BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet (stalk section) planting. During 2015, results were obtained from field experiments conducted at the Sugar Research Station at St. Gabriel evaluating the potential for 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 conducted at the Sugar Research Station, and physical damage to billets caused by different planters was assessed. Results from two field experiments comparing billet and whole stalk planting of sugarcane and energy cane varieties is reported separately.

Chemical seed treatments continued to be evaluated in field experiments to determine whether they can increase yields obtained from billet plantings in Louisiana. Results were obtained from on-going and newly established experiments comparing different varieties, treatments, and application methods.

Second ratoon results were obtained in a field experiment with two varieties, HoCP 96-540 and L 03-371, evaluating application of all Syngenta® seed treatment chemicals combined with an in-furrow spray application. The tonnage and total sugar yield differences that were detected among treatments in plant cane or first ratoon were no longer evident in second ratoon (Table 1). Some benefits were obtained from application of the chemicals as an in-furrow spray, but the yield increases were not as large as those provided by dip treatments in other experiments. Earlier experiments evaluated mostly dip and sometimes in-furrow spray 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, the in-furrow spray chemical application method was used in this experiment. All chemical treatments contained the insecticide Cruiser (thiamethoxam) at a rate of 5.5 oz of formulated product per acre and the three fungicides contained in Dynasty (azoxystrobin, fludioxanil, and mefanoxam) at a rate of 16.8 oz of formulated product per acre. Treatments were applied in a 36 inch band over the top of billets in the planting furrow before covering with a CO_2 backpack sprayer using a broadcast volume of 15 gallons per acre.

Second ratoon yields also were determined for 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 applied in-furrow and non-treated whole stalks. 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) 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 second ratoon, differences were detected between treatments in cane tonnage and total sugar yield for L 99-226 (Table 2). Sugar yield was higher for the Plene treatment compared to whole stalks.

Table 1. Effects of combined Syngenta chemical in-furrow spray treatments on cane tonnage and total sugar yield for HoCP 96-540 and L 03-371 billets and whole stalks in 2013 plant cane, 2014 first ratoon, and 2015 second ratoon in a field experiment at the Sugar Research Station.

Variety and treatment	Plant cane Tons cane/A[1]	Plant cane Sugar/A (lbs.)[1]	First ratoon Tons cane/A[1]	First ratoon Sugar/A (lbs.)[1]	Second ratoon Tons cane/A[1]	Second ratoon Sugar/A (lbs.)[1]
HoCP 96-540						
Non-treated billets	31.5 a	7,217 ab	33.2 a	6,115 ab	33.8	6,745
Treated billets	35.0 a	8,233 a	28.4 a	5,474 b	34.7	7,356
Non-treated whole stalks	34.1 a	7,820 ab	28.5 a	5,231 b	32.1	6,844
Treated whole stalks	31.3 a	7,033 b	34.1 a	6,563 a	32.5	6,575
L 03-371						
Non-treated billets	28.7 a	6,050 a	26.4 ab	4,963 ab	30.9	6,616
Treated billets	29.7 a	6,536 a	31.0 a	5,821 a	30.5	6,649
Non-treated whole stalks	28.3 a	6,448 a	22.9 b	4,248 b	29.5	6,323
Treated whole stalks	31.6 a	7,128 a	27.9 ab	5,266 ab	32.4	7,002

[1]Mean values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05). A = acre. No letters shown when all means were similar.

Table 2. Comparison of 2013 plant cane, 2014 first ratoon, and 2015 second ratoon yield components for three varieties, HoCP 96-540, L 99-226 and L 01-299, in plantings of Plene (single-bud cuttings), 3-4 bud billets with and without in-furrow spray treatment with Syngenta seed-treatment chemicals, and whole stalks in a field experiment conducted at the Sugar Research Station.

Variety and treatment	Plant cane Tons cane/A[1]	Plant cane Sugar/A (lbs.)[1]	First ratoon Tons cane/A[1]	First ratoon Sugar/A (lbs.)[1]	Second ratoon Tons cane/A[1]	Second ratoon Sugar/A (lbs.)[1]
HoCP 96-540						
Plene	53.5 a	12,127 a	54.1 a	6,152 a	34.1 a	7,383 a
Non-treated billets	52.1 a	11,649 a	55.5 a	6,719 a	36.0 a	7,652 a
Treated billets	56.5 a	12,847 a	49.6 a	5,499 a	36.7 a	7,637 a
Whole stalks	55.8 a	12,504 a	57.1 a	6,582 a	34.9 a	7,404 a
L 99-226						
Plene	51.6 a	12,125 a	62.3 a	7,672 a	46.3 a	9,958 a
Non-treated billets	38.1 c	8,545 b	55.1 a	6,252 b	37.3 ab	7,999 ab
Treated billets	46.8 ab	10,363 ab	59.4 a	7,167 a	40.8 ab	8,999 ab
Whole stalks	40.7 bc	9,715 b	59.1 a	6,836 ab	33.2 b	7,277 b
L 01-299						
Plene	62.1 a	13,301 a	65.0 a	6,718 b	40.8 a	8,868 a
Non-treated billets	53.7 a	11,308 b	61.6 a	7,465 ab	35.6 a	7,885 a
Treated billets	61.4 a	13,447 a	64.9 a	8,263 a	42.5 a	9,460 a
Whole stalks	62.3 a	13,148 ab	65.4 a	8,502 ab	39.7 a	8,455 a

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

First ratoon yields were determined and compared in 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 with a 15 gal/acre broadcast rate, Uniform + Cruiser dip, and Uniform + Cruiser in-furrow spray. Treatments affected cane tonnage and total sugar/acre yields (Table 3). Cane tonnage and total sugar yield in first ratoon were generally similar for whole stalks and the dip chemical treatments, whereas yields for in-furrow spray treatments were lower.

Table 3. Comparison of 2014 plant cane and 2015 first ratoon cane tonnage and total sugar yields for HoCP 96-540 billets planted with and without treatment with different combinations of Syngenta seed-treatment chemicals and non-treated whole stalks in a field experiment 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
Non-treated billets	39.3 ef	6,099 cd	46.0 cd	9,445 cde
Non-treated whole stalks	47.2 bc	7,475 ab	55.1 a	11,492 a
Billets Uniform dip treatment	46.7 bcd	7,211 ab	51.5 abc	10,704 abc
Billets Uniform in-furrow spray	36.6 f	5,477 d	45.5 cd	9,174 cde
Billets Dynasty dip treatment	44.3 cde	6,715 bc	51.2 abc	10,255 abcd
Billets Dynasty in-furrow spray	41.1 def	5,930 cd	43.7 d	8,784 de
Billets Cruiser dip treatment	52.3 ab	7,972 a	49.5 abcd	9,790 bcde
Billets Cruiser in-furrow spray	43.4 cde	6,567 bc	47.8 bcd	9,766 bcde
Billets Uniform + Cruiser dip treatment	53.6 a	8,065 a	54.4 ab	11,112 ab
Billets Uniform + Cruiser in-furrow spray	36.1 f	5,370 d	43.2 d	8,665 e

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

A 2015 plant cane experiment compared HoCP 96-540 non-treated billets and whole stalks to billets receiving a dip application of Cruiser insecticide (thiamethoxam), Dynasty fungicide (axozystrobin, fludioxanil, and mefanoxam), Uniform fungicide (azoxystrobin and mefanoxam), QuadrisXtra (azoxystrobin and cyproconazole), Cruiser + Dynasty, Cruiser + Uniform, Cruiser + QuadrisXtra, and the disinfectant Pinesol. The concentrations of the insecticide and fungicides in the dip solutions were reduced to approximate commercial label rates, and the fungicides were adjusted to have similar concentrations of active ingredients for one fungicide, azoxystrobin. The rates for each chemical were 11.5 oz/acre formulated product of Cruiser (0.3% in the dip solution), 27.7 oz/acre of Dynasty (0.72% dip), 6.5 oz/acre of Uniform (0.17% dip), and 10.45 oz/acre of QuadrisXtra (0.27% dip). Pinesol was diluted at the recommended rate of ¼ cup (60 ml) per gallon of water (1.6% solution). The experiment was conducted in cooperation with Dr. Paul White of the USDA-ARS Sugarcane Research Unit.

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 highest for the Cruiser + Dynasty treatment compared to all other treatments except Cruiser + Uniform. Cruiser + QuadrisXtra had a higher initial stand than non-treated billets, and the population in the Pinesol treatment was lower than for all other treatments. The following spring after a stressful winter, shoot populations were higher for whole stalks than for the single chemical dips but not the insecticide + fungicide dips. All chemical treatments had a higher shoot population than non-treated billets, and the population for non-treated billets was higher than for Pinesol. Millable stalk population was highest for the Cruiser + Uniform treatment and whole stalks with similar populations in all the other chemical treatments except Dynasty alone and Cruiser + QuadrisXtra. These two treatments were not different from non-treated billets. The Pinesol stalk population was lower than all other treatments.

Differences were detected among treatments for plant cane yield components sugar per ton of cane, cane tonnage, and total sugar yield but not stalk weight (Table 5). None of the chemical treatments had a significantly higher stalk sugar content than non-treated billets. All chemical treatments had comparable cane tonnage to whole stalks, and all had higher tonnage than non-treated billets, except for Dynasty and Uniform applied alone. All chemical treatments had comparable total sugar yield to whole stalks and a higher yield than non-treated billets, except Dynasty alone and Cruiser + QuadrisXtra. Pinesol total sugar yield was lower than for all treatments, except for non-treated billets.

Table 4. Comparison of plant cane fall shoot, spring shoot, and millable stalk populations for HoCP 96-540 billets with and without dip treatment with different combinations of seed-treatment chemicals and whole stalks in a field experiment conducted at the Sugar Research Station during 2015.

Treatment	Fall shoots/acre[1]	Spring shoot population/acre[1]	Millable stalks per acre[1]
Non-treated billets	10,840 c	15,650 d	32,765 cd
Non-treated whole stalks	12,723 bc	33,845 a	45,696 a
Cruiser dip	12,130 bc	21,471 c	39,666 ab
Dynasty dip	12,897 bc	21,367 c	38,028 bc
Uniform dip	12,966 bc	26,839 b	41,165 ab
QuadrisXtra dip	12,688 bc	27,013 b	43,465 ab
Cruiser + Dynasty	16,138 a	30,743 ab	43,814 ab
Cruiser + Uniform	14,221 ab	29,847 ab	45,383 a
Cruiser + QuadrisXtra	13,733 b	30,464 ab	38,481 bc
Pinesol	6,274 d	9,795 e	26,909 d

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

Table 5. Comparison of plant cane yield components for HoCP 96-540 billets with and without dip treatment with different combinations of seed-treatment chemicals and whole stalks in a field experiment at the Sugar Research Station during 2015.

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
Non-treated billets	2.31 ab	221.2 abc	34.5 de	7,638 d
Non-treated whole stalks	2.58 ab	222.3 ab	47.8 abc	10,640 ab
Cruiser dip	2.72 a	216.1 abc	42.5 bc	9,192 bcd
Dynasty dip	2.20 b	211.3 bc	40.2 cd	8,434 cd
Uniform dip	2.38 ab	227.2 a	42.0 bcd	9,526 bc
QuadrisXtra dip	2.34 ab	227.2 a	51.0 a	11,560 a
Cruiser + Dynasty	2.42 ab	221.2 abc	47.5 abc	10,507 ab
Cruiser + Uniform	2.53 ab	226.1 a	49.5 ab	11,169 a
Cruiser + QuadrisXtra	2.71 a	224.5 ab	53.0 a	11,886 a
Pinesol	2.28 ab	207.8 c	28.2 e	5,856 e

[1]Mean 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.

A field experiment was planted to compare two billet planting methods and whole stalk planting. Two varieties, HoCP 96-540 and HoCP 04-838, were included with two planting dates. Billets were planted with a conventional drum planter in which billets are metered under the drum into a single open furrow or with a double-drill planter in which billets are carried over the top and through two funnels into each of two narrow drills opened in the row. Whole stalks were hand planted at a rate of three stalks and a lap. The planting rates for the billets were determined as number of billets running in the open furrow or for both drills combined. The two planting dates were August 26 and October 9, 2014. The experiment was conducted in cooperation with Dr. Paul White of the USDA-ARS Sugarcane Research Unit.

At the first planting date, the planting rate was higher for double-drilled billets of HoCP 96-540 and higher for double-drill planted billets of both varieties for the second planting date (Table 6). The weight of cane planted differed among treatments for both planting dates, as well, with more cane planted by the double-drill planter. The amount of physical damage caused by the harvester and two planters was determined and compared for the first planting (Table 7). Some damage to billets caused by the mechanical planters was indicated by the reduced average length for both varieties, the higher number of damaged buds per billet, and the lower percentage of undamaged billets for HoCP 04-838. Physical damage was less evident for the double-drill planter compared to the conventional under-the-drum planter.

Table 6. Planting method comparison results for planting rates as determined by number of billets in the row furrow or cane weight for HoCP 96-540 and HoCP 04-838 planted at two dates as billets with a conventional drum planter in an open furrow or in a double-drill and hand planted whole stalks in a field experiment conducted at the Sugar Research Station during 2015.

		August planting date		October planting date	
Variety	Method	Planting rate[1]	Cane weight[1]	Planting rate[1]	Cane weight[1]
HoCP 96-540	Open furrow	6.0 b	17.8 bc	5.3 b	15.5 c
HoCP 96-540	Double drill	10.2 a	26.2 a	9.3 a	35.4 a
HoCP 04-838	Open furrow	5.8 b	19.1 bc	5.4 b	20.9 bc
HoCP 04-838	Double drill	6.3 b	22.2 ab	8.2 a	26.0 b
HoCP 96-540	Whole stalk	-	12.8 c	-	14.0 c
HoCP 04-838	Whole stalk	-	14.7 c	-	13.9 c

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

Table 7. Planting method comparison results for billet characteristics determined for HoCP 96-540 and HoCP 04-838 after cutting with the mechanical harvest and then after passing through the conventional drum planter or the double-drill planter in a field experiment conducted at the Sugar Research Station during 2015.

		Billet characteristics[1]				
Time of evaluation	Variety	Length (inches)	Number of buds/billet	Number of damaged buds	Number of damaged internodes	Billets with no damage
After harvester	HoCP96-540	23.0 a	3.1	0.1	0.5	64%
After drum planter	HoCP96-540	21.5 ab	3.0	0.1	0.4	40%
After double-drill planter	HoCP96-540	20.9 b	2.8	0.1	0.3	68%
After harvester	HoCP04-838	24.1 a	3.4	0.2 b	0.8	42%
After drum planter	HoCP04-838	18.9 b	3.1	0.6 a	0.8	22%
After double-drill planter	HoCP04-838	20.2 b	3.3	0.4 a	0.7	32%

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

The fall (initial) shoot counts in the first planting were higher for double-drill planted billets compared to the drum planter and whole stalks for HoCP 96-540 and higher for both planters compared to whole stalks for HoCP 04-838 (Table 8). Buds on billets tend to germinate better than on whole stalks, and the planting rate was higher for billets, so these results would be expected. After a winter with stressful environmental conditions, spring shoot populations are often higher for whole stalk plantings compared to billet plantings. However, spring shoot populations were similar for all methods in the first planting and higher for double-drilled billets of HoCP 96-540 in the second planting (Table 9). Millable stalk populations were higher for double-drilled billets and whole stalks compared to drum planted billets of HoCP 96-540 but similar for all methods in the first planting (Table 8). In the second (late) planting, double-drilled billets had a higher stalk population than the other planting methods for both varieties (Table 9).

Table 8. Planting method comparison results for plant cane fall shoot, spring shoot, and millable stalk populations of HoCP 96-540 and HoCP 04-838 planted as billets with a conventional drum planter in an open furrow or in a double-drill and hand planted whole stalks in a field experiment conducted at the Sugar Research Station during 2015 (first planting – August 26, 2014).

Variety/Treatment	Fall shoots/acre[1]	Spring shoot population/acre[1]	Millable stalks per acre[1]
HoCP 96-540			
Double-drill billets	35,828 a	24,846	43,560 a
Drum planter/open-furrow billets	22,173 b	27,913	36,522 b
Whole stalk hand plant	17,340 b	33,471	42,412 a
HoCP 04-838			
Double-drill billets	42,594 a	44,104	53,197
Drum planter/open-furrow billets	42,473 a	40,238	50,327
Whole stalk hand plant	21,992 b	41,446	49,904

[1]Mean values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05). No letters shown when all means were similar.

Table 9. Planting method comparison results for plant cane fall shoot, spring shoot, and millable stalk populations of HoCP 96-540 and HoCP 04-838 planted as billets with a conventional drum planter in an open furrow or in a double-drill and hand planted whole stalks in a field experiment conducted at the Sugar Research Station during 2015 (second planting – October 9, 2014).

Treatment	Fall shoots/acre[1]	Spring shoot population/acre[1]	Millable stalks per acre[1]
HoCP 96-540			
Double-drill billets	-	19,817	42,262 a
Drum planter/open-furrow billets	-	16,917	33,894 b
Whole stalk hand-plant	-	22,475	35,857 b
HoCP 04-838			
Double-drill billets	-	38,063 a	55,161 a
Drum planter/open-furrow billets	-	24,771 b	43,530 b
Whole stalk hand-plant	-	27,430 b	45,131 b

[1]Mean values for comparisons within a variety and column followed by the same letter were not significantly different (P=0.05). Low shoot emergence in the late planting did not allow for fall counts.

Differences in plant cane yield components were detected among the planting methods and varieties in both plantings. In the first planting, no differences were found for stalk weight and sugar per ton of cane, while the cane tonnage and total sugar yields were higher for the whole stalk planting than both billet plantings for HoCP 04-838 but only the drum planted billets of HoCP 96-540 (Table 10). In the second planting, double-drilled billets had a higher stalk weight than hand-planted whole stalks of HoCP 96-540, and there were no differences in sugar per ton (Table 11). Cane tonnage and total sugar yields were higher for whole stalk planting than both billet planting methods for HoCP 96-540, and double-drilled billets had a higher cane tonnage than drum-planted billets. For HoCP 04-838, the only difference among methods for the aggregate yield components was higher cane tonnage for whole stalks compared to drum-planted billets.

Table 10. Planting method comparison results for plant cane yield components of HoCP 96-540 and HoCP 04-838 planted as billets with a conventional drum planter in an open furrow or in a double-drill and hand planted whole stalks in a field experiment conducted at the Sugar Research Station during 2015 (first planting – August 26, 2014).

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
HoCP 96-540				
Double-drill billets	1.9	219.5	41.1 ab	9,074 ab
Drum planter/open-furrow billets	2.2	223.2	38.0 b	8,461 b
Whole stalk hand-plant	2.2	224.4	47.4 a	10,644 a
HoCP 04-838				
Double-drill billets	1.6	223.2	34.3 b	7,645 b
Drum planter/open-furrow billets	1.6	216.7	32.1 b	6,949 b
Whole stalk hand-plant	1.7	223.4	40.3 a	9,005 a

[1]Mean values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05). No letters shown when all means were similar.

Physical damage to billets causes loss of buds and rind damage that provides starting points for stalk rot. Harvester modifications have been developed that can minimize physical damage to billets. However, mechanical planting can then cause additional damage. During the 2015 planting season, billet damage caused by four types of planters was evaluated. Billet characteristics and mechanical damage were determined after harvesting (before the planter) and after passing through two planters (Table 12). A Benoit planter did not increase billet damage. A Louviere planter had fewer buds per billet and a higher level of internode damage after billets passed through the planter. Both planters provide active delivery of billets to an elevator at the front of the wagon that carries the billets over the top into two funnels directing billets into separate drills.

The billet planting rate and billet characteristics were evaluated for four billet planters during 2015 (Table 13). The planters included two Benoit planters and a Louviere planter designed to deliver billets in a double-drill for 8-ft-center rows and a Traube three-row planter for 6-ft-center rows. The new planters all carry billets over the top of an elevator rather than billets passing under a drum. All four planters did a good job providing a planting rate of 3-4 billets running in the furrow. The average length ranged from 18-22 inches with 3-4 buds per billet. Variability among planters was recorded for the percentage of billets with no obvious mechanical 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 that were not accounted for in the evaluations. Damage may be greater when billets are harvested from lodged cane.

Table 11. Planting method comparison results for plant cane yield components of HoCP 96-540 and HoCP 04-838 planted as billets with a conventional drum planter in an open furrow or in a double-drill and hand planted whole stalks in a field experiment conducted at the Sugar Research Station during 2015 (second planting – October 9, 2014).

Variety and treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
HoCP 96-540				
Double-drill billets	2.4 a	208.9	38.0 b	7,943 b
Drum planter/open-furrow billets	2.1 ab	214.7	33.0 c	7,089 b
Whole stalk hand-plant	2.0 b	216.6	43.2 a	9,351 a
HoCP 04-838				
Double-drill billets	2.1	217.2	36.7 ab	7,965
Drum planter/open-furrow billets	2.3	213.1	32.2 b	6,897
Whole stalk hand-plant	2.1	207.6	38.7 a	8,027

[1]Mean values for comparisons within a variety and column followed by the same letter were not significantly different (*P*=0.05). No letters shown when all means were similar.

Table 12. Comparison of billet characteristics and mechanical damage caused by the harvester and two types of planters during 2015.

		Billet characteristics[1]				
Planter	Time of evaluation	Length (inches)	Number of buds/billet	Number of damaged buds	Number of damaged internodes	Billets with no damage
Benoit	After harvester	21.1	3.5	0.42	0.64	48%
	After planter	21.7	3.8	0.65	0.54	52%
Louviere	After harvester	23.2 a	4.0 a	0.64	0.22 b	44%
	After planter	19.2 b	3.4 b	0.75	0.53 a	25%

[1]Values for comparisons within a planter and column followed by the same letter were not significantly different (*P*=0.05). No letters shown when all means were similar.

Table 13. Comparison of billet characteristics, mechanical damage, and planting rate for four billet planters during 2015.

Planter	Planting rate[1]	Billet characteristics: Length (inches)	Number of buds/billet	Number of damaged buds	Number of damaged internodes	Billets with no damage
Benoit	2.8/4.3	17.6	3.0	0.33	0.53	53%
Benoit	4.2/4.8	21.7	3.8	0.65	0.54	52%
Louviere	3.4/4.7	19.2	3.4	0.75	0.53	25%
Traube	3.7	19.7	3.0	0.13	0.61	39%

[1]Number of billets running in the planting furrow. Three planters planted a double-drill (on 8-ft-center-rows), and the rate is provided for each drill.

Conversion from 6-foot-center to 8-foot-center rows on at the Rivet farm offered the opportunity to monitor and compare stand establishment and stalk populations produced from double-drill billet and whole stalk plantings of multiple varieties planted from late August to mid-September 2014. 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, but these differences were not evident in the shoot populations in the plantings the following spring (Table 14). Millable stalk populations were similar in billet and whole stalk plantings, except in two fields. With the challenging environmental conditions during and following planting, the similar yields obtained in billet and whole stalk plantings were encouraging and may reflect improvements in the planters now being used to plant billets.

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. New billet planters are causing less damage and providing more consistent planting rates than conventional drum planters. Chemical protection against stalk rot damage would be desirable, and chemicals are available that can improve stand establishment under adverse conditions and prevent reduced yields. Subsequent research will focus on lower rates and an effective chemical 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 14. Fall and spring shoot populations and millable stalk counts compared in billet and whole stalk plantings on 8-foot-center-rows on Rivet farm during 2014.

Location	Block	Planting date	Variety	Seedcane	Right drill 15' shoot count Fall	Right drill 15' shoot count Spring	Left drill 15' shoot count Fall	Left drill 15' shoot count Spring	Both drills shoot count Fall	Both drills shoot count Spring	Millable stalks per acre[1]
Surprise	14	8/22	HoCP 00-950	Billet	107	74	136	63	243	138	50,357
				Whole	86	87	98	104	184	192	53,071
Holiday	16	8/25	L 01-283	Billet	147	66	105	71	252	137	51,857
				Whole	92	106	85	95	177	200	58,071*
Holiday	15	9/7	HoCP 04-838	Billet	153	97	139	114	292	211	58,857
				Whole	115	97	100	105	215	203	57,928
Holiday	33	9/7	HoCP 04-838	Billet	110	114	107	102	217	217	52,357
				Whole	93	93	92	95	185	188	51,642
Holiday	8	9/7	L 01-299	Billet	79	61	77	60	156	121	42,071
				Whole	37	67	54	60	91	127	47,714*
Belmont	8	9/11	HoCP 96-540	Billet	88	100	87	125	175	225	51,714
				Whole	72	112	74	127	146	239	50,142
Fairoaks	19	9/11	HoCP 96-540	Billet	54	66	46	76	100	142	42,928
				Whole	36	80	40	62	76	142	41,428
Fairoaks	64	9/13	L 01-283	Billet	53	78	54	84	107	162	43,000
				Whole	27	74	37	90	64	165	45,857
Fairoaks	7	9/14	L 01-283	Billet	70	94	59	89	129	182	49,428
				Whole	23	68	21	90	43	158	51,000
Fairoaks	16	9/15	L 01-283	Billet	59	65	47	102	106	166	51,928
				Whole	33	57	33	57	66	114	52,857

[1]Stalk count means followed by an asterisk (*) were significantly higher than the corresponding mean of the same variety and field planted with the other type of seedcane (*P*=0.05).