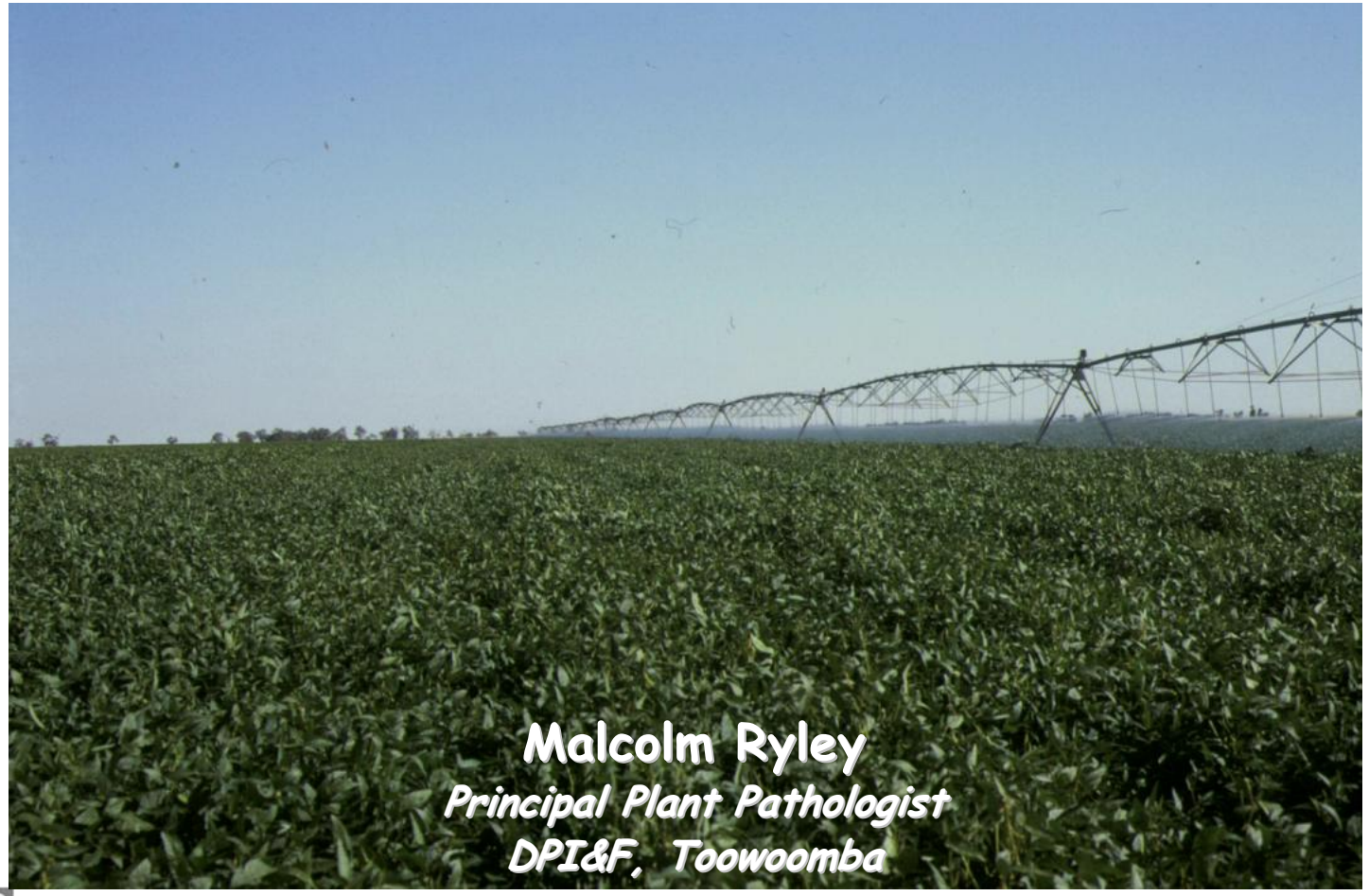
Purple seed stain and other emerging diseases



Malcolm Ryley
Principal Plant Pathologist
DPI&F, Toowoomba

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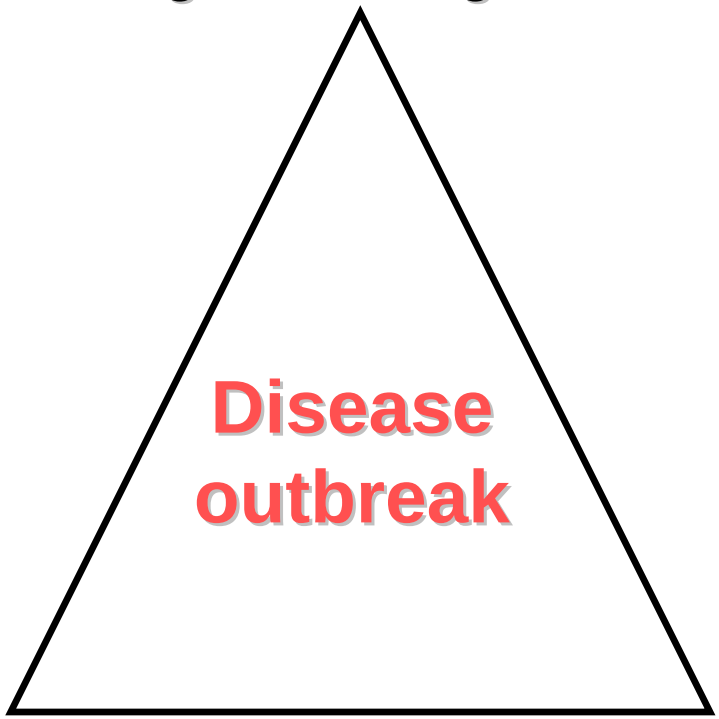
Disease triangle

Host – variety, growth stage



Pathogen – biology

Environment – physical and chemical

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Soilborne diseases

- Most infect roots, stem bases
- Most survive as resistant structures or in infected residues
- Spread by movement of infected soil, plant parts
- Tend to build up over time in a paddock

Airborne diseases

- Infect aboveground plant parts
- Most survive on alternative hosts, seeds, or infected residues
- Spread mostly by wind, infected residues, infected seeds, insects
- Severity does not necessarily increase over time

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Soybean diseases in sugarcane farming systems

- One soybean/pulse crop every 4/5 years
- A few soilborne diseases are common – root knot nematodes, sclerotium base rot, rhizoctonia rot
- Disease outbreaks are most likely to be sporadic

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Purple seed stain – symptoms

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Purple seed stain -symptoms

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Purple seed stain – effect on quality

- Germination  Reduction depends on amount of discolouration
- Oil content 
- Protein content 
- Seed weight  Reduction depends on amount of discolouration
- Marketability 
- Processed product  Seed hardness, curd colour, miso texture

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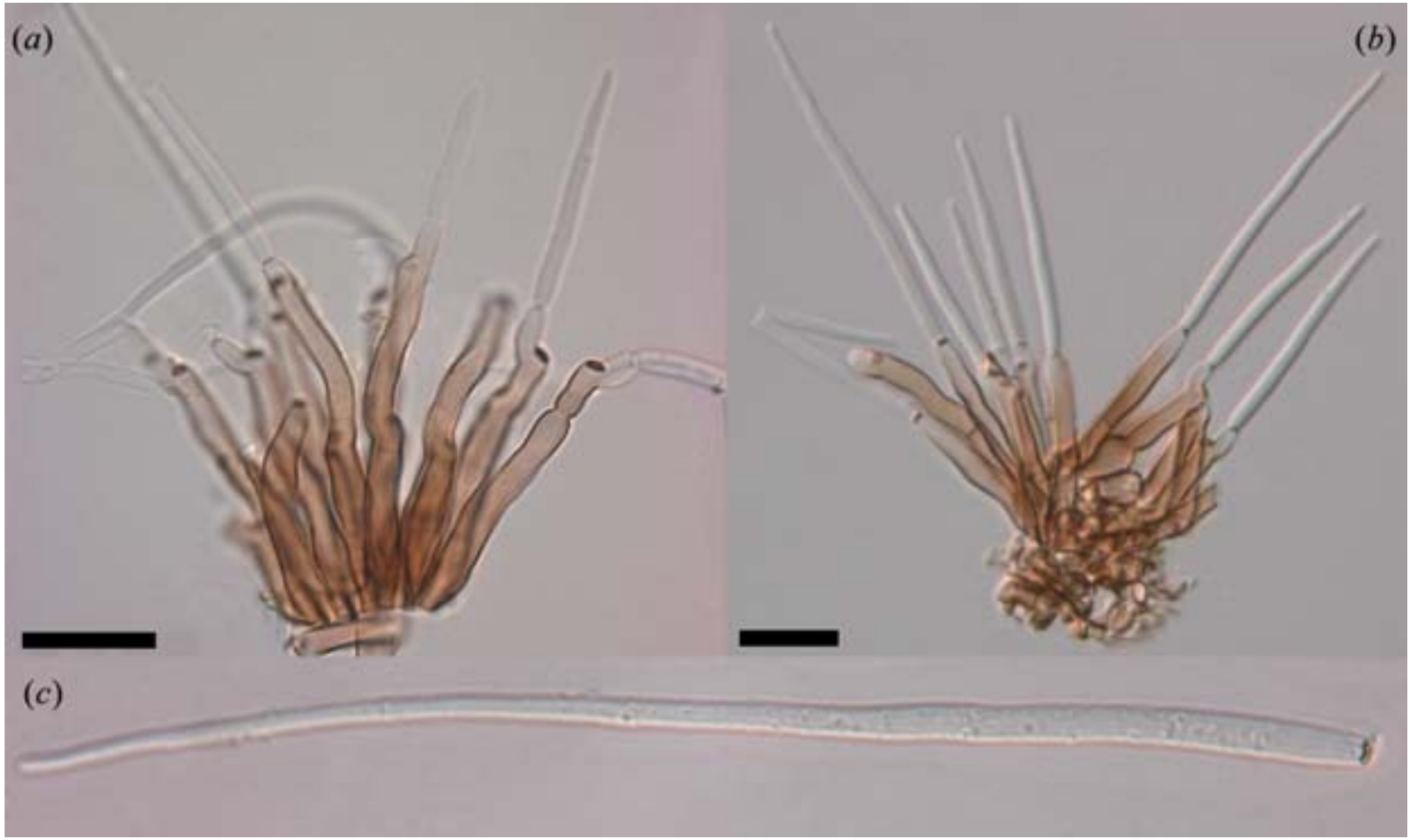
Purple seed stain – spores of *Cercospora kikuchii*



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Purple seed stain - sporulation

- Spore production 15-35°C (opt.23-27°C), high humidity (>92% RH) within 3-5 days
- Two peaks of spore production - beginning of growing season, at R4 (pod 2cm long)

Purple seed stain – infection

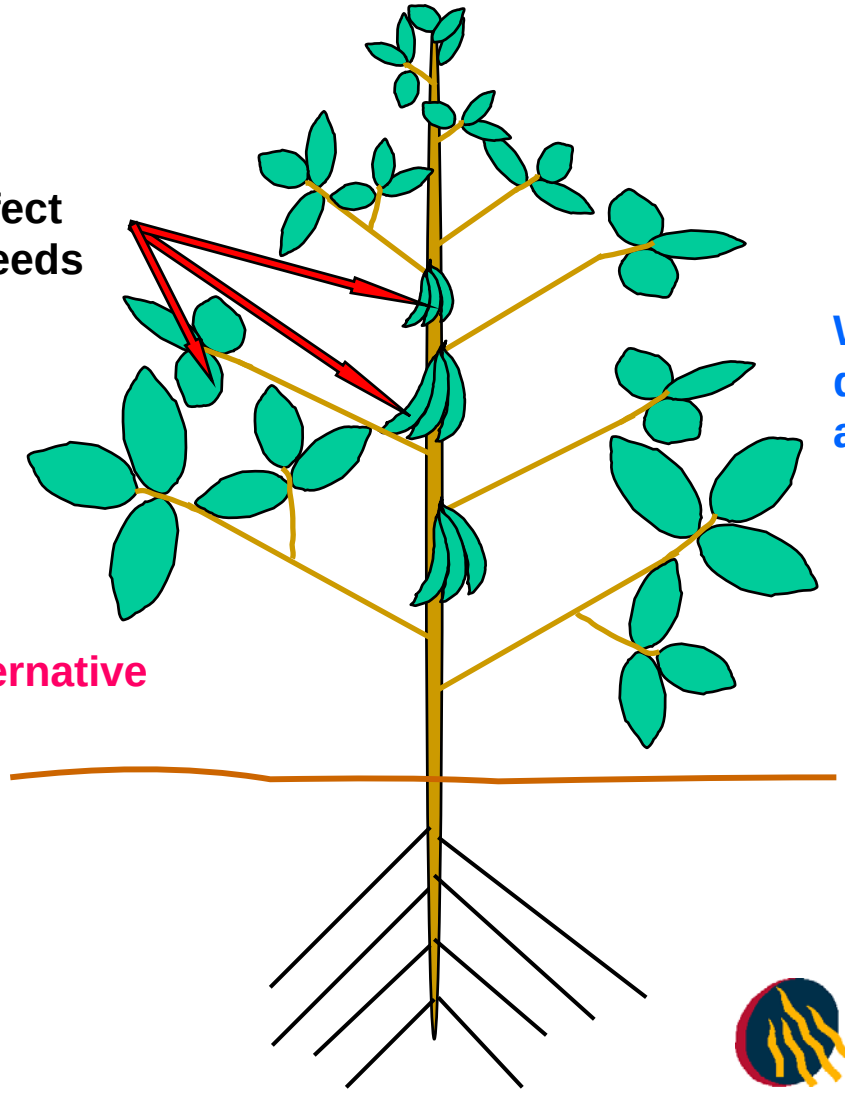
- Higher incidence when pods 5-20 mm than at 5 mm
- No infection at 15°C or 35°C; 25°C best, 30°C better than 20°C
- Minimum of 18 hr wetness even if interrupted by humid period
- Long pod dry-down increases infection

Purple seed stain -survival

- Seedlings from infected seeds die, or are stunted
- Alternative hosts O.S. – clusterbean (*Cyamopsis*), cowpea, greenbean, sicklepod (*Cassia obtusifloia*), clotbur (*Xanthium stumarium*)
- Unidentified *Cercospora* sp. on clusterbean and *X. chinense* in Qld

Biology of *Cercospora kikuchii*

Airborne spores infect leaves, pods and seeds



Warm, humid weather during pod maturation and seed development

Survives in seeds, alternative hosts and residues

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Purple seed stain- management

- Disease-free planting seed
- Residue management
- Volunteer control
- Resistance

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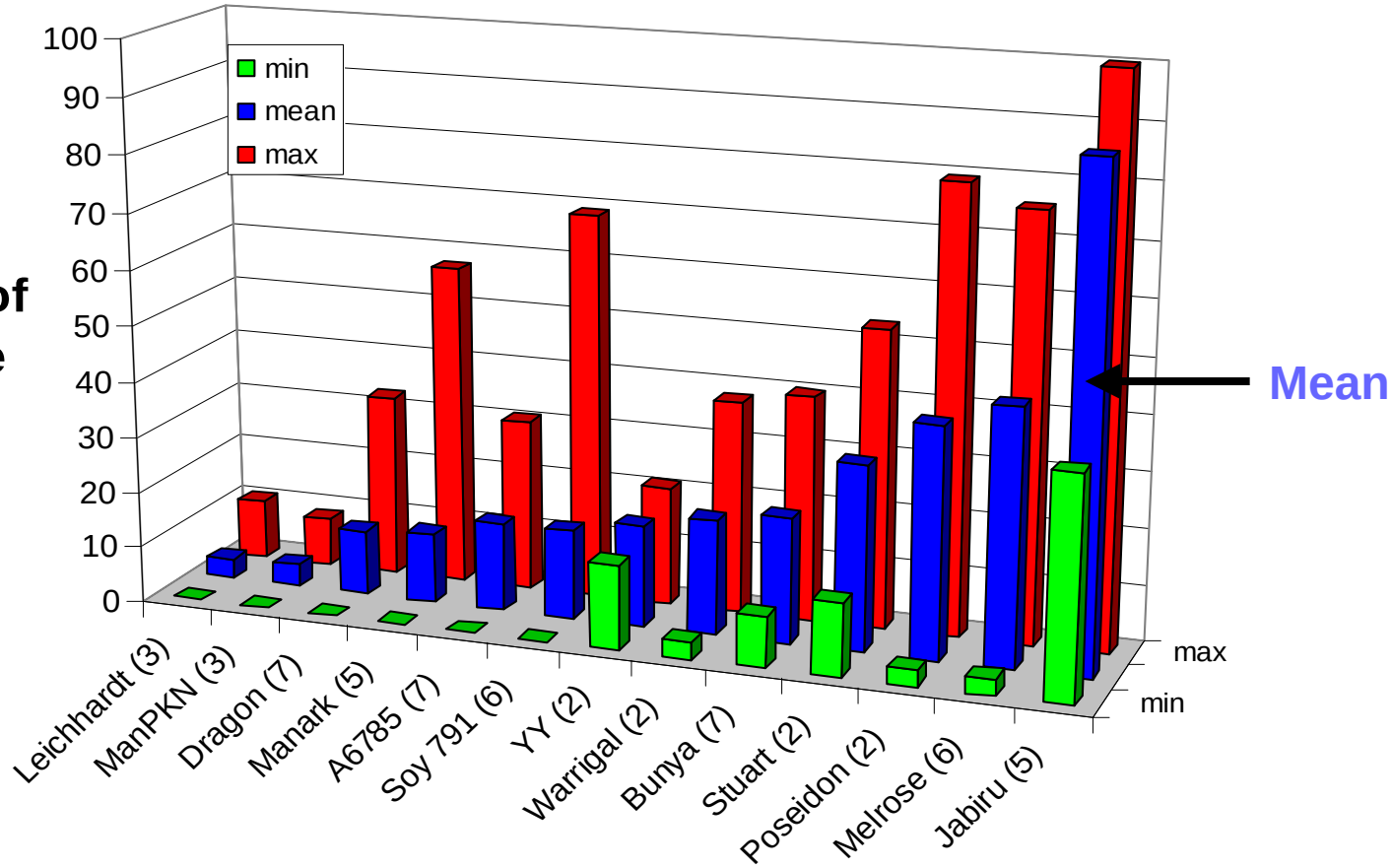
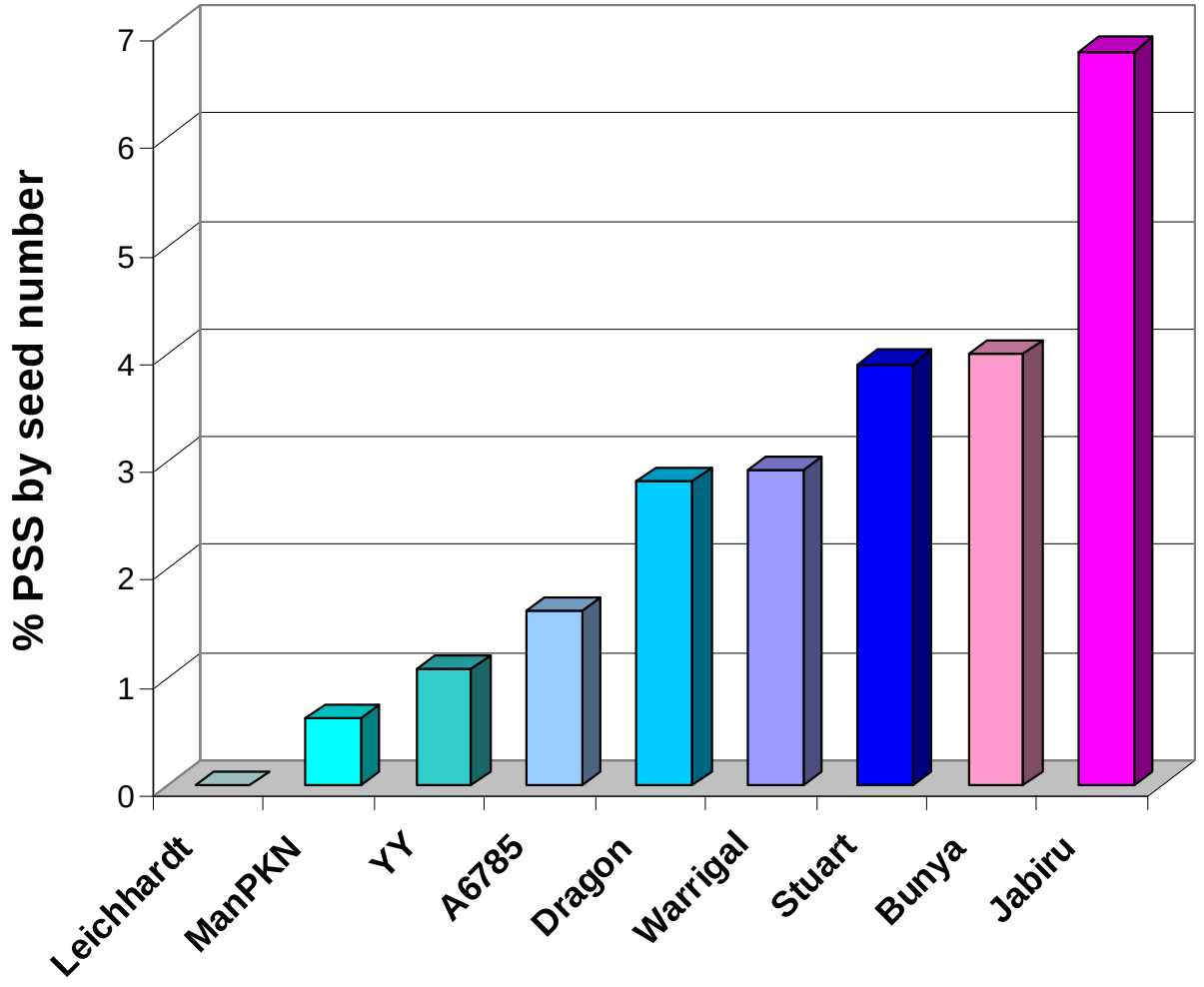
Purple seed stain - resistance

PSS as % of worst line



Purple seed stain - resistance (Eumundi 2004/05)



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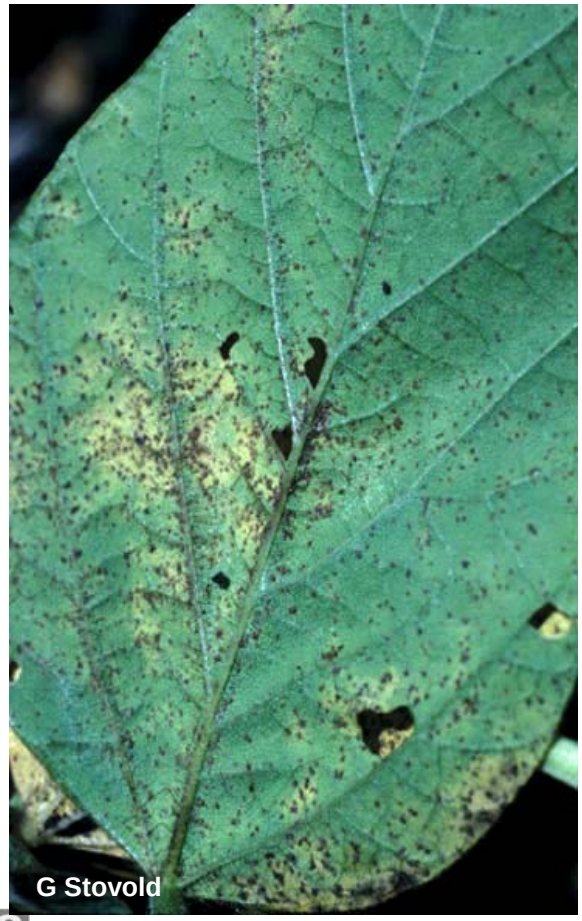
Rust - symptoms



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Downy mildew - symptoms

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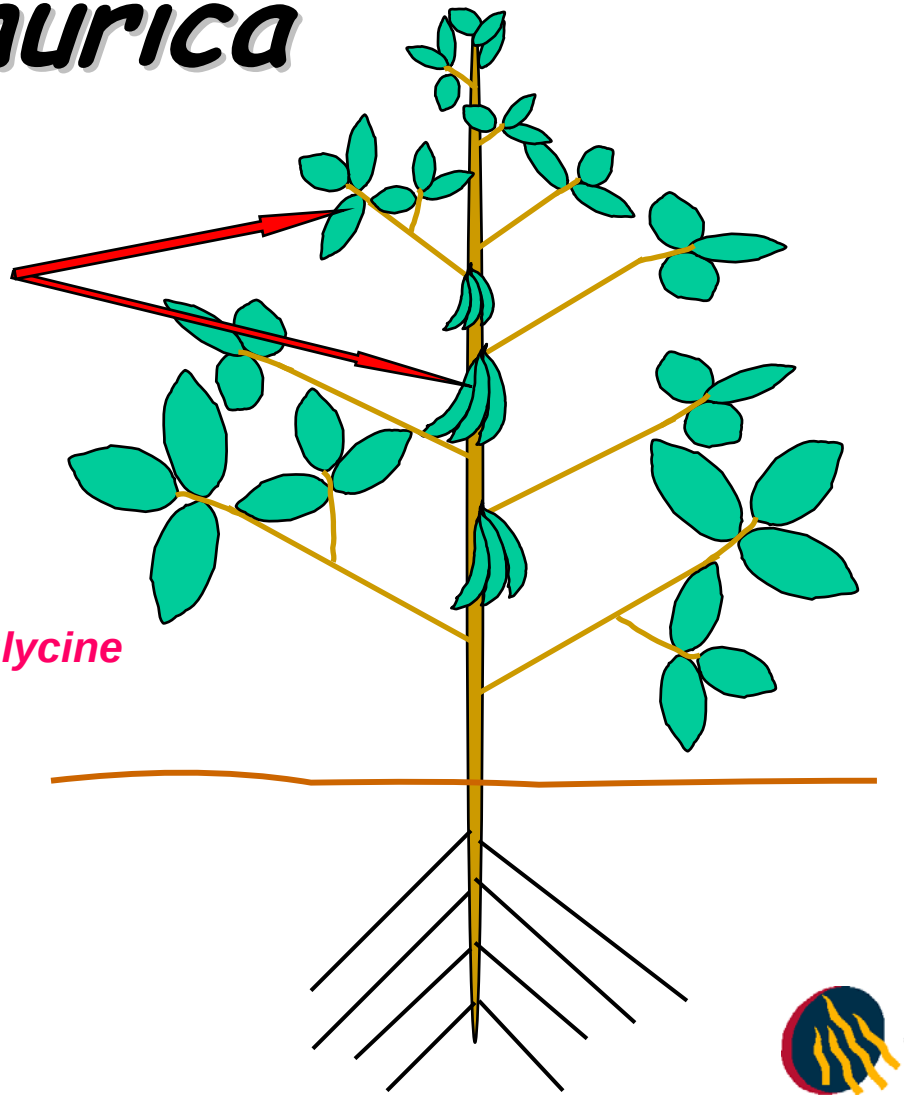
Infection by *Phakopsora pachyrhizi* & *Peronospora manschurica*

Airborne spores infect leaves and pods



Cool, humid weather; leaf wetness, late in season

Survive on other *Glycine* spp.

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Rust and downy mildew - management

- Late season diseases - impact mimimal
- Disease-free seed (DM)
- Fungicides ?
- Resistance

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Leaf sheath red rot of cane

- caused by *Sclerotium rolfsii*
- attacks dying leaf sheaths
- common on cane trash

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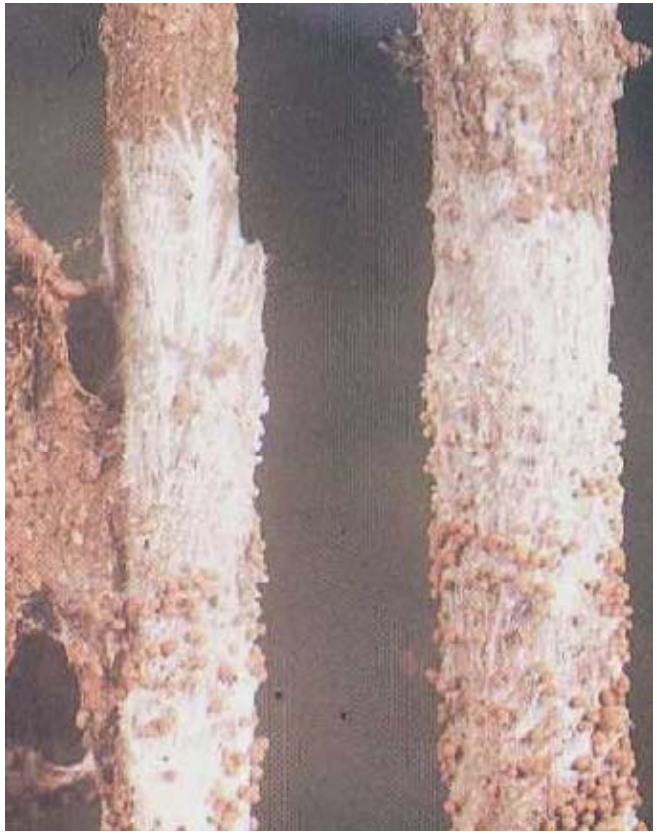
Sclerotium base rot of soybean



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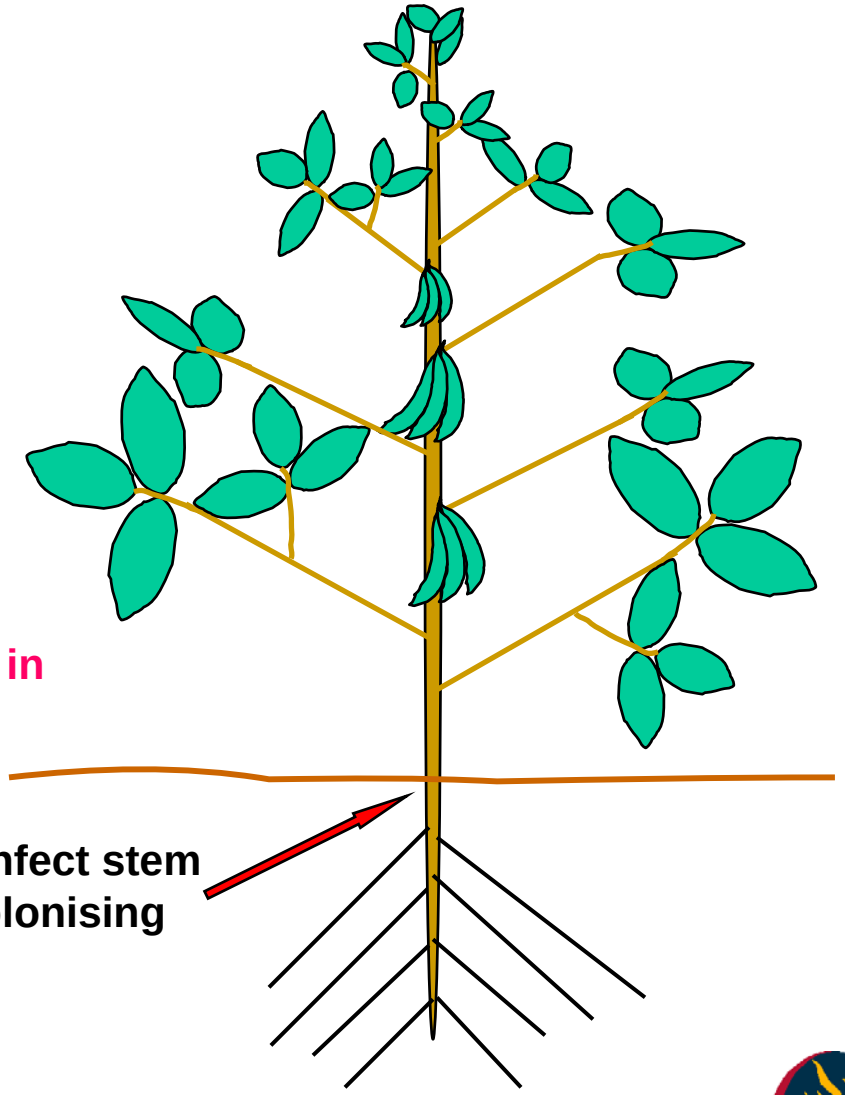
Infection by *Sclerotium rolfsii*



Heat, and moist soil

Survives as sclerotes in soil

Soilborne sclerotes infect stem base, usually after colonising plant residue

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Base rot - management

- avoid infected fields
- fallow before planting soybeans
- cane trash management
- avoid damage during growth

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Bacterial blight - symptoms

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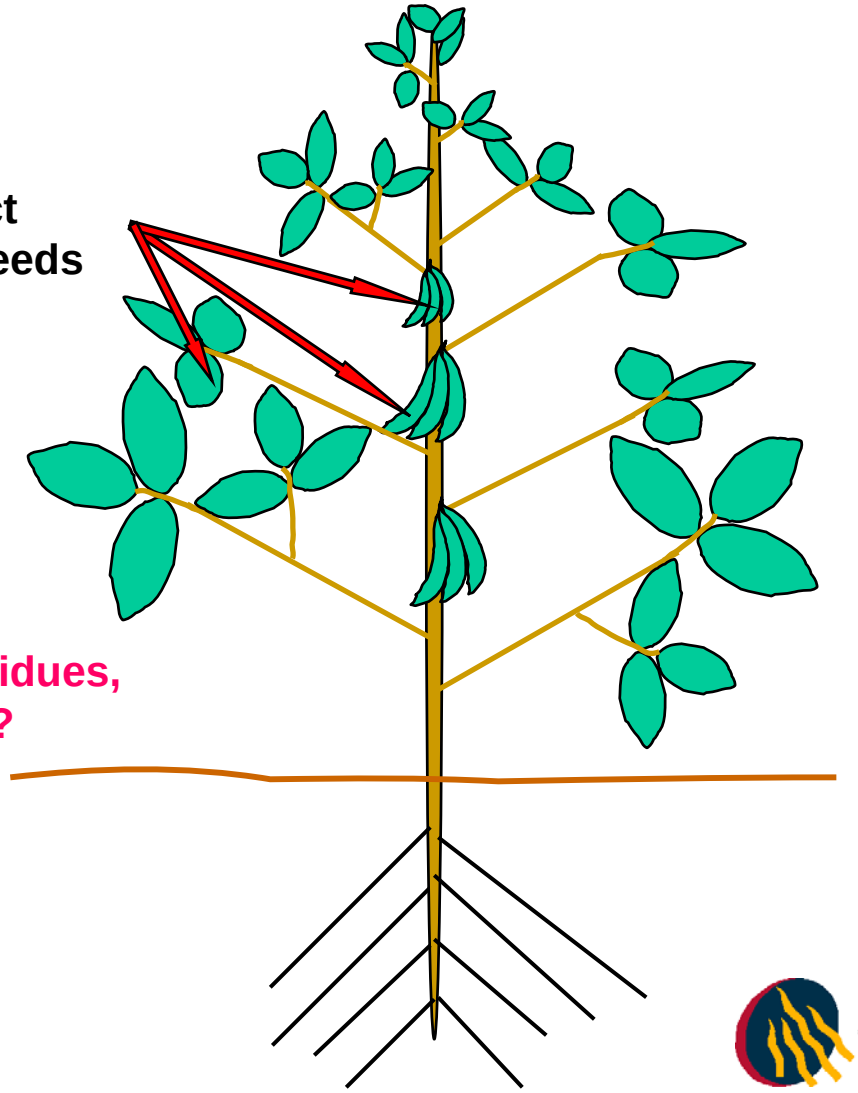
Biology of *Pseudomonas savastanoi* pv.*glycinea*

Airborne cells infect leaves, pods and seeds



Wet, windy weather

Survives in seeds, residues, and alternative hosts ?

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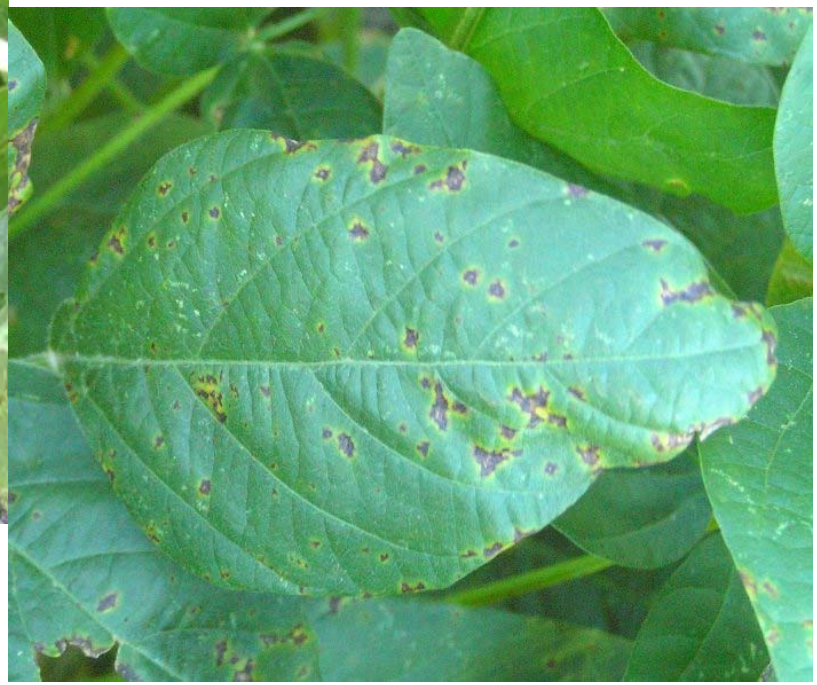
Bacterial blight – varietal differences



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Charcoal rot - symptoms

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Charcoal rot – internal signs

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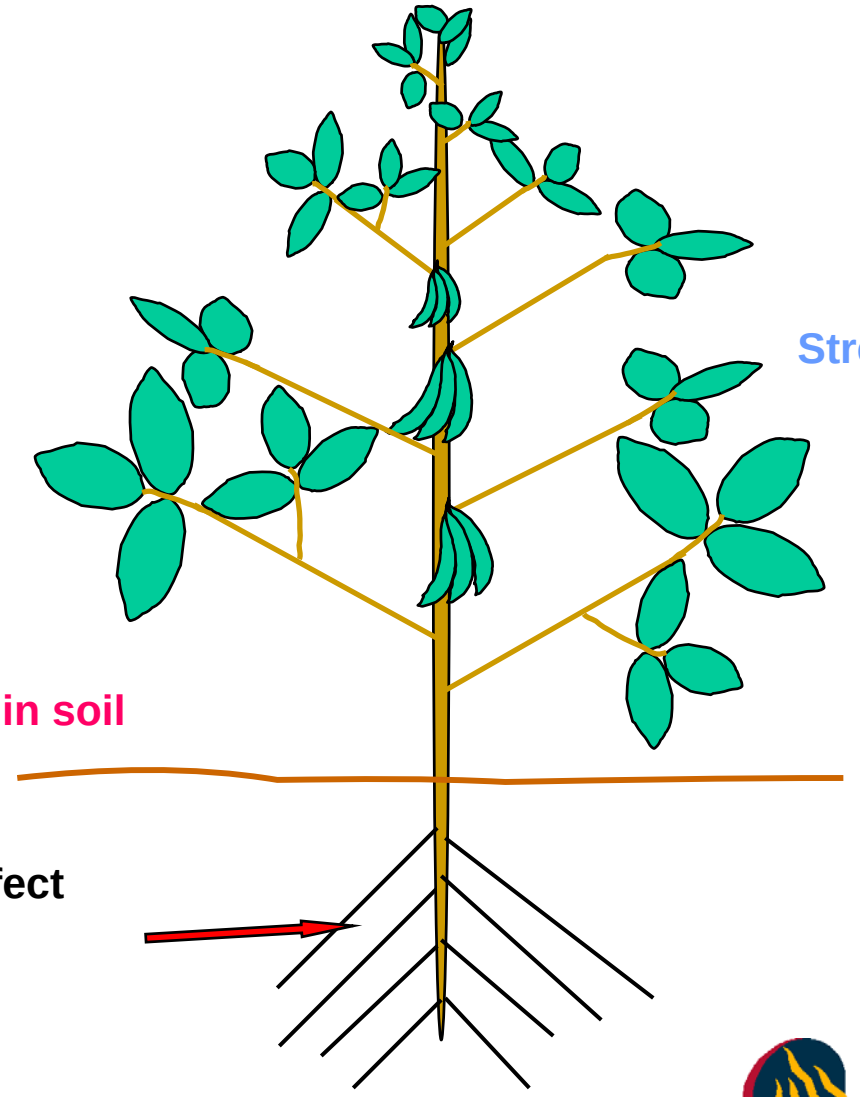
Infection by *Macrophomina phaseolina*



Stress after flowering

Survives as sclerotes in soil

Soilborne sclerotes infect roots of seedlings

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Seedling death - symptoms

Pythium spp.

Rhizoctonia solani

Pythium spp.

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Seedling death

- favoured by: waterlogged soil (*Pythium*), warm, moist soil and residues (*Fusarium*, *Sclerotium*)
- survival: oospores (*Pythium*), residues (*Fusarium*), sclerotes (*Sclerotium*)
- managed by: improved drainage (beds), trash management, seed fungicides

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Phytoplasma - symptoms

- Very low incidence
- Small, puckered leaves
- Proliferation of shoots
- Spread by leafhoppers

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Viruses – the sleepers ?

- 50 viruses recorded on soybean, 3 in Australia
- Soybean mosaic virus, peanut mottle virus, alfalfa mosaic virus
- Many viruses have weed hosts
- Spread by aphids, thrips

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Managing soybean diseases

- Select varieties with resistance to diseases
- Use high-quality, disease-free seed
- Plant into well-prepared seedbed
- Harvest promptly

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The future ?

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