

# VERTICILLIUM WILT

Verticillium wilt is caused by the soil-borne fungal pathogen *Verticillium dahliae*. Symptoms are most severe during cooler conditions, extended wet or overcast weather and/or waterlogging, and in late maturing crops.



## FACT SHEET

### THE PATHOGEN

Several strains have been identified in Australian cotton:

- Two non-defoliating strains (Vegetative Compatibility Groups (VCGs) 2A and 4B)
- One defoliating strain (VCG 1A)

A mix of strains occurs within cotton growing regions, but the most prevalent pathotype recovered through diagnostic sampling is the non-defoliating strain VCG 2A.

Virulence varies widely among isolates within each strain (from mild to severe), however, VCG 4B is generally considered to be less virulent.

Differences in reported virulence and the regional dominance of *Verticillium* strains are likely to be influenced by environmental adaptation.

Defoliating strains tend to be adapted to warmer conditions (soil temperatures around 27°C), while non-defoliating strains often perform better at lower soil temperatures (16–20°C).

Under ongoing selection pressure from host resistance and environmental factors, this soil-borne pathogen can evolve, leading to increased disease severity (virulence) and adaptation to new hosts.

### SYMPTOMS

**External symptoms** typically include wilted plants, leaf mottle and necrosis, defoliation and in some cases, the death of plants.



**Internal symptoms** can be observed by cutting into the stem at the base of the plant, just above the soil. An infected plant will display flecked brown discolouration of the vascular tissues running from the main root up into the stem.

Not all plants infected by *V. dahliae* show external symptoms of disease, highlighting the importance of disease monitoring by stem cuts in the field.

Symptoms of *Verticillium* wilt and *Fusarium* wilt (*Fusarium oxysporum* f. sp. *vasinfectum* - Fov) can be difficult to tell apart, so plants suspected of being infected with either of these diseases need to be diagnosed by a pathologist.



## ECONOMIC IMPACT

Failure to implement effective management practices can lead to high levels of *V. dahliae* inoculum, resulting in significant yield losses (estimated to be over 60% in some affected fields).

Present in most cotton growing regions of New South Wales and in some parts of Queensland, this disease is particularly significant in the Namoi, Gwydir, and Goondiwindi regions.

***Research by the Australian Cotton Disease Collaboration (the ACDC) is investigating the potential for machine vision sensing to differentiate diseases with similar symptoms such as Verticillium and Fusarium wilts, and whether disease severity can be predicted before symptoms are visible***

## MANAGEMENT PRACTICES

### **Practice Come Clean. Go Clean.**

*Verticillium dahliae* is almost impossible to eradicate once established, so focus on preventing its introduction. Practice Come Clean. Go Clean. by washing down machinery, equipment and vehicles, and undertake and undertake field operations in 'dirty' fields last to reduce the risk of spreading pathogens around a farm.

### **Know your pathogen**

Pathologists are increasingly encountering mixed pathogen presence and vascular symptoms that cannot be reliably distinguished through field assessment alone. Submission of samples for diagnostic testing remains the most dependable method of ensuring accurate disease identification, enabling the most appropriate disease management practices to be implemented.

***The ACDC is continuing to provide diagnostic support to assist growers and consultants with the timely identification of pathogens in fields, creating a database to understand the prevalence and distribution of different cotton diseases across Australia.***

### **Plant the highest V-rank variety**

Cotton varieties with a higher V-rank are less susceptible to *Verticillium* wilt. However, current varieties that are resistant at warmer ambient temperatures (25 – 27°C) can decline at cooler temperatures (20 – 22°C). Consequently, cooler conditions, particularly when combined with extended wet weather, can result in more severe disease expression.

### **Use balanced nutrition**

Excessive nitrogen can result in prolonged maturity due to late season growth, placing more stress on the plant, potentially increasing its susceptibility to *Verticillium* wilt. Additionally, high nitrogen can reduce the production of defence compounds (e.g. phenolics and phytoalexins), increasing the plant's vulnerability to infection. Potassium is also an important nutrient for plant defences, and potassium deficiency has been associated with more severe symptoms.

### **Avoid excessive moisture**

Throughout the season avoid over-watering and waterlogging where possible, as *Verticillium* wilt is worse in cool, wet conditions. Avoid late season irrigations that extend maturity and encourage late-season growth. Aim to minimise irrigation runoff to reduce the amount of inoculum moved in tail water and around the farm.

***Research by the ACDC is quantifying the impact that varying irrigation methods and nutrition management has on disease incidence of Verticillium wilt under different environmental conditions.***

### **Ensure that crop destruction and incorporation occurs soon after picking**

For most diseases (including *Verticillium* wilt), best practice is to incorporate trash residues immediately after picking to reduce inoculum build-up. Smaller residue size enhances the rate of breakdown by increasing the surface area for microbial activity, thereby reducing the survival of soilborne pathogens like *V. dahliae* and *Fov*.

***Research by the ACDC is investigating links between inoculum load, soil type, environmental practices, and yield loss to Verticillium wilt to guide detailed recommendations for managing crop residues.***

**Rotate with non-host crops, and avoid back-to-back cotton**

Rotate with non-host crops such as sorghum or maize to reduce disease severity.

**The Australian Cotton Production Manual's**

*Potential disease implications of rotation crops (in relation to the following cotton crop) table outlines the likelihood of inoculum levels increasing or decreasing, helping growers choose the most suitable rotation crop before cotton with respect to their disease of concern.*

Control alternative hosts including volunteer and ratoon cotton. Some weeds species also host Verticillium wilt including amaranth, Noogoora burr, Bathurst burr, and cow vine.

Avoid frequent fallows to maintain microbial diversity and populations of beneficial bacteria and fungi.

**The Cotton Pest Management Guide's** *Weeds as Hosts of Cotton Pathogens* table lists common weeds found in Australian cotton fields that act as host plants for various cotton diseases.

**Consider the use of biological controls to manage Verticillium wilt**

Sero-X is registered for the reduction of microsclerotia formation of Verticillium wilt. For more information, contact Innovate Ag. <https://innovate-ag.com.au/contact/>



Speckled *V. dahliae* tap root.

>> For more information on symptom comparison and overlap among different wilt diseases, refer to the CottonInfo **Wilt Aware** factsheet.

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by Sharna Holman, CottonInfo Disease and Biosecurity Technical Lead/QDPI, in collaboration with the ACDC. Acknowledgments: Dr Linda Smith, the ACDC/QDPI.

**For further information**

[www.cottoninfo.com.au](http://www.cottoninfo.com.au)

[www.unisq.edu.au/research/the-acdc](http://www.unisq.edu.au/research/the-acdc)



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