

Integrated Disease Management

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Developing an Integrated Disease Management (IDM) strategy for your farm

Effective disease management must be integrated with management of the whole farm. Basic strategies should be implemented regardless of whether or not a significant disease problem is evident. These basic strategies should focus on the host, the pathogen and the environment.

Pathogen

Impact from disease can be reduced and even avoided if pathogen is prevented from building up in an area.

Conduct your own field disease survey

It is important to be aware of what diseases are present and where they occur. Conduct an early and late season disease surveys and record findings to allow comparison over time. See below for in season troubleshooting. In addition train farm staff to look for and report unusual symptoms. If a suspect cotton plant is located, submit suspect plant samples and healthy comparison plant samples to a plant pathologist for diagnosis/confirmation. Refer to the 'Cotton Symptoms Guide' or the Cotton Pest Management Guide for instructions on how to send a sample.

Come Clean Go Clean

Minimise the risk of moving diseases onto or off your farm or from one field to another by considering machinery movements within the farm and having a

strategy for ensuring clean movement of machinery onto and around the farm.

Minimise spillage and loss when transporting modules, hulls, cotton seed or gin trash.

Ensure all staff and visitors are aware of the requirements to 'Come Clean-Go Clean' (See page 96).

Control alternative hosts and volunteers

Having a host free period prevents buildup of disease inoculum and carryover of disease from one season to the next. The pathogens that cause Verticillium wilt, Fusarium wilt, Black root rot, Tobacco Streak Virus and Alternaria leaf spot can also infect common weeds found in cotton growing areas.

Having a host free period is particularly important for diseases such as Cotton Bunchy Top, that can only survive in living plants. Controlling alternative hosts, especially cotton volunteers and ratoons will help reduce the risk of yield damage from cotton bunchy top.

Crop residues are managed to minimise carryover of pathogens into subsequent crops

The pathogens that cause Verticillium wilt, Fusarium wilt, Black root rot, boll rots, seedling disease and Alternaria leaf spot can all survive in association with cotton and some rotation crop residues. Manage crop residues to minimise carryover of pathogens into subsequent crops. Incorporate cotton crop residues as soon as possible after harvest, except where Fusarium wilt is present.

Where Fusarium wilt is present residues should be slashed and retained on the surface for at least one month prior to incorporation. The Fusarium wilt pathogen can also survive and multiply on the residues of non-host crops such as cereals. Currently recommendations are that residues should be incorporated or removed as soon as possible after harvest.

Crop rotations are utilised to assist in disease management

Use rotation crops that are not hosts for the pathogens present. The Verticillium wilt pathogen has a large host range and most legume crops are hosts of the Black root rot pathogen. Legumes such as mungbeans and soy beans also increase the Fusarium wilt pathogen. Disease risks can be higher for back to back cotton fields.

In addition to fixing substantial quantities of nitrogen, alternative crops such as vetch, canola and mustards can provide a biofumigation effect against Black root rot under specific management regimes.

Cotton is highly dependent on mycorrhiza, specialised fungi which form beneficial associations with plant roots, and can act as agents in nutrient exchange. Bare fallow for more than 3 to 4 seasons or removal of top-soil (especially more than 40cm) may result in a severe lack of mycorrhiza; a cereal or green-manure crop may restore sufficient mycorrhizal fungi for cotton.

The Cotton Rotation Finder can assist with developing a rotation strategy.

BEST PRACTICE

- Control volunteer and ratoon cotton throughout the year.
- Ensure vehicles, equipment and people have followed Come Clean, Go Clean.
- Where pathogens are known to be present, plant resistant varieties as late as possible in the window.
- Monitor crops throughout the season for disease.
- Manage crop residues and consider crop rotations based on best practice for diseases present in the field.
- Utilise industry pathology services where unusual symptoms or new diseases are present.

Fungicides

All cotton seed sold in Australia for planting is treated with a standard fungicide treatment. A protective fungicide is registered for the control of *Alternaria* leaf spot on Pima cotton only.

Control of insect vectors

Diseases caused by a virus or phytoplasma can often be prevented by controlling the vector that carries the pathogen. Cotton bunchy top (CBT) can be transmitted by aphids feeding on infected plants then migrating to healthy plants. Transmission of Tobacco streak virus (TSV) to plants relies on the virus from infected pollen entering plant cells through the feeding injury caused by thrips. Control of insect vectors should be considered IPM principles and resistance risks (See IPM chapter).

Viruses can only survive in living plants. Control of cotton ratoons and volunteers throughout winter will reduce pathogen levels and also lower vector insect populations, drastically reducing disease risk.

Host

A particular plant may be immune, resistant or susceptible. Breeders also use the term 'tolerance' to imply good performance (yield) despite the presence of disease.

Plant resistant varieties

For back to back fields, disease risks can be higher, increasing the importance of planting resistant varieties and using other IDM strategies. Levels of resistance to *Verticillium* wilt and *Fusarium* wilt are indicated by higher V Rank and F Rank respectively. Bacterial Blight can still be a problem in some old Pima varieties. New blight resistant varieties of Pima are available. In addition to resistance, consider the seedling vigour of a variety particularly when watering up or planting early. Refer to CSD variety notes for more information.

Grow a healthy crop

A healthy crop is more able to express its natural resistance to disease. Adopt a balanced approach to crop nutrition, especially with nitrogen and potassium. Both deficiencies and excesses provide better conditions for the development of diseases such as *Verticillium* wilt and *Alternaria* leaf spot. Excess nitrogen greatly increases the risk of boll rot particularly in fully irrigated situations.

Replanting

Replanting decisions should be made on the basis of stand losses, not on the size of the seedlings. For more information refer to Chapter 18a.

Environment

Pathogens have optimum environmental requirements for infection to occur and for the disease to spread and multiply in the host plant. It may appear difficult to manipulate the environment but it can be achieved by altering row or plant spacing, irrigation method or frequency or by changing the sowing date.

Preparing optimal seed bed conditions

Plant into well prepared, firm, high beds to optimise stand establishment and seedling vigour. Carefully position fertiliser and herbicides in the bed to prevent damage to the roots. Fields should have good drainage and not allow water to back-up and inundate plants.

Irrigation scheduling

Applying water prior to planting provides better conditions for seedling emergence than watering after planting. Watch for signs of water stress early in the season if the root system has been weakened by disease (eg. Black root rot) and irrigate accordingly. Avoid waterlogging at all times, but especially late in the season when temperatures have cooled. Irrigations late in the season can result in a higher incidence of *Verticillium* wilt. Tail water should also be managed to minimise the risk of disease spread.

Agronomic management

High planting rates can compensate for seedling mortality however a dense canopy favours development of bacterial blight, *Alternaria* leaf spot and boll rots. Provide balanced crop nutrition to assist the plants' natural resistance to disease. Avoid rank growth and a dense canopy with optimised nitrogen and water and with the use of growth regulators where required.

If Black root rot is present, either manage for earliness to get the crop in on time (in short season areas) or manage for delayed harvest to allow catch up (in longer season areas).

When *Verticillium* wilt is a concern, plan for an earlier finish to avoid cool conditions later in the season.

In fields where *Fusarium* wilt is present avoid inter row cultivations after seedling stage as mechanical damage to the roots provide a site for infection by the pathogen.

Sowing date

Delay sowing as late as possible within the planting window to avoid cool, wet conditions that favour disease. Aim to sow when the soil temperature is 16°C and rising.



Monitor for plants with unusual symptoms. (Photo: Jamie Iker)

In season disease trouble shooting

Early season

Compare number of plants established per metre with number of seeds planted per metre. Refer to section 9C for further information about crop establishment and replanting decisions.

Walk the field and look for plants that show signs of poor vigour or unusual symptoms.

Examine seedling roots.

During and late season

Walk field and look for plants that are dead, show signs of poor vigour or have unusual symptoms.

Cut stems and examine for discoloration.

Where disease is detected in new fields, or if unsure about diagnosis, contact the cotton pathologists in your state:

QLD DAFF pathologist – 07 3255 4356. NSW DPI pathologist – 02 6799 2454

Exotic Plant Pest Hotline 1800 084 881

For more information the following resources and tools are available at https://www.mybmp.com.au/auth_user/grower_tools_and_resources.aspx

- Cotton Pest Management Guide
- Cotton Symptoms Guide
- Rotation Crop Comparison Tool

COME CLEAN. GO CLEAN.

Practicing good farm hygiene will help prevent the entry and spread of diseases, weeds and pests onto your farm. These pests will impact on your business so you need to make sure that Come Clean Go Clean is part of your business.

Step 1: Wash down



Park on a clean wash down pad where contaminants can be trapped.

Apply high pressure water to all surfaces to remove all trash and mud, being sure to get into crevices where residual mud or trash might be trapped.

Don't forget to clean out the inside of the cab and vehicle foot pedals and other surfaces that have come into contact with dirty footwear.

Step 2: Decontaminate



Apply decontaminant (e.g. 10% water dilution of Castrol Farmcleanse or equivalent) liberally to all surfaces especially areas that were dirty. Also decontaminate mats, tools and footwear. Leave the decontaminant to work for 10

minutes unless directed otherwise by the label.

Step 3: Final Rinse



Rinse decontaminant. Clean all mud off the pad with high pressure water so it is clean for the next person and that mud & debris isn't picked up by wet tyres. Where equipment has not been cleaned down on farm,

thoroughly inspect to ensure cleanliness.

MAKE COME CLEAN GO CLEAN A PRIORITY

Come clean Go clean takes commitment especially during busy

periods such as harvesting. The risks are real, so ensure that all equipment and people stop and clean down.

INFORM PEOPLE

Well designed signage informs visitors that Come Clean Go Clean is important and they share responsibility for protecting the farm from risk.

Signs should be placed at all external entrances, directing visitors to have clean vehicles and to contact the farm office before entering.

Come Clean Go Clean requirements should be communicated with contractors and consultants well in advance.

WASHDOWN FACILITIES

On farm facilities allow farm employees, contractors and visitors to clean their vehicle and equipment in an easy to manage area where waste water can be contained. Facilities should be readily accessible, have sealed or packed gravel surface, access to high pressure water, washdown product and power, and be away from production areas and not drain into waterways or cropping areas.

For more information go to www.mybmp.com.au or please contact D&D team disease & biosecurity lead Susan Maas susan.maas@crdc.com.au 0477344214

Stop the spread of diseases, weeds & pests on this farm.

**Come
clean.
Go
clean.**

Please contact farm office before entering:

Tel: _____

UHF: _____



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