

# Cotton Industry Biosecurity Plan

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In 2009, Plant Health Australia (PHA), Cotton Australia Ltd and the Cotton Industry Biosecurity Group reviewed the Cotton Industry Biosecurity Plan (IBP). This plan, originally released in 2006 was formulated by industry, state and federal governments and Plant Health Australia to assist with identification of biosecurity priorities and allocation of resources to critical areas and the generation of strategies that help adoption of recommended practices and awareness of new biosecurity threats.

## Why does the Australian Cotton Industry need a Biosecurity Plan?

Australia's geographic isolation has meant that it is relatively free of many pests that cause significant problems for cotton production overseas. Maintaining Australia's freedom from these exotic pests will help ensure the future profitability, sustainability and marketability of Australian cotton.

The incursion of Mealybug in cotton has highlighted the impact of a new pest incursion. By the time this pest was reported and diagnosed, it was considered not technically feasible to eradicate, causing major problems across the industry.

Industry biosecurity aims to minimise risks posed by exotic organisms. For this to be effective it relies on the involvement of all stakeholders – including growers, industry, government agencies and the public. Through the IBP the cotton industry has in place procedures to:

- Identify the highest risk pests from overseas (threat identification and analysis);
- Guard the industry against exotic pests (risk mitigation activities);

- Know when an exotic pest has arrived (surveillance) and identify it (diagnostics); and,
  - Deal with exotic pests if they are found (contingency plans).
- To date, 12 key organisms have been identified as threats to the industry based on the economic risk they present should they become established in Australia. At this stage, only invertebrate pests and diseases have been identified as threats although weeds may be revisited at future reviews.

A copy of Version 2 of the Cotton IBP is available from the PHA website biosecurity section.

## How have the pest and disease threats been determined?

The relative importance of potential pest problems have been ranked by experts in the IBG by estimating the level of threat associated with the probability of the pest's entry into Australia, factors influencing the pest's establishment and spread, the difficulty of identification and/or eradication, as well as the likely impacts of the pest on production and market access. It should be noted that, just prior to their detection, Mealybugs were just being added to the pest lists in the IBP review process. This shows that new threats can emerge at any time.

## Farm biosecurity

Cotton growers are the key to protecting Australian cotton crops from exotic insects and diseases. Growers should look out for unusual crop symptoms and implement practices that prevent or minimise pest incursions.

Good farm hygiene – come clean, go clean – should be practiced on all farms regardless of whether pests or diseases are present, and farm hygiene has been a critical of pest control to limit the spread and impact for Fusarium wilt, and Mealybugs. Pest control will also minimise the spread of an exotic pest before their presence is known or after they are identified. Diseases can be spread by animals, people and machinery so farm hygiene and restricting unnecessary people



Image courtesy CSIRO

Cotton growers are the key to protecting Australia's crops from exotic insects and diseases like cotton leaf curl virus. It is important that you are aware of the risk, and if you spot anything unusual on your crop you should always check it out and call your local entomologist, pathologist or the Exotic Plant Pest Hotline on 1800 084 881. The call is free (except from mobiles) and early detection will help protect your industry. Visit [www.planthealthaustralia.com.au](http://www.planthealthaustralia.com.au) for further information.



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**LOOK. BE ALERT. CALL AN EXPERT.**

**1800 084 881**

and vehicle movement around the farm will prevent disease spread. Volunteers and some weeds can harbour pests and diseases. So controlling weeds in non-crop areas around the farm reduces the potential for pest and disease build up. Visits to farms overseas should be declared on re-entry to Australia. Prior to returning to Australia, wash all clothes and foot wear as well as hair which may carry fungal spores, bacteria, or even small insects.

To assist cotton growers with farm biosecurity, Cotton Australia, DEEDI and PHA are producing the Cotton Farm Biosecurity Manual. This manual will support growers using the myBMP on-line system to identify and put in place farm biosecurity measures to better protect their crops.

**Surveillance in the cotton industry**

A major part of implementing the Cotton IBP and Farm Biosecurity measures is surveillance for exotic plant pests. The key aim of surveillance is for detection of pests as early as possible. The benefits of early detection of a new pest to the cotton industry will be:

- An increased chance that eradication or containment within a limited area will be successful;
- Reduced cost to industry and the surrounding community if eradication or containment can be achieved; and,
- More rapid implementation of new management practices if eradication is not possible.

While AQIS has strict controls for the introduction of cotton plants and seeds at the border, many of these pests are small or difficult to see. There is still a chance of their accidental introduction as hitchhikers, such as in packing material or in soil or plants in poorly cleaned machinery and equipment. Some pests can also arrive on people’s clothing, boots and hair or in accidentally or deliberately undeclared plant material. Surveillance for several exotic pathogens is undertaken as part of routine assessment of cotton field trials by I&I NSW, DEEDI and cotton breeding programs.

**Reporting unusual pests**

Any unusual plant pest should be reported immediately to your Department of Primary Industry (DPI) or by ringing the Exotic Plant Pest Hotline. Early reporting enhances the chance of effective control and eradication. It is important to note that suspect material should not be moved or collected without seeking advice from the DPI as incorrect handling could spread the pest or make samples unsuitable for identification.

**How can we learn more?**

More information about prevention and control of pests and diseases can be found on the Cotton CRC website at [www.cottoncrc.org.au](http://www.cottoncrc.org.au)

**Further information on cotton industry biosecurity activities please contact Greg Kauter (02) 9669 5222 or go to [www.cottonaustralia.com.au/research/biosecurity/](http://www.cottonaustralia.com.au/research/biosecurity/)**  
**To view the Australian Cotton Industry Biosecurity Plan visit: [www.planthealthaustralia.com.au/](http://www.planthealthaustralia.com.au/)**  
**Phone the Exotic Plant Pest Hotline on 1800 084 881.**

# Exotic pests and diseases of greatest threat to Australian cotton

**Cotton boll weevil**

*Anthrenus grandis*

Cotton boll weevil is specific to cotton and causes large yield losses due to damage to developing bolls and subsequent reduction in lint production. In the USA, control of cotton boll weevil using insecticides costs hundreds of millions of dollars.



**Boll weevil.** (Jack Kelly Clark, University of California, [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu))

**Spider mites**

*Tetranychid mites*

Spider mites are in the group that includes ticks. They feed on the undersides of leaves, sucking out the cell contents. Their damage causes a characteristic bronzing of leaves, and if uncontrolled can dramatically reduce yield and fibre quality. Several species are found in Australian cotton, the most common of which is the two-spotted spider mite. However, overseas there are a range of other species that have different host preferences, cause more severe damage or have resistance to some of our key acaricides.



**Adult female carmine spider mite, *Tetranychus cinnabarinus*.** (Jack Clark, University of California, [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu))

**Indian green jassid***Amrasca devastans*

Indian green jassid is a sap-sucking insect pest that can cause yield losses of up to 25%. While several 'jassid' species are found in Australian cotton the damage they cause is relatively minor, rarely if ever affecting yield. Green jassids inject a toxin as they feed that causes leaves and bolls to drop and can stunt plant growth. Elsewhere green jassids can be managed using resistant varieties and insecticides. Hairy-leafed varieties are used in parts of Africa and the sub-continent where cotton is hand harvested to provide effective resistance against green jassids. Such varieties are not suitable for mechanical harvest as the leaf hairs cause excessive leaf trash in the cotton lint.



Indian green jassid. (Industry &amp; Investment NSW)

**Tarnished plant bug***Lygus lineolaris*

The tarnished plant bug is a pest of over 250 plant species. In cotton, its feeding causes seed abortion, stem or leaf wilting and poor seed germination. It has 2–5 generations per year and can therefore quickly build up to high levels.

Lygus bug. (Jack Clark, University of California, [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu))**Whitefly***Bemisia tabaci* B-type or Q-type

Whitefly feeding results in a sticky residue, sooty moulds, reduced boll size and poor lint quality. Although the B-type whitefly is present in Australia there is a risk of other B-type strains and other biotypes, e.g. Q-type, entering the country with different insecticide resistance profiles. Whiteflies are also vectors of damaging exotic viruses such as cotton leaf curl disease.

*Bemisia tabaci* B-type. (Neil Forester)**Melon aphid***Aphis gossypii* – exotic strains

Aphids damage cotton by feeding on young leaves and bolls which can reduce yield. They produce a sticky residue that can cover leaves resulting in reduced photosynthesis and contamination of lint as bolls open, reducing the crop's value. This species may also carry exotic diseases such as blue disease. As well as the risk of disease, there is a risk that new aphid strains entering the country will have different insecticide resistance profiles, making control more difficult.



Melon aphid. (Lewis Wilson, CSIRO)

**Verticillium wilt**

Defoliating strains

Australian strains of Verticillium wilt are described as mild in comparison to the defoliating strains that originated in North America but are now becoming more widespread. If established in Australia, management would be reliant on the use of resistant varieties, with a lag of several years before adapted varieties were available.

**Cotton leaf curl disease (CLCuD)**

CLCuD, sometimes referred to as Gemini virus, can cause yield losses of up to 35% in cotton. It is spread by a whitefly vector. There are at least seven different begomoviruses and several different DNA satellite molecules associated with CLCuD. A cotton plant needs to be infected with at least one begomovirus and one satellite to develop CLCuD.

Symptoms of CLCuD are seen on leaves and initially appear as a swelling and darkening of leaf veins, followed by a deep downward cupping of the youngest leaves then either an upward or downward curling of the leaf margins. Leaf-like structures (enations) on the veins are common and vary in size from only a few millimetres in diameter to almost the size of a normal leaf. These larger structures are often cup-shaped.



Leaf curl disease. (Cherie Gambley, QPIF)

**Fusarium wilt**

*Fusarium oxysporum f. sp. vasinfectum* – exotic strains

Fusarium wilt is a fungal disease. Strains of *Fusarium* were identified in Australia in 1993 however the introduction of new strains (races) would increase the difficulty of management as new resistant varieties would be required.

External symptoms can appear in the crop at any stage but most commonly appear in either the seedling phase or after flowering when bolls are filling. Leaves appear dull and wilted before yellowing or browning progresses to eventual death from the top of the plant. Seedlings may either wilt and die or survive, but often with stunted growth. Adult plants may wilt and die, especially under conditions of stress. Some affected plants may re-shoot from the base of the stem. Lengthwise cutting of the stem from affected plants will show continuous brown discolouration of the tissue. The internal discolouration is similar to that of *Verticillium* wilt but usually appears as continuous browning rather than flecks. Sometimes the discolouration is visible in only one side of the stem. External symptoms do not always reflect the extent of discolouration in the stem.



Fusarium wilt causing vascular discoloration and root knots caused by nematodes. (Chris Anderson, I&I NSW)

**Texas root rot**

*Phymatotrichopsis omnivore*

Texas root rot is an extremely damaging fungal disease with a wide host range. It causes sudden death of affected plants, usually during the warmer months. In cotton, infection can result in 100% crop loss. If this disease became established in Australia, control would be extremely difficult as management using rotations and fungicides is usually only partially effective. Symptoms include yellowing or bronzing of leaves, leaves wilt and die; dead leaves usually remain on plant. At this stage, roots are dead and surface is covered with network of tan fungal strands.



Texas root. (Chris Anderson, I&I NSW)

**Blue disease**

Blue disease is a virus specific to cotton that can reduce yield potential by up to 20%. It is spread by a vector, the cotton aphid. It has been associated with plants infected with cotton leaf roll dwarf virus (CLRDV) and has similarities with cotton bunchy top, anthocyanosis and cotton leaf roll. It is not known if the same pathogen causes all these diseases or if there are multiple pathogens causing similar symptoms. CLRDV was not detected from Australian cotton affected by cotton bunchy top disease. Cotton blue disease affected leaves tend to be smaller, thick, more brittle and leathery and have an intense green to bluish colour with yellow veins. Reddening of stem petioles and leaf veins can occur in some infections. Leaf edges tend to roll downwards and under and plants become stunted due to a shortening of the branch internodes and produce many

## Exotic threats

branches, giving a bunched zig-zag stem habit. Symptoms are more obvious in plants infected at an early age and stunting is more pronounced. Infected plants also produce smaller bolls and boll shed may occur. Single infected plants can be overlooked if overgrown by nearby healthy plants.



Blue disease. (Ivan Bonacic INTA – EEA Sáenz Peña)

### Bacterial blight

*Xanthomonas Axonopodis* or *X. Campestris PV Mavacearum* – exotic strains

Although strains of bacterial blight are already present in Australia, they are no longer a problem due to varietal resistance. Exotic strains (races) occur, however, that are 'hypervirulent' and, if established in Australia, would cause large yield losses. The disease is seed borne allowing easy dispersal and introduction of new races into new areas. Bacterial blight is spread by high temperature, humidity and rainfall.

The initial symptoms include the undersides of leaves have angular water soaked lesions. Lesions dry and darken with age then leaves are shed. Black lesions spread along stem. Bolls often infected at base or tip. Lesions dry out and prevent the boll opening. The pathogen is capable of symptomless transfer and therefore could be undetected through quarantine.

Symptoms include yellowing or bronzing of leaves, leaves wilt and die; dead leaves usually remain on plant. At this stage, roots are dead and surface is covered with network of tan fungal strands.



Bacterial blight.