BILLET PLANTING RESEARCH

J. W. Hoy[1] and C. F. Savario[1]
[1]Department of Plant Pathology and Crop Physiology

Research continued to develop methods to maximize the chances of success with billet (stalk section) planting. During 2019, 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 chemicals to improve stand establishment and yield in billet plantings.

Seed Treatment Chemical Experiments at the Sugar Research Station

Chemical seed (billet) 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.

First ratoon results were obtained in two field experiments conducted at the Sugar Research Station. One experiment compared HoCP 96-540 non-treated billets and whole stalks to billets either sprayed in-furrow or dip-treated with seed treatment chemicals singly or in combinations. The treatments were non-treated billets, non-treated whole stalks, Platinum 75 SG insecticide (thiamethoxam 75% granular, Syngenta) applied at 5.67 oz/acre/acre as an in-furrow spray and a dip; Quadris fungicide (azoxystrobin 22.9%, Syngenta) at 5.8 oz/acre as an in-furrow spray and a dip at 11.5 oz/acre; Quilt Xcel fungicide (azoxystrobin 13.5% and propiconazole 11.7%, Syngenta) applied at 10.2 oz/acre as an in-furrow spray and a dip at 20 oz/acre; Headline fungicide (pyraclostrobin 23.6%, BASF) as a dip at 11.5 oz/acre; Priaxor fungicide (fluxapyroxad 14.33% and pyraclostrobin 28.58%, BASF) as a dip at 11.5 oz/acre; Platinum + Quadris as an in-furrow spray at 5.67 oz/acre and 5.8 oz/acre, respectively, and a dip at 5.67 oz/acre and 11.5 oz/acre, respectively; Platinum + Quilt Xcel as an in-furrow spray at 5.67 oz/acre and 10.2 oz/acre, respectively, and a dip at 5.67 oz/acre and 20 oz/acre, respectively; Platinum + Headline; and Platinum + Priaxor.

Differences detected among treatments in plant cane during 2018 were no longer evident in first ratoon during 2019 (Table 1). The non-treated billet yields for total sugar per acre were higher than for Headline and Priaxor dip treatments. Industry yields were off during 2019 due to a combination of adverse environmental conditions, and the yields in this experiment were low for all treatments.

The second experiment completed through first ratoon in 2019 compared non-treated billets and whole stalks of HoCP 96-540 to billets treated with a group of FMC Corporation fungicides and insecticides applied singly and in combination as dip treatments and applied with experimental FMC 3RIVE 3D equipment that applies pesticides in-a-drill as foam. The treatments were: non-treated billets planted in an open furrow or in a double-drill, non-treated whole stalks in a double-drill, 3RIVE applied insecticide/biofungicide combination in a double-drill, 3RIVE applied fungicide/insecticide combination in a double-drill, insecticide/biofungicide dip, Topguard Terra fungicide (flutriafol 42%) 8 oz/acre dip, Ethos XB insecticide/fungicide (bifenthrin 15.67% and *Bacillus amyloliquefaciens* strain D747 5.0%) dip, and for comparison with previous experiments, a combination of Platinum 75 SG insecticide (thiamethoxam 75%, granular) at 5.67 oz/acre and Quilt Xcel fungicide (azoxystrobin 13.5% and propiconazole 11.7%) at 20 oz/acre applied as a dip.

Table 1. Comparison of 2018 plant cane and 2019 first ratoon cane tonnage and total sugar yields for HoCP 96-540 billets planted non-treated and with in-furrow spray or dip treatment with different combinations of seed-treatment chemicals and non-treated whole stalks in a field experiment at the Sugar Research Station

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	30.6 de	6,522 cd	35.6 ab	5,461 a
Non-treated whole stalks	42.8 a	9,197 a	34.9 abc	4,876 ab
Platinum ifs[2]	29.0 e	6,124 d	31.0 abc	4,588 ab
Quadris ifs[2]	33.7 bcde	7,218 bcd	33.6 abc	5,026 ab
Quilt Xcel ifs[2]	32.8 cde	6,881 bcd	31.4 abc	4,436 ab
Platinum + Quadris ifs[2]	33.3 cde	6,908 bcd	35.2 ab	4,595 ab
Platinum + Quilt Xcel ifs[2]	32.3 cde	6,938 bcd	29.5 bc	4,407 ab
Platinum dip	30.7 de	6,505 cd	31.5 abc	4,444 ab
Quadris dip	34.0 bcde	7,221 bcd	36.7 a	5,044 ab
Quilt Xcel dip	30.8 de	6,575 cd	33.4 abc	4,452 ab
Headline dip	36.4 abcd	7,867 abcd	31.5 abc	4,188 b
Priaxor dip	32.9 cde	6,896 bcd	28.8 c	4,154 b
Platinum + Quadris dip	37.7 abcd	8,058 abc	36.4 a	5,061 ab
Platinum + Quilt Xcel dip	40.7 ab	8,470 ab	32.7 abc	4,675 ab
Platinum + Headline dip	38.2 abc	8,003 abc	33.5 abc	4,583 ab
Platinum + Priaxor dip	35.1 bcde	7,405 bcd	35.5 ab	4,551 ab

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

[2] In-furrow spray (ifs).

In the second experiment, the higher yields in plant cane resulting from the dip applications of seed treatment chemicals were still evident only for the Quilt Xcel + Platinum treatment, and this treatment was the only one that was comparable to the whole stalk planting (Table 2). Again, yields were low across treatments in the experiment.

In a field experiment at the Sugar Research Station in plant cane during 2019, multiple seed treatment chemicals applied as a dip treatment to billets were compared to non-treated billets and whole stalks (Table 3). The treatments 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 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. Machine-cut billets approximately 22 inches in length were run through a mechanical planter, dip-treated, and hand-planted using a two running billet planting rate. The experiment was planted on 9/17/2018 and harvested on 12/2/2019.

Table 2. Comparison of 2018 plant cane and 2019 first ratoon cane tonnage and total sugar yields for HoCP 96-540 billets planted non-treated or treated with different combinations of seed-treatment chemicals applied as a foam (3RIVE) or dip and non-treated whole stalks in a field experiment at the Sugar Research Station

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 open-furrow	30.0 de	5,913 d	26.7 c	4,299 c
Non-treated billets double-drill	28.0 e	5,642 d	28.6 bc	5,131 bc
Non-treated whole stalks	54.3 a	12,058 a	43.6 a	7,199 a
Ethos 3D insecticide/biofungicide mix 3RIVE	33.5 de	6,453 cd	33.5 bc	5,594 bc
Fungicide/insecticide mix 3RIVE	28.5 e	5,664 d	30.2 bc	4,861 bc
Topguard Terra dip	44.5 abc	9,096 b	33.3 bc	5,494 bc
Ethos XB insecticide dip	34.8 cde	6,844 cd	33.7 bc	5,474 bc
Ethos XB insecticide/biofungicide dip	38.5 bcd	8,205 bc	28.9 bc	4,905 bc
Quilt Xcel + Platinum	46.5 ab	9,527 b	35.7 b	5,988 ab

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

Compared to non-treated billets, all chemical treatments increased stand emergence (primary shoots) following planting, and all were comparable to whole stalk planting (Table 3). Spring shoots were higher for the Platinum + Quilt Xcel treatment compared to non-treated billets, and all chemical treatments were comparable to whole stalk planting (Table 3). Millable stalk population was higher for Topguard Terra applied at 6 oz and 9 oz rates, Platinum +Quilt Xcel, and Trivapro (Table 3).

Compared to non-treated billets, Topguard Terra applied at 12 oz increased stalk weight, and there were no effects from the treatments on sugar per ton of cane (Table 4). There were sizable numerical differences between non-treated billets and the chemical treatments, but due to variability between plots within treatments, only the Platinum + Quilt Xcel treatment had a significantly higher cane tonnage yield compared to non-treated billets, and this treatment and the Topguard Terra 9 oz treatment had higher total sugar per acre yield (Table 4). All the chemical treatments had comparable cane tonnage and total sugar yields to whole stalks.

Table 3. Shoot and stalk populations in plant cane for non-treated billets and whole stalks compared to billets dip-treated with seed treatment chemicals in a field experiment conducted during 2019

Treatment	Primary shoots per acre[1]	Spring shoots per acre[1]	Millable stalks per acre[1]
Non-treated billets	6,727 b	26,909 b	34,786 c
Non-treated whole stalks	10,736 a	38,307 a	35,762 bc
Topguard Terra 6 oz/acre	9,725 a	36,145 ab	38,097 ab
Topguard Terra 9 oz/acre	9,795 a	36,878 ab	39,178 a
Topguard Terra 12 oz/acre	9,655 a	32,486 ab	37,017 abc
Platinum + Quilt Xcel	10,004 a	39,631 a	38,202 ab
Trivapro	8,819 a	32,590 ab	37,958 ab

[1]Mean values within a column followed by the same letter were not significantly different (P>0.05). Primary shoots, spring shoots and millable stalk populations were determined on 11/2/2018, 4/16/2019 and 8/15/2019, respectively.

Table 4. Comparison of plant cane yield components obtained from plantings of non-treated billets and whole stalks and billets dip-treated with seed treatment chemicals in a field experiment conducted during 2019

Treatment	Stalk weight (lbs.)[1]	Sugar/ton cane (lbs.)[1]	Tons cane/acre[1]	Sugar/acre (lbs.)[1]
Non-treated billets	1.9 b	201 a	36.0 b	7,236 ab
Non-treated whole stalks	2.2 ab	194 a	42.0 a	8,148 a
Topguard Terra 6 oz/acre	2.1 ab	193 a	40.5 ab	7,817 ab
Topguard Terra 9 oz/acre	2.2 ab	203 a	40.1 ab	8,140 a
Topguard Terra 12 oz/acre	2.3 a	183 a	36.5 b	6,680 b
Platinum + QuiltXcel	2.1 ab	196 a	41.8 a	8,193 a
Trivapro	2.0 ab	200 a	39.6 ab	7,920 ab

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

Seed Treatment Chemical Experiments on Commercial Farms

Two experiments were conducted on commercial farms to evaluate the ability of seed treatment chemicals 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 furrow. One experiment was conducted in Rapides Parish with L 01-283. The experiment consisted of only two treatments: 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 5.67 oz/acre in approximately 40 gal of water per acre. Each treatment was applied to four replicates of three 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.

A second experiment was conducted in St. Mary Parish with L 01-299. The experiment consisted of five treatments: non-treated billets and billets receiving a spray application of either Quadris alone, Platinum alone, Quadris + Platinum, or Quadris + Platinum + Dyne-Amic nonionic surfactant (Helena Chemical Co.) at 0.5%. The experiment was planted on 10/22/2018 and harvested on 12/13/2019.

In the field experiment conducted on a commercial farm in Rapides Parish, the Quadris + Platinum spray application at planting resulted in large increases in initial stand establishment, the spring shoot population, and the millable stalk population compared to non-treated billets (Table 4). At harvest, the plant cane yield for the Quadris + Platinum treatment was higher for all yield components: sugar per ton of cane, tons of cane per acre, and total sugar per acre (Table 5). In previous experiments, sugar per ton has rarely been higher for chemical treatments. Most of the positive effect from the application of seed treatment chemicals has come from increased shoot population and increased cane tonnage.

Table 5. Comparison of L 01-283 plant cane fall (primary) shoot, spring shoot, and millable stalk populations for a billet seed treatment chemical experiment conducted in Rapides Parish during 2019

Treatment	Fall shoots/acre[1]	Spring shoot population/acre[1]	Millable stalks per acre[1]
Non-treated billets	32,143 b	41,500 b	50,643 b
Quadris + Platinum	66,429 a	66,643 a	62,000 a

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

Table 6. Effect of seed-treatment chemicals on plant cane yield of L 01-283 in a field experiment conducted in Rapides Parish during 2019

Treatment	Sugar/ton (lbs.) [1]	Tons cane/acre[1]	Sugar/acre (lbs.) [1]
Non-treated billets	160.9 b	32.6 b	5,244 b
Quadris + Platinum	186.4 a	39.7 a	7,398 a

[1]Mean values within a column followed by the different letters were significantly different ($P \leq 0.05$).

In the field experiment conducted on a commercial farm in St. Mary Parish, none of the four chemical treatments increased fall or spring stands or the millable stalk population compared to non-treated billets. At harvest, one of the four treatments, Platinum applied alone, increased yield resulting in higher sugar per ton, juice purity, cane tonnage, and total sugar per acre (Table 6). Sugar per ton of cane was again higher in the experiment similar to the Rapides Parish experiment.

Table 7. Effect of seed-treatment chemicals on plant cane yield of L 01-299 in a field experiment conducted in St. Mary Parish during 2019

Treatment	Sugar/ton (lbs.) [1]	Juice purity[1]	Tons cane/acre[1]	Sugar/acre (lbs.) [1]
Non-treated billets	173.1 b	85.9 b	38.7 b	6,680 b
Quadris	175.9 ab	86.3 ab	39.3 ab	6,900 b
Platinum	194.6 a	88.0 a	41.1 a	7,990 a
Quadris + Platinum	180.6 ab	86.7 ab	39.8 ab	7,177 b
Quadris + Platinum + Dyne-Amic surfactant	184.0 ab	87.6 ab	39.4 ab	7,244 b

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

In the field experiments conducted at the Sugar Research Station during 2019, the seed treatment chemicals continued to show potential to increase stands and stalk populations in billet plantings that resulted in increased cane tonnage and total sugar yield in plant cane. The yield differences between chemical treatments and no treatment were less in experiments in first ratoon. The positive results of the experiments conducted at the Sugar Research Station have been obtained from dip application of the chemicals. Applying the chemicals as a dip treatment may be difficult to achieve on-farm. Therefore, two experiments were conducted to evaluate the effect of the most consistently beneficial treatment, fungicide + insecticide, when applied by a spray rig on a mechanical planter. The results from the Rapides Parish experiment are very encouraging. This experiment was planted during the normal planting season using a commercial planting rate and a variety that has previously exhibited some tolerance to billet planting. Industry yields were down during the 2019 season due to a combination of adverse environmental conditions, and the yield obtained from the non-treated billets was much lower than would be typical for plant cane. However, the yield obtained from treated rows was much closer to average. The experiment in St. Mary Parish was planted late and with a high planting rate, two factors that could have reduced the opportunity for the chemical treatments to have a positive effect. This seemed to be the case, as no shoot population increases were detected during the growing season. The higher yield obtained from the Platinum insecticide alone treatment was a very positive outcome under the circumstances. Overall, the results with the seed-treatment chemicals continue to be promising, and the research will be continued. Developing an application method that will give similar beneficial results to a dip but be feasible in commercial planting systems is a high priority.