FIRST OUTBREAK OF SUGARCANE SMUT IN AUSTRALIA

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ABSTRACT

Sugarcane smut (Ustilago scitaminea) was identified for the first time in Australia in the Ord River Irrigation Area (ORIA), in the semi-arid tropics of Western Australia, in July 1998. Commercial sugarcane production began in the ORIA in 1995. The ORIA is about 1600 km from sugarcane production areas along the eastern seaboard of Australia and 2500 km from Java, where high levels of smut are known to occur. In surveys up to October 1998, smut was found on nine farms; however, the main concentration of the disease was initially on one farm. The two most severely infected crops (about 600 and 250 infected plants/ha) were planted from uninfected sources in September 1996 and May 1997 respectively, indicating a rapid build-up of the disease in the hot, dry climate of this area. Spread in planting material and by wind within the ORIA occurred during 1998. It is most likely that sugarcane smut entered Australia as windborne spores, probably from Indonesia. Surveys in eastern Australia have found no evidence of the disease.

Keywords: Sugarcane smut, western australia, ord river irrigation area.

INTRODUCTION

Sugarcane smut (Ustilago scitaminea Syd.) was identified in the Ord River Irrigation Area (ORIA; 15°45'S, 128°45'E) in the semi-arid tropics of Western Australia on 20 July 1998. Smut had not previously been recorded in Australia and it is regarded as the most serious exotic plant disease threat to the Australian sugar industry.

Sugarcane has been grown in the ORIA since 1975 for experimental evaluation and maintenance of planting stock. Commercial sugarcane production in the area commenced in 1995. There are now about 3800 ha planted to sugarcane of the following varieties: Q96 (1517 ha), NCo310 (999 ha), Q99 (666 ha), Q95 (296 ha), Q117 (230 ha) and other varieties (104 ha). Of these varieties, NCo310 and Q117 are considered to be the most susceptible to U. scitaminea and together they occupy about one third of the area planted.

Western Australia is free of a number of important sugarcane diseases found elsewhere in Australia and strict phytosanitary measures apply to sugarcane imports to the state. The ORIA is about 1600 km from production areas in eastern Australia and 2500 km from Java, the nearest known occurrence of sugarcane smut. The disease is considered to be the most important disease of sugarcane in Indonesia (Mirzawan et al, 1996) and a severe epidemic is still in progress in the variety M442-51 (B.J. Croft, personal observations, 1996-98). Apart from Saccharum (interspecific hybrids), the only other known host of sugarcane smut near the ORIA is Imperata cylindrica (L) Beauv., which occurs in small, isolated populations in the region.
INCURSION RESPONSE

Several smut-affected tillers were forwarded to Agriculture Western Australia Plant Pathology laboratories at South Perth for examination and were found to conform to the published descriptions of *U. scitaminea* (Ainsworth, 1965). Confirmation of this diagnosis was obtained from CABI Bioscience. A specimen is lodged as PERTH 5106826 in the WA Herbarium.

Agriculture Western Australia's response to the finding of smut followed its generic emergency/incident response plan and the specific contingency plan developed by the Bureau of Sugar Experiment Stations (Croft and Magarey, 1997). From 23 July to the end of October, 139 fields totaling 2222 ha were inspected in the ORIA. Priorities for inspection were susceptible varieties Q117 and NCo310 within a 2 km radius of known infected fields, other varieties (Q95, Q96 and Q99) adjacent to infected fields and plantings with links (plant source or machinery use) to the infected fields. Inspection within fields was done only in young plant and ratoon crops with about 6 to 10 weeks regrowth. In addition, perimeter searches were conducted on standing cane. Other crops of Q117 and NCo310 throughout the irrigation area were inspected as a second priority.

SURVEY RESULTS

By the end of October, smut-infected plants had been found in 22 areas of crop (varieties within an irrigation bay with the same planting date, source and cutting regime) in 16 irrigated fields on nine farms. All infected crops were placed under quarantine and where needed, additional inspections were conducted to provide estimates of infection levels. Survey results according to variety and severity of infection are summarised in Table 1.

Table 1. Smut incidence in different varieties in the Ord River irrigation scheme in October 1998, three months after smut was discovered.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Total Inspected*</th>
<th>Infected</th>
<th>&lt;1%</th>
<th>1-5%</th>
<th>&gt;5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCo310</td>
<td>999</td>
<td>387</td>
<td>188</td>
<td>163</td>
<td>25</td>
</tr>
<tr>
<td>Q117</td>
<td>230</td>
<td>163</td>
<td>101</td>
<td>87</td>
<td>11</td>
</tr>
<tr>
<td>Q99</td>
<td>666</td>
<td>323</td>
<td>36</td>
<td>36**</td>
<td>0</td>
</tr>
<tr>
<td>Q96</td>
<td>1517</td>
<td>1100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>400</td>
<td>249</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3812</td>
<td>2222</td>
<td>325</td>
<td>286</td>
<td>36</td>
</tr>
</tbody>
</table>

Note: * does not include perimeter inspections of mature crops

** one stool only found

The most heavily infected crop (Q117, 1 ha first ratoon, 3 ha second ratoon, planted in September 1996) was found to have about 600 infected plants/ha. The plant source for this crop had been removed so its status could not be determined but no smut was found on that farm. A crop of first ratoon NCo310 (30 ha, planted in May 1997) had a mean of 250 infected plants/ha, but the most heavily infected area (8 ha) had over 500 infected plants/ha. The plant source of this crop was found to have a low level of infection (<1 infected plant/ha.) The Q 117 appears to have been the primary focus of the disease with further spread by wind and plant material.
within the farm. Infected Q117 from this farm was used to plant four fields on other farms in April/May 1998, and these were all infected at levels ranging from less than <1 to 240 infected plants/ha.

A crop of fourth ratoon NC0310 (8 ha, planted in October 1994) on an adjacent farm was found to be infected (77 infected plants/ha) probably by wind-borne spores. This crop had been used to plant a further 40 ha in April 1998, but this area was found to have <1 infected plant/ha. Three other crops on this farm had low levels of infection, most likely resulting from wind-borne-spread of spores from the primary farm.

Apart from the two farms described above and those with smut associated with the recent planting of infected Q117, five other farms were found with smut (mainly with levels of <1 infected plant/ha). As one of these was about 10 km south of the apparent initial focus of the disease, wind-borne-spread is the most likely cause.

Except for a single infected plant in a Q99 crop immediately adjacent to the most heavily infected Q117, there was no smut found in any of the other cultivars. No infected I. cylindrica was found but the closest population was about 25 km NE of the farms with sugarcane smut.

Three bird species frequent sugarcane crops before canopy closure in the ORIA, namely the magpie goose (Anseranas semipalmata), the brolga (Grus rubicundus), and the Australian Bustard (Ardeotis australis). It can be speculated that their activities may have contributed to local spread and rapid build-up of the disease.

CONTAINMENT MEASURES

By late October 1998, the following actions had been taken to control the disease and limit the risk of spread within Australia. Areas of heavily infected crop in the ORIA were destroyed to reduce inoculum levels. The local industry agreed to phase out Q117 and NC0310, mainly over the next two seasons (i.e. by late 2000), with crop removal priorities based on infection levels. The risk of spread from the ORIA to eastern Australia and the benefits/costs of stronger action were under consideration from a national perspective. Interstate phytosanitary regulations were imposed to reduce the risk of spread. Consideration of options for an Australian location for screening for sugarcane smut resistance commenced, and agreement was reached for the screening of Australian varieties and germplasm in Indonesia.

At the end of October, a considerable area of sugarcane in the ORIA remained to be cut and the regrowth inspected after harvesting was completed in late November. Since perimeter inspection of standing mature cane is not particularly reliable in heavy yielding crops, it is likely that other infected crops will be detected by inspections conducted towards the end of 1998.

To confirm the absence or presence of sugarcane smut in eastern Australia, intensive surveys commenced there shortly after smut was first reported in the ORIA. Of the 416 000 ha of sugarcane in Queensland and New South Wales, more than 7,000 ha had been inspected specifically for sugarcane smut. Inspections concentrated on susceptible cultivars and farms with any links to the ORIA. Sugarcane smut has not been detected. Routine plant source and disease inspections conducted by trained inspectors before the report of sugarcane smut in the ORIA covered a further 8100 ha in 1998 without detection of the disease. Specific surveys for sugarcane smut will continue in eastern Australia.

CONCLUSIONS

From the investigation of the outbreak of sugarcane smut, it can be concluded that:

- the entry of smut was most likely by wind-borne inoculum from outside Australia
- the primary introduction of smut into ORIA occurred recently, possibly in 1996
conditions in the ORIA support the rapid build-up and spread of sugarcane smut,

- varieties Q96 and Q99 may have useful levels of resistance

- there is no evidence of smut in sugarcane production areas of eastern Australia.

ACKNOWLEDGMENTS

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REFERENCES


PRIMER REGISTRO DEL CARBÓN DE LA CAÑA DE AZÚCAR EN AUSTRALIA

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RESUMEN

El carbón de la caña de azúcar (*Ustilago scitaminea*) se detectó por primera vez en Australia en el distrito de Riego Río Ord (ORIA), en el trópico semiárido del oeste de Australia en Julio, 1998. La producción comercial de caña de azúcar se empezó en ORIA en 1995. El ORIA está ubicado a 1600 km de las áreas azucareras de las costas del este de Australia y 2500 km de Java, donde se presentan niveles altos de incidencia del carbón. En evaluaciones realizadas hasta Octubre, 1998, el carbón se había encontrado en nueve fincas; sin embargo, la mayor incidencia de la enfermedad tan sólo se registró en una finca. Las dos fincas más afectadas (alrededor de 600 y 250 plantas afectadas/ha) fueron establecidas empleando fuentes de semilla no afectada en Septiembre de 1996 y Mayo de 1997, respectivamente, indicando la rapidez en el aumento de la incidencia en esa área caliente y de clima seco. La diseminación de material de siembra y la presencia del viento sucedieron durante 1998 en ORIA. La vía más probable de ingreso del carbón de la caña de azúcar a Australia fue a través del viento que transportó las esporas desde Indonesia. Búsquedas realizadas en el este de Australia no han demostrado la presencia de la enfermedad en esa zona.

**Palabras claves:** carbón de la caña de azúcar, Oeste de Australia, Distrito de Riego Río Ord
PREMIERE DETECTION DU CARBONE DE LA CANNE A SUCRE EN AUSTRALIE

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RÉSUMÉ
Le carbone de la canne à sucre a été détecté pour la première fois en Australie dans la région d’irrigation Rivière Ord (ORIA), dans le tropique semi-aride de l’ouest d’Australie en Juillet 1998. La production commerciale de la canne à sucre a été commencé à l’ORIA en 1995. L’ORIA est à peu près 1600 km de la région de la production de canne à sucre le long du littoral de l’est d’Australie et 2500 km de Java, où se présentent les carbones de niveau haut. Dans les enquête jusqu’à Octobre 1998, le carbone a été découvert dans les neuvres fermes, cependant, la concentration major de la maladie a été enregistré initialment à une seul ferme. Les deux corps les plus infectés (à peu près de 600 et 200 plantes infectées) ont été planté qui étaient des sources non-infectées, en Septembre 1996 et Mai 1997 respectivement, indiquant une augmentation rapide de la concentration de la maladie dans cette région où le climat est sec et chaud. La propagation dans les matériels de plantation et par le vent a été eu lieu pendant 1998 en ORIA. La probabilité d’entrée du carbone de la canne à sucre en Australie est par le vent qui transporte les spores probablement de l’Indonésie. Les enquêtes dans l’est d’Australie n’ont pas démontré la présence de la maladie dans cette zone.

Mots clés: carbone de la canne à sucre, l’ouest d’Australie, region d’irrigation de la rivière ord.