REACTION OF SUGARCANE CLONES TO STRAIN B OF USTILAGO SCITAMINEA SYD.

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ABSTRACT
Among the Hawaiian clones tested H 70-2665, 71-4919 and 66-3732 were found to be very highly resistant. H66-2182 and 70-1092 were highly resistant, H 68-7482 and H 70-9455, were resistant and intermediate resistant, respectively.

Seven clones of the 1974 series, 74 P 1693, 1505, 1375, 0347, 2747, 0545 and 0305 were rated very highly resistant. Three clones, 74 P 1293, 2885 and 0549 were rated highly resistant and one clone 74 P 1501, was rated resistant. Only one clone 74 P 2721 was rated intermediate resistant.

In the 1975 series, three clones, 75 P 1121, 0545 and 0607 were found very highly resistant. Seven clones, 75 P 0327, 0155, 0371, 0417, 1695, 0293 and 0369 were found highly resistant. Nine clones, 75 P 0351, 0279, 0539, 0765, 0289, 0667, 0309, 0825 and 0047 were found to be resistant.

INTRODUCTION
Sugarcane (Saccharum officinarum L.) is one of the major crops as well as one of the dollar earning crops of the Philippines. It is extensively grown in many areas in Negros, Panay, Leyte, Cotabato, Davao, Batangas, Laguna and Pampanga.

Like other crops, sugarcane is attacked by different diseases most notable of which is smut (Ustilago scitaminea). Attempts to control the disease by the use of resistant varieties and hot water treatment of seedpieces have been reported (Thompson8). However, the use of resistant varieties is more promising. Severe outbreaks of the disease have been checked in many countries through the use of resistant varieties (Antoine1).

Testing of varieties against smut on a large scale is being undertaken at Philsucom, La Granja Sugarcane Research Station.

Rivera5 reported varieties CP 29/116 and NCo 310 to be highly resistant to
smut; POJ 3016 as average, B 37/122 as highly susceptible; and H 44-3098 as very highly susceptible. Rivera et al. found that out of the 43 Phil. varieties tested to smut, 6 were found very highly resistant, 18 were highly resistant, 10 were moderately resistant, 6 were average and 3 were moderately susceptible. They also reported that 4 outstanding Phil. commercial varieties were rated as follows: Phil. 5333, highly resistant; 5460, 56226 and 58260, moderately resistant. These varietal reactions were found to be relatively similar to those occurring under commercial field conditions. Inspite of the availability of information on the resistant or susceptibility of the cane varieties in the Philippines to smut, no work has been done regarding the use of identified strains as source of inoculum for screening, hence this study.

Since smut is a disease of economic importance, all promising varieties produced by the Breeding Department undergo routine smut disease resistance trials. This paper presents the reaction to smut of sixty one Hawaiian clones, thirty three clones of the 1974 series, and forty seven clones of the 1975 series. The experiments were conducted from January, 1977 to December, 1978 at the Department of Crop Protection, Philsucom, La Granja Experiment Station, La Carlota City.

MATERIALS AND METHODS

The susceptibility or resistance to smut of 141 clones of sugarcane was tested. Sixty one clones that came from Hawaii were tested as part of the cooperative study of Philsucom-Hawaii. Thirty three clones of the 1974 series and 47 clones of the 1975 series were included in the study.

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Smut grade</th>
<th>Stools infected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very highly resistant</td>
<td>1</td>
<td>1.0 – 2.5</td>
</tr>
<tr>
<td>Highly resistant</td>
<td>2</td>
<td>2.6 – 5.5</td>
</tr>
<tr>
<td>Resistant</td>
<td>3</td>
<td>5.6 – 7.5</td>
</tr>
<tr>
<td>Intermediate resistant</td>
<td>4</td>
<td>7.6 – 12.5</td>
</tr>
<tr>
<td>Intermediate average</td>
<td>5</td>
<td>12.6 – 15.5</td>
</tr>
<tr>
<td>Intermediate susceptible</td>
<td>6</td>
<td>15.6 – 18.0</td>
</tr>
<tr>
<td>Susceptible</td>
<td>7</td>
<td>18.1 – 22.5</td>
</tr>
<tr>
<td>Highly susceptible</td>
<td>8</td>
<td>22.6 – 22.5</td>
</tr>
<tr>
<td>Very highly susceptible</td>
<td>9</td>
<td>25.6 – 100</td>
</tr>
</tbody>
</table>
Source of inoculum. The inoculum used in the experiment was Strain B of the fungus which was collected from Isabela, Negros Occidental.

Method of inoculation. The dipping method of inoculation was used. This was done by dipping cane points for 10 min. in spore suspensions (5 \times 10^6 spores/ml).

Collection of data. The occurrence of smut whips was observed and recorded at monthly intervals until the canes were eight months old. The degree of infection of the canes were expressed in percent of infected stools.

A stool was considered infected when smut appeared on one or more stalks arising from one cane point. The results were finally expressed in total percent infected stools. Percentage infection was computed by adding the number of infected stools divided by the total shoots in the row, then multiplied by 100. The average of the replicate (10 stools per replicate) represented the reaction of a certain clone. The smut reaction was graded on a 1 to 9 scale as indicated in Table 1, grade 1 being the most resistant and grade 9 the most susceptible.

RESULTS AND DISCUSSIONS

The results of the experiments are shown in Tables 2, 3 and 4. The reaction of clones varied from very highly resistant to very highly susceptible. Among the Hawaiian clones tested, three clones were found to be very highly resistant, H 70-2665, 71-4919 and 66-3732; two clones, H 66-2182 and 70-1092 were highly resistant; two clones, H 68-7482 and H 70-9455 were resistant and intermediate resistant, respectively. The other clones were found to be intermediate susceptible to very highly susceptible.

**TABLE 2. Reaction of Hawaiian clones to Strain B of* U. scitaminea

<table>
<thead>
<tr>
<th>Clones</th>
<th>Rating</th>
<th>Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>H 70-2665</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>H 71-4919</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>H 66-3732</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>H 66-2182</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>H 70-1092</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>H 68-7468</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>H 70-9455</td>
<td>4</td>
<td>Intermediate resistant</td>
</tr>
</tbody>
</table>

*Conducted during the year 1977-78.
PLANT PATHOLOGY

TABLE 3. Reaction of 1974 Phil Clones to strain B of U. scitaminea

<table>
<thead>
<tr>
<th>Clonesa</th>
<th>Rating</th>
<th>Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>74 P 1693</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 1505</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 1375</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 0347</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 2747</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 0545</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 0305</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>74 P 1293</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>74 P 2885</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>74 P 0549</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>74 P 1501</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>74 P 2721</td>
<td>4</td>
<td>Intermediate resistant</td>
</tr>
</tbody>
</table>

*Conducted during the year 1977-78.*

In the 1974 series (Table 3), 7 clones, 74 P 1693, 1505, 1375, 0347, 2747, 0545 and 0305 were rated very highly resistant. Three clone viz., 74 P 1293, 2885, and 0549 were rated highly resistant and 1 clone 74 P 1501, was rated resistant. Only 1 clone 74 P 2721 was rated to be intermediate resistant. Twenty-one clones were rated intermediate susceptible to very highly susceptible.

Table 4 shows the reaction of the 1975 clones to smut. Out of 47 clones tested, 3 clones viz., 75 P 1121, 0545 and 0607 were found very highly resistant. Seven clones, viz., 75 P 0327, 0155, 0371, 0417, 1695, 0293 and 0369 were found highly resistant. Nine clones, viz., 75 P 0351, 0279, 0539, 0765, 0280, 0667, 0309, 0825 and 0047 were found to be resistant.

It was observed that resistant clones exhibited smut infection at 4 to 5 months while the intermediate resistant and the susceptible clones at about 3 months and 1-1/2 months, respectively. The delay in the expression of symptoms in the resistant varieties may be due to chemical, morphological, physiological or genetic factors. Chemicals in plants play a role in protecting them against plant pathogenic microorganisms. Kuo reported that phenolic compounds make plant resistant to certain disease. High reducing sugars and moisture and low fiber were reported correlated with susceptibility of sugarcane varieties to downy mildew (Stevenson). However, Fawcett demonstrated that immunity of varieties to smut infection under normal conditions was due to physical properties of the bud and
TABLE 4. Reaction of 75 Phil clones to Strain B of *U. scitaminea*

<table>
<thead>
<tr>
<th>Clones&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rating</th>
<th>Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 P 1121</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>75 P 0545</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>75 P 0607</td>
<td>1</td>
<td>Very highly resistant</td>
</tr>
<tr>
<td>75 P 0327</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0156</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0371</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0417</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 1696</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0293</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0369</td>
<td>2</td>
<td>Highly resistant</td>
</tr>
<tr>
<td>75 P 0351</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0279</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0539</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0765</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0289</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0667</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0309</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0825</td>
<td>3</td>
<td>Resistant</td>
</tr>
<tr>
<td>75 P 0047</td>
<td>3</td>
<td>Resistant</td>
</tr>
</tbody>
</table>

<sup>a</sup>Conducted during the year 1977-78.

not due to any chemical substances present in the composition of the plant. Likewise, Leu<sup>3</sup> showed that the number of chromosomes in the clones of *Saccharum spontaneum* has no correlation with their susceptibility.

**SUMMARY**

One hundred forty-four clones were screened for resistance to strain B of sugarcane smut during the years 1977 to 1978 at the Philsucom; La Granja Sugarcane Experiment Station. Sixty-one clones came from Hawaii, thirty-three clones of the 1974 series and 47 clones of the 1975 series were included in the study. Among the clones tested, 13 were classified as very highly resistant, 12 highly resistant, 11 resistant and two intermediate resistant.
The susceptible clones exhibited smut symptom much earlier than the resistant clones.

REFERENCES


REACCION DE LOS CLONES DE LA CANA DE AZUCAR AL LINAJE B DEL USTILAGO SCITAMINEA SYD

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RESUMEN

En las series de 1974, siete clones viz., 74 P 1693, 1505, 1375, 0347, 2747, 0545 y 0305 fueron clasificadas muy altamente resistentes. Tres clones, viz., 74 P 1293, 2885 y 0549 fueron clasificados altamente resistentes y un clone, 74 P 1501 fue clasificado resistente. Solamente
un clone, 74 P 2721 fue clasificado moderadamente resistente.

En las series de 1975, tres clones 75 P 1121, 0545, y 0607 fueron encontrados muy altamente resistentes. Siete clones, 75 P 0327, 0155, 0371, 0417, 1695, 0293 y 0369 fueron encontrados altamente resistentes. Nueve clones, 75 P 0351, 0279, 0539, 0765, 0289, 0667, 0309, 0825 y 0047 fueron encontrados resistentes.