NSW GOVERNMENT Department of Primary Industries

FACTSHEET

Nigrospora crown rot for biocontrol of giant Parramatta grass

Introduction

This factsheet describes recent research into a naturally occurring (endemic) fungus *Nigrospora oryzae,* which causes crown rot in weedy Sporobolus grasses (WSGs). This group of related perennial tussock grasses are introduced invasive species. They produce large amounts of long-lived seed and have tough leaves that are difficult for livestock to graze, reducing production.

Until recently the control of WSGs has been dependent on chemicals that are expensive and often provide only short term suppression. Biological control in the form of Nigrospora crown rot is now a viable option for WSGs, particularly giant Parramatta grass. As producers are becoming aware of Nigrospora crown rot they are integrating the biocontrol with their existing weed management strategies. Except in cases where an immediate reduction in GPG is required, chemical control is becoming less necessary.

Nigrospora crown rot fungus is generally a saprophyte (uses dead plant material for nutrients), or is occasionally a secondary cause of disease. In introduced WSGs it produces crown rot. The disease is known to kill giant Parramatta grass (GPG) and reduce infestations to non-economic levels over a couple of years. Up to 78% reduction in tussock size (over 15 months) and 64% reduction in tussock presence (over 12 months) has been observed in the field, due to the effects of Nigrospora crown rot.

Nigrospora oryzae has also been observed inducing disease in Parramatta grass (PG) and giant rats tail grass (*GRT*). How effective it will be as a biocontrol agent in these species is discussed below.

Abbreviations

GPG = giant Parramatta grass (*Sporobolus fertilis*)

GRT = giant rat's tail grass (*Sporobolus pyramidalis* or *Sporobolus natalensis*)

Figure 1. GPG affected by crown rot (pale orange leaves).

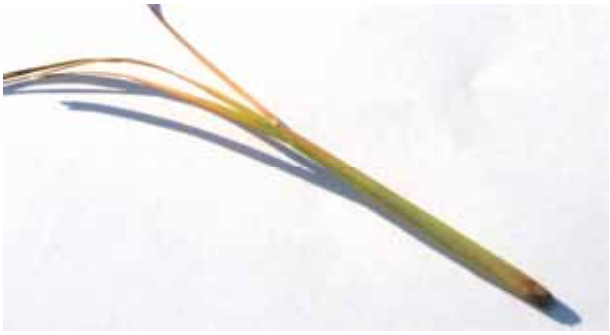

Figure 2. Crown rot in a GPG tiller.

PG = Parramatta grass (*Sporobolus africanus*)

WSGs = weedy *Sporobolus* grasses (includes GPG, GRT, PG and *Sporobolus jaquemontii*)

Nigrospora crown rot symptoms

Nigrospora crown rot produces pale orange leaves on diseased tillers. The diseased tillers are easy to remove from the crown and have a brown-coloured base instead of the normal white colour. Yellowing caused by crown rot will always occur in the central

folded leaf of a tiller, not just in the outer leaves as can be caused by frost or age.

The symptoms of crown rot become obvious in spring 7-10 days after the first effective rainfall event after winter. By late December through to mid January the disease is usually easiest to spot. The amount of disease and rate of spread can be dependent on rainfall.

During autumn and winter the symptoms of the disease tend to disappear, reappearing the following spring.

Using Nigrospora crown rot as a biocontrol agent

Nigrospora crown rot may need to be introduced to an infestation and managed for maximum effect, or it may already be present in small amounts and only require better management to increase its spread and effectiveness.

Introducing Nigrospora crown rot to an infestation

Ideally, *N.oryzae* spores will be available as a commercial preparation for inoculating large areas of GPG. Until a commercial preparation is developed the only way to introduce the crown rot-causing spores is by transplanting diseased plants.

Diseased plants can be introduced from other areas, but it is best practice to source infected plants from local infestations whenever possible. It is worth making an initial check for crown rot-affected plants that may have gone unnoticed and could provide local transplanting stock, before introducing diseased plants from outside the local area.

The natural spread of the disease has been patchy, but with more producers introducing diseased plants this situation will improve.

Transplanting diseased plants

Crown rot-diseased plants should be transplanted along ridges and areas of high cattle traffic.

Dig up diseased plants using a mattock or spade and take 5-10 cm depth of soil and roots. Keep the plants cool between digging up and planting. Try to plant when the soil is moist. Use a mattock to open the soil next to a healthy WSG plant. Plant the diseased plant in this hole and stomp around it to ensure good root ball-to-soil contact.

Research is underway to determine the best time of year to introduce diseased plants. Because diseased plants are hard to find in late autumn and winter, most diseased plant transfer will take place between late spring and early autumn.

Where can I get diseased plants?

Northern New South Wales (NSW) coastal cattle producers are using Nigrospora crown rot as a control measure by moving diseased plants onto their properties when they can locate suitable material. Crown rot disease has been found from the Tweed to the lower mid-north coast in NSW. Contact your local weeds officer or District Agronomist who may be able to recommend sites with active crown rot disease infections.

Figure 3. Planting diseased plants in research plots.

Restrictions on the movement of diseased plants

Some WSGs are declared or prohibited plants in NSW and Queensland. Movement of prohibited plants including WSGs across a state border requires a permit. Check with your local weed control officer before moving WSG plants. It is best practice to identify and use any local infection sites for diseased plant transfers.

Spreading crown rot through an infestation

The spores of *N.oryzae* are spread in a number of ways:

- in water with overland flows after rain
- in air, short distances to new host plants, and
- through animal and vehicle movement.

Water movement after rain

Over time rain water will move spores downhill. By planting diseased plants into an infestation at the top of a ridge or hill, rain water will spread the spores through an infestation. A single diseased plant can spread spores and infect plants over 0.1 ha in 12 months.

Air transfer

Spores from diseased plants can move in the air a short distance to new host plants.

Animal and vehicle movement

Disease incidence is often highest along cattle tracks and is more likely to show up in areas where cattle movements are more frequent. It is also likely that vehicles aid the movement of spores. Slashers and other cutting equipment are also likely to move diseased plant material around a property.

Figure 3. A diseased plant was planted at the top of this ridge. Over 2 years water has spread the spores downhill and the depressions are now GPG free.

Figure 4. 90% of GPG plants along this cattle track were diseased compared with 30% of plants away from the track.

Managing crown rot for maximum control

Crown rot can be managed for maximum suppression and control of WSGs.

Grazing, slashing and burning

Initial research has observed a greater rate of disease spread in GPG infestations that are well grazed. Moderate to heavy grazing produces a flush of new growth. Disease symptoms occur in new shoots while they are still short and green, and do not occur in tall, hayed-off plants. Any management practice that produces a flush of new growth is more likely to help the spread and effectiveness of disease.

Crown rot disease symptoms have been seen on both burnt and slashed GPG. Burning and slashing also result in a flush of new shoots and it is likely both management options may assist in the spread of crown rot disease. Research is planned to confirm this theory.

Figure 5. Well grazed GPG on the left side of fence.

Figure 6. Pale orange new leaves of a diseased GPG plant after burning.

Figure 7. Two years after slashing a section of Nigrospora crown rot-infected paddock there is less GPG in that part of the paddock.

Effects on Parramatta grass and giant rat's tail grass

Nigrospora crown rot is now known to occur in two other WSGs, PG and GRT. Both these species have been found with crown rot disease in the field and a survey has found diseased GRT as far north as central Queensland. It is still too early to know what economic impact Nigrospora crown rot will have on these species.

Given its genetic closeness to GPG, PG is likely to respond similarly to Nigrospora crown rot, and current trials are suggesting high susceptibility.

Disease symptoms exhibited by GRT in the field are slightly different to GPG. The initial symptoms of the disease occur when plants become progressively wilted, leaf colour bleaches and stems produce very few seed heads compared to healthy plants.

Figure 8. Pale, diseased GRT with few seed heads in the foreground, with darker green healthy plants behind.

Effects on native *Sporobolus* species

Native *Sporobolus* grasses are not usually present in high densities in pastures as they lack the competitive ability of the introduced WSGs.

There have been no observations of Nigrospora crown rot in any native species in the field. Host specificity testing with the natives *Sporobolus creber* and *Sporobolus diandrus* has shown no evidence of crown rot symptoms.

N. oryzae will grow on the native *Sporobolus virginicus* but to date no evidence of disease has been noticed. Because *Sporobolus virginicus* is an important plant for maintaining the stability of sandy coastal areas, more research is needed to confirm its level of susceptibility to Nigrospora crown rot. Fortunately there is usually geographic separation between *Sporobolus virginicus* and other WSGs which may minimise the transfer of *N. oryzae* to this important native species.

Future research

Solid culture of *N. oryzae* using vegetable juice agar does produce spores but is labour intensive and unsuitable for the production of commercial amounts of spores. Further research and funding are needed to develop commercial preparations of *N. oryzae* spores.

Research into the inoculation of PG in southern NSW and Victoria and GRT in Queensland is also required. Diseased plants have been collected from the field but it is not yet known if the course of the disease is the same as it is with GPG.

Additional work on the susceptibility of *Sporobolus virginicus* to *N. oryzae* is also needed.

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Images

Figure 1, 2, 4, 5, 6, 7 and 8 - David Officer

Figure 3 – Sethu Ramasamy

Publications available

Weedy Sporobolus Grasses Best Practice Manual (2007), Queensland Department of Primary Industries and Fisheries. View or download at www.dpi.nsw.gov.au/weeds

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