RIPENER EFFICACY AS AFFECTED BY RATOON STUNT DISEASE

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ABSTRACT

Over a three-year period the efficacy of glyphosate was studied on RSD infected and non-infected plots of the variety CP 65-357. The efficacy of glyphosate was significantly greater in the non-infected plots. Although the sucrose content was increased in all treated plots, application of glyphosate resulted in a positive effect on sugar per hectare in the non-infected cane and a negative effect on sugar per hectare in the RSD infected cane.

INTRODUCTION

Initial work with the ripener glyphosate produced unacceptable frequencies of non-responsive fields in Louisiana (Legendre and Martin4,5). In efforts to improve ripener technology, the identification of agents or factors that would reduce the level of response were considered. It has been demonstrated that sugarcane infected with ratoon stunt disease (RSD) has higher level of sucrose than non-infected sugarcane (Forbes et al2). It was therefore hypothesized that RSD-infected sugarcane would not respond to ripener treatment as much as non-infected sugarcane. The research reported herein was undertaken to test this hypothesis.

MATERIALS AND METHODS

During the 1976-1978 harvest seasons replicated 6 meter plots of the cultivar CP 65-357 were grown at the St. Gabriel Farm of the Louisiana Agricultural Experiment Station. Plots planted with 1st progeny of heat treated (Cifuentes et al1) seed were considered disease-free. Plots planted with progeny of RSD infected seed were considered RSD-infected.

During the second week of September, glyphosate was sprayed at 3.36 kg/ha in 168 liters of solution/ha. Six weeks after treatment all plots were sampled. Ten stalk samples were cut flush with the ground, stripped, topped through the apex, weighed, and milled once through a 3-roller mill. For each juice sample, brix was determined by hydrometer, apparent sucrose by polarization, and apparent purity as the ratio of apparent sucrose and brix (Meade and Chen7). From these results, the yield of recoverable sugar per ton of cane was calculated by a method previously described (Legendre and Henderson5). The yield of cane/ha was cal-
culated by multiplying mean stalk population/ha by mean stalk weight. Finally, the yield of recoverable sugar/ha was calculated by multiplying recoverable sugar/ton by yield of cane/ha.

The experiment was designed in a randomized complete block with a split plot arrangement of treatments. The varietal source of variation was examined on the whole plot with disease by glyphosate factorial effects observed on sub-plots.

To express the efficacy of the glyphosate treatment, in each replicate the yield component of the treated plots were expressed as percent of their respective control plots.

**RESULTS AND DISCUSSION**

The effects of RSD on the yield components studied are presented in Table 1. The infected plots had significantly higher sucrose, purity and sugar per ton than non-infected plots. Although not statistically significant, the RSD infected plots also had lower stalk weight and sugar per hectare than the non-infected plots. These results are in accordance with previously reported effects of RSD (Forbes et al).

**TABLE 1. Effect of RSD on yield components of CP 65-357.**

<table>
<thead>
<tr>
<th>Yield component</th>
<th>RSD free</th>
<th>RSD infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrose*</td>
<td>15.7%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Purity*</td>
<td>78.7%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Sugar/Ton*</td>
<td>90 kg/ton</td>
<td>95 kg/ton</td>
</tr>
<tr>
<td>Stalk Weight</td>
<td>1.14 kg</td>
<td>1.06 kg</td>
</tr>
<tr>
<td>Sugar/Hectare</td>
<td>9533 kg/ha</td>
<td>9287 kg/ha</td>
</tr>
</tbody>
</table>

* Statistically significant at the 0.5% level of probability.

As seen in Table 2, the efficacy of glyphosate was greater in the non-infected plots than in the infected plots. The values of sucrose, purity and sugar per ton for the treated plots were not different for infected and non-infected plots. Thus the reduced efficacy in infected plots may be associated with the higher initial values of sucrose, purity, and sugar per ton associated with the incidence of the disease.

As reported earlier (Martin et al) glyphosate affects the growth rate of sugarcane and therefore, can affect stalk weight, and tonnage. As also seen in Table 2 glyphosate had a greater effect on stalk weight in the RSD Infected plots than in the non-infected plots, although not statistically significant.

Integration of all yield components revealed that the presence of RSD significantly altered the effects of glyphosate on sugar per hectare. Glyphosate treatment increased the sugar per hectare of non-infected plots by an average of 4.37%. The same treatment resulted in a 6.41% reduction in sugar per hectare in the RSD infected plots.
TABLE 2. The effect of RSD on the percent change in yield components as a result of glyphosate application.

<table>
<thead>
<tr>
<th>Yield component</th>
<th>RSD free</th>
<th>RSD infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrose*</td>
<td>11.56</td>
<td>6.74</td>
</tr>
<tr>
<td>Purity*</td>
<td>3.12</td>
<td>0.95</td>
</tr>
<tr>
<td>Sugar/ton*</td>
<td>13.51</td>
<td>7.20</td>
</tr>
<tr>
<td>Stalk weight</td>
<td>-7.52</td>
<td>-12.30</td>
</tr>
<tr>
<td>Sugar/hectare</td>
<td>4.37</td>
<td>-6.41</td>
</tr>
</tbody>
</table>

* Statistically significant at the 0.5% level of probability.

These results help explain some of the inconsistencies originally experienced with glyphosate. Indeed, the efficacy of the ripener is negated by the presence of RSD. It is worth emphasizing that while there was no significant difference in the yield of sugar per hectare between the infected and non-infected untreated plots, the application of glyphosate resulted in a positive effect on the non-infected cane and a negative effect on the RSD-infected cane.

REFERENCES


RESUMEN

En un periodo de tres años fue estudiado la eficacia del glyphosine en ensayos de la variedad CP 65-357 infectada y no infectada con R.S.D.

La eficacia de glyphosine fue significativamente más grande en los ensayos no infectados.

Aunque el contenido de sacarosa se incremento en todos los ensayos tratados, la aplicación de glyphosine resultó en un efecto positivo en azúcar por hectárea en caña no infectada y efecto negativo en azúcar por hectárea en caña infectada con R.S.D.