



Fig 1. Field symptoms of *Fusarium* wilt of cotton infected with *Fov* at different growing stages: **a)** disease occurs as early as cotyledon stage showing wilting and chlorosis; **b)** leaf chlorosis and necrosis (left) and green wilting (right) on young cotton plants; **c)** characteristic die back on mature cotton; **d)** characteristic profound brown vascular discolouration

Disease: Fusarium wilt of cotton

Pathogen: *Fusarium oxysporum* f. sp. *vasinfectum*; Australian biotypes

Classification: K: Fungi, D: Ascomycota, C: Sordariomycetes, O: Hypocreales, F: Nectriaceae

Fusarium oxysporum f. sp. *vasinfectum* Synder & Hans (*Fov*) associated with Fusarium wilt of cotton was first identified in 1892 in cotton fields in Alabama, USA. In Australia, it was first reported in cotton in 1993. The fungus is also detected worldwide across cotton growing regions. Since its detection, *Fov* remains a significant pathogen of the Australian cotton industry.

Biology and Ecology:

Fov belongs to *Fusarium oxysporum* species complex and is a soil borne and seed borne pathogen. Currently, there are six recognised races and 21 known vegetative compatible groups. Australian *Fov* belongs to a genetically unique group, which locally evolved from its wild type. *Fov* alone causes serious disease, but with some overseas races disease incidence and severity is often greater in the presence of nematodes.

Due to genetic diversity, some *Fov* isolates were erected to new species of *F. gossypinum*, *F. cugenangense* and *F. triseptatum*, while Australian *Fov* was closely related to *F. odoratissimum*.

Distribution:

Historically, race 1 and 2 were from the USA, race 3 from Egypt and race 4 from India. Races 6 and 8 came from Brazil and China, respectively. However, race distributions have changed due to international trading and transportation, as well as advances in research. Race 4 was discovered in California, USA which was more virulent than the Indian race 4. Race 8 was also detected across many states in the USA. The Australian *Fov* biotype has been detected in cottonseed exported to the USA for stockfeed and a closely related biotype has been reported in China.

Host Range:

While cotton is the primary host, *Fov* is known to infect other crops, either symptomatically or asymptotically. Common weeds are also known to harbour the pathogen.

Impact:

Fov can infect and colonise the vascular system of susceptible cotton at any growing stage. *Fov*-incited symptoms include leaf chlorosis and necrosis, and profound vascular discolouration of roots and stems. Severe infection may result in plant death.

Average Fusarium wilt disease incidence in Australia has remained below 10% in recent years due to the adoption of highly resistant cultivars. However, incidence was recorded up to 96% in one NSW field in the 2019/20 season. In the USA, complete crop losses have been observed in individual fields.

Management options:

Management requires an integrated approach. Plant cultivars with high levels of resistance and delay planting until temperatures are warmer and less conducive to disease. Use urea rather than anhydrous ammonia; avoid over fertilisation. Manage irrigation water to contain tailwater, limiting waterlogging and runoff. Avoid interrow cultivation which may damage roots providing a source for pathogen entry. Control weeds and volunteers. Mulch cotton residues after picking, leaving on the soil surface for 90-120 days for solarisation. *Fov* can survive saprophytically on other crop residues so either remove or incorporate these as soon as possible to aid faster decomposition. Summer flooding, where there is adequate water, can reduce soil inoculum levels. Always practice farm hygiene – “Come clean go clean” between farms and infected fields to minimise spread of the pathogen.

Further Reading: Davis et al. (2006) *Plant Dis* 90:692-703; Kochman (1995) *Australas Plant Pathol* 24:74-74; Le et al (2020) *Australas Plant Pathol* 49:277-284; Lombard et al. (2019) *Persoonia* 43:1-47; Maryani et al. (2019) *Stud Mycol* 92:155-194; Scheikowski et al. (2010) *Beltwide Cotton Conference*, 4-7/01/2010, New Orleans, Louisiana: 214

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