

**BUREAU OF SUGAR EXPERIMENT STATIONS  
QUEENSLAND, AUSTRALIA**

**BS172S - PATHOGEN RISK ANALYSIS TO PRIORITISE  
RESEARCH AND QUARANTINE NEEDS  
OF THE AUSTRALIAN SUGAR INDUSTRY**

**SUGARCANE SMUT - A CONTINGENCY PLAN  
FOR THE AUSTRALIAN SUGAR INDUSTRY**

**by  
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## **1.0 INTRODUCTION**

### **Sugarcane**

Australia is one of the top three exporters of sugar on the world market. The total production of sugar in Australia is in excess of 5M tonnes with a value of \$2B. Over 85% of the sugar is exported to 30 international destinations. The sugar industry is a major employer and component of the economy of regional coastal areas in northern New South Wales and Queensland. The industry has expanded at 3-5% per year for the last seven years with new sugar mills being built in the Ord River District of Western Australia and the Atherton Tablelands in Queensland.

### **Contingency Planning for Exotic Diseases**

Australia has remained free of many serious animal and plant diseases partly because of its isolation and partly due to its strict quarantine laws. This disease-free status has allowed Australia to provide agricultural products with lower pesticide usage and to produce these products more efficiently and at a lower cost than some of our competitors. Maintenance of this disease-free status is being threatened by the increasing ease of world travel and the growing demand for important agricultural products.

In response to the risk of entry of animal diseases, which could not only affect animal industries but also human health, the AUSTVETPLAN has been developed and refined over many years. This plan is a detailed contingency plan for the response to an incursion of a serious animal disease. Detailed agreements on the cost sharing arrangements for eradication programs is included for some of the diseases.

Plant industries are faced with a much wider range of plant species which need protection and exotic pest species which could cause serious economic losses. The Federal Government Standing Committee on Agricultural Resource Management (SCARM) has developed a general, non-specific, incursion management strategy (SIMS) (Fig. 1.1). This strategy outlines the broad areas of an incursion management plan and the appropriate authorities involved. The two key features of the strategy are the operation of a Consultative Committee which is convened by the Plant Health Committee after an incursion occurs. Recently the SCARM Task Force on Incursion Management (STF) has developed a generic incursion management plan (GIMP) for plant industries. This plan outlines the four steps to incursion management: prevention, preparedness, response and recover (Fig. 1.2). These plans give a good basis for development of specific management plans.

Some plant industries have seen the need for specific contingency plans for diseases which stand out as being of major economic importance and also which have a high risk of entering Australia. Specific contingency plans have been prepared for Black Sigatoka of bananas, 1996, Fireblight of pome fruit, 1996 and Dutch Elm disease, 1994. Incursions of both Black Sigatoka and Fireblight have occurred in the 1996/97 period. The contingency plans were at least partially successful in assisting with eradication programs. These plans have been used as models in the development of this incursion plan for sugarcane smut.

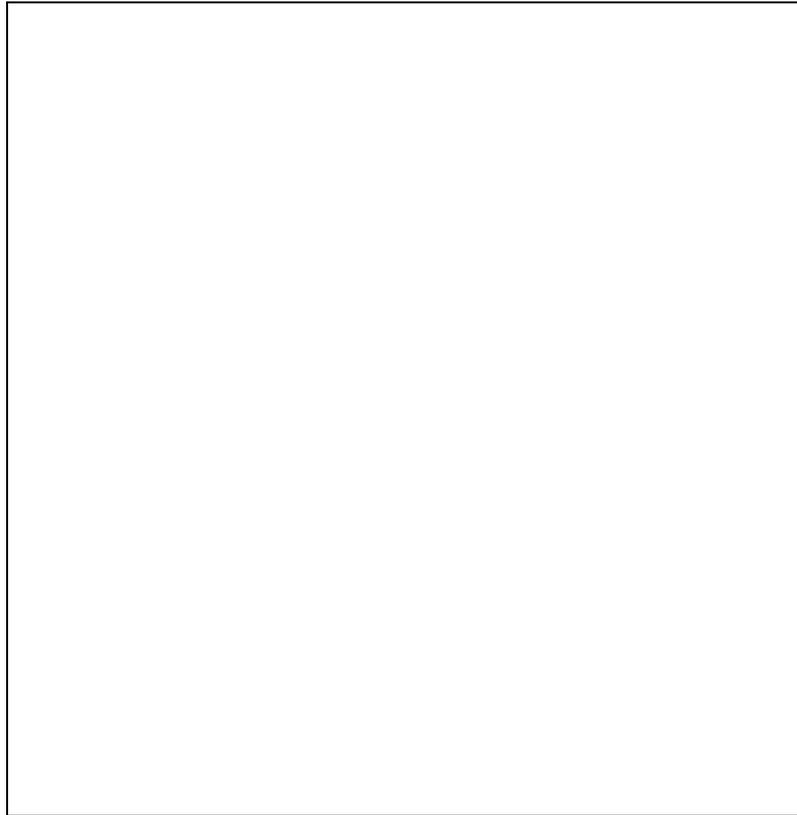
## **Sugarcane Smut**

Sugarcane smut was first recorded in South Africa in 1877, but has since been recorded in all commercial sugarcane growing countries except Australia, Fiji and Papua New Guinea. During the 1970s and 1980s, smut spread to Hawaii, the Caribbean, South, Central and North America. The disease can cause yield losses of greater than 50% in susceptible varieties and can make ratoon (re-growth) crops unprofitable. Smut can be successfully controlled by resistant varieties, but the loss of productive susceptible varieties has caused major disruptions to sugar industries around the world.

Sugarcane smut stands out as the highest exotic disease risk for sugarcane in Australia because of its economic importance, its history of spread and its current close proximity to Australia. This contingency plan attempts to provide a basic review of the disease with special emphasis on factors likely to be important in eradication or containment programs and action plans for eradication or containment. The plan covers both incursions into commercial cropping areas and into back-yard plots of sugarcane in non-commercial cropping situations such as the Torres Strait, Cape York or metropolitan areas. This first edition of the contingency plan will need to be reviewed after consultation with industry groups and with further developments in the sugar industry and with developments in the smut disease situation outside Australia.

## 2.0 FACT SHEET: Sugarcane Smut

A typical sugarcane smut “whip”.



**Disease & Cause:** Sugarcane smut is one of the most serious diseases of sugarcane. Affected cane is severely stunted and production losses of 20-30% are common in susceptible varieties. The loss of susceptible varieties would cause major disruption to plant improvement programs. The disease has had a history of spread around the world, particularly in the 1970s and early 1980s.

The disease is caused by a fungus, *Ustilago scitaminea*.

**Host range:** Sugarcane smut will infect species of *Saccharum*, *Erianthus*, *Imperata* and *Rottboelia*. Infection in the latter two genera of grasses is limited in nature.

**Distribution:** All sugar industries except those in New Guinea (including Irian Jaya), Fiji (and other South Pacific islands) or Australia.

**Key Signs:** Sugarcane smut is easily identified by the black whip-like structure that forms from the growing point of the sugarcane plant. This whip replaces the spindle leaf. Whips are formed in shoots developing from infected cane cuttings, cane that is infected from spores attached to the bud, shoots developing in contaminated soil and from side-shoots developing on mature stalks. The whip has a thin membrane which breaks to release the mass of black spores. When all spores are blown or fall from the whip, the straw coloured core of the whip remains. Abnormal whips which contain some

flower parts can sometimes be formed. Before the whip forms there is some shortening and crinkling of the youngest leaves.

Infected plants are usually stunted and individual stalks are thin with a grassy-like appearance.

**Spread:** Sugarcane smut is primarily spread by wind dispersal of the spores or by planting infected or contaminated cane cuttings. The spores usually spread only a short distance, 10-15 m. However in gale-force winds or cyclones spores can travel many kilometres. Movement of spores on machinery and shoes is also possible.

**Persistence of the fungus:** The spores can only survive for 2-3 months in moist soil but for longer periods in dry soil or other dry environments. The fungus can survive within infected cane plants as long as the plant remains alive. It requires a living plant to produce spores.

**Control Strategy:** The strategy is to eradicate the disease as quickly as possible to prevent spread within the industry. This will be achieved by destruction of infected plants, strict quarantine and movement controls on cane plants and machinery, plough-out of infected crops, fallowing, tracing and surveillance to determine the extent and distribution of the disease, decontamination of equipment coming off affected sites and planting resistant varieties.

The fungus is readily eliminated from infected cane by hot water treatment (52°C for 30 minutes). Any cane coming from an infected quarantine region to a non-infected region would need this treatment before dispatch.

**IF YOU SUSPECT SUGARCANE SMUT**

**IMMEDIATELY NOTIFY:**

**Peter Whittle, BSES, 07 3331 3333  
Barry Croft, BSES, 07 4068 1488  
or Rob Magarey, BSES, 07 4068 1488**

**DO NOT REMOVE ANY MATERIAL  
FROM A SUSPECT PLANT,  
AS THIS MAY SPREAD THE SPORES  
OF THE FUNGUS.**

# **PART 1**

## **SMUT INCURSION**

### **ACTION PLAN**

### 3.0 ACTION PLAN

#### 3.1 Summary of Action Plan

TIME	ISSUE	RESPONSIBLE PERSONS	ACTION
Day 1	Notification of suspect outbreak of smut	BSES/Department/AQIS Officer	Immediately contact BSES Pathologist. Barry Croft 07 4068 1488 Cover suspect whip with a fine mesh cloth bag. Rob Magarey 07 4068 1488 Peter Whittle 07 3331 3333 or Director BSES 07 3331 3333 <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <b>DO NOT REMOVE PLANTS FROM FIELD</b> </div>
Day 1-2	Diagnosis	BSES Pathologist	Travel to site, inspect suspect plant
	Negative diagnosis	BSES Pathologist	Suspend operations
	Uncertain diagnosis	BSES Pathologist	Collect specimen, return to laboratory and inspect microscopically, also dispatch by express courier to:  International Mycological Institute (IMI) Bakeham Lane Egham Surrey TW20 9TY UK  ☎: 441 7844 70111 Fax: 441 7844 70909 Email: IMI@CABI.ORG  Peter Whittle for DNA identification BSES 50 Meiers Road Indooroopilly Qld 4068 ☎: 07 3331 3333 Fax: 07 3871 0383
	Positive identification	BSES Pathologist	Notify BSES/State Dept. Director, prepare initial report. Director to notify Chief Quarantine Officer (Plants) in State. Place infected premises under quarantine. Collect specimens and dispatch to IMI for confirmation.

TIME	ISSUE	RESPONSIBLE PERSONS	ACTION
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Day 2-3	Implementation of quarantine action	Operations Manager and BSES Pathologist	Quarantine alert teams formed and instructed in disease identification, survey/trace back methods and disinfection techniques. Survey and trace back commenced. Collection and destruction of smut whips on infested premises.
Day 2-3		Consultative Committee	Committee is convened and briefed on incursion. Press Release is prepared and circulated to Government and Industry. Chairman of Committee negotiate with Federal and State Ministers on release of Press Release to media and statement by Minister or his nominee.
Day 3-5	Review of initial survey data	Operations Manager	Collect and summarise survey data and report prepared for Consultative Committee. Expand surveys and traceback (ongoing). Destruction of smut whips (ongoing).
		Consultative Committee	Review survey data and recommend Restricted Area (RA) and Control Area (CA) for restriction of movement of plants, plant parts and machinery. Establish RA and CA by proclamation of necessary legislation. Assess likely success of eradication given available survey data. Prepare and circulate updated Press Release.
Day 6-9	Survey and traceback	Operations and Planning Managers	Collect, compile and interpret survey data. Prepare report for Consultative Committee.
	Second meeting of Consultative Committee (In affected district if commercial cane area)	Consultative Committee	Consultative Committee to meet in district of outbreak (if commercial cane area) and meet with BSES Pathologist and Operations Manager. Review survey data and report from IMI and recommend:  (a) eradication (b) more information - continue alert (c) eradication not possible , move to active containment.
	(a) Eradication	AQIS and Chairman, Consultative Committee	Prepare recommendation for eradication including cost/benefit analysis and a budget. Submit recommendation and budget to SCARM through the Plant Health Committee.
	Decision to eradicate made	Operations Manager	Organise destruction of all infected and buffer crops. Re-survey fields surrounding infected crops. Continue wider surveys and traceback. Organise counselling of affected farmers. Convene Information Meetings for Industry in affected district.
Consultative Committee		Prepare Press Release on decisions of Consultative Committee and SCARM. Inform industry organisations and interstate governments on decisions.	

TIME	ISSUE	RESPONSIBLE PERSONS	ACTION
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Day 10-20	Review	Program and Operations Manager	Reports prepared daily on ongoing survey results. Report on progress of eradication.
		Consultative Committee	Review survey and eradication reports. Re-assess decision to eradicate.
1-36months		Operations Manager	Report monthly on ongoing surveys and eradication.
		Consultative Committee	Meet bi-monthly or as required to review eradication program.
3-5 years	Review	Operations Manager	Final report prepared.
		Consultative Committee	Review final report and success of eradication. Committee to cease function.
Post-eradication	Surveillance	AQIS	Maintain surveillance and off-shore control programs.
Day 6-9	(b) More information	Operations Manager	Surveys and traceback (ongoing). Report prepared on daily basis.
Day 6-20	(c) Eradication not possible	Consultative Committee	Consultative Committee ceases to function and Containment Committee formed. Preparation of containment plan. Prepare State legislation if required to restrict movement of plants and machinery and enforce ploughouts. Report to industry organisations. Discuss industry-wide levy to fund containment with State and Industry bodies.
		Operations Manager	Organise strategic surveys in district outside infested district. Establish road-blocks on major roads out of district to inspect for plants and contaminated machinery. Organise survey teams to monitor disease levels and issue plough-out orders as required to reduce inoculum. Convene information meetings in affected area.
1-12 months		BSES/State Plant Improvement Manager	Establish propagation areas of known resistant varieties initially in affected area but also in other districts. Distribute resistant varieties to affected growers.
		BSES Pathologist	Develop plan for production of disease-free planting material by Productivity Boards. Establish smut resistance screening for advanced clones in Plant Improvement Program. Organise visit by leading overseas Pathologist with expertise in smut control. Dispatch sample to Ken Damann, Louisiana State University for DNA finger-printing to determine DNA type and relationship to overseas isolates.

### 3.2 Confirmation of incursion

Anyone finding a plant which they believe may be infected with smut should immediately contact the nearest office of the BSES or relevant State Department. This office should immediately contact an experienced sugarcane pathologist (BSES) or their nearest AQIS office.

**Under no circumstances should the suspect smut infected plants be removed from the infected premises. If there will be some delay before the pathologist can visit the site to inspect the suspect plant, the suspect smut whips should be covered with a fine mesh cotton bag (eg. pillow case).**

Any suspect diseased plant should be inspected by a pathologist (BSES or State Department) who will confirm that the plant is infected with smut disease. The pathologist will take samples for dispatch to suitable taxonomists (Appendix 1) for further confirmation but actions should be initiated immediately the pathologist has confirmed the presence of the disease to the best of his ability.

After the pathologist has positively identified smut disease he should immediately place the infected premises under quarantine and no plant material or agricultural machinery should be allowed to leave the premises. After consultation with the Director of BSES and the relevant State Directors of Primary Industries and AQIS, a restricted area should be declared around the infected premises. The extent of this quarantine area will depend on the exact location of the incursion and the geographical and other characteristics of the region.

The pathologist should notify the Director of BSES or the relevant State Department of Primary Industries. He should also prepare a brief report on the details of the incursion. This notification should be made urgently.

### 3.3 Notification of a serious quarantine incursion

The following list of authorities should be informed of the details of the incursion by the Director of BSES or the relevant Director of the State Department of Primary Industries before any press releases.

- A. Assistant Director  
Plant Quarantine Policy Branch  
AQIS  
GPO Box 858  
CANBERRA ACT 2601  
Facsimile: (02) 6272 3307 Telephone: (02) 6272 3933
- B. The Minister  
Department of Primary Industries and Energy  
GPO Box 858  
CANBERRA ACT 2601  
Facsimile: (02) 6273 4120 Telephone: (02) 6277 7520

- C. The Minister  
Queensland Department of Primary Industries  
80 Ann Street  
BRISBANE QLD 4001
- Facsimile: (07) 3229 0260 Telephone: (07) 3239 3000
- D. The Minister  
Agriculture Western Australia
- E. The Minister  
New South Wales Department of Primary Industries
- F. Chairman  
Canegrowers  
GPO Box 1032  
BRISBANE QLD 4001
- Facsimile: (07) 3864 6429 Telephone: (07) 3864 6444
- G. Chairman  
New South Wales Cane Growers Association  
PO Box 27  
WARDELL NSW 2477
- Facsimile: (0) 6683 4503 Telephone: (02) 6683 4205
- H. Chairman  
Ord River District Canegrowers Association  
Kununurra
- Facsimile: (08) 9169 1489 Telephone: (08) 9169 1488
- I. Chairman  
Queensland Sugar Corporation  
GPO Box 891  
BRISBANE QLD 4001
- Facsimile: (07) 3221 2906 Telephone: (07) 3231 0199
- J. Chairman  
Sugar Research and Development Corporation  
PO Box 12050  
BRISBANE QLD 4002
- Facsimile: (07) 3210 0506 Telephone: (07) 3210 0495

K. Director  
BSES  
PO Box 86  
INDOOROOPIILLY QLD 4068

Facsimile: (07) 3871 0383 Telephone: (07) 3331 3333

L. Mill Directors, Cane Protection & Productivity Board Chairman, Mill Suppliers Committee, BSES Regional Extension Officer in the district in which the incursion occurs.

M. Chairman  
Australian Cane Farmers Association Ltd  
GPO Box 608  
BRISBANE QLD 4000

Facsimile: (07) 3303 2024 Telephone: (07) 3303 2020

N. Chairman  
Australian Sugar Milling Council Pty Ltd  
GPO Box 945  
BRISBANE QLD 4001

Facsimile: (07) 3221 1310 Telephone: (07) 3221 5633

O. Minister  
Primary Industries  
Port Moresby  
Papua New Guinea

(The Minister should be requested to initiate an inspection of sugarcane and wild relatives in his country to determine whether smut has also been introduced to Papua New Guinea).

P. Director  
Ramu Sugar Ltd  
Gusap  
P O Box 2183  
Lae  
Papua New Guinea

Facsimile: 0015 675 443295 Telephone: 0011 675 443291

The involvement of offices of the ministers of the federal and relevant state departments of Primary Industries must be assumed in any quarantine incursion. The Director of BSES or relevant state department or their delegated officer should contact the Minister's press secretary and appraise him/her of the details of the incursion and discuss the release of the initial and future significant press releases. All press releases should be sent to the Minister's press secretary before they are released to the media. This will allow the minister to reply to any media enquiries.

An example of a possible press release is given in Appendix 3. A fact sheet giving details of smut disease should be forwarded to all organisations with the initial press release.

On the initial press release the Director of BSES or the relevant state department will nominate a media spokesperson(s) whose name will be shown on the press release. Other staff should contact this person before releasing or making any comments on the incursion to the media.

### **3.4 Formation of Sugarcane Smut Consultative and Containment Committees**

A Sugarcane Smut Consultative Committee (SSCC) should be formed to assess the initial survey results, make recommendations on eradication to SCARM through the Plant Health Committee and to direct eradication if feasible. The suggested format of the committee would be:-

Director of BSES, Chairman of Committee  
 BSES Group Manager for Agronomy and Crop Protection or State  
 Department Manager of appropriate department (Program Manager)  
 State Chief Quarantine Officer  
 BSES Plant Pathologist  
 AQIS Representative  
 Media Liaison Officer  
 Regional Extension Officer for region where incursion has occurred  
 (Operation Manager)  
 Industry Representatives (observers)

This committee should meet as soon as possible after the incursion has been confirmed and then after the initial survey which will hopefully be completed within one week.

If eradication is not feasible, the Consultative Committee will be renamed the Containment Committee and the AQIS representative may leave the Committee if he wishes.

### **3.5 Surveillance**

An urgent requirement will be to determine the extent of the incursion. This action should be initiated immediately.

#### **3.5.1 Northern Australia**

If the incursion occurs in a sparsely isolated area of Northern Australia the NAQS Co-ordinator should be advised and requested for assistance.

The team leader should interview the owner of the premises to try and trace back the source of the infection. If cane plants or machinery have been brought from or taken to another site in the last 2 years the team should immediately inspect these sites or arrange for another team to inspect the site(s).

If there are no obvious links to other sites, the survey team should conduct a survey of all sugarcane radiating out from the original source. This survey would be the next priority after following any possible links. Sugarcane is mainly grown in backyard or garden situations and therefore surveys should concentrate on current or abandoned dwellings.

Concurrent with the survey, all smut whips should be collected and destroyed to reduce the risk of further spread of the disease.

Survey teams consisting of sugar industry personnel should be initiated in all commercial sugarcane areas concentrating on the closest areas to the incursion. Team members should be prepared to change clothes after inspecting infected premises.

The survey team should be instructed on correct methods of approaching members of the public during the survey and their legal rights and limits of entry to property by relevant state department or AQIS staff.

### **3.5.2 Other non-commercial crop area**

If the incursion is in a non-commercial crop area other than the far northern areas of Australia, such as Brisbane or Townsville, the local AQIS office should be informed immediately and in consultation with this office an action plan developed. A survey team should be formed including AQIS staff and staff of BSES or State Departments. The AQIS officers should interview the owner of the infected premises to obtain information about movement of cane plants on/to and off the infected premises in the last two years.

A survey should be conducted tracing the source of the plants involved and any plants moved off the infected premises. When the tracing has been completed the survey team should inspect all properties within a 1km radius in a city or 10km radius in the country. The survey should then be extended to cover a wider area depending on the situation.

### **3.5.3 Commercial Crop Area**

It will be essential to initiate surveys urgently if an incursion is found in a commercial crop area. This will be required to limit any further spread and so that appropriate responses can be initiated.

Inspection teams should be formed which may include BSES, State Department, Cane Protection & Productivity Board, sugar mill and AQIS staff.

The owner and manager of the property should be interviewed to determine the source of planting material brought on to the property in the last two years and whether planting material from the property has been moved to other properties. Movement of machinery should also be determined and the other farms in the same harvesting group identified. Inspection teams should inspect all properties identified by the interview.

The approach to the inspection in commercial crops will depend on the growth stage of the crop. In crops less than 2m in height it should be possible to walk the crops but if the crop is lodged, inspections will be difficult. Inspections in lodged crops could be conducted from the headland and then row for row as the cane is harvested.

If the cane is less than 2 m in height every row on every block of cane within a 2 km radius of the initial finding should be walked row for row and the number and distribution of any infected plants noted carefully on mill maps. During the inspection of these fields any smut whips located should be collected in fine mesh cloth bags for destruction and the infected stools marked. This same procedure should be followed for the farms with links to the infested farm as identified by interviews with the owners/managers and local mill and Cane Protection and Productivity Board staff.

After this initial survey a meeting should be held of the Sugarcane Smut Consultative Committee to assess the findings of the survey. This committee will determine whether eradication is feasible or containment of spread to non-infested areas should be the objective of future actions. If eradication is considered to be feasible the Consultative Committee will make a recommendation to the Plant Health Committee. While the Plant Health Committee and SCARM consider the recommendation eradication should proceed with industry and possibly state funds.

If incidence is low in the initial survey the inspection teams should then proceed to inspect 10% of fields on a stratified random pattern throughout the rest of the mill area. If a known highly susceptible variety is grown in the mill area a high percentage of fields of this variety should be included in the survey.

All other canegrowing districts, particularly those adjoining the infested area should conduct random surveys of 1% of fields to determine the status of the disease in these districts.

All canefarmers should be sent a leaflet describing the disease and be asked to report any suspect plants to their nearest BSES or State Department Office.

### **3.6 Eradication**

All smut whips collected in the initial survey should be immersed in boiling water for one hour and then buried.

If the SSCC considers eradication a feasible option all infested fields and buffer areas should be destroyed (See Section 5.2.4).

### **3.7 Containment**

If the SSCC considers eradication is not possible, actions should be taken to contain the incursion to the region where the incursion has occurred. All movement of sugarcane planting material, plant parts and sugarcane machinery, will be restricted. Planting material will require a period in an approved quarantine facility with suitable hot water treatments (See Section 5.2.7) before release to another region. All machinery must be thoroughly cleaned of all dirt and organic matter and steam cleaned before moving out of the infested area. A certificate stating the equipment has been inspected and is suitable for transport should be issued by a State official.

Road-blocks should be established on all main roads out of the infested region to ensure that no sugarcane is carried out of the region.

The SSCC should develop a policy for the plough-out of infected crops within the infested area in an attempt to reduce inoculum pressure. A suggested limit of 5% infected plants be established. This will require a large inspection team to monitor the level of disease in crops. This team will be managed by the SSCC in co-operation with local groups such as the Cane Protection & Productivity Board.

The Director of BSES or relevant State Departments should limit further planting of known highly susceptible varieties in the infested region. Suitable resistant varieties should be multiplied as quickly as possible for distribution to growers with particular attention to known infested farms.

### **3.8 Information Meetings**

Meetings of all sugar industry personnel, both milling and grower sectors, should be convened in the infested mill area by the SSCC as soon as possible to explain the current status of the incursion and the proposed control program. This meeting will be essential to keep the industry fully informed and to enlist their assistance in the control programs. Similar meetings should be conducted in other regions as time permits.

### **3.9 Overseas Expert**

An overseas expert on smut control in sugarcane should be invited to review the eradication or containment program. The best time for the visit of the expert will be decided by the SSCC, but it is likely to be between 3-12 months after the incursion when the extent of the incursion has been determined and urgent actions have been undertaken.

**PART 2**

**SUGARCANE SMUT**

**TECHNICAL REVIEW**

#### 4.0 NATURE OF THE DISEASE

Sugarcane smut or culmicolous smut is caused by the fungus, *Ustilago scitaminea*, which belongs in the Basidiomycotina group of the fungi. *U. scitaminea* is a biotroph which grows in association with the meristem of the plant and eventually causes the meristem to produce a smut whip. The smut whip is a very characteristic curved black structure which emerges from the leaf whorl. Sugarcane smut causes serious economic losses in cane yield and has resulted in the loss of many productive sugarcane varieties.

#### 4.1 Aetiology

Sugarcane smut is caused by *Ustilago scitaminea* Sydow (Annals of Mycology 22:281 - 1924). The description of the fungus as given by Sivanesan and Waller (1986) is:

*Sori produced from stem apex as whip-like structures each at first covered by a thin silver-grey membrane of host tissue which soon flakes away. Spore mass powdery, dark brown. Spores globose to sub-globose, reddish brown, typical smooth or punctate, 5 - 10 (mostly 6 - 8) um diameter.*

There are a number of other smut diseases of *Saccharum* and related genera. However, these diseases affect the inflorescence and do not produce the typical whip-like structure distinctive of *U. scitaminea*. Occasionally, *U. scitaminea* will cause modified inflorescences, so any such symptoms should be treated as possible smut.

The other species causing smut in *Saccharum* and related genera are described in Sivanesan and Waller (1986). There have been several races of the smut fungus reported overseas. The race of the fungus in an incursion will affect the resistance of varieties to the disease.

**IF YOU SUSPECT SUGARCANE SMUT**

**IMMEDIATELY NOTIFY:**

**Peter Whittle, BSES, 07 3331 3333**

**Barry Croft, BSES, 07 4068 1488**

**or Rob Magarey, 07 4068 1488**

**DO NOT REMOVE ANY MATERIAL  
FROM A SUSPECT PLANT,  
AS THIS MAY SPREAD THE SPORES  
OF THE FUNGUS.**

## 4.2 Host Range

*Saccharum* interspecific hybrids (Ferreira and Comstock, 1989)  
*S. officinarum* (Ladd and Heinz, 1976)  
*S. spontaneum* (Ladd and Heinz, 1976)  
*S. robustum* (Ladd and Heinz, 1976)  
*S. edule* (Ladd and Heinz, 1976)  
*S. barberi* (Alexander and Rao, 1981)  
*S. sinense* (Alexander and Rao, 1981)  
*Erianthus saccharoides* (McMartin, 1945)  
*Imperata arundinacea* (McMartin, 1945)  
*Rottboellia cochinchinensis* (Latiza, 1980 and Irawan, personal communication)

**Note:-** *Sorghum bicolor* (Hutchinson, 1972) and *Zea mays* (Hirschhorn, 1963) can produce symptoms when artificially inoculated but are not considered natural hosts.

## 4.3 Distribution

Sugarcane smut has been recorded from all sugarcane producing countries except Australia, Fiji and Papua New Guinea. The countries from which it has been recorded by the International Society of Sugar Cane Technologists Pathology Committee (Autrey *et al*, 1992, 1995) are:

### Culmincolous smut

Afghanistan	Guatemala	Nigeria
Antigua	Guyana	Pakistan
Argentina	Haiti	Panama
Bangladesh	Hawaii	Paraguay
Barbados	Honduras	Philippines
Belize	Hong Kong	Portugal
Bolivia	India	Puerto Rico
Brazil	Indochina	Reunion
Burkina Faso	Indonesia	Senegal
Cambodia	Iran	Somalia
Cameroon	Jamaica	South Africa
Chad	Japan	Sri Lanka
China	Kenya	St Kitts and Nevis
Colombia	Malagasy Rep.	Sudan
Costa Rica	Malawi	Swaziland
Cote d'Ivoire	Malaysia	Taiwan
Cuba	Mali	Thailand
Dominica	Martinique	Trinidad
Dominican Rep.	Mauritius	Uganda
Ecuador	Mozambique	Uruguay
Egypt	Myanmar	U.S.A.
El Salvador	Nepal	Venezuela
Ethiopia	Nicaragua	Zaire
Guadeloupe	Niger	Zimbabwe

In Indonesia, smut has been recorded on the islands of Java, Sumatra and Sulawesi in commercial cane crops. The only island which has commercial cane crops free of smut is Kalimantan. Smut has not been recorded on the eastern islands of Indonesia including Irian Jaya.

#### 4.4 Diagnosis

##### 4.4.1 Plant symptoms

Sugarcane smut is characterised by the distinctive long whip-like structure which develops from the apex of a stalk (Figure 4.1). The “whip” can be 5-10 cm to 1.5 m in length, straight or curved. The whip is composed of a central core of fibrous tissue surrounded by the black powdery spores of the fungus and initially enclosed in a thin, silvery, membranous sheath. Occasionally a partially formed flower will be produced with the upper part converted into a smut whip. Before the whip develops the youngest leaves become shortened, erect and crinkled.

Infected plants have thin stalks and widely spaced nodes. Badly affected plants have a grassy appearance with profuse tillering. Side-shoots developing on infected stalks will also produce characteristic smut whips.

##### 4.4.2 Fungal taxonomy

*U. scitaminea* is identified by its dark brown, minutely punctate teliospores (5.5-7.5 µm diameter) with a thin episporium (Fig. 4.2).

For positive identification spores should be collected by an authorised BSES pathologist from suspect plants in a sealed bag or tube. Samples should be dispatched to IMI (see Appendix 1) and to Peter Whittle, BSES, 50 Meiers Road, Indooroopilly Qld 4068. Spore samples for DNA analysis should be allowed to air-dry in an enclosed incubator (place open tube in incubator for 1-2 days) at 24 - 28°C, the tube sealed and sent to one of the researchers listed in Appendix 1. **Samples should be stored under strict security in an AQIS registered laboratory.**

#### 4.5 Varietal Resistance

Resistance to sugarcane smut in commercial hybrid sugarcane varieties is widely used for control in countries where the disease is present. Some of the original noble canes (*Saccharum officinarum*) are highly resistant to smut. *S. spontaneum*, *S. barberi* and *S. robustum* clones show a range of reactions to smut but some of the clones used in early hybrids were highly susceptible and have passed this characteristic on to modern hybrids.

#### 4.6 Epidemiology

##### 4.6.1 Infection

Teliospores of *U. scitaminea* germinate readily under moist conditions. The germinated spore produces a promycelium which can bud out sporidia which are oval shaped, tapering toward the extremities and measure 6 x 2 µm. Sporidia, or hyphae produced by the sporidia, or promycelium fuse to form a dikaryon mycelium which is the infective stage of the fungus.

Infection only occurs through the lower portion of the bud scales of buds on standing cane or on setts planted into infested soil. Infection in soil is less efficient than infection through

buds on standing cane. The fungus penetrates the bud and invades the meristematic region of the bud.

Figure 4.1 a. Smut whip showing black spores and membranous sheath. Note also crinkled erect leaves.  
b. Severely stunted, grassy stool of smut infected cane with many whips.

Figure 4.2 The smut fungus, *U. scitaminea* Syd. Left: Chlamydo spores (x 2,300). Germination of a chlamydo spore; a - spore, b - promycelium and c - sporidium (x 2,300)

While the bud remains dormant so does the fungus. As the bud germinates and the plant grows, the fungus maintains an association with the meristem. Any new bud primordia also contain the fungus.

#### **4.6.2 Reproduction and dispersal**

The smut whips (sorus of the fungus) start to emerge in plants 2-4 months of age with peak whip production at 6-7 months. The whips grow at up to 10 cm per week and can release  $10^8$ - $10^9$  teliospores/day for up to 3-4 months. Teliospores are adapted to aerial dispersal. It is suggested that simultaneous outbreaks in the Caribbean and South America in the 1970s were from spores carried on high level air currents from Africa. Within a few years of arriving in the Caribbean, smut spread to North America and throughout Central America. Teliospores spread by the wind infect the buds on standing cane or the buds on cuttings planted into infested soil.

Teliospores can also be spread in irrigation water, on contaminated plant residues and on contaminated machinery or clothing. Sugarcane harvesters have the potential to carry large numbers of spores and provide ideal conditions for spore survival. Movement of these machines presents a major risk of spread of disease to new areas. Other farm machinery and vehicles could also carry spores. Transport of spores on clothing or other personal items by travellers also presents a risk for introduction of the fungus to new areas.

Systemically infected cuttings act as an important method of spread of the fungus.

#### **4.6.3 Survival**

Teliospores in air-dried soil can survive for at least 9-10 months but spores can only survive for 2-3 months in moist soil. Fallowing for 12 months with intensive control of volunteer plants and irrigation of the site will eliminate the fungus from infested soil.

#### **4.7 Manner and risk of introduction**

The spread of sugarcane smut into nearly all sugarcane producing countries by long-distance aerial transmission suggests that it is likely that the disease will eventually arrive in Australia. The risk of this occurring would be greatly increased if there is further spread in Indonesia. Current Indonesian plans to establish sugarcane industries in Irian Jaya and East Timor would greatly increase the risk. However, it is possible that long distance spread of spores could occur from other areas such as Africa, the Philippines, South East Asia or India.

The introduction of spores on contaminated machinery or on the personal items of international travellers is also a significant risk. Illegal import of infected cuttings is a significant risk. Noble sugarcane, *Saccharum officinarum*, and *Saccharum edule* are important cultural and food items for many Asian and South Pacific island peoples and particularly to Papua New Guineans. Illegal imports of these species have been detected on a number of occasions in recent years.

## 5.0 PRINCIPLES OF CONTROL AND ERADICATION

### 5.1 Introduction

If sugarcane smut was detected in Australia, the response would depend on whether the infected plants were found in commercial crops or as isolated plants in non-crop areas.

#### a) Isolated plants in non-crop areas

Sugarcane and its relative, *Saccharum edule*, are widely grown throughout the Torres Strait and in home gardens in northern Australia and as far south as Sydney. If smut was found in isolated plants in a non-crop area, it would be feasible to eradicate the outbreak. This would involve:-

- Immediate isolation and destruction of all *Saccharum* species within 10 km of the outbreak and follow-up destruction of any regrowth.
- Intensive surveys within 150km of the incursion. These surveys would concentrate on current and abandoned dwellings where sugarcane may have been planted.
- Public awareness campaign to alert all AQIS, BSES, State Departments of Primary Industries in Queensland, NSW and WA, Cane Protection & Productivity Board staff, cane farmers and the general public to report any symptoms resembling smut whips.

#### b) Infected plants in commercial crops

If the incursion is restricted to a small number of fields it may be possible to eradicate the disease and the immediate response should assume eradication is possible until surveys determine the distribution of the disease.

If infected plants were found in commercial crops it would be essential to determine as soon as possible the extent of infection. If infection was widespread and whips have been present for some time, eradication is unlikely to be successful and containment is likely to be the only viable option. Containment will involve strict quarantine on movement of all sugarcane plant parts and contaminated machinery. Reduction of inoculum sources by plough-out and fallowing of infested fields, removal and destruction of smut whips, roguing individual infected plants, eradication of abandoned sugarcane, planting disease-free material and planting of resistant varieties would all be important in containing the spread of the disease.

Experience in Hawaii suggests that the spread of the disease between isolated cane growing areas (eg Hawaiian islands) can be delayed for a number of years which will allow these areas to prepare for the spread of the disease.

### 5.2 Methods to eradicate and prevent spread

Eradication of smut from isolated incursions in non-commercial crop areas has a high probability of success if the disease is detected early. Monitoring of the distribution of the disease in neighbouring countries will be important to warn of the approach of the disease. In non-commercial crop situations such as wild *Saccharum* species and garden

*Saccharum* species it will be difficult to detect the disease. Regular surveys of qualified inspectors and good public awareness are the best approaches. Regular contact with sugar industries in neighbouring countries should be maintained to monitor the smut disease status of their crops. If smut is reported from near neighbours, for example, Irian Jaya, Papua New Guinea or East Timor, surveillance should be increased in the Torres Strait, Cape York, Ord River and Northern Territory.

### 5.2.1 Quarantine and movement controls

Quarantine and movement control should be imposed at several levels:

Infected Premises (IP): A premises on which sugarcane smut is confirmed or presumed to exist. Total movement control is imposed.

Dangerous Contact Premises (DCP): A premises containing susceptible host plants, which are known to have been in direct or indirect contact with an IP or infected plants. Total movement control is imposed.

Suspect Premises (SP): A premises containing plants which may have been exposed to smut and which will be subjected to quarantine and intense surveillance. Provided there is no evidence of infection, the premises then reverts to normal status.

Restricted Area (RA): A restricted area will be drawn around all IPs and DCPs and include as many SPs as practical. The actual distance in any one direction is determined by factors such as terrain, the distribution, harvesting and management practices, the weather (particularly rainfall, temperature and prevailing winds) and the distribution of other host plants in home gardens.

The RA is not determined by drawing a circle of a certain diameter around the IP. The boundaries must be modified as new information comes to hand. A high level of movement control and surveillance will apply.

Control Area (CA): A CA will be imposed around the RA and include all remaining SPs. The purpose of the CA is to control movement of susceptible plant species for as long as is necessary to complete traceback and epidemiological studies. Less stringent movement control and surveillance will apply. Once the limits of the disease have been confidently defined, the CA boundaries and movement restrictions should be relaxed or removed.

Movement controls should be maintained to contain the disease to within infested areas.

### 5.2.2 Traceback

It is important in any incursion to try and identify the source of the outbreak. If the infection has resulted from the illegal entry of an infected cutting, the period in which the infected plant has been present and the subsequent movement of infected cuttings from the original infected plant, will be important factors in determining the likely success of eradication, the extent of the restricted area and the actions required.

If it appears likely that the incursion is from a contaminated machine then the movements of the machine should be traced.

Aerial incursions may require a much wider survey to determine whether spot incursions have occurred in other locations. Movements of plants and machinery from the infested premises should be thoroughly investigated.

### 5.2.3 Surveillance Surveys

Eradication or restricting spread of smut will depend on the initial distribution, and surveys should be initiated as soon as possible after the first record of the disease.

#### a) In non-commercial crop areas

All *Saccharum* species within a 1km radius in a city or a 10km radius in the country of the initial finding should be inspected and then inspections should be made radiating out from this initial area. The surveys would concentrate on current and abandoned dwellings where sugarcane may have been planted.

A careful record should be kept of the location of cane plants for follow-up inspections. Follow-up inspections should be carried out at 3, 6 and 12 months after the first finding. Extreme care should be taken when a positive infection is found to decontaminate all clothing and equipment before continuing inspections.

#### b) Commercial crop areas

On finding smut in a commercial crop the entire field in which the disease was found should be walked row for row and the intensity of infection determined. All fields within a 2 km radius of the initial infection should be walked row for row, followed by inspections of 10% of fields at random throughout the remaining mill area or adjoining mill areas. All fields on farms belonging to the same farmer/company and the same harvester group as the infested farm should be inspected. Any farm on which machinery or planting material from the infested farm has been shifted to in the previous two years should be inspected. If a highly susceptible variety is present in the region (eg Q117) inspections should include a high percentage of fields of this variety. Extreme care should be taken to decontaminate all clothing and machinery before moving from a known infested site.

Random inspections should be made throughout all other mill areas concentrating on any known susceptible varieties.

Careful records of the number of infected plants per field, the distribution of infected plants within a field (eg. infected plants in runs down a row suggesting infected planting material or individual plants scattered throughout the field suggesting aerial transmission) and the location of infested fields (mark on mill maps).

The intensity and number of positive findings in the initial 2 km radius survey and the survey of farms with a link to the original farm should be reviewed before proceeding with the wider survey. If disease is widespread on these farms, it is likely that the disease has been present for some time and eradication is unlikely to be possible. Future action should concentrate on preventing movement from this region/mill area to surrounding regions/mill areas. If only a few infested plants or fields are found close to the original

infection, there may be some possibility of eradication and strict quarantine should be enforced around the infected farms. Detailed surveys should continue within the infested mill areas.

#### 5.2.4 Destruction of infected plants

**No smut whips should be removed from the infested premises except for scientific purposes by an authorised person. Great care should be taken to limit the dispersal of spores.**

The actual methods of destroying infected plants will depend on the number of plants involved and the growth stage of the crop. Wherever possible all smut whips should be removed first. The whip should be enclosed in a fine cloth mesh bag with care not to disturb the whip so that as many spores as possible are captured. The mesh bag should be immersed in boiling water for at least one hour. A treatment facility should be set up on the infested property. After treatment the whips can be buried in a non-crop area.

If there are less than 50 infected plants, they should be dug out and should be burnt in an incinerator or in a pit.

The cane in the infested fields should be destroyed by rotary hoeing the field. The crop may be slashed or knocked down with a tractor first to assist in the hoeing. The field should be rotary hoed, disced or ploughed 3-4 and 6-8 weeks after the initial hoeing to destroy all volunteers. After these cultivations any further volunteers should be sprayed with glyphosate. If weather makes it impossible to plough the field it should be sprayed with glyphosate at 10l/ha, left for at least 2-3 weeks and ploughed as soon as possible after this time. The field should be left fallow with no sugarcane volunteers for 12 months.

If there are a large number of infected plants in the field, all whips should be removed and the field rotary hoed or sprayed with glyphosate.

If the survey shows that only a small number of fields are infested (1-5), an area of 300-500 m around the extremities of the infested fields should be rotary hoed and left fallow for at least six months. If no rain falls within the first two months, and irrigation is available, the field should be irrigated to field capacity on at least two occasions.

The actual extent of the initial infestation will determine whether it is necessary to continue ploughout of infested fields. If there are many infested fields it may be necessary to set a level of infection which would require ploughout (eg 5% of stools) to help reduce the inoculum for further spread outside the initial infested region.

#### 5.2.5 Decontamination of clothing and machinery

##### *Clothing*

Where possible, disposable clothing (eg hats and overalls should be worn). All other clothing worn in an infested field should be washed in hot water (>60°C). This would include hats. The clothing should be sealed in a plastic bag for transport to the laundry. Shoes or boots should be thoroughly washed with a household disinfectant.

Survey teams should shower and change their clothes after inspecting an infested site before moving to another field.

### ***Vehicles and Machinery***

All vehicles and machinery should be thoroughly washed and steam cleaned to remove all dirt and plant residues before leaving an infested property. The vehicle or machine must be inspected by an authorised person before it is allowed to move. Private vehicles which have not driven off the main road entering the property can be exempt from this requirement, if the road is not bounded by the infested field or the infested field has been ploughed in. Survey teams and other visitors to infested sites should avoid driving vehicles close to the infested field if possible.

#### **5.2.6 Control with resistant varieties**

The known infested fields and those close by should be planted with resistant varieties after the prescribed fallow period.

Varieties with high levels of resistance to smut have been bred in most overseas sugar industries. Many of these varieties are held in variety collections at BSES and CSR Experiment Stations. A number of Australian varieties are also resistant to the disease. In the case of an incursion, a selection of these resistant varieties should be multiplied for use on infested farms and for possible introduction into the area if eradication is unsuccessful or is not possible.

Screening for smut resistance should not commence in Australia until it is clear that there is no possibility of eradication. If possible, the site for screening for resistance should be situated at least 10km from commercial crops in the region where smut has become endemic. Standard screening techniques as recommended by the International Society of Sugar Cane Technologists should be followed. The technique involves immersing setts of the test varieties in a  $10^6$  spore suspension for 10 minutes, keeping the setts moist for 12-24 hours, planting the setts in the field and recording the percentage of diseased plants developing from the inoculated setts.

#### **5.2.7 Hot water treatment and fungicides**

Hot water treatment of cane can be used to eliminate smut from infected planting material. Treatment at 52°C for 30 minutes can give 98% control and the long hot water treatment of 50°C for 3 hours is also effective. Softening of the buds during hot water treatment can make the buds more susceptible to reinfection from spores in the soil. A fungicide added to the hot water treatment can prevent this problem and actually protects the cane from reinfection for many months. The fungicides which have been found effective are triadimefon (<sup>a</sup> Bayleton, 500ppm) and propiconazole (<sup>a</sup> Tilt or Cane Sett Treatment 0.2 ml/L). Cold fungicide treatments have not been effective.

<sup>a</sup> Registered for use on sugarcane but not at these rates or application methods. An application for emergency registration to the National Registration Authority would be required.

#### **5.2.8 Approved Seed Plots**

Distribution of approved seed should be discontinued until the extent of the incursion is determined. It may be necessary to hot water and fungicide treat all cane being distributed from an approved seed plot. The approved seed plot should be inspected for smut row-for-row before any cane is distributed.

### **5.2.9 Abandoned sugarcane and alternative hosts**

All abandoned sugarcane within 50km of the incursion should be destroyed as this could act as a source of inoculum of the disease. Spraying with glyphosate may be the most effective and efficient method of destruction but follow-up sprays may be necessary.

In some areas the wild sugarcane relative, *S. spontaneum*, has established as a weed (eg banks of the Mulgrave River near Cairns). Attempts should be made to destroy these plants if they are found to be infected with smut. This would need to be discussed with the Department of Natural Resources to determine the environmental impacts of any control program.

Sugarcane grown in backyards should be inspected in the area near any incursion and any infected plants should be destroyed.

### **5.3 Feasibility of control in Australia**

If sugarcane smut is found on isolated plants outside a commercial cane growing area, it is feasible to eradicate the disease from Australia. If an initial incursion occurred in a commercial crop it is unlikely that eradication will be possible but the response to the incursion should assume that eradication is possible until the extent of the incursion is known. Experience from Hawaii has shown that the spread of the disease within a country with distinct breaks between cane growing areas can be delayed for a number of years through careful quarantine. This delay in spread allowed resistant varieties to be planted before the arrival of the disease. Ultimately, if eradication is not achieved, the disease can be successfully controlled with resistant varieties but this will involve the loss of valuable commercial varieties and potentially serious yield losses in the period of changeover from susceptible to resistant varieties.

**IF YOU SUSPECT SUGARCANE SMUT**

**IMMEDIATELY NOTIFY:**

**Peter Whittle, BSES, 07 3331 3333  
Barry Croft, BSES, 07 4068 1488  
or Rob Magarey, BSES, 07 4068 1488**

**DO NOT REMOVE ANY MATERIAL  
FROM A SUSPECT PLANT,  
AS THIS MAY SPREAD THE SPORES  
OF THE FUNGUS.**

## **6.0 ACKNOWLEDGEMENTS**

The authors would like to acknowledge Mike Cole and Mick Lloyd of AQIS for their helpful comments and Eve Kain of the BSES library for help in obtaining literature.

**APPENDIX 1****CONTACTS FOR TAXONOMY OF THE FUNGUS**

Confirmation of the identity of *Ustilago scitaminea* can be obtained by sending specimens to:

International Mycological Institute  
Bakeham Lane  
Egham Surrey TW20 9TY UK

☎: 441 7844 70111  
Fax: 441 7844 70909  
Email: IMI@CABI.ORG

For DNA identification, samples could be sent to:

Susan Schenck  
Hawaiian Agricultural Research Centre  
99-193 Aiea Heights Dr  
Aiea Hawaii 96701 USA

☎: 1 808 486 5386  
Fax: 1 808 486 5020  
Email: SSCHENCK@HARC-HSPA.COM

For DNA type identification, samples could be sent to:

Ken Damann  
Department of Plant Pathology  
Louisiana State University  
Baton Rouge  
LA 70803 USA

☎: 1 504 388 1401  
Fax: 1 504 388 1415  
Email: KDAMAN@LSUVM.SNCC.LSU.EDU

## APPENDIX 2

### SURVEY FOR SUGARCANE SMUT

#### Method

1. Teams of 2-4 people will be trained in recognition of sugarcane smut, survey methods, disinfection and protocols for surveys on private and public lands.
2. Equipment:-
  - disposable hats, overalls and gloves
  - washable boots
  - illustrated guide to sugarcane smut
  - mill or local authority maps, hand held GPS device (one per team)
  - fine mesh cotton bags and secateurs to collect whips.
  - 70% methylated spirits in hand held spray bottles to disinfect equipment
  - copper trough, gas heating ring and gas bottle for destruction of whips
  - portable cleaning kit for boots
  - survey report sheets
  - identification and leaflets explaining reason for survey
  - mobile phone
3. Owners of private properties will, where possible, be advised in advance of the survey, by letter drop, radio, and/or TV.
4. Team to dress in protective clothing before entering property and display identification tags.
5. Where possible, leave vehicle on farm roads.
6. Team leader to identify group to property owner/manager if available, explain survey and provide them with a leaflet on sugarcane smut.
7. All cane plants are inspected or the pre-determined number of blocks and rows walked in commercial crops.
8. When a smut whip is located, it should be carefully covered in a fine mesh bag, the stalk cut and the bag sealed. If large numbers of whips are present (eg. > 100), the team should leave the field without removing whips. The necessity to remove whips will be reviewed regularly depending on the number and intensity of infestations.
9. All whips should be immersed in boiling water for one hour on leaving the field on the infested property. Disposable clothing should also be immersed in the boiling water. Treated material should be buried on the infested property.
10. Complete survey form.

11. Advise property owner/manager of survey results.
12. If smut is located on the property, report results immediately to the operation control centre.
13. At the end of each day, the survey sheets will be entered onto the data base and a summary report prepared and forwarded to the operations manager.



**Sugarcane Smut Survey**  
**Dwellings/Abandoned Cane**

**Dwelling Location: (Street No./Local Authority No./GPS Co-Ordinates):**

.....

**Owner/Occupier:**

.....

**Sugarcane no. stools:** ..... **No. of whips located:** .....

**Type of sugarcane -**

**Noble:** .....

**Edule:** .....

**Commercial:** .....

**Spontaneum:** .....

**Trace back - source of plants:** .....

**Movement plants to other properties:** .....

**Comments:** .....

.....

.....

**Team Leader:** ..... **Signature:** ..... **Date:**.....

**APPENDIX 3 - DRAFT PRESS RELEASE**



**From the office of**  
..... **MLA**  
**Minister for Primary Industries**

December 1, 1998

**Program to Eradicate Sugarcane Smut**

The Primary Industries Minister, ....., said today that sugarcane smut had been detected on a sugarcane farm in the Burdekin River irrigation area of northern Queensland with the property immediately being quarantined.

Mr ..... said Bureau of Sugar Experiment Stations (BSES) senior pathologist ..... had inspected the infected plants and confirmed that smut disease was present. Further confirmation will be available when results from samples which were sent to the International Mycological Institute in the UK are received.

Sugarcane Smut is a serious disease of sugarcane which can reduce yields, but it can be successfully controlled.

“This is the first suspected case of sugarcane smut in Australia and a control plan developed by BSES with assistance from AQIS has been activated,” Mr. .... said.

“Under the plan, a BSES task force has begun tracing all movements of cane and machinery from the suspect property and has commenced a survey of neighbouring farms. This includes a total ban on movement of cane and machinery from the suspect property. BSES, AQIS and the QDPI are working closely with the sugar industry to ensure the outbreak is eradicated or contained as quickly as possible,” Mr. .... said.

Sugarcane smut can be spread long distances by wind and on contaminated plants or machinery. The source of this outbreak is unknown at this stage.

Media contact: Mr ..... (Ministerial Advisor)  
Phone: .....  
Fax: .....

Technical information contacts: Barry Croft - 07 4068 1488  
- 0147 613 089  
Rob Magarey - 07 4068 1488

Attached: Fact Sheet on sugarcane smut  
Location map of outbreak

## APPENDIX 4 - ERADICATION PROCEDURE

### Commercial crops

1. Enclose smut whips in a fine mesh cotton bag and immerse in boiling water for one hour. Bury treated whips in a non-crop area on the infested farm.
2. If only a small number of infected plants are found (<50), dig out the whole plant, place in a pit, cover with straw, douse with diesoline and set alight. When the fire is burnt out, cover the pit with soil.
3. If many infected plants in a field or after removing the diseased plants, mulch the existing crop with a heavy duty rotary hoe and plough the field.
4. Thoroughly wash all equipment with a high pressure hose and steam clean on a designated area away from crops, collect drainage water in a pit.
5. Repeat ploughing after 3-4 weeks and 6-8 weeks.
6. If no rain is received and irrigation is available, irrigate the field to field capacity and repeat after second ploughing.
7. Inspect field every 2-3 weeks for 6 months and spray any volunteers with glyphosate.
8. If the weather makes ploughing impossible, spray the field with 10L/ha glyphosate.
9. Leave field fallow for at least 12 months.
10. Only replanted field with known resistant variety.
11. Inspect original infested field at least twice in the first crop after replanting.
12. Equipment
  - Heavy duty rotary hoe (as used to mulch tree stumps) and suitable tractor.
  - Plough (disk or mould-board).
  - Copper trough, gas ring and gas bottle for boiling whips.
  - Fine mesh cotton bags and secateurs.
  - 70% methylated spirits in a hand held spray bottle.
  - Hire pressure washing rig and mobile steam cleaner.
  - Straw and diesoline.
  - Disposable clothing for members of team.
  - Portable shower and change of clothing, laundry bags.
  - Spray equipment and glyphosate.
  - Hoes, shovels and cane knives.

*(Note: Equipment and actual procedure may vary depending on the growth stage of the crop)*

### **Non-crop areas**

1. Enclose smut whips in a fine mesh cotton bag and immerse in boiling water for one hour. Bury treated whips in a non-crop area on the infested property or in an approved dump site.
2. Dig out the whole of the underground stubble of the cane and collect all leaves, stalk and stubble material. Dig a pit on the property or at an approved dump site. Cover the plant material with straw, douse with diesoline and set alight. When the fire is burnt out, cover the pit with soil. When transporting the plant material to a dump site, the material should be enclosed in plastic bags or other enclosed container. In a city area, a commercial incinerator may be used to burn the plant material.
3. The area from which the plant was removed should be levelled out and thoroughly watered.
4. An inspector should return to the site every 2-3 weeks for 6 months and destroy any plants as in 2 above.
5. **Equipment**
  - Hoes, shovels and cane knives.
  - Fine mesh cotton bags and secateurs.
  - 70% methylated spirits in a hand held spray bottle.
  - Copper trough, gas ring and gas bottle for boiling whips.
  - Heavy duty plastic bags or covered industrial waste bins.
  - Disposable clothing for members of the team.

## **APPENDIX 5 - MANAGEMENT AND CO-ORDINATION**

The following general model for management of a disaster should be established with clearly defined responsibilities for all involved.

### **Job Descriptions**

#### **Program Manager**

- Co-ordinate, manage and direct the resources of the overall eradication or containment program as per the guidelines in the contingency plan. Appoint planning, operations and infrastructure and communications managers.
- Prepare budgets for the eradication/containment program.
- Prepare reports on the progress of the eradication/containment program and present these at the Sugarcane Smut Consultative Committee meetings.
- Ensure timely and effective communication and liaison with industry, politicians and community leaders.
- Convene and chair regular meetings of the eradication/containment task force.

**Manager Infrastructure and Communications**

- Prepare lists of resource needs with associated costs and justification after discussions with the Management team.
- Ensure cost effective, efficient and timely procurement and delivery of resources.
- Prepare reports on expenditure, assets and personnel for stakeholders.
- Liaise with Planning and Operations Managers to provide reports to the media liaison officer, Consultative Committee and other stakeholders.

**Manager Operations**

- Appoint members of the eradication/containment taskforce and instruct them in the roles they will play in the program.
- Supervise the operations of the eradication/containment taskforce.
- Evaluate progress and identify problems and develop strategies to rectify problems.
- Prepare detailed reports on the progress of the program for Program Manager.

**Manager Planning**

- Review the progress of the eradication/containment program from a technical perspective.
- Identify changes in the eradication/containment program in the light of progress reports and after consultation with specialists to ensure efficient and effective implementation of the program.
- Co-ordinate and chair meetings of specialists to ensure cost effective recommendations to the task force.
- Organise visit by overseas expert(s) with experience in smut disease control.
- Analyse data summaries and prepare maps from surveys, advise operations manager of future survey directions and advise Program Manager of recommendations on modifications to quarantine zones.

**APPENDIX 6****REFERENCES**

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