BILLET PLANTING RESEARCH

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Research continued to develop methods to maximize the chances of success with billet (stalk section) planting. During 2020, results were obtained from field experiments conducted at the Sugar Research Station at St. Gabriel and on two commercial farms evaluating the potential for seed-treatment pesticides to improve stand establishment and yield in billet plantings. In addition, a greenhouse experiment was conducted to evaluate the effect of pesticide treatments on disease symptom severity and an experiment was conducted to compare gene expression in sugarcane plants inoculated with the red rot pathogen, *Colletotrichum falcatum*, and treated with the insecticide, thiamethoxam.

Seed-Treatment Pesticide Experiments at the Sugar Research Station

Billet pesticide 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 treatments and application methods. In all experiments, billets 20-22 inches in length were cut with a mechanical harvester and run through a mechanical drum planter to provide planting material similar to what would be planted on commercial farms.

One experiment was completed through second ratoon in 2020 comparing non-treated billets and whole stalks of HoCP 96-540 to billets treated with fungicides and insecticides applied singly and in combination as dip treatments or applied with experimental FMC 3RIVE 3D equipment that applies pesticides in-a-drill as foam. The treatments were: two check treatments with non-treated billets planted in an open furrow or in a double-drill, non-treated whole stalks in a double-drill, 3RIVE applied Ethos 3D insecticide/biofungicide combination (bifenthrin 15.67% and *Bacillus amyloliquefaciens* strain D747 5.5%, FMC Corporation) applied at 6 oz/acre in a double-drill, 3RIVE applied Topguard Terra fungicide (flutriafol 42% at 6 oz/acre, FMC) + Capture insecticide (bifenthrin 17.15% at 28 oz/acre, FMC) combination in a double-drill, Topguard Terra fungicide (flutriafol 42%) 8 oz/acre dip, Ethos XB insecticide/fungicide (bifenthrin 15.67% and *Bacillus amyloliquefaciens* strain D747 5.0%, FMC) dip, and for comparison with previous experiments, a combination of Quilt Xcel fungicide (azoxystrobin 13.5% and propiconazole 11.7%, Syngenta) at 20 oz/acre and Platinum 75 SG insecticide (thiamethoxam 75%, granular, Syngenta) at 5.67 oz/acre applied as a dip.

As in previous field experiments, significant increases in billet planting yields provided by pesticide treatments that were evident in plant cane progressively lessened in the ratoon crops (Table 1). Only whole stalks had significantly higher yield than the non-treated billet checks in second ratoon.

In one field experiment at the Sugar Research Station in first ratoon during 2020, multiple seed-treatment pesticides applied as a dip treatment to billets at planting were compared to non-treated billets and whole stalks. The treatments applied were: Topguard Terra fungicide

(flutriafol 42%, FMC) applied at three rates, 6, 9, and 12 oz/acre; Quilt Xcel fungicide (azoxystrobin 13.5% and propiconazole 11.7%, Syngenta) + Platinum 75 SG insecticide (thiamethoxam 75% granular, Syngenta) applied at 20 oz and 5.67 oz/acre, respectively; and Trivapro fungicide (benzovindiflupyr 2.9%, azoxystrobin 10.5%, and propiconazole 11.9%, Syngenta) applied at 13.7 oz/acre. The first ratoon was harvested on 11/2/2020.

Table 1. Comparison of 2018 plant cane, 2019 first ratoon, and 2020 second ratoon on cane and total sugar yields for HoCP 96-540 billets planted non-treated or treated with different combinations of seed-treatment pesticides applied as a foam (3RIVE) or dip and non-treated whole stalks in a field experiment at the Sugar Research Station

	Plant cane[1]		First ratoon[1]		Second ratoon[1]	
Treatments	Tons cane	Sucrose (lbs/acre)	Tons cane	Sucrose (lbs/acre)	Tons cane	Sucrose (lbs/acre)
Non-treated billets, open-furrow	30.0 de	5,913 d	26.7 c	4,299 c	27.9 bc	5,558 bc
Non-treated billets, double-drill	28.0 e	5,642 d	28.6 bc	5,131 bc	24.7 c	5,064 c
Non-treated whole stalks	54.3 a	12,058 a	43.6 a	7,199 a	39.2 a	8,269 a
Ethos 3D + Capture insecticide/biofungicide 3RIVE (foam)	33.5 de	6,453 cd	33.5 bc	5,594 bc	32.5 abc	7,066 abc
Fungicide/insecticide 3RIVE (foam)	28.5 e	5,664 d	30.2 bc	4,861 bc	30.9 abc	6,312 abc
Topguard Terra dip	44.5 abc	9,096 b	33.3 bc	5,494 bc	33.2 abc	6,921 abc
Capture insecticide dip	34.8 cde	6,844 cd	33.7 bc	5,474 bc	29.5 abc	6,128 abc
Ethos XB insecticide/biofungicide dip	38.5 bcd	8,205 bc	28.9 bc	4,905 bc	36.9 ab	7,653 ab
Quilt Xcel + Platinum dip	46.5 ab	9,527 b	35.7 b	5,988 ab	32.3 abc	6,541 abc

[1]Mean values within a column followed by the same letter were not significantly different ($P>0.05$).

The only treatment that increased yield in plant cane, Quilt Xcel + Platinum dip, still had a higher yield in first ratoon compared to non-treated billets (Table 1). Whole stalks also had higher cane yield than non-treated billets.

A plant cane experiment was conducted comparing non-treated billets and whole stalks to billets dip treated with the following treatments: Topguard Terra fungicide (flutriafol 42%, FMC) at 7 oz/acre, Topguard Terra + Prevathon insecticide (chlorantraniliprole 5%, FMC) at 20 oz/acre, Topguard Terra + Prevathon at 28 oz/acre, Topguard Terra + Platinum insecticide (thiamethoxam 75% granular, Syngenta) at 5.7 oz/acre, Quilt Xcel fungicide at 20 oz/acre + Platinum 75 SG, and ET-F fungicide (copper sulfate 19.8%, Earth Sciences Laboratories) at 20 oz/acre. The experiment was planted 9/17/2019 and harvested 12/11/2020.

Table 2. Comparison of 2019 plant cane and 2020 first ratoon cane and total sugar yields obtained from plantings of non-treated billets and whole stalks and billets dip-treated with seed-treatment pesticides in a field experiment conducted at the Sugar Research Station

	Plant cane[1]		First ratoon[1]	
Treatment	Cane (tons/acre)	Sugar (lbs/acre)	Cane (tons/acre)	Sugar (lbs/acre)
Non-treated billets	36.0 b	7,236 ab	36.0 b	5,070 ab
Non-treated whole stalks	42.0 a	8,148 a	42.0 a	5,644 a
Topguard Terra 6 oz/acre	40.5 ab	7,817 ab	40.5 ab	5,388 ab
Topguard Terra 9 oz/acre	40.1 ab	8,140 a	40.1 ab	5,697 a
Topguard Terra 12 oz/acre	36.5 b	6,680 b	36.5 b	4,482 b
Platinum + QuiltXcel	41.8 a	8,193 a	41.8 a	5,673 a
Trivapro	39.6 ab	7,920 ab	39.6 ab	5,532 ab

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05).

The 2020 plant cane experiment experienced little environmental stress after planting, and the only difference detected between treatments for primary shoot emergence was the Topguard Terra + Platinum treatment that had more shoots than the whole stalk planting (Table 3). In the spring, the same treatment and the Quilt Xcel + Platinum treatment had more shoots than non-treated billets and Topguard Terra + Prevathon 20 oz (Table 3). The Topguard Terra + Platinum treatment also had more spring shoots than the ET-F treatment.

Some yield components varied among treatments (Table 4). Stalk weight was higher for whole stalks compared to non-treated billets and Topguard Terra + Prevathon 20 oz. The Topguard Terrra + Prevathon 20 treatment had higher commercially recoverable sugar than the non-treated billets. Cane yield was higher for Topguard Terra + Platinum and Topguard Terra + Prevathon 28 oz compared to whole stalks and ET-F. The Topguard Terra + Prevathon 28 oz and Quilt Xcel + Platinum treatments had higher sugar yield than whole stalks and ET-F.

A second plant cane experiment evaluated the effect of Platinum dip application to billets of L 01-299 and Ho 12-615. Platinum 75 SG was applied at 5.7 oz/acre. Sugar content was not affected by treatment for either variety. Stalk weight was higher for whole stalks compared to non-treated billets but not treated billets of Ho 12-615 (Table 5). Cane and total sugar yields were higher for treated billets of L 01-299 compared to non-treated billets and whole stalks, but all treatments were similar for Ho 12-615 (Table 5).

Table 3. Primary and spring shoot populations in plant cane for non-treated billets and whole stalks compared to billets dip-treated with seed-treatment pesticides in a field experiment conducted at the Sugar Research Station during 2020

Treatment	Primary shoots per acre[1]	Spring shoots per acre[1]
Non-treated billets	8,296 ab	12,444 c
Whole stalks	7,425 b	15,720 abc
Topguard Terra 7 oz	8,575 ab	15,511 abc
Topguard Terra 7 oz + Prevathon 20 oz	7,947 ab	12,758 c
Topguard Terra 7 oz + Prevathon 28 oz	8,749 ab	17,777 abc
Topguard Terra 7 oz + Platinum 5.7 oz	10,342 a	19,903 a
Quilt Xcel 20 oz + Platinum 5.7 oz	9.097 ab	19,275 ab
ET-F 20 oz	8,505 ab	13,908 bc

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05). Primary and spring shoot populations were determined on 11/5/2019 and 3/16/2020, respectively.

Table 4. Plant cane yield components for HoCP 96-540 billets planted non-treated or treated with different combinations of seed-treatment pesticides applied as a dip and non-treated whole stalks in a field experiment at the Sugar Research Station during 2020.

Treatment	Stalk weight (lbs) [1]	CRS (lbs) [1]	Tons per acre[1]	Sugar per acre (lbs) [1]
Non-treated billets	2.4 b	201.4 b	41.2 ab	8,318 ab
Whole stalks	3.0 a	208.7 ab	37.0 b	7,734 b
Topguard Terra	2.5 ab	209.2 ab	38.5 ab	8,103 ab
Topguard Terra + Prevathon 20 oz	2.1 b	215.1 a	39.5 ab	8,432 ab
Topguard Terra + Prevathon 28 oz	2.5 ab	209.9 ab	44.8 a	9,388 a
Topguard Terra + Platinum	2.5 ab	212.7 ab	44.8 a	8,621 ab
Quilt Xcel + Platinum	2.6 ab	203.3 ab	42.2 ab	9,564 a
ET-F	2.5 ab	213.9 ab	36.7 b	7,856 b

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05).

Table 5. Effect of Platinum insecticide dip on yield of L 01-299 and Ho 12-615 in plant cane of an experiment conducted at the Sugar Research Station during 2020

Variety	Treatment	Stalk weight (lbs)[1]	CRS (lbs)[1]	Tons cane per acre[1]	Sugar per acre (lbs)[1]
L 01-299	Non-treated billets	2.22 a	188.2 a	32.82 b	6,184.4 b
	Treated billets	2.49 a	188.0 a	37.86 a	7,129.8 a
	Whole stalks	2.29 a	194.0 a	32.48 b	6,296.7 b
Ho 12-615	Non-treated billets	1.93 b	188.3 a	35.54 a	6,689.4 a
	Treated billets	2.15 ab	187.5 a	38.32 a	7,217.8 a
	Whole stalks	2.33 a	186.1 a	32.37 a	6,302.5 a

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

Seed-Treatment Pesticide Experiments on Commercial Farms

Three experiments were conducted on commercial farms to evaluate the ability of seed-treatment pesticides to improve billet planting stand establishment and yield when the chemicals were applied with a multiple nozzle spray rig to billets dropping from a mechanical planter into the planting furrow. First ratoon results were determined for one experiment conducted in Rapides Parish with L 01-283. A plant cane experiment was conducted at the same location during the 2020 season with L 01-299. A second plant cane experiment was conducted during 2020 in St. James Parish with L 01-283.

The first Rapides Parish experiment in first ratoon during 2020 consisted of only two treatments applied at planting: non-treated billets and billets receiving a spray application of a combination of Quadris fungicide (azoxystrobin 22.9%, Syngenta) plus Platinum 75 SG insecticide (thiamethoxam 75%, granular, Syngenta). Quadris was applied at a rate of 11.5 oz/acre, and Platinum was applied at 5.7 oz/acre in approximately 40 gal of water per acre. Each treatment was applied to four replicates of three entire rows. The treated area for each replicate was estimated to fill one truck for the mill at harvest. The experiment was planted on 9/9/2018 and harvested on 12/15/19 in plant cane and on 11/16/2020 in first ratoon.

Significant increases in TRS, cane, and sugar yields detected in plant cane were no longer evident in first ratoon (Table 6). Treatment differences resulting from application of seed-treatment pesticides at planting are typically less in the ratoon crops compared to plant cane. However, the treated rows in this experiment still had higher yields of 19 lbs TRS, 3.1 tons of cane, and 1,456 lbs of sugar compared to the non-treated rows suggesting some carry-over of the beneficial effect of the treatment on plant cane yields.

Table 6. Effects of Quadris + Platinum treatment on plant cane (2019) and first ratoon (2020) yields of L 01-283 planted as billets in on-farm test in Rapides Parish with pesticides applied with planter spray rig.

	TRS (lbs) [1]		Tons per acre[1]		Sugar per acre (lbs) [1]	
Treatment	Plant cane	First ratoon	Plant cane	First ratoon	Plant cane	First ratoon
Non-treated billets	160.9 b	199.0 a	32.6 b	41.1 a	5,244 b	8,197.3 a
Quadris + Platinum	186.4 a	218.1 a	39.7 a	44.2 a	7,398 a	9,652.7 a

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05).

In the plant cane test in Rapides Parish during 2020, Platinum 75 SG was applied at 5.7 oz/acre and Quilt Xcel was applied at 20 oz/acre. TRS was not increased by treatment, but both cane and sugar yields were higher in treated rows (Table 7). The yield from the field was below average for typical plant cane. The treatment protected some of the yield potential providing 6.1 more tons of cane and 1,503 lbs of sugar. The experiment was planted 9/1/2019 and harvested 11/16/2020.

Table 7. Effects of Platinum + QuiltXcel treatment on plant cane yield of L 01-299 billets in on-farm test in Rapides Parish with chemicals applied with planter spray rig during 2020.

Treatment	TRS (lbs) [1]	Tons per acre[1]	Sugar per acre (lbs) [1]
Non-treated billets	206.6 a	25.8 b	5,346.8 b
Platinum (5.7 oz) + QuiltXcel (20 oz)	215.4 a	31.9 a	6,860.3 a

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05).

In the plant cane test in St. James Parish during 2020, Platinum 75 SG was applied at 5.7 oz/acre and Quilt Xcel was applied at 20 oz/acre. The field had high fertility, and the cane was not exposed to environmental stress after planting. TRS and sugar yield were not higher in treated rows while cane yield was higher (Table 7). Cane yield was 3.1 tons higher and sugar yield was 481 lbs higher. The experiment was planted 9/12/2019 and harvested 11/24/2020.

Table 8. Effects of Platinum + Quilt Xcel treatment on plant cane yield of L 01-283 billets in on-farm test in St. James Parish with chemicals applied with planter spray rig during 2020.

Treatment	TRS (lbs) [1]	Tons per acre[1]	Sugar per acre (lbs) [1]
Non-treated billets	241.9 a	47.6 b	11,502.9 a
Platinum (5.7 oz) + Quilt Xcel (20 oz)	236.8 a	50.7 a	11,983.5 a

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05).

Results from the seed-treatment pesticide field experiments with billets continue to be promising. New chemicals continue to be evaluated. The results continue to suggest that applications of single pesticides have erratic effects on billet planting performance, whereas a combination of any one of multiple fungicides and insecticide are consistently beneficial. Most of the results from small plot experiments conducted at the Sugar Research Station have been obtained with dip application of the chemicals. In experiments comparing dip application to a spray application over the top of billets before covering, spray application did not provide the benefit obtained from dip application. Dip application may be more difficult to achieve on a commercial basis. The positive on-farm test results from a second season at two locations suggest that application with a planter-mounted spray rig using multiple nozzles and a high volume of water can achieve the complete, thorough coverage needed to obtain the protection of yield potential the fungicide/insecticide combination can provide in billet plantings.

The improvements in stand establishment and yield obtained from treatment have been greater in seasons when billet plantings have been exposed to environmental stress after planting. Planted billets suffer more than whole stalks when any type of problem occurs, and this fact has made shifting from whole stalk to billet planting difficult in Louisiana, even though multiple factors are pushing the industry to change to billet planting. The small plot experiment results raise the question of whether the treatment will only be an insurance policy that will be of benefit only in seasons when problems are encountered. The results from the St. James Parish on-farm experiment were particularly encouraging because the planter applied treatment provided a positive economic return on investment even in the situation with cane growing under optimal conditions with good fertility and little or no stress.

Experiments to Evaluate Pesticide Treatment Effects on Stalk Rot Symptom Severity and Plant Gene Expression

A greenhouse experiment was conducted with three-node billets of HoCP 96-540 to determine the effects of dip application of Quilt Xcel fungicide (20 oz/acre rate), Platinum insecticide (5.7 oz/acre rate), or a combination of fungicide and insecticide compared to no treatment on bud germination, plant growth, and stalk rot symptom development. Billets were planted in non-sterile sugarcane field soil, and billets were inoculated with the red rot pathogen, *Colletotrichum falcatum*, then planted in steamed soil. The inoculated billets were surface disinfested by dipping in 10% commercial bleach for 5 minutes. Billets were planted in trays with three per tray, placed in the greenhouse and allowed to germinate and grow for 6 weeks. Billets were then washed free of soil, plant root and shoot growth were assessed, the billets were split, and red rot symptoms were assessed.

Complete analysis of the results is still in progress. Preliminary results suggest that the effects of disease and pesticide treatments on plant growth were not significant at 6 weeks after planting, but treatment effects on disease symptom severity were detected. Fungicide treatment alone reduced stalk rot symptom severity while treatment with insecticide alone did not. However, treatment with the combination of fungicide and insecticide resulted in greater reductions in symptom severity than fungicide treatment alone in both inoculated billets and billets grown in non-sterile field soil (with natural inoculum).

An experiment is in progress to evaluate the effects of *C. falcatum* infection and treatment with the systemic insecticide, thiamethoxam (Platinum) on gene expression in plants of a red rot susceptible variety, HoCP 96-540. The experiment will determine the response of sugarcane plants to infection of the stalk tissues by the pathogen and how treatment with the systemic insecticide affects the plant response. Plant tissue samples were collected from non-inoculated, non-treated plants; inoculated, non-treated plants; and inoculated, treated plants. Samples were collected before planting, 1 week after planting, and 4 weeks after planting. Total RNA has been extracted, and RNA sequence analysis is in progress. This research is being conducted in cooperation with Dr. Jon Richards.

SOYBEAN PRODUCTION RESEARCH IN FALLOW SUGARCANE PRODUCTION SYSTEMS

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Effect of Biostimulant/Biofertilizer Treatment on Soybean

A study was conducted in a commercial soybean field in 2020 at Champagne Farms in Franklin, LA to evaluate the effect of foliar applied biostimulant/biofertilizers on soybean. Soybean seed were planted in two drills on the top of sugarcane beds and were spaced 24 inches apart. The experimental design was a randomized complete block design with 4 replications, and the plot size was 35 ft. wide X 250 ft. in length. Treatments were applied to the soybean variety P39A58X using a Bowman self-propelled sprayer at the R2/R3 growth stage on June 1, 2020 and were repeated at the R3/R4 growth stage on June 19, 2020. Biostimulant/biofertilizer treatments included Bioforage® at 16 oz/A, Harvest Plus® at 32 oz/A, Anova® at 32 oz/A, Allevia® at 24 oz/A, and Full Scale® at 16 oz/A. An untreated check was also included for comparison. Plots were harvested with a commercial combine on August 12, 2020. Soybean yield (bushels/A) was adjusted to 13% moisture content. The biostimulant/biofertilizers provided no yield advantage as compared to the nontreated control (Table 1).

Table 1. Effect of six biostimulant/biofertilizer treatments applied at the R2/R3 and R3/R4 growth stage to the soybean variety P39A58X in 2020 at Champagne Farms in Franklin, LA

Treatment[1]	Rate/A	Soybean Yield (Bushels/A[2])
Bioforage	16 oz	43.5 a[3]
Harvest Plus	32 oz	41.6 a
Anova	32 oz	41.7 a
Allevia	24 oz	39.5 a
Full Scale	16 oz	38.4 a
Check	-	41.1 a

[1]R2/R3 treatment applied on June 1, 2020; R3/R4 treatment applied on June 19, 2020.
[2]Soybeans harvested August 12, 2020; moisture adjusted to 13%.
[3]Means within a column followed by the same lowercase letter are not significantly different at P=0.05.

Effect of Tank-mixing Insecticide with Paraquat Harvest Aid

In 2020, studies were conducted to evaluate the effect of tank-mixing insecticide with paraquat harvest aid on red banded stink bug (RBSB) control and soybean yield and soybean damage. The studies were conducted in commercial soybean fields in Franklin, LA and Vacherie, LA. The experimental design was a randomized complete block design with 4 replications, and the plot size was 35 ft. wide X 1240 ft. in length at the Franklin study site and 30 ft. wide X 965 ft. in length at the Vacherie study site. Treatments were applied with a Bowman self-propelled sprayer 15 days prior to harvest. Treatments included paraquat (Gramoxone 2SL®) at 16 oz/A, paraquat (Gramoxone 2SL®) at 16 oz/A + Lannate® at 16 oz/A, and paraquat (Gramoxone 2SL®) at 16 oz/A + Acephate® at 0.5 lb/A. In order to determine RBSB density, plots were swept immediately prior to the harvest aid application, and were found

at a density of 15 per 25 sweeps at the Franklin study site and 3 per 25 sweeps at the Vacherie study site. The Franklin study site was harvested on August 19, 2020 and the Vacherie study site was harvested on September 5, 2020 with a commercial combine to determine soybean yield (soybean yield was calculated at 13% grain moisture). Immediately prior to harvest, plots were swept to determine RBSB populations and were found at a density of 59, 30, and 22 RBSB per 25 sweeps at the Franklin site for the paraquat, paraquat + Lannate®, and paraquat + Acephate® treatments, respectively (Table 2). For the Vacherie site, RBSB averaged 10, 2, and 1 per 25 sweeps for the paraquat, paraquat + Lannate®, and paraquat + Acephate® treatments, respectively (Table 3). Soybean yield was similar for all treatments at each study site; however, soybean damage differed among sites. Soybean damage was determined by taking a sample of each plot to a USDA grading facility and having the samples graded. Soybean damage was significantly reduced for the Franklin site when insecticide was tank-mixed with paraquat. Soybean damage averaged 1.8% for the paraquat + Acephate treatment, 4.2% for the paraquat + Lannate treatment, and 10.7% when paraquat was applied alone. Based on a 10.7% damage level, it was estimated that payment dockage of $1.05 per bushel would be deducted.

Table 2. Effect of tank-mixing insecticide with a paraquat harvest aid on red banded stink bug, soybean yield, and soybean damage in 2020 at Champagne Farms in Franklin, LA

Treatment[1]	Rate/A	Red Banded Stink Bug[2] (no./25 sweeps)	Soybean Yield (bushels/A[4])	Soybean Damage (%)
Paraquat	16 oz	59 a[3]	43.3 a	10.7 a
Paraquat + Lannate	16 oz + 16 oz	30 b	42.3 a	4.2 b
Paraquat + Acephate	16 oz + 0.5 lb	22 b	45.5 a	1.8 b

[1]Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2]Field averaged 15 red banded stink bugs per 25 sweeps prior to application of treatment.
[3]Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
[4]Soybeans harvested August 19, 2020; moisture adjusted to 13%.

Table 3. Effect of tank-mixing insecticide with a paraquat harvest aid on red banded stink bug, soybean yield, and soybean damage in 2020 at Blackberry Farms in Vacherie, LA

Treatment[1]	Rate/A	Red Banded Stink Bug[2] (no./25 sweeps)	Soybean Yield (Bushels/A[4])	Soybean Damage (%)
Paraquat	16 oz	10 a[3]	65.0 a	1.6 a
Paraquat + Lannate	16 oz + 16 oz	2 b	63.3 a	1.7 a
Paraquat + Acephate	16 oz + 0.5 lb	1 b	66.5 a	1.5 a

[1]Induce® non-ionic surfactant at 0.25% v/v added to all treatments.
[2]Field averaged 3 red banded stink bugs per 25 sweeps prior to application of treatment.
[3]Means within a column followed by the same lowercase letter are not significantly different at P=0.05.
[4]Soybeans harvested September 5, 2020; moisture adjusted to 13%.

ON-FARM RESEARCH TO EVALUATE IRRIGATION STRATEGIES

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Sugarcane acreage is increasing in Louisiana, primarily in northern and western parishes that experience lower annual rainfall and have soil types prone to drought. Many farms in these areas are equipped with irrigation resources, yet there is a lack of research-based information for irrigation trigger points, sugarcane response, and the costs-benefit analysis of this practice.

In July 2020, an on-farm irrigation experiment was conducted in a first stubble field of HoCP 09-804 in Cheneyville, LA. The experimental design for the experiment was a randomized complete block design, with 4 replications. The plot size was 7 rows wide (42 ft.) by 1,200 ft. (length of field). Treatments were randomly assigned to one of two treatments (irrigation or non-irrigated check). The irrigated treatment was managed using Drill & Drop sensors (Sentek Sensor Technologies, Stepney, South Australia). The two soil moisture sensors were installed on the fourth row of the first replication to capture changes in soil moisture so that irrigation timing could be estimated. One sensor was placed within the center of the row, and the second sensor was offset onto the row hip (approximately 12 inches from the row center). Irrigation water was surface applied and directed into the wheel furrows for the irrigation treatment. Irrigation events occurred on August 18, and September 16, 2020. Approximately 3.2 inches of water was applied at each irrigation event.

On November 17, 2020, a hand-cut, 10-stalk sample from each plot was harvested and processed using Spectra Cane NIR to determine theoretical recoverable sugar (lbs./ton of sugarcane). After sampling, the center five rows of each plot were harvested with a sugarcane chopper harvester and loaded into two semi-trucks. Sugarcane weight was recorded at the raw sugar factory. These weights along with plot area were used to estimate sugarcane yield (tons/acre). Sugar yield (lbs./A) was calculated as the product of TRS and cane yield. Results indicated a numerical increase in sugarcane yield and TRS from applying irrigation but was not statistically different from the non-irrigated treatment (Table 1). This lack of yield response to irrigation was expected given that 2020 had normal rainfall with few extended dry periods. The research site had 34.5 inches of rainfall over the irrigation season (April-September). When comparing the two sensors, the difference in measured soil moisture was primarily attributed to availability within the row due to the wet conditions resulting in vertical root growth instead of growing toward the furrows as expected in a dry year (Figure 1). However, compaction in the furrow may have been a factor as indicated by lower overall water content throughout the entire season, less evapotranspiration (stairsteps of water lost from the root zone), and less response to rainfall and irrigation applications.

Table 1. Effect of three irrigation events on sugarcane yield parameters for first stubble HoCP 09-804 in Chenevyille, LA in 2020

Treatment	Cane Yield (tons/A)	TRS (lb/ton)	Sugar Yield (lbs./A)
Irrigation	42.9 a[1]	284 a	12,163 a
No Irrigation	42.2 a	279 a	11,766 a

[1]Significant differences between treatments were specified per column using different letters.

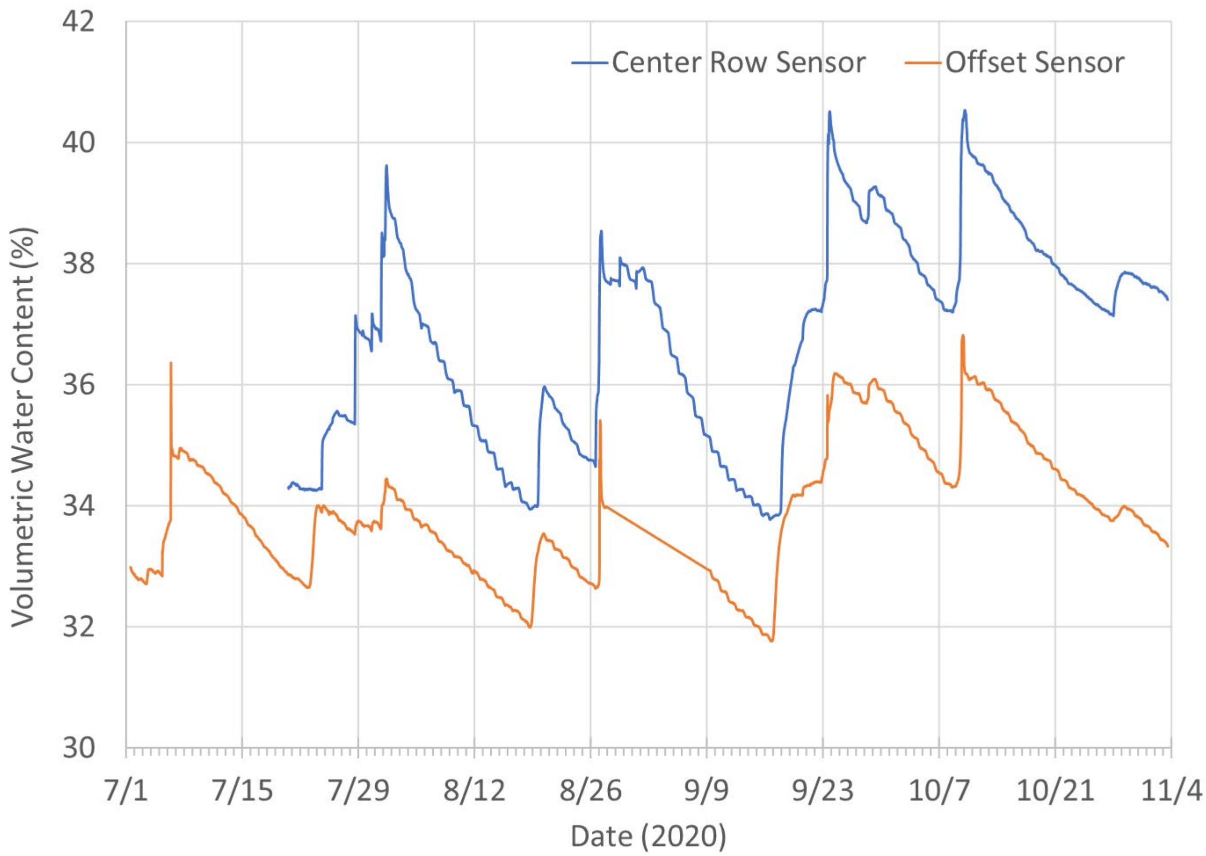

Figure 1. Soil moisture sensor data was collected from the top 34 inches of the soil profile beginning in July 2020 until shortly before harvest in November 2020. Irrigation events occurred on August 18 and September 16. Soil moisture responses to Hurricanes Laura and Delta occurred on August 27 and October 9, respectively.

This research will continue to evaluate sugarcane response to irrigation. As more irrigation seasons of soil moisture data are collected, a soil water balance will be utilized to model soil moisture for comparison to measured results. When agreement between field and modeled conditions meet expectations, sugarcane will be added to the STAMP decision support tool for scheduling irrigation.