

## 2010 VARIETY RESPONSE TO GLYPHOSATE

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### INTRODUCTION

Use of chemical ripeners to supplement sugarcane natural ripening has received much attention since the 1970's. Glyphosate is, and has been, the predominant cane ripener used in Louisiana since 1980. Research has shown that glyphosate can increase sucrose concentration in terms of the yield of theoretical recoverable sugar per ton of cane (TRS/TC) and reduce stalk fiber content. Availability of ripener-treated sugarcane at initiation of the harvest season has improved factory sugar recovery and cane throughput because of the lower trash associated with glyphosate-treated cane. Glyphosate can have deleterious effect on cane tonnage, but moderate increases in recoverable sugar per ton of cane usually provides a positive gain in the overall theoretical recoverable sugar yield per acre (TRS/A); thus improving returns for sugarcane producers and landowners.

### OBJECTIVE

Currently, glyphosate is the only labeled chemical ripener for increasing the sucrose content of sugarcane in Louisiana. A key objective in ripener research is to determine the responsiveness of newly released sugarcane varieties to glyphosate.

### VARIETAL RESPONSE

In 2010, seven commercial varieties and one advanced experimental variety were evaluated for response to glyphosate at the Sugar Research Station in St. Gabriel, LA. A split plot experimental design with 3 replications was used. Whole plots consisted of the glyphosate ripener Roundup PowerMax at 5.3 oz/A (6 oz/A Polado equivalent) and a non-treated plot serving as a control. Varieties, HoCP 96-540, L 99-226, L 99-233, HoCP 00-950, L 01-283, L 01-299, L03-371, and HoCP 04-838 were sub-plots. The sub-plot area was 50 feet long by 1 row wide (6 feet). Ripener was applied on September 1, 2010 and plots were harvested on October 12, 2010, approximately 6 weeks after treatment. A 10-stalk hand sample was collected from each plot, weighed and processed for sucrose analysis. The remaining cane was harvested with a combine and loaded into a weigh wagon to determine cane yield.

Roundup PowerMax negatively affected tonnage of all varieties in 2010 except for L 01-299 (Table 1). HoCP 96-540, L 99-226, HoCP 00-950, L 01-283, and L 01-299 had significant increases in TRS/TC where Roundup PowerMax was applied. Increases in TRS/TC were more than 10% for HoCP 96-540, L 99-226, L 01-283, and L 01-299. In contrast, HoCP 00-950, L03-371, and HoCP 04-838 had moderate gains in TRS/TC, gaining 5 to 8% over their respective control. Only a minimal gain in TRS/TC was observed for L 99-233 treated cane. In 2010, the

significant decrease in cane tonnage with only a moderate to minimal increase in TRS/TC negatively affected TRS/A for all varieties except L 01-283, and L 01-299. The lack of response in TRS/A may be related to climatic conditions which favored increased growth in the control plots following glyphosate treatment as well as the higher than normal TRS/TC levels that occurred in mid-October. Further, the treatment-harvest interval for this test exceeded the norm for early in the season by approximately two weeks. When harvested at 28-35 days after treatment it has been found that a significant increase in TRS/A can be anticipated for most varieties.

Table 1. Effect Roundup PowerMax on seven commercial sugarcane varieties and one experimental variety on yield of cane per acre (TC/A), yield of theoretical recoverable sugar per ton cane (TRS/TC), percent TRS increase above the nontreated control, and yield of theoretical recoverable sugar per acre (TRS/A) 6 weeks after treatment.

| Variety     | Ripener     | TC/A<br>(tons)        | TRS/TC<br>(lbs) | TRS<br>increase<br>(%) | TRS/A<br>(lbs/A) |
|-------------|-------------|-----------------------|-----------------|------------------------|------------------|
| HoCP 96-540 | Non Treated | 56.0                  | 221             |                        | 12,358           |
|             | RU PowerMax | 35.2 (-) <sup>1</sup> | 245 (+)         | 10.9 (+)               | 8,604 (-)        |
| L 99-226    | Non Treated | 52.5                  | 229             |                        | 12,032           |
|             | RU PowerMax | 39.8 (-)              | 255 (+)         | 11.4 (+)               | 10,127 (-)       |
| L 99-233    | Non Treated | 49.7                  | 216             |                        | 10,735           |
|             | RU PowerMax | 38.0 (-)              | 222             | 2.8                    | 8,431 (-)        |
| HoCP 00-950 | Non Treated | 45.4                  | 237             |                        | 10,767           |
|             | RU PowerMax | 31.1 (-)              | 256 (+)         | 8.0 (+)                | 7,972 (-)        |
| L 01-283    | Non Treated | 42.9                  | 217             |                        | 9,323            |
|             | RU PowerMax | 34.6 (-)              | 240 (+)         | 10.6 (+)               | 8,312            |
| L 01-299    | Non Treated | 35.2                  | 219             |                        | 7,709            |
|             | RU PowerMax | 28.8                  | 251 (+)         | 14.6 (+)               | 7,220            |
| L 03-371    | Non Treated | 52.5                  | 234             |                        | 12,285           |
|             | RU PowerMax | 34.7 (-)              | 246             | 5.1                    | 8,539 (-)        |
| HoCP 04-838 | Non Treated | 50.2                  | 224             |                        | 11,237           |
|             | RU PowerMax | 37.5 (-)              | 236             | 5.4                    | 8,842 (-)        |

<sup>1</sup> For individual varieties, differences between the non-treated and Roundup (RU) PowerMax ( $p \leq 0.05$ ) are denoted using a (+) or (-). A (+) indicates a greater value and (-) a lower value for the PowerMax treatment compared with the non-treated.

## **A LOOK AT ALTERNATIVE CHEMISTRY TO GLYPHOSATE FOR USE AS A SUGARCANE RIPENER**

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### **INTRODUCTION**

Louisiana's climate limits physiological growth of sugarcane to a maximum time span of nine months before processing of the sugarcane crop. Today there are 11 sugar factories remaining to crush over 12,000,000 tons of sugarcane annually. Since 1969, 33 processors have closed sugar factory operations. Louisiana growers in 2009-2010 produced 7.9 million tons more than was produced in the 1969-1970 crop. In spite of increases in daily processing capacities of the 11 remaining sugar factories, the total number of days required to process the State's crop has increased. Mill managers have shifted the harvest period to begin processing cane earlier in the year to handle the increase in cane tonnage and to avoid the threat of freezing conditions which often occur in late December and/or early January.

Shifting of the harvest period into late September or early October has led to greater proportion of immature cane being processed. Recoverable sugar per ton of cane generally increases in most Louisiana sugarcane varieties as the harvest season advances until the first freeze occurs. Extended periods of high incident sun light and cool night temperatures promote sugar accumulation in immature cane, which is also termed natural ripening.

In Louisiana, glyphosate has been used as a ripener since 1980. Glyphosate has had great success in improving early season recoverable sugar per ton of cane in Louisiana. However, in recent years farmers have been more reluctant to use glyphosate as a ripener due to less than desirable stubble regrowth in treated fields.

Researchers have been on a quest to find an alternative ripener to glyphosate that displays potential to increase the yield of theoretical recoverable sugar per ton of cane (TRS/TC) and overall sugar yield per acre as well as glyphosate with little or no impact on subsequent stubble crop(s) ratooning ability.

One such product, Palisade (trinexapac-ethyl), manufactured by Syngenta Crop Protection, is used in Brazil and other Latin American countries as a sugarcane ripener. Palisade differs from glyphosate in that it is classified as a plant growth regulator, unlike the herbicide glyphosate. This report deals with the results of experiments in which Palisade was tested as a sugarcane ripener in Louisiana in comparison with glyphosate and control plots where no ripeners were used.

## CURRENT EXPERIMENTS

### 2010 Spring Shoot Counts

Beginning on March 14, 2010, shoot emergence data were collected weekly on the 2009 ripener-by-variety experiment conducted at the LSU AgCenter's Sugar Research Station. These first-stubble plots were evaluated to assess possible residual effects of glyphosate or Palisade on shoot reemergence following fall treatment in 2009 with either glyphosate or Palisade on five varieties, HoCP 95-540, L 99-226, L 99-233, HoCP 00-950, and L 01-283. The data show that both glyphosate and Palisade treated plots had higher shoot population when compared to non-treated plots (Figure 1). Some of the shoots from the plots treated with glyphosate were white and stunted, but the Palisade-treated plots showed no whitening or growth reduction.

### Short Term Residual Effect of Ripeners

For the 2009 ripener-by-variety experiment, plots were scheduled to receive the same ripener treatments as the previous year in late August 2010. This was to determine the residual effect of continuous ripener treatment from the plant-cane crop through the crop cycle for the five varieties listed in the previous section. Severe lodging occurred and treatments were not applied; however, the plots were harvested in 2010 to evaluate residual effect of the ripener treatments in the first-stubble crop. No significant interactions were found suggesting that there were no negative residual effects for any of the varieties due to the ripener treatment in the first-stubble crop (data not shown).

### Effect of Nitrogen Rate on Ripeners

In late April 2010, a plant-cane crop of HoCP 96-540 was fertilized with UAN at rates of 60, 100, and 140 units of nitrogen per acre. Glyphosate or Palisade was applied to plots on August 20, 2010, to investigate the response of sugarcane to ripeners with differing nitrogen levels. The experiment was arranged as a split block with 3 replications. Plots were hand sampled and processed. No significant differences were observed for the ripener-by-nitrogen rate interaction as well as for nitrogen rate plots. Averaged across nitrogen rates, both glyphosate and Palisade-treated plots yielded statistically more TRS/TC of cane than the non-treated plots. The TRS/TC for glyphosate, Palisade, and the non-treated were 228, 221, and 207, respectively (Table 1).

### Harvest Interval

Many of the previous techniques used by researchers to evaluate potential ripeners were based on results observed for glyphosate. Palisade, unlike glyphosate, is not a herbicide; hence protocols previously used may have been biased in favor of glyphosate. Both glyphosate and Palisade were applied to HoCP 96-540 plots on August 9, 2010. The experiment was arranged as a randomized complete block with 4 replications. Sugarcane was hand harvested at 6, 8, 10, and 12 weeks post-treatment. TRS/TC was significantly greater for glyphosate over the control for all harvest sample intervals and significantly greater for Palisade over the non-treated at 8, 10, and 12 weeks following treatment (Table 2). The response in TRS/TC for Palisade treated cane doubled at 10 weeks after treatment compared to the 6- and 8- week sampling dates. This suggests that a longer treatment interval may be beneficial to improving of Palisade effectiveness as a ripener.

### Surfactants and Spray Volumes

In September 2010 a field of third stubble L 99-226 was used to evaluate the value of additional surfactant with loaded glyphosate products as well as application spray volumes. Plots were arranged in a randomized complete block design with 4 replications. Sugarcane ripeners included Roundup PowerMax applied at 5.3 oz/acre and Palisade EC at 19 oz/acre. Spray volumes included 8 and 16 gal/acre. Addition of the non-ionic surfactant Induce® to the spray mixture at rates of 0 and 0.25% volume/volume was also evaluated. A non-treated control was included for comparison. For each of the glyphosate and Palisade treatments, tonnage and sugar yield were not different from the non-treated control (Table 3). TRS/TC was greater than the non-treated control plots when Glyphosate was applied at 8 or 16 gallons per acre spray volume whether or not surfactant was added. For Palisade, TRS/TC was increased compared with the non-treated control when applied in 16 gallons per acre spray volume with or without surfactant addition, but not when applied in 8 gallons per acre. Application of Palisade at the higher spray volume would not be practical when considering aerial application. However, this data indicates that the efficacy of Palisade is enhanced by the higher spray volume.

Figure 1. Shoot counts in the spring of 2010 as an average of five varieties following ripener treatment in the fall of 2009.

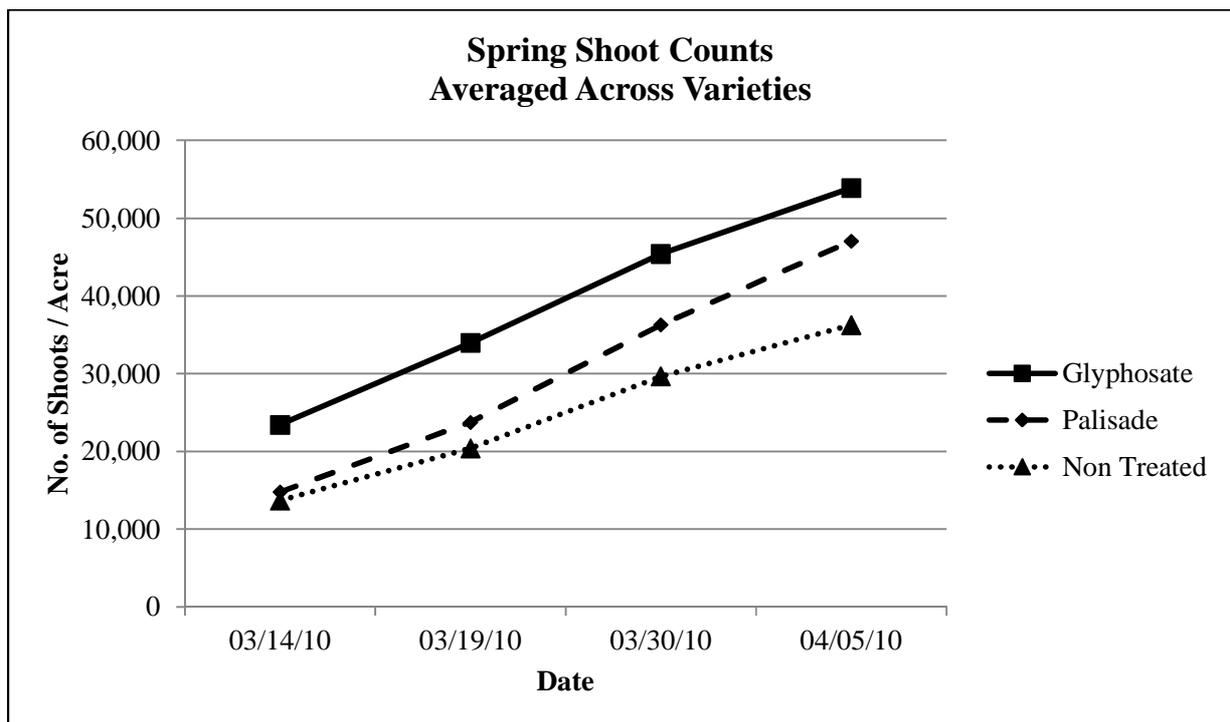


Table 1. Effects of glyphosate and Palisade ripener treatments averaged across three nitrogen rates (60, 100 and 140 lb/ac), 6 weeks after treatment.

| <b>Ripener</b> | <b>TRS/TC</b><br>(lbs/ton) | <b>Fiber</b><br>(%) | <b>Stalk wt.</b><br>(lbs) | <b>Stalk ht.</b><br>(in) |
|----------------|----------------------------|---------------------|---------------------------|--------------------------|
| Glyphosate     | 228 + <sup>1</sup>         | 10.8                | 2.24                      | 95.6                     |
| Palisade       | 221 +                      | 11.3                | 2.18                      | 97.6                     |
| Non-treated    | 207                        | 11.1                | 2.35                      | 99.6                     |

<sup>1</sup> A plus (+) indicates that the percent increase in TRS/TC was significant (P=0.05) when compared to the non-treated control plot. There was no interaction between fertilizer rates and ripener treatments; therefore, the figures in the table are averaged across the three nitrogen rates.

Table 2. Effect of the ripeners Roundup PowerMax and Palisade on theoretical recoverable sugar per ton cane (TRS/TC) measured at 6, 8, 10, and 12 weeks after treatment (WAT).

| <b>Harvest interval (WAT)</b> | <b>Non-treated average</b><br>TRS/TC<br>(lbs/ton) | <b>Roundup PowerMax treated</b><br>% increase in TRS<br>vs. non treated | <b>Palisade treated</b><br>% increase in TRS<br>vs. non treated |
|-------------------------------|---|---|---|
| 6                             | 180   | 21.1 + <sup>1</sup>   | 11.0  |
| 8                             | 203   | 11.3 +  | 8.9 +   |
| 10                            | 225   | 21.1 +  | 18.2 +  |
| 12                            | 217   | 25.3 +  | 19.6 +  |

<sup>1</sup> A plus (+) indicates that the percent increase in TRS was significant when compared to the non-treated (P=0.05).

Table 3. Effect of surfactant and spray volume on Roundup PowerMax and Palisade treated sugarcane 6 weeks after treatment (WAT).

| <b>Ripener</b> | <b>Sprayer volume</b><br>(Gal/A) | <b>Surfactant</b><br>(y/n) | <b>Cane yield</b><br>(tons) | <b>TRS/TC</b><br>(lbs/ton) | <b>Sugar yield</b><br>(lbs/A) |
|----------------|----------------------------------|----------------------------|-----------------------------|----------------------------|-------------------------------|
| Glyphosate     | 8                                | No                         | 22.5                        | 305 + <sup>1</sup>         | 6824                          |
| Glyphosate     | 8                                | Yes                        | 25.6                        | 307 +                      | 7833                          |
| Glyphosate     | 16                               | No                         | 22.5                        | 308 +                      | 6897                          |
| Glyphosate     | 16                               | Yes                        | 25.8                        | 300 +                      | 7729                          |
| Palisade       | 8                                | No                         | 22.9                        | 287                        | 6576                          |
| Palisade       | 8                                | Yes                        | 23.3                        | 284                        | 6588                          |
| Palisade       | 16                               | No                         | 24.3                        | 291 +                      | 7075                          |
| Palisade       | 16                               | Yes                        | 26.5                        | 290 +                      | 7660                          |
| Non-treated    |                                  |                            | 24.4                        | 276                        | 6778                          |

<sup>1</sup> A plus (+) indicates that the percent increase in TRS was significant when compared to the non-treated (P=0.05).