	292
				Whole	115	100	215
Holiday	33	9/7	HoCP 04-838	Billet	110	107	217
				Whole	93	92	185
Holiday	8	9/7	L 01-299	Billet	79	77	156
				Whole	37	54	91
Holiday	8	9/19	L 01-299	Billet	44	44	88
Belmont	8	9/11	HoCP 96-540	Billet	88	87	175
				Whole	72	74	146
Fairoaks	19	9/11	HoCP 96-540	Billet	54	46	100
				Whole	36	40	76
Fairoaks	64	9/13	L 01-283	Billet	53	54	107
				Whole	27	37	64
Fairoaks	7	9/14	L 01-283	Billet	79	68	147
				Billet no treat	70	59	129
				Whole	23	21	43
Fairoaks	16	9/15	L 01-283	Billet	59	47	106
				Whole	33	33	66