THE FACTS

Some guidelines for production in affected areas

Varietal reactions

Results from field trials indicate that there is a range of susceptibility in current commercial varieties. The least susceptible cotton varieties should reduce the rate of fusarium wilt buildup in fields. The table below lists the reaction of some current cultivars (in alphabetical order) in three broad susceptibility groups. A number of other varieties require further testing.

LEAST SUSCEPTIBLE	MODERATELY SUSCEPTIBLE	MOST SUSCEPTIBLE
CS8S	Delta GEM	CS50
Delta EMERALD*	DP 5415	Delta JEWEL*
Delta OPAL*	Siokra L22	Sicala 34
Delta PEARL	Siokra L23	Siokra 1-4
Sicala V-2		Siokra V-15
Sicot189		

* New release in 1998

Weed control

Bob Davis (QDPI Indooroopilly) found that weeds grown in two fusarium wilt affected cotton fields on the Downs and near Boggabilla were symptomless hosts of the fungus. Weeds from 14 families and 22 species were screened. Isolates of *Fusarium* were found in the vascular systems of *Amaranthus macrocarpus* (dwarf amaranth), *Hibiscus trionum* (bladder ketmia) and *Sesbania cannabini* (sesbania). Hence these weeds should be controlled in fallows.

Varietal trial showing different levels of Fusarium wilt tolerance from complete susceptibility (foreground) and more tolerant varieties (top of picture).

Practise best practice

Diseases such as fusarium wilt, black root rot and verticillium wilt and a range of weeds pose potential threats to farm profit. It is important to try to prevent introduction into new areas or minimise spread and build up of diseases, weeds and pests.

Best Practice involves choosing the best option when a choice has to be made. Sometimes it is not possible nor practical but the practise of Best Practice will maximise ecological sustainability on farm. Best Practice options are to:-

- Keep irrigation tail-water and run-off water on farm
- Keep machinery and vehicles, that enter or leave the farm, free from dirt or crop debris which could carry the fungus to clean ground
- Control weeds
- Use a crop rotation strategy
- Maintain good soil nutrition levels
- Minimise spillage and loss when transporting modules, hulls, cotton seed or gin trash
- Ensure seed used is from fusarium wilt free areas

SUSPECT SAMPLES

Samples of plants that die or suffer from any unusual symptom, should be submitted for identification of cause to either:-

- **Dr Joe Kochman - DPI, PO Box 102, TOOWOOMBA Q 4350; or**
- **Dr Natalie Moore - DPI Plant Pathology Building, 80 Meiers Road, INDOOROOPILLY Q 4068.**
- Samples should consist of sections of stem (15-20cm long) from 4-10 plants, without leaves and wrapped in paper. Information on: location, field history, cultivar and a description of symptoms should be included. Please dispatch samples as soon as possible to ensure they arrive in a suitable condition for analysis. Sample submission forms will be available from members of the CRC national cotton extension team.
- **SAMPLES SHOULD NOT BE SUBMITTED TO ACRI, NARRABRI NSW.**

For further information contact:-

- Dr Joe Kochman Ph (07) 4688 1245, Fax (07) 4688 1199
- Dr Stephen Allan Ph (02) 6799 1500, Fax (02) 6793 1186
- Dr Natalie Moore Ph (07) 3896 9337, Fax (07) 3896 9533
- Mr Greg Salmond Ph (07) 4669 0815, Fax (07) 4662 4966

WILT ALERT

FUSARIUM WILT OF COTTON

Dr Joe Kochman, Toowoomba[1], Dr Stephen Allen, Narrabri[2], Dr Natalie Moore, Indooroopilly[1] and Mr Greg Salmond, Dalby[1].

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Co-operative Research Centre for Sustainable Cotton Production

Wilt caused by the soil-inhabiting fungus *Fusarium oxysporum* f.sp *vasinfectum (Fov)* is a destructive disease of cotton in south eastern USA, Egypt, Tanzania and China.

The first confirmed record of the disease in Australia was from wilted cotton in the Brookstead/Cecil Plains area in the Darling Downs of Queensland in March 1993. Fusarium wilt has since been recorded in many commercial cotton crops on the Downs. In addition to incidence on the Downs, this disease has been now identified at isolated locations at Mungindi, Boggabilla, Goondiwindi and Moree. During January 1998 *Fov* was confirmed in wilting plants in the Theodore area of Queensland. In March *Fusarium oxysporum* was identified in plants from the Miles area. To date (April 1998), fusarium wilt has not been recorded in the Emerald or St George areas of Queensland or cotton production areas in the Namoi and Macquarie Valleys of New South Wales.

Dead patches aligned with irrigation flow in a Fusarium wilt affected field.

Fusarium wilt can cause extremely high losses when susceptible varieties are grown on heavily wilt-infested soil and weather conditions are favourable. The species *Fusarium oxysporum* is very diverse and contains a large number of saprophytic and pathogenic forms. The pathogenic forms are grouped into formae speciales (f.sp.) based on their ability to attack particular host plants. The f.sp. vasinfectum is able to cause a vascular wilt disease of cotton and is further sub-divided into races. Worldwide, up to eight races of Fov have been identified. Some are confined to acid sandy soils and associated with nematodes while others are prevalent in alkaline, heavy clay soils. Some races of Fov can also infect and survive on alternate hosts which include both weeds and other crops.

Studies of the Australian isolates of Fov from cotton indicate that there are two strains of the fungus which have developed locally and have not been introduced from overseas. The first strain was identified from the Darling Downs and the second from the Boggabilla area. The two strains differ in their ability to attack different varieties, are in different Vegetative Compatibility Groups (VCG) and have different DNA fingerprints.

The symptoms of fusarium wilt of cotton are described in the following table and illustrated along with the symptoms of several other diseases/conditions with which it could be confused.

Cooperative Research Centre for Sustainable Cotton Production
C.R.D.C.
DPI Queensland Department of Primary Industries Farming Systems Institute
NSW Agriculture

THE FACTS

BE WILT AWARE!

FUSARIUM WILT	VERTICILLIUM WILT	'SUDDEN' WILT	LIGHTNING STRIKE
Caused by *Fusarium oxysporum* f.sp. *vasinfectum*.	Caused by *Verticillium dahliae*.	Caused by normally saprophytic *Fusarium spp.*	———
Plants may be affected at any time throughout the season. Seedlings appear to be more susceptible in cold soils.	Most common late in the season or after wet and/or cool weather.	Occurs after wet weather or waterlogging.	Occurs during thunderstorms.
Fungal growth and disease incidence favoured by mean temperatures above 23°C but disease incidence in seedlings can be high in cold soils.	Favoured by mean temperatures below 25°C.	Favoured by cultivation prior to irrigation and warm weather.	———
Plant death, wilting, yellowing, stunting, defoliation, some attempted regrowth.	Leaf mottling, death of leaf tissue between the veins and around margins, defoliation sometimes.	Sudden wilting followed by defoliation and some regrowth.	Dead plants or plants with brittle dry upper stem areas. Some plants attempt regrowth.
Brown/chocolate discolouration of vascular tissue throughout the entire main stem.	Dark brown, tan to black discolouration of vascular tissue throughout the entire main stem.	Some browning of vascular tissue in the lower stem - especially just under the bark.	Roots and lower stems of surviving plants relatively unaffected.
Areas of reduced or patchy stand usually spreading in the direction of irrigation.	Stand usually not affected. Diseased plants scattered throughout the stand.	Stand usually not affected - isolated plants or several plants together in a row - esp. in low patches or near tail drain.	Roughly circular bare patches - sometimes irregular in shape.
Soil-inhabiting, spread with soil and plant debris - especially in irrigation water.	Soil-inhabiting, spread with soil and plant debris - especially in irrigation water.	Soil-inhabiting, spread with soil - especially in irrigation water or flood water.	———
Survives as single celled, thick-walled clamydospores (7-13 microns) or saprophytically on plant debris in soil.	Survives as multi-cellular thick-walled microsclerotia (30-60 microns).	Survives as a saprophyte living on plant debris in soil.	———
Can be seed borne.	Not seed borne.	Not seed borne.	———

Figure 1

Seedlings showing vascular browning caused by Fusarium wilt.

Figure 2

Fusarium wilt of cotton near Brookstead Qld.

Figure 3

Fusarium wilt in a crop of organic cotton near Boggabilla NSW.

Figure 4

Early stages of Fusarium wilt in a cotton plant. Some plants may drop all leaves; others may retain some leaves.

Figure 5

Some dead leaves may be retained on affected plants

Figure 6

Some plants attempt regrowth from lower parts of the stem.

Figure 7

Splitting the stem shows a well developed brown discolouration of the vascular tissue.

Figure 8

Cutting the stem also shows the distinctive brown discolouration when compared to healthy stems (on the right)

Figure 9

Vascular discolouration associated with verticillium wilt is usually less developed and dark brown or tan to black in colour.

Figure 10

Plants affected by 'sudden' wilt.

Figure 11

Defoliation of plants affected by 'sudden' wilt.

Figure 12

An irregular patch of dead plants resulting from a lightning strike.