

Managing Fusarium Diseases of Vegetables

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Overview

- What do we know about the fungus Fusarium?
- What diseases do Fusarium species cause on vegetables?
- What conditions favour Fusarium diseases and how does the fungus spread?
- What integrated management options are there?





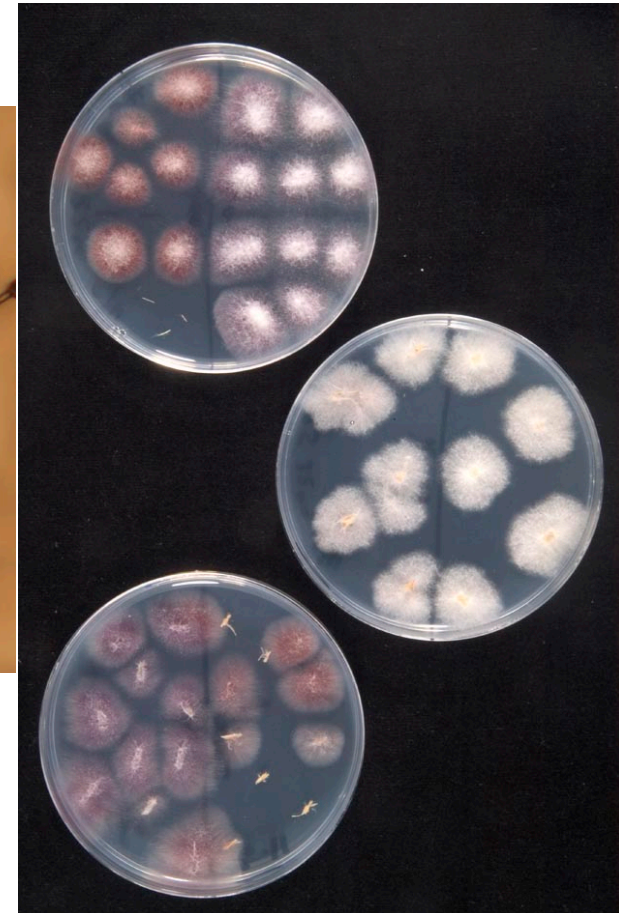
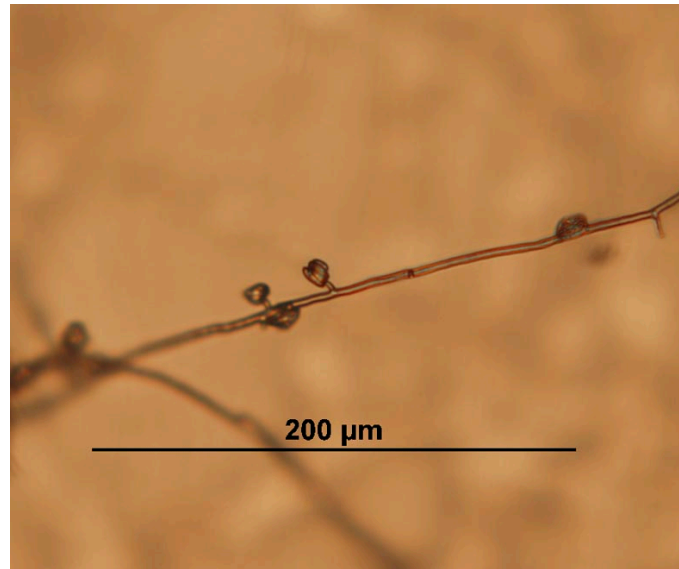
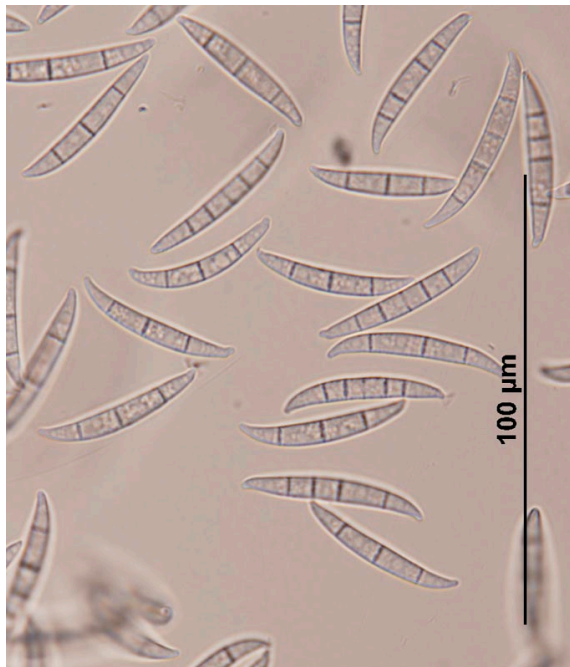
The fungus, *Fusarium*

- *Fusarium* is a common soilborne fungus – most species are common saprophytes while a few are important plant pathogens
- Plant pathogenic *Fusarium* fungi are necrotrophs (they feed on dead plant tissue) – which implies they produce enzymes or toxins that kill plant cells as they invade
- Host specialised strains (f.spp.) and races occur
- *Fusarium* pathogens of vegetables produce characteristic banana-shaped spores (macroconidia), as well as other smaller (jellybean) ones (microconidia) and small resting bodies (chlamydospores & sclerotia)





Fusarium spores & cultures





Key Fusarium diseases of Vegetables

- Wilt and Yellows diseases – many different host-specific strains of *Fusarium oxysporum*
- ***Not all Fusarium wilt pathogens are known to occur in Australia – important Biosecurity implications***
- Stem, crown, and root rots – mostly certain *F. oxysporum* and *F. solani* strains; occasionally other *Fusarium* species involved (e.g. *F. avenaceum* associated with dry rot of carrots; & various other species on asparagus crowns)
- *F. solani* causes a fruit & stem rot on capsicums & pumpkins
- Damping off, wilt and root rot disease complexes with other fungi &/or oomycetes – e.g. beans, peas, cucumbers



Examples of Fusarium wilt diseases

Host	Fusarium oxysporum strain (f.sp.)	Present in Australia
Beans	phaseoli	-?
Brassicas	conglutinans	+
Capsicums	capsici	-
Cucurbits	cucumerinum	+
	melonis; niveum	+
	luffae; lagenariae	-
	momordicae; benincasae	-
Eggplant	melongenae	-
Lettuce	lactucae	-
Onions etc	cepae	-?
Peas	pisi	+
Snake beans	tracheiphilum	+
Spinach	spinaciae	+



Fusarium wilt of cucumbers





Fusarium wilt of spinach





Basal plate rot of leeks





F. solani on pumpkin



Fusarium wilt of tomatoes



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Source, spread and favoured conditions

- Can be a contaminant of seed and spreads in nurseries
- The fungus survives for many years in soil on farms and is difficult to eradicate
- Spread with soil and media, water, sciarid flies, contaminated equipment & workers (hands, footwear & clothing)
- Favoured by ammonium nitrogen; K deficiency favours Brassica yellows
- Certain wilt diseases are favoured in particular temperature ranges
- Plant stress – water, nutrition, fruit load – favours disease





Addition of urea stimulates Fusarium wilt



Addition of urea stimulates Fusarium wilt





Some mechanisms for N-form x Disease

- NH_4 decreases soil pH & increases amino acid in root exudates – influences rhizosphere biota
- NH_4 stimulates germination of pathogen propagules (*Fusarium solani* & *F. oxysporum*)
- NH_4 increases virulence of *F. oxysporum*
- NH_4 represses uptake of NO_3 and K and stimulates Cl uptake – disease severity is greater when the K:Cl ratio \neq 3.5





Key management strategies

- Resistant varieties – race resistance genes
- Grafting onto resistant rootstocks
- Avoid ammonium (NH_4^+) fertilisers
- Avoid over-watering – use less more often
- Preventative measures - crop & farm hygiene & biosecurity:
e.g. come clean – go clean
- Control sciarid flies & soil-borne insect pests
- Remove or bury plant waste
- Crop rotation, cover crops, organic amendments, microbial biocontrols; plant defence activators; no registered chemicals except fumigation





Prevent cross-contamination

- Seedling hygiene





Crop hygiene

- Minimise plant contact
- Remove crop waste directly





Conclusions

- Most vegetables are susceptible to a Fusarium disease
- There are some strains of this pathogen that are not known to occur in Australia
- Fusarium is difficult to manage because it becomes endemic on farms & chemical controls are not effective
- An integrated and holistic approach is the only effective way to manage them



Thank You

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