

Disease

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FUSARIUM WILT UPDATE June 2011

Fusarium wilt of cotton was first identified in Australia on the Darling Downs in 1993. The disease has now been found in most cotton producing areas in Queensland and New South Wales.

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COMMONLY ASKED QUESTIONS ABOUT FUSARIUM WILT

What is Fusarium wilt?

Fusarium wilt is a disease of cotton caused by the soil-inhabiting fungus *Fusarium oxysporum f.sp. vasinfectum* (*Fov*). This fungus (pathogen) invades the cotton plant via the roots and colonises the vascular tissue in the stem and spreads throughout the whole plant. Symptoms may include stunting, wilting and death accompanied by a brown discoloration within the stem and branches of the plant.

Three strains of the pathogen have been recognised in Australia based on 'vegetative compatibility groups'. The 'Downs' strain is the most common strain and occurs in all regions. The 'Boggabilla' strain has only been found in cotton on a small group of farms just south of Boggabilla in NSW and the 'Mungindi' strain has only been detected in cotton plants from one farm near Mungindi.

Where did it come from?

The pathogenic Australian strains of *Fov* have



Fusarium in tail ditch - fusarium infection often associated with water flow

evolved from native, non-pathogenic populations of *Fusarium oxysporum* that are common in most Australian soils. Repeated cropping with susceptible cotton varieties applied a selection pressure that resulted in strains of *Fusarium oxysporum* that could attack cotton.

What are the symptoms and when do you see them?

Wilting and dead seedlings may appear soon after emergence sometimes in patches or along rows. Splitting the stem open reveals a distinctive brown discoloration extending right up the stem.

Depending on the weather conditions and the level of resistance of the cotton variety, plants may wilt and die at any time throughout the rest of the season. Affected plants may occur in patches often spreading in the direction of irrigation. As the crop matures symptoms may include a patchy stand and stunting leading to an uneven plant height. A distinctive brown discoloration can be seen extending right up the stem when the stem is split open.

What weather conditions favour the disease?

Fusarium wilt is most severe when the crop is exposed to wet and cool conditions in spring. Symptom development is suppressed by hot dry conditions.

Can the fungus be spread from one field to another or from one farm to another?

YES! The disease can spread from field to field, farm to farm and even region to region. Spores of the fungus are effectively carried over long distances in infested soil and/or in infected plant material on boots, vehicles, farm machinery and equipment and also in water (irrigation tailwater and overland flows).

How long can the spores of the fungus last in the soil?

Spores of the fungus (*Fov*) can survive in the soil for at least 10 years, even in the absence of cotton. If highly susceptible cotton varieties are continuously grown in infected fields, the *Fov* population in the soil will build up to the point where production may not be possible even with the most resistant varieties of cotton.

Are there alternative hosts?

YES! Bladder ketmia, sesbania pea, dwarf amaranth, bellvine and wild melon are weed hosts that show no external symptoms. These weeds may act as an on farm reservoir for the disease and need to be managed in-crop and during fallow periods.

Can the pathogen survive in the absence of host plants?

YES! Once the fungus is introduced into a field it can persist in the absence of cotton plants by surviving as a saprophyte on decaying residues of other crops and weeds in the soil and also in the rhizosphere of some other plants. Some research has shown that *Fov* can build up as a saprophyte on cereal residues just as fast as it can build up on cotton.



Fusarium causes vascular tissue discolouration completely through the stem

Similarly, incorporation of organic matter in the form of green manure crops (e.g. Lablab) increases the soil population of *Fov* and therefore this practice should be avoided.

What should growers do if they suspect Fusarium wilt in their cotton crops?

Early detection and containment of new outbreaks are key strategies for managing *Fov*. All farm staff and contractors should be advised of the symptoms and be encouraged to be on the lookout. It is important that growers and consultants confirm and declare if the disease is present in an area. The Fusarium wilt diagnostic

service provided by Agri-Science Queensland (DEEDI) is funded by the cotton industry and is free to growers. The majority of samples submitted return a negative result and some growers who are withholding samples could be worried unnecessarily. Early detection of the disease and establishment of a control program has proven to be the best approach. It is essential that specimens from new outbreaks be analysed to detect any new strains of *Fov* and to monitor the stability of current strains.

Can the Fusarium wilt fungus be eradicated from fields?

NO! However, some treatments may reduce carryover of the pathogen

Flooding of fields: In some circumstances, and where appropriate, flooding of fields for 30 to 60 days during summer could be a management option to reduce Fusarium wilt, however it does not eradicate the pathogen.

Solarisation: In fields where small patches of Fusarium wilt have been identified, some have advocated solarisation under clear plastic for a minimum of 5-6 weeks, during summer. This is not recommended as re-colonisation of the treated area from the adjacent untreated areas can potentially lead to an increase in the pathogen population.



Leaf mottle is another symptom of Fusarium

Fumigation: The use of soil fumigants (e.g. metham sodium) is not recommended. As well as killing many beneficial fungi and bacteria, such treatments rarely kill all the pathogen spores. *Fov* rapidly re-colonises the treated soil eventually leading to a higher incidence of the disease in the long term. Fumigants are generally less effective in heavy clay soils than in lighter soils.

What are the current recommendations to manage this disease?

** By the time the disease has become established in a distinct patch the pathogen is likely to have spread over a much larger area via irrigation tailwater or the movement of farm machinery*

* Raking and burning the whole field is **NOT** an option as raking is likely to spread the disease.

* Minimise traffic in and out of the area and avoid any traffic under wet conditions. Where possible minimise tail water from the affected patch.

Long term management of Fusarium involves an integrated approach and the current Integrated Disease Management strategies for Fusarium wilt are as follows:

- Plant varieties with a high F-rank. Resistant varieties will slow the build-up of *Fov* in the soil.
- Plant seed treated with BION®. BION is a 'plant activator' that helps protect seeds and emerging plants from Fusarium wilt and Black Root Rot. The unique active ingredient activates the natural defences of the plant before it is exposed to pathogens,
- Delay planting. Cool, wet early season conditions are conducive to infection and the development of Fusarium wilt. The best way, therefore to avoid such favourable conditions is by planting as late as possible within the planting window.



Fusarium may first show as wilting symptoms on isolated plants

- Avoid inter-row cultivation with knives if possible. This causes root damage and provides an entry point for the pathogen.
- Adopt suitable stubble management strategies: Pulling and mulching infected cotton stubble and retaining it on the soil surface for at least a month prior to incorporation is the best treatment to reduce in-field *Fov* spore levels.
- Consider rotation crops.
- Bare fallow rotation prior to cotton helps reduce disease severity in the subsequent crop. A summer sorghum/maize – fallow-cotton rotation can increase cotton plant survival, reduce disease incidence and increase yields in the 3rd year when compared to continuous cotton. Legumes may increase disease so potentially should be avoided in infected fields. When using cereal rotations burn, bury or bale the cereal residues as soon as possible after harvest.
- Minimise tailwater and minimise the exit of floating residues of all crops in affected fields (eg use trash racks in drop boxes). Design or modify irrigation reticulation systems to return water from infected fields directly to the storage used for their supply or install settling ponds before on-flow to other fields.
- Practice good farm hygiene to keep farms disease free (vehicle washing facilities/ footbaths); Washdown with Farmcleanse is recommended to minimise disease spread.
- Ensure all traffic including contractors Come Clean! Go Clean!
- Conduct regular field inspections for early detection and containment of isolated outbreaks.
- Control weeds as there are a number of alternative weed hosts that contribute to pathogen survival and carryover.