

# SUGARCANE DISEASES IN SOUTHERN AFRICA

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SOUTH AFRICAN SUGARCANE  
RESEARCH INSTITUTE

# **SUGARCANE DISEASES IN SOUTHERN AFRICA**



Published by

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Updated January 2014

ISBN: 1-874903-30-1

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# Principles of disease control in sugarcane

## Varietal resistance

Disease control in sugarcane is achieved mainly by means of resistant varieties. Frequent inspections of new varieties at the various selection stages in the breeding programme, together with screening trials against some of the most important diseases, are intended to eliminate susceptible varieties. This ensures that the varieties eventually released to growers have a high measure of general resistance to disease. However, the resistance of new varieties may not be permanent. New problems or the reappearance of diseases that were previously important can occur, and varieties once adequately resistant may not remain so under changing circumstances.

The breeding and selection of new varieties to meet the industry's requirements is a lengthy process. It also takes a long time for growers to replace existing varieties with varieties that are more resistant to disease, particularly if the susceptible variety is widely planted. For both these reasons a variety cannot always be rapidly withdrawn from production. Disease problems must therefore often be contained by other means, pending the eventual planting of new, resistant varieties. In the case of ratoon stunting disease (RSD), virtually no variety possesses adequate resistance or tolerance, and control of this disease depends entirely on methods other than varietal resistance.

The incidence of many diseases is related to specific environmental conditions. For example, smut is most prevalent in the warmer, northern areas where susceptible varieties, although suitable elsewhere, are not recommended. Mosaic is most likely to occur in the cooler, southern areas. Resistant varieties should be planted to cope with disease pressures in the specific areas.

Growers should try all new, resistant varieties that become available for their area to see if they will be useful under the growing conditions on their farms. Dependence on a single variety should be avoided where this is economically possible, as outbreaks of new diseases can cause serious losses if the variety is susceptible.

## Seedcane quality

Most important sugarcane diseases, including RSD, smut, mosaic, leaf scald and to some degree, red rot, are systemic, that is, they are present within the cane stalk. These diseases can therefore be spread by planting infected seedcane, they can persist in the stubble to recur after cutting, and they also survive in volunteer regrowth to contaminate newly planted fields. Similar control measures are used to combat all of the systemic diseases in seedcane.

The planting of healthy seedcane is essential for general disease control. Growers should establish 'nurseries' with heat-treated stock to provide healthy, high quality seedcane to meet their annual planting requirements. Alternatively, certified seedcane should be obtained from a registered nursery. Hot water treatment, at 50°C for two hours, is essential for the control of RSD and eliminates other diseases, including chlorotic streak. Seedcane requirements should be estimated well in advance, so that adequate stocks can be produced. Seedcane fields must be inspected



Hot water treatment of seedcane.



regularly to ensure that they remain free of disease, and only the plant and first ratoon crops should be used as seedcane.

### Field control practices

Healthy seedcane must be planted into fields that are free from volunteer regrowth; if any volunteers present are diseased, much of the benefit of planting good seedcane will be lost. A fallow period of at least three months should follow the removal of all volunteers before replanting the new crop.

The inspection and roguing of cane fields to remove diseased plants can do much to contain diseases such as smut at a low level. The periodic inspection of fields also gives early warning of new problems as they develop and enables action to be taken at the most appropriate time. The eradication of severely diseased fields also greatly reduces the amount of infective material.

The incidence and effects of some important diseases, notably RSD and smut, are greatest when the cane crop suffers stress. Good crop management, including optimal nutrition, good weed control and adequate moisture contribute to disease control.

### Summary

Disease control in sugarcane and therefore the maintenance of optimum productivity depends on:

- planting resistant or tolerant varieties.
- planting good quality, disease-free seedcane.

- eliminating volunteers before replanting.
- inspecting and roguing cane fields regularly.
- eradicating severely contaminated fields.
- managing the crop well.

No single one of these factors is the answer to disease control but an integrated programme including all the above points, conducted by all growers, will provide a large measure of success.



Photo: Karlien Trimpelmann, Lowveld LPD&VCC

Inspecting fields for diseases and off-types is important for disease control.



Good quality, disease-free seedcane should be obtained from a well managed nursery.

# IMPORTANT DISEASES





# Ratoon stunting disease (RSD)

## Cause

A bacterium (*Leifsonia xyli* subsp *xyli*).

## Importance

RSD is common in all areas and causes a greater overall loss in yield than any other sugarcane disease in South Africa. Losses are most severe when the crop suffers from stress and are therefore most likely under rainfed conditions, where yields can be reduced by 20 to 40%. Yields of affected fields decline progressively with successive ratoons. Substantial losses can also occur under irrigated conditions. Significant losses may occur in most varieties, although some are more severely affected than others.

## Symptoms

- Diseased stools become stunted, often giving affected fields an uneven appearance, particularly in ratoon crops.
- Red-brown to black dots or streaks at the base of the nodes may be seen when mature stalks are sliced lengthwise. These may be inconspicuous in some varieties and more easily seen in others.
- RSD can be diagnosed serologically using an immunoassay, by polymerase chain reaction (PCR) or by the examination of xylem sap under the microscope for the presence of the characteristic bacteria.

## Spread

- By planting infected seedcane.
- By using contaminated implements, particularly cane knives and harvesters.
- RSD survives in infected volunteers and is spread to healthy cane, mainly at harvest.

## Control

- Use hot water treatment (2 h at 50°C) to provide healthy seed-cane stocks.

- Sterilise cane knives and harvester blades. This is particularly important when cutting seedcane fields or nurseries.
- Eradicate volunteers completely before re-planting.
- Leave commercial fields fallow for at least three months after all volunteers have been removed before replanting.

## Note

All varieties currently grown in South Africa have some degree of susceptibility to RSD, but some are particularly susceptible, e.g. N14, N17 and N25.



Internal symptoms of RSD.



RSD can result in severe stunting and, occasionally, death of infected stools.



# Smut

## Cause

A fungus (*Ustilago scitaminea*).

## Importance

Smut is an important fungal disease of sugarcane in South Africa. It is widespread and most severe in the irrigated northern areas and in northern Zululand, but can occur in all areas in susceptible varieties. Smut is most common in poorly grown cane. Losses in yield increase with successive ratoons and can be very severe in susceptible varieties.

## Symptoms

- Dark brown, whip-like structures usually develop from the tops of infected shoots and stalks or sideshoots.
- Severely infected stools degenerate into clumps of grasslike, unmillable shoots.

## Spread

- By planting infected seedcane.
- By wind-blown spores.
- Newly planted cane can be infected after planting in contaminated soil.

## Control

- Plant resistant varieties.
- Plant disease-free seedcane.
- Rogue affected fields and plough out severely smutted fields.
- Eradicate volunteers before replanting.
- Use a fungicide when seedcane of susceptible varieties is being heat treated.

### Note

Smut can be contained in some susceptible varieties by the intensive application of field control measures, including roguing and elimination of volunteers. However, in highly susceptible

varieties such as NCo310, field control measures may be inadequate in areas that are favourable for smut development. For this reason, NCo310 is no longer approved for planting. In such a situation, the planting of more resistant varieties is recommended.



A smut whip emerging from the top of an infected stalk.



Thin, elongated stalks (incipient whips) of an infected stool extending above the canopy.



A severely infected stool that has degenerated into a clump of grass-like shoots.



# Mosaic

## Cause

Sugarcane mosaic virus (SCMV).

## Importance

Mosaic is currently the most important viral disease of sugarcane in South Africa. Although the disease is widely distributed, severe outbreaks are largely restricted to the cooler areas of the southern coastal hinterland and high altitude inland areas. Mosaic can cause severe yield losses in several varieties, including NCo376 and N19.

## Symptoms

- Characteristic mottling of leaves, seen as dark green 'islands' on a pale green background.
- Mottling is most distinct on young leaves, particularly at the base of leaf blades.
- Infected stools tend to have a yellow-green appearance and may be severely stunted.
- Symptoms may be seen on the young internodes of the stalk in some varieties.

## Spread

- By planting infected seedcane.
- By various species of aphids, particularly the maize aphid (*Rhopalosiphum maidis*) and *Hysteronema setariae*. Maize and several grasses are also hosts of SCMV.

## Control

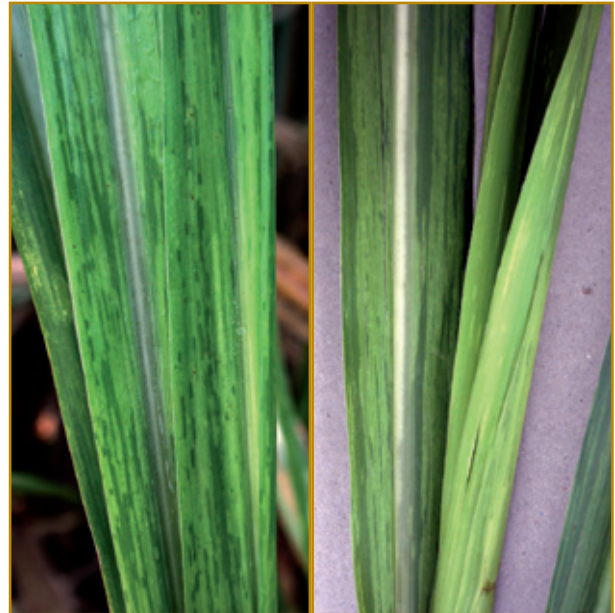
- Plant resistant varieties.
- Plant healthy seedcane.
- Control grass weeds effectively as the aphids feed and breed on flowering grasses.
- Mosaic can spread very rapidly, particularly in young cane in mid-summer. Avoid planting and harvesting susceptible varieties between

mid-October and the end of January, particularly in mosaic-prone areas.

- Where possible, avoid proximity to maize.

## Note

Severe outbreaks can occur in any area, if infected seedcane is propagated.



Foliar symptoms of mosaic.



Stunting due to mosaic.



# Brown rust

## Cause

---

A fungus (*Puccinia melanocephala*).

## Importance

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Brown rust is widespread in South Africa. It is most likely to occur in cool weather (17 to 24°C) when the relative humidity is high for extended periods. Young cane (three to six months old) is most prone to infection. Severe rust infection will reduce yields significantly.

## Symptoms

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- Orange to brown pustules on the lower surfaces of leaves.
- Severely infected leaves may die prematurely.
- In a serious outbreak, affected fields have a general orange-brown colouring.
- Most conspicuous on young plants.



Foliar symptoms of brown rust.

## Spread

---

- By wind-blown and rain-splashed spores.

## Control

---

- Plant resistant varieties.
- Apply a registered fungicide, preferably before symptom development.



Severe brown rust in a susceptible variety.



# Tawny rust\*

(previously known as African sugarcane rust)

## Cause

A fungus (*Puccinia fulvous* sp. nov).

## Importance

Tawny rust is a new disease of sugarcane in South Africa. It is widespread and infects a number of important varieties under both irrigated and rainfed conditions. Early indications are that yield losses are similar to those caused by brown rust and severe infections will reduce yields substantially. The disease is most common and severe in spring and autumn.

## Symptoms

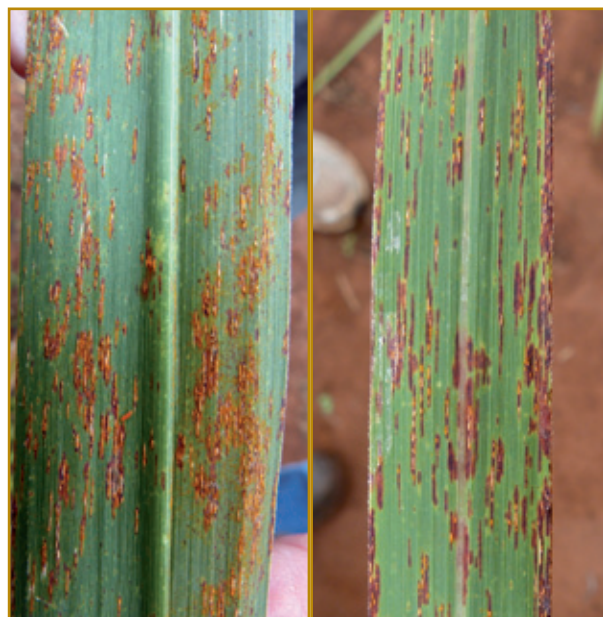
- Dark brown lesions on the leaf, running parallel to the leaf veins with bright orange spores developing profusely in pustules on the upper and lower leaf surfaces.
- Severely infected leaves may die prematurely.
- Affected fields have a general orange-brown appearance.
- Symptoms have been observed on plants of all ages.

## Spread

- By wind-blown and rain-splashed spores.

## Control

- Plant resistant varieties.
- Apply a registered fungicide, preferably before symptom development.



Foliar symptoms of tawny rust.



Severe tawny rust symptoms in a susceptible variety.

\* Name to be confirmed - awaiting approval.



# Yellow leaf syndrome (YLS)

## Cause

Two different pathogens have been associated with YLS; sugarcane yellows phytoplasma (SCYP) and *Sugarcane yellow leaf virus* (SCYLV). Both these pathogens occur in South Africa.

## Importance

YLS is widespread in the South African sugar industry and can cause yield loss in some varieties. Symptoms are most obvious in stressed, maturing cane, particularly in winter.

## Symptoms

- A yellow to yellow-red coloration of the under-surface of leaf midribs that may extend into the lamina.
- Symptoms are most clearly seen on the third to the sixth leaf from the top of the stalk.
- Most frequently seen in maturing cane in the cooler months.
- Symptoms can appear rapidly, but fade in most varieties with the onset of good growing conditions in summer.

## Spread

- By aphids (SCYLV) and leaf-hoppers (SCYP).
- By planting infected seed-cane.

## Control

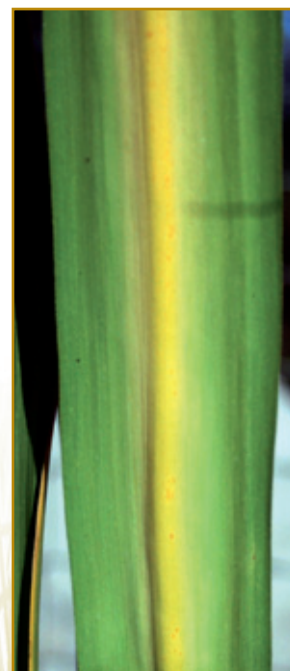
- Grow tolerant varieties.
- Avoid planting seedcane with conspicuous symptoms.
- YLS apparently spreads very rapidly. It is not eliminated from seedcane by standard HWT.

## Note

YLS is probably the same disorder as 'yellow wilt', which was common in east and central Africa in the 1960s and early 1970s.



Characteristic yellowing of the midrib due to YLS.



Yellow to yellow-red discoloration may extend into the lamina.

# Pineapple sett rot

## Cause

A soil-inhabiting fungus (*Ceratocystis paradoxa*).

## Importance

Pineapple sett rot is fairly common when cane is planted under cool, dry or excessively wet conditions that delay germination. All varieties may be affected and heat-treated seedcane is particularly susceptible. Economic losses may occur following poor germination and growers may have to partially or completely replant affected fields.

## Symptoms

- Failure to germinate or weak growth after planting.
- Infected setts rot and have a red to black internal discoloration and a characteristic fruity smell.

## Spread

Spores of the fungus survive in the upper layer of the soil and infect seedcane through cut ends and cracks.

## Control

- Use healthy setts of an appropriate age to ensure rapid germination.
- Treat seedcane with a registered fungicide. This is particularly important when planting in the cooler months or after heat treatment.
- Avoid planting when germination is likely to be delayed.

## Note

The use of a fungicidal dip or spray offers some protection to the seedcane if poor conditions for germination occur after planting.



Rotting of a sugarcane sett due to pineapple sett rot.



Poor germination caused by pineapple sett rot.



# Leaf scald

## Cause

A bacterium (*Xanthomonas albilineans*).

## Importance

Leaf scald is endemic in the northern irrigated areas, but sporadic outbreaks have occurred elsewhere. Although limited in distribution, leaf scald is potentially a very serious disease, and can cause unpredictable and severe damage to susceptible varieties.

## Symptoms

- Narrow, sharply defined white to yellow lines on the leaves.
- Blotchy leaf chlorosis.
- Leaves wither (scald) and curl inwards.
- Basal sideshoots, often with the above symptoms, on affected stalks.
- Internal red streaks at the nodes of affected stalks.
- In susceptible varieties growing under stress, stalks, whole stools or patches of cane may suddenly wilt and die, possibly without showing other symptoms.

## Spread

- By planting infected seedcane.
- On contaminated implements.
- By rain splash and irrigation water.

## Control

- Plant resistant varieties.
- Use healthy seedcane.
- Sterilise cane knives (10% Jeyes Fluid), especially during seedcane preparation.

## Note

Most released varieties are resistant. If susceptible varieties were to be widely grown, leaf scald could be serious in many areas.



Narrow white lines on the leaves are characteristic of leaf scald.



Stool death due to leaf scald.

# Sour rot

## Cause

A fungus (*Phaeocystostroma sacchari*).

## Importance

*Phaeocystostroma sacchari* is common, but is usually a weak pathogen. It can, however, cause substantial sucrose losses if mature crops are subjected to prolonged drought.

## Symptoms

- Infected stalks rot and have an orange internal discoloration and a characteristic sour odour.
- The rind of an infected stalk turns orange and later black.
- Coiled black masses of spores (pustules) erupt through the rind of affected stalks. Pustules may also be visible on leaf sheaths, midribs and lower areas of the leaf blades.
- Leaf yellowing and premature desiccation may occur.

## Spread

By wind-blown and rain-splashed spores. Infection usually occurs through the nodes.

## Control

- Affected cane should be harvested as soon as possible.
- If feasible, over-mature cane should be avoided.

### Note

When stalks are only slightly affected by sour rot they can recover if irrigation or rainfall occurs after a drought period. However, if the drought persists, portions of the stalk above the infected internodes continue to deteriorate. Severe infections can cause the disease to extend underground and kill the entire stool.



Symptoms of sour rot.



Internal rotting of the stalk due to sour rot.



# Red rot

## Cause

A fungus (*Glomerella tucumanensis*).

## Importance

Red rot is widespread and common. It is most likely to be severe in the cooler areas, particularly in old or carry-over cane or following frost, drought or borer damage. It can cause severe losses due to premature stalk death and a reduction in sucrose content.

## Symptoms

- Elongated red lesions on the leaf midrib.
- Internal red discoloration of the stalk tissues, with characteristic white blotches.
- Rotting often occurs at the nodes, affecting the buds and reducing germination.
- When the disease is advanced, cavities may form within the stalk, often containing a grey fungal mycelium.
- Seriously rotted stalks may die and become 'mummified'.

## Spread

By wind-blown and rain-splashed spores; usually infects through wounds in the stalk.

## Control

- Plant resistant varieties.
- Plant healthy seedcane.
- Avoid carry-over cane, where possible.
- Cut affected cane early.



Red rot symptoms on the leaf midrib.



Internal symptoms of red rot in a highly susceptible variety.

# Pokkah boeng

## Cause

A fungus (various *Fusarium* sp.)

## Importance

Pokkah boeng is widespread and can occur on most varieties, but usually causes little damage. Symptoms develop during rainy periods when growth is rapid. The incidence and severity of pokkah boeng can vary greatly from year to year depending on the varieties grown and environmental conditions.

## Symptoms

- Mild chlorosis and slight distortion at the base of young leaves.
- Young leaves may be wrinkled, twisted and shortened.
- The spindle may not unfurl properly and the growing point may become distorted. After further growth a distorted area may be seen lower down the stalk.
- The growing point of susceptible varieties may die, resulting in sideshooting or death of the shoot.
- Lesions may penetrate across much of the stalk resulting in 'knife-cuts'.

## Spread

By wind-blown spores.

## Control

No control measures are necessary. Potential new varieties that are susceptible are discarded during selection.

## Note

Symptoms of pokkah boeng (the name means distortion of the top of the stalk) are often seen in the field. Most South African varieties are tolerant and suffer only minor damage. Variety N34 was highly susceptible and suffered severe damage, and was therefore withdrawn from the list of approved varieties. N41 is also somewhat susceptible to the disease.



Mild symptoms of pokkah boeng.



Shortened young leaves.



'Knife-cut' pokkah boeng.



# Maize streak

## Cause

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A virus (*Maize streak virus* - MSV).

## Importance

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Maize streak is a new disease in the South African sugar industry and has been shown to cause severe stunting when plants are heavily infected.

## Symptoms

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- Broad, chlorotic translucent streaks running parallel to the leaf veins.
- Streaks are usually observed on all leaves of infected plants and may also be seen on leaf sheaths.
- Infected stools are usually stunted.

## Spread

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- By planting infected seedcane
- By leafhoppers (*Cicadulina* sp).

## Control

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- Plant resistant varieties
- Plant healthy seedcane
- Remove volunteers before replanting
- Rogue affected fields and eradicate when advised to do so by Local Pest, Disease and Variety Control Committee.

## Note

Variety N44 is susceptible to infection and has been degazetted.



Symptoms of maize streak.



Broad chlorotic streaks run parallel to the leaf veins.

## **MINOR DISEASES**





# Brown spot

## Cause

A fungus (*Cercospora longipes*).

## Importance

Brown spot is widely distributed, but is more prevalent and noticeable in the mistbelt and in cooler areas. It is usually not of great significance.

## Symptoms

- Red-brown leaf spots, surrounded by a narrow yellow 'halo'.
- Spots are oval to linear, varying in size from small flecks to 10 mm or more in length. They are more numerous on older leaves.
- Severely infected older leaves may die prematurely.

## Spread

By wind-blown and rain-splashed spores.

## Control

Most varieties are relatively resistant.

### Note

Brown spot is probably the most frequently observed disease in the sugar industry. Very severe outbreaks may have slight economic effects.



Typical brown spot symptoms.

# Ring spot

## Cause

A fungus (*Leptosphaeria sacchari*).

## Importance

Ring spot is widely distributed and can occur throughout the year, but has negligible effect on yield.

## Symptoms

- Irregular shaped lesions, up to 10 mm or more in length, on the older leaves.
- Lesions are straw coloured to brown, usually with a darker margin.
- Small black fruiting bodies of the fungus are usually present on mature lesions.

## Spread

By wind or rain-borne spores.

## Control

No control measures are necessary.

### Note:

Ring spot is of negligible importance in the varieties presently grown.



Irregular, straw-coloured lesions characteristic of ring spot.

## Eye spot

### Cause

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A fungus (*Bipolaris sacchari*).

### Importance

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Eye spot is rare and there have been only sporadic outbreaks. It is a minor problem.

### Symptoms

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- Oval lesions with reddish centres and straw-coloured margins.
- Straw-coloured 'runners', which turn reddish, extending from the lesions to the leaf tip.
- Severe infection may cause leaves to die off and the growing point to be killed.

### Spread

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By wind-blown spores in wet weather.

### Control

---

No control measures are necessary.

### Note

Eye spot has characteristic symptoms. It can occur on several varieties but all widely grown varieties are resistant.

## Red leaf spot

### Cause

---

A fungus (*Dimeriella sacchari*)

### Importance

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This disease was first observed in South Africa on N52. It is considered to be of minor importance.

### Symptoms

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- Red dots that develop in clusters to form larger red lesions, usually developing on the leaf surface facing the sun.
- Lesions do not usually penetrate the leaf.
- Lesions are more common on older (5<sup>th</sup> and 6<sup>th</sup>) leaves and tend to be concentrated towards the leaf tip.

### Spread

---

By wind-blown and rain-splashed spores.

### Control

---

No control is warranted.



Typical eye spot symptoms with 'runners' extending from eye-shaped lesions



Foliar symptoms of red leaf spot.



# Yellow spot

## Cause

A fungus (*Mycovellosiella koepkei*)

## Importance

This disease is rare in South Africa but damaging epidemics have been reported in high rainfall areas in other countries. Yellow spot is favoured by cool, wet conditions.

## Symptoms

- Yellow lesions on the upper and lower leaf surfaces, including the lower surface of the midrib. Older lesions may be brick-red to reddish-brown.
- Early symptoms usually appear as minute chlorotic dots on the second to third youngest leaf.
- Lesions are irregular in shape and may increase to 1cm in diameter.
- Severely infected leaves may die prematurely.

## Spread

By wind-blown and rain-splashed spores.

## Control

No control is currently necessary in South Africa.

# Gumming

## Cause

A bacterium (*Xanthomonas axonopodis* pv *vasculorum*).

## Importance

Gumming is of minor importance, although widely distributed. It is most common in areas of high humidity, such as the mistbelt and irrigated areas.

## Symptoms

- Straw coloured streaks of varying length starting from the tips and margins of older leaves.
- If the stalk becomes systemically infected, sharply defined, dark red-brown streaks develop on the leaves. These may be confined to the older leaves and extend onto the leaf sheath.
- A silvery gum may exude from these darker striped areas on the lower surface of the leaves.
- Gum pockets may form inside young stalk tissues.
- Leaf chlorosis may follow infection of the stalk.

## Spread

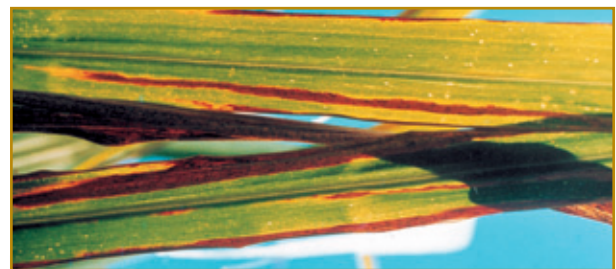
- By wind-blown rain and by irrigation water.
- By planting infected seedcane.
- On contaminated implements.

## Control

- Plant resistant varieties.
- Select disease-free seedcane.

## Note

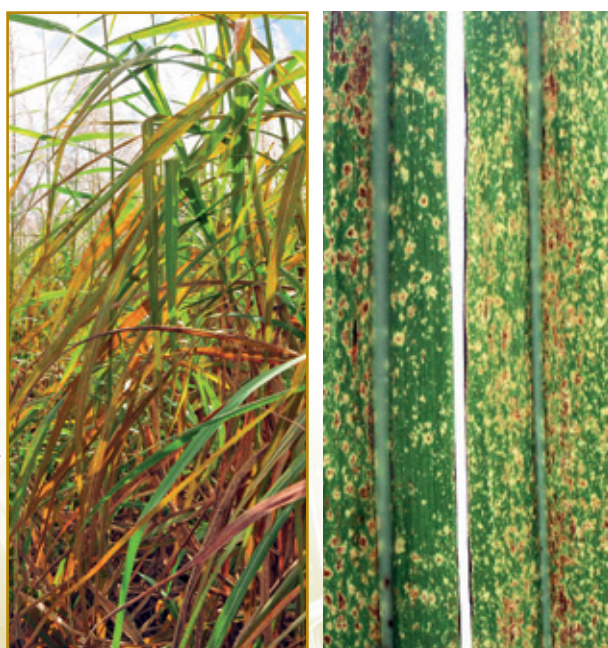
Most commercial varieties are relatively resistant.



Straw-coloured, irregular lesions, typical of gumming.



Partial chlorosis of the leaf due to gumming infection.



Typical symptoms of yellow spot.

# Red stripe / Top rot / False red stripe

## Cause

Bacteria (Red stripe / top rot: *Acidovorax avenae* subsp. *avenae*; False red stripe: various *Xanthomonas* sp.)

## Importance

Red striping caused by various bacterial pathogens, is commonly observed on the leaves of a number of popular South African varieties and is usually of minor importance. Red stripe, caused by *Acidovorax avenae* subsp. *avenae* may occasionally develop into top rot when the pathogen attacks the leaf spindle and growing point. Symptoms of red stripe and false red stripe tend to develop on susceptible varieties during periods of high humidity. Red stripe is favoured by high temperatures and tends to infect young cane while false red stripe is more common on older cane when temperatures are mild.

## Symptoms

- Narrow yellow-red stripes running parallel to the leaf midrib. Red stripe symptoms develop from the middle of the leaf while false red stripe symptoms tend to occur from the leaf tip.
- Stripes may coalesce to form thicker stripes and develop a more intense red colour.
- Small white flakes may develop on the surface of the stripe.
- The older leaves of plants affected by red stripe / top rot become chlorotic and wilt. The spindle leaves may die and can easily be pulled out of the top of the stalk. The rotted spindle has an unpleasant odour.

## Spread

- Mainly through wounds caused by one leaf scraping against another.
- Bacteria may be spread by rain-splash.

## Control

Varietal resistance.



Top rot caused by *Acidovorax avenae* subsp. *avenae*.



Foliar red striping caused by *Xanthomonas* sp.



## Basal stem rot

### Cause

A soil-inhabiting fungus.

### Importance

Basal stem rot is widespread, but is common only in the cooler, southern and inland areas. Some severe damage has occurred in small patches but this disease is generally of minor importance.

### Symptoms

- Reddish-brown rotting at the base of the stalk.
- White fungal mycelium around and between the basal leaf sheaths.
- In addition, a brown to green secondary fungus is often seen on the basal leaf sheaths.
- Infected shoots are often spiky and stunted with brown-orange leaves, causing patches of poor growth.
- Infected stools are weakened and may die, leaving gaps in the row.

### Spread

It spreads slowly through the soil.

### Control

- Plant resistant varieties where this disease is known to be a problem.
- Ridge up around infected stools.

### Note

Basal stem rot usually occurs in young cane in spring and early summer.



Infected stalks usually have a secondary fungal growth on the leaf sheaths.



White fungal mycelium and rotting evident after removal of leaf sheaths.

## Sheath rot

### Cause

A fungus (*Cytospora sacchari*).

### Importance

Sheath rot is widely distributed but is of minor importance.

### Symptoms

- Red-brown patches on the leaf sheath.
- Black fungal bodies erupt from the sheath, giving it a rough feel.

### Spread

By wind-blown and rain-splashed spores.

### Control

No control measures are necessary.

### Note

Commonly seen, particularly if cane is grown under adverse conditions, but it has little or no effect on growth.



Red discoloration of the leaf sheath due to sheath rot.

# Chlorotic streak

## Cause

Causal agent unknown.

## Importance

Chlorotic streak is often present in cane grown on poorly-drained soils. Otherwise it is not a serious disease.

## Symptoms

- Creamy-yellow streaks with wavy margins, mainly on older leaves. Streaks are diffuse at first, but later are better defined and may have necrotic centres.
- Bright red streaks at the nodes are seen when the stalk is sliced lengthwise. The streaks are usually brighter and longer than those caused by RSD.
- Affected stools are stunted, causing patchy, poor growth.

## Spread

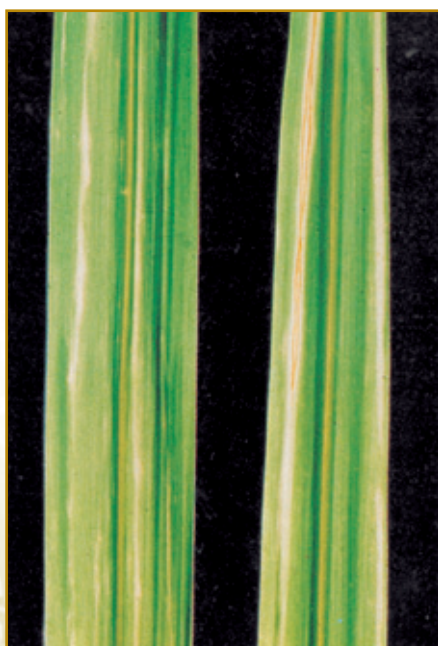
- By infected seedcane.
- Through the soil.
- In flood and drainage water.

## Control

- Plant disease-free seedcane.
- Hot water treat seedcane.
- Improve drainage.

## Note

Most varieties are resistant.



Irregular chlorotic stripes caused by chlorotic streak.

# Streak

## Cause

Sugarcane streak virus.

## Importance

Streak is rarely seen and is of little importance.

## Symptoms

- Clearly marked translucent chlorotic streaks in a fine broken linear pattern covering the leaf, parallel to the veins. Most easily seen on young leaves.
- Infected stools may be stunted.

## Spread

- By infected seedcane.
- By the leafhopper *Cicadulina mbila*.

## Control

Plant resistant varieties.

## Note

Streak was a widespread, serious disease in KwaZulu-Natal on variety Uba in the early 1900s. All presently grown varieties are resistant.



Translucent narrow streaks on leaves of a streak-infected stool.



# **DISEASES THAT DO NOT OCCUR IN SOUTHERN AFRICA**

Many important diseases of sugarcane can be spread in propagation material. These include all viral and phytoplasmal diseases, most bacterial diseases and many diseases caused by fungi. Therefore, unless special precautions are taken, moving sugarcane from one country to another can pose a serious risk of introducing new diseases into the country. Special quarantine procedures are in force in South Africa to prevent this occurring.

# Fiji leaf gall

## Cause

Fiji disease virus (FDV).

## Importance

Fiji leaf gall is a very serious disease in some cane growing countries. The effects are most severe in ratoon crops.

## Symptoms

- Characteristic raised whitish-yellow elongated galls on the lower leaf surface and sheath.
- Infected shoots have a stiff, distorted appearance. The top of the plant becomes fan-like.
- Plants are stunted, giving a patchy appearance to the crop.
- The growing point of susceptible varieties may die, resulting in sideshooting.

## Spread

- By leafhoppers.
- By planting infected seedcane.

## Control

In countries where Fiji leaf gall occurs, control is achieved through the use of resistant varieties, planting healthy seedcane and roguing infected fields.

### Note

Some important South African cane varieties including N19, are known to be susceptible. If Fiji leaf gall were ever introduced here it could be a very serious problem, as *Perkinsiella saccharicida*, one of the species of leafhopper that transmits the disease, is widely distributed in South Africa.

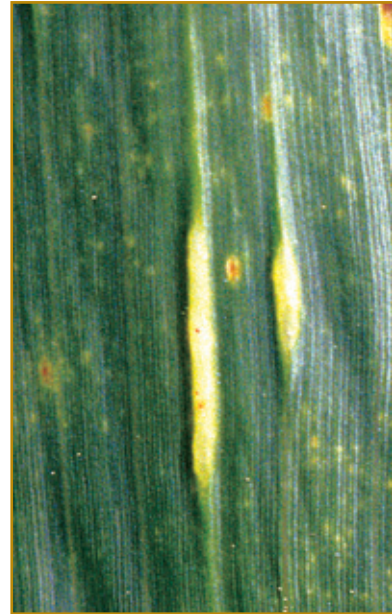


Photo: Rob Magarey, Sugar Research Australia

Galls on the undersurface of the leaf blade and midrib.



Photo: Rob Magarey, Sugar Research Australia

Severe stunting caused by Fiji disease virus.



# Orange rust

## Cause

A fungus (*Puccinia kuehnii*).

## Importance

This disease is usually of minor importance, but a new strain of *P. kuehnii* recently caused significant losses in the Australian sugar industry. Symptoms are most prevalent in semi-mature to mature cane. Disease development is favoured by humid summer and cool autumn conditions.

## Symptoms

- Mature lesions are orange to orange-brown with orange spore masses breaking through the lower surface of the leaf.
- Lesions usually occur in clusters.
- Lesions are usually more prevalent on the lower half of the leaf.
- Affected fields have a general orange-brown appearance.

## Spread

By wind-blown and rain-splashed spores.

## Control

The control of orange rust in Australia was achieved by planting resistant varieties.



Photo: Rob Magarey, Sugar Research Australia

Orange rust on the lower surface of the leaf.



Photo: Rob Magarey, Sugar Research Australia

A field severely infected with orange rust.

# Sugarcane white leaf (SCWL)

## Cause

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A phytoplasma.

## Importance

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This disease can cause severe yield losses in some cane growing countries, particularly when infected seedcane is planted or the cane becomes infected at an early stage of growth. Dry and warm growing conditions combined with infertile, sandy soil favour the development of SCWL.

## Symptoms

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- Striped or mottled patterns may develop on the leaves or they may be completely white.
- The spindle leaves turn white.
- Increased tillers with white leaves may develop.
- Sideshooting just above ground level may occur.



Symptoms of white leaf.

## Spread

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- Infected seedcane.
- By certain leafhoppers.

## Control

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- Resistant varieties.
- Healthy seedcane.
- Roguing of diseased plants.
- Eradication of severely infected fields.



# **NUTRITIONAL, ENVIRONMENTAL AND CHEMICAL DISORDERS OF SUGARCANE**



# Frost damage

## Cause

Excessively low temperatures.

## Symptoms

- The symptoms and effects of frost differ with the degree of frost experienced.
- Slight frost. The upper leaves are killed but the spindle and growing point are not affected. There is little effect on growth.
- Moderate frost. The leaves, spindle and growing point are killed. The spindle turns black and can be pulled out. Growth eventually continues but is set back.
- Severe frost. The leaves, spindle and growing point are killed. Damage may extend down the stalk and affect the buds. Side shoots develop, their position on the stalk depending on the severity of the frost. Growth may be severely set back.

## Control

- Avoid planting in low-lying areas that are prone to frost.
- Avoid hedges and other obstructions that impede airflow on slopes in frost-prone areas.
- In areas that are prone to frost, plant varieties that put on rapid, early growth and can be harvested annually if frosted.

## Note

Severely frosted millable cane should be cut before fermentation and rotting occurs. Cane that is too short to handle should not be cut back. Unless frost is exceptionally severe it will not penetrate below ground level, and therefore very young cane will suffer from leaf scorching only.



The stalk on the right shows death of the growing point and side-shooting caused by frost.



Leaf chlorosis due to low temperatures.



Frosted area in a valley bottom.



## Ratoon chlorosis (iron deficiency)

### Cause

Ratoon chlorosis is caused by iron deficiency induced by high soil alkalinity.

### Symptoms

- Intervenial chlorosis of young leaves, usually most evident in young ratoon crops. When severe, all the leaves of young plants over large patches may be completely chlorotic.
- Usually occurs in patches but large areas of fields may be affected.

### Control

Foliar sprays of 1% ferrous sulphate.

### Note

Ratoon chlorosis is most commonly seen on light sandy soils, particularly where heavy dressings of filtercake have been applied. Patches of ratoon chlorosis often mark the sites of old lime dumps in the field.

Cane production may be affected if severe chlorosis is not corrected. Young cane with mild symptoms often recovers without treatment.



Chlorotic cane as a result of iron deficiency.

## Banded chlorosis

### Cause

Banded chlorosis is generally caused by sudden spells of cold weather. It may also occur after very hot weather.

### Symptoms

- Well defined, chlorotic bands across the leaves. Multiple banding is common.
- The bands occur in a similar position on leaves of a similar age across whole fields or parts of a field.
- The bands may become necrotic if the leaf tissue is severely damaged.

### Note

Varieties differ markedly in their susceptibility to banded chlorosis. The leaves are damaged when still rolled in the spindle and symptoms only appear after further growth. This is not an important problem.



Well defined symptoms of banded chlorosis.

## Aphid/Mite injury

### Cause

Feeding by mites.

### Symptoms

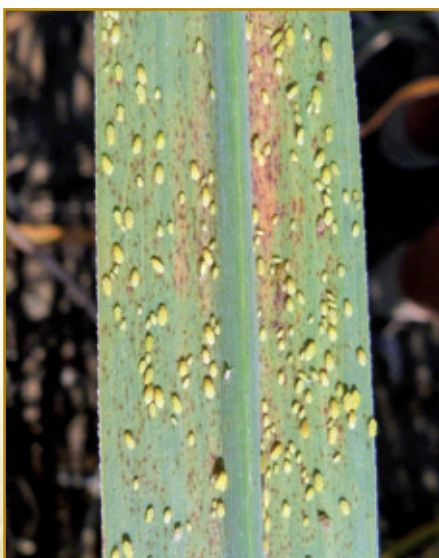
- Feeding by various arthropods may result in leaf freckling. A fine red freckling, usually towards the leaf tips, is a symptom of mite damage.
- The symptoms are superficially similar to those of rust.

### Note

Mite injury is most likely to occur in periods of dry weather. It can be common and can temporarily give affected fields a general red-brown colour. It is not considered to be economically important.



Red freckling of a leaf caused by mite damage.



Aphid feeding can result in extensive leaf freckling.

## Sooty mould

### Cause

Two species of fungi (*Capnodium* sp and *Fumago sacchari*).

### Symptoms

- Leaves and stalks of affected plants are covered with a superficial black film, which appears as soot.
- The fungal growth develops on the sticky secretions left by aphids, leafhoppers and mealybugs.

### Control

No treatment is usually required.

### Note

Since the fungi do not infect the cane itself they do not cause any direct damage. Severe infestations may impair photosynthetic activity by shading the leaves and growth may be temporarily slowed. Sucking insects are most common in warm, dry weather.



Sooty mould growing on aphid secretions.



## Lightning damage

### Cause

Lightning strikes in the field.

### Symptoms

- Circular patches of killed or damaged stools, up to several metres across.
- In the centre of affected patches the damage is more severe, with evidence of burning. Towards the periphery, leaves are bronze to purple in colour.
- Severely damaged stalks are shrunk, with internal cavities.
- The growing point may be killed, causing side-shooting.

### Note

Lightning strikes are not uncommon, but they are of little concern, except as a fire hazard.

## Hail damage

In mature crops, hail shreds the leaves and pits or bruises the sheaths, stalks and buds. In young crops, the leaves and shoots are beaten down and broken. In most cases the effect is temporary and the crop recovers. Shredding and buckling of leaves can also be caused by very strong winds.



Internal cavities and rotting following a lightning strike.



Leaf shredding due to hail.



# Chemical injury

## Cause

Careless or incorrect application of chemicals.

## Symptoms

- Damage from herbicide varies with the herbicide involved, and symptoms often resemble those of diseases.
- Contact herbicides can cause leaf lesions similar to those of ring spot. The lesions, however, tend to be more irregular in shape and occur on leaves that are most likely to intercept misdirected spray. New leaves grow normally.
- Translocated, hormone-type herbicides, such as 2,4-D, may affect the growth habit of the plant, causing bent or distorted stalks, or may cause growth abnormalities, such as multiple buds or calluses at the nodes.

## Note

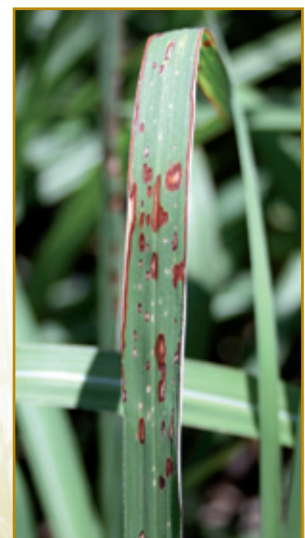
Varieties differ markedly in their sensitivity to excessive applications of herbicides.



Stalk deformities caused by 2,4-D.



Injury caused by translocated chemicals.



Leaf lesions caused by a contact herbicide.



## Chlorotic leaf markings

Chlorotic leaf markings may have a number of causes. Blotches on the lower surface of the leaf are a characteristic of some varieties. Freckles may be caused by insects such as thrips or may have a genetic origin. Distinct chlorotic stripes or patches on the leaves and sheaths may also be of genetic origin. In young cane an interveinal chlorosis similar to symptoms of iron deficiency may occur temporarily after application of ripeners to the previous crop.



Leaf blotches, characteristic of certain varieties.



Genetic leaf freckling.



Distinctive, chlorotic patterns of genetic origin.



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