

Botryosphaeriaceae in Australian cereal grains: An overview

Botryosphaeriaceae Workshop
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Wheat head disorders

- Black spot
- False black chaff
- Fusarium head blight (FHB)
- White grain disease (WGD)



Source: ag.ndsu.edu

Fusarium head blight (FHB)



Source; Hortonseedservices.com



Source: Grainscanada.gc.ca

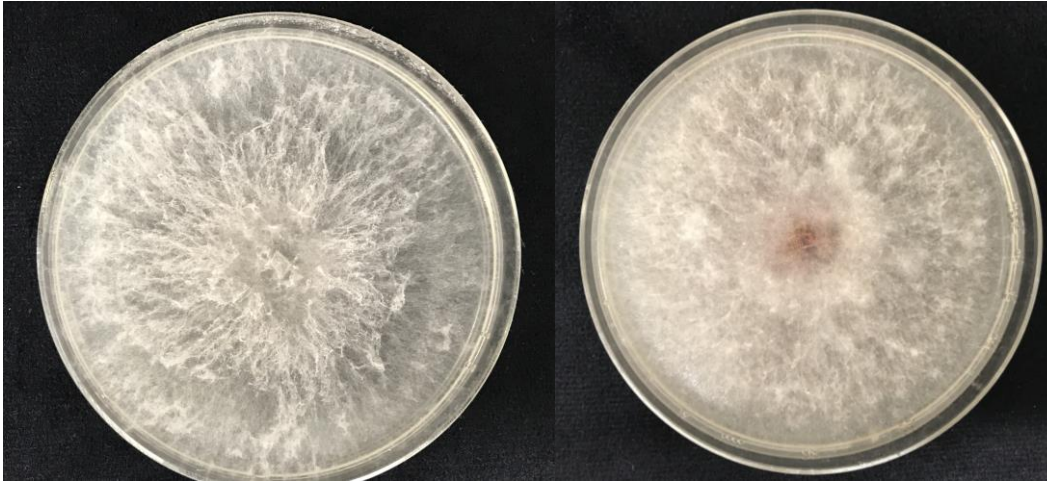
White grain disease (WGD)



Source: agric. wa.gov.au

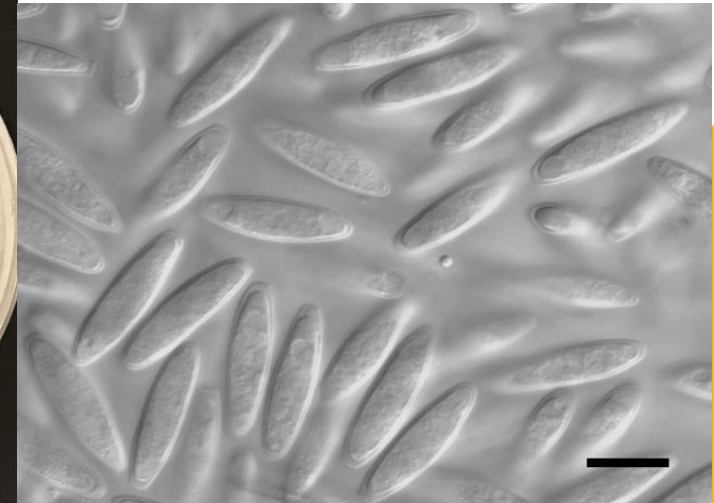
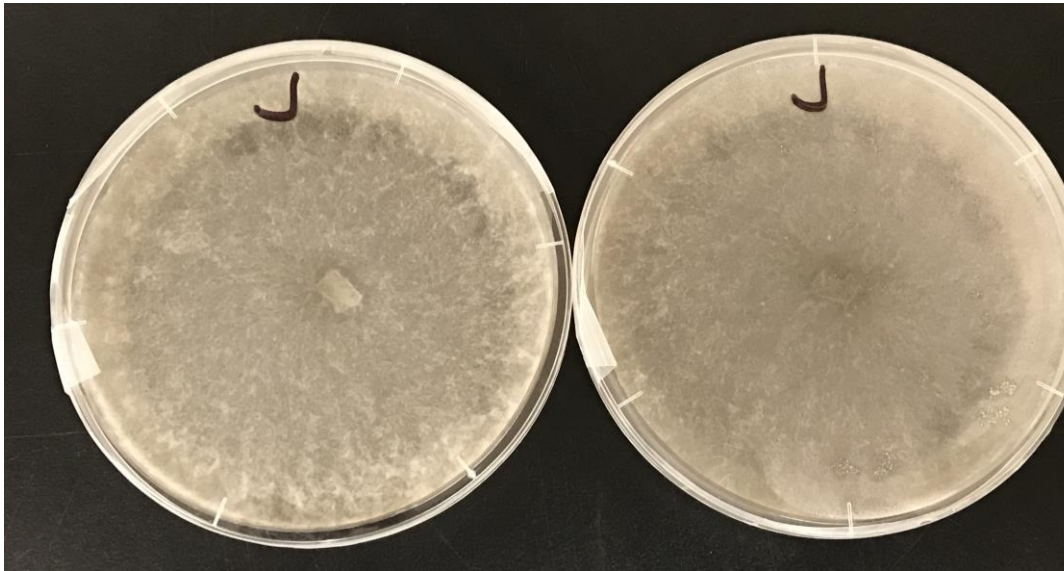


Source: Labroots.com



Source: extensionpublications.unl.edu

Fusarium head blight



Source: Slippers et al., 2004, APP34(2):213-220

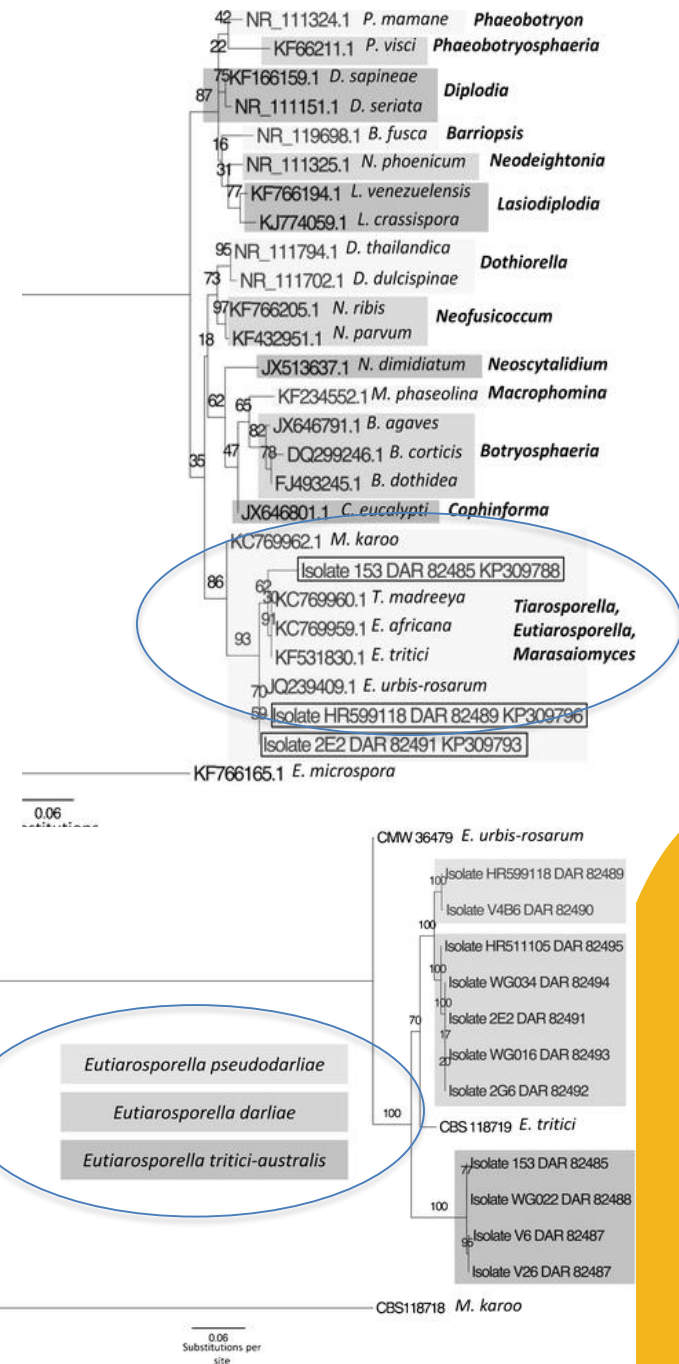
White grain disease

White grain disease

- first recorded in Qld in 1999
- stubble borne, favoured by wet periods
- minimal effect on the nutritional value of flour
- is not associated with toxins or grain quality concerns
- problem in winter grown wheat and barley in Australia
- WGD are known to be associated with a complex of closely related fungi (*Eutiarosporella* spp.)

WGD causal organism

- causal agent was identified as *Botryosphaeria zeae*
 Classification: K: Fungi,
 D: Ascomycota,
 C: Dothideomycetes,
 O: Botryosphaeriales,
 F: Botryosphaeriaceae
- Re-classified into *Eutiarosporella* spp - *E. darliae*, *E. tritici-australis*, and *E. pseudodarliae* (Thynne et al. 2015)





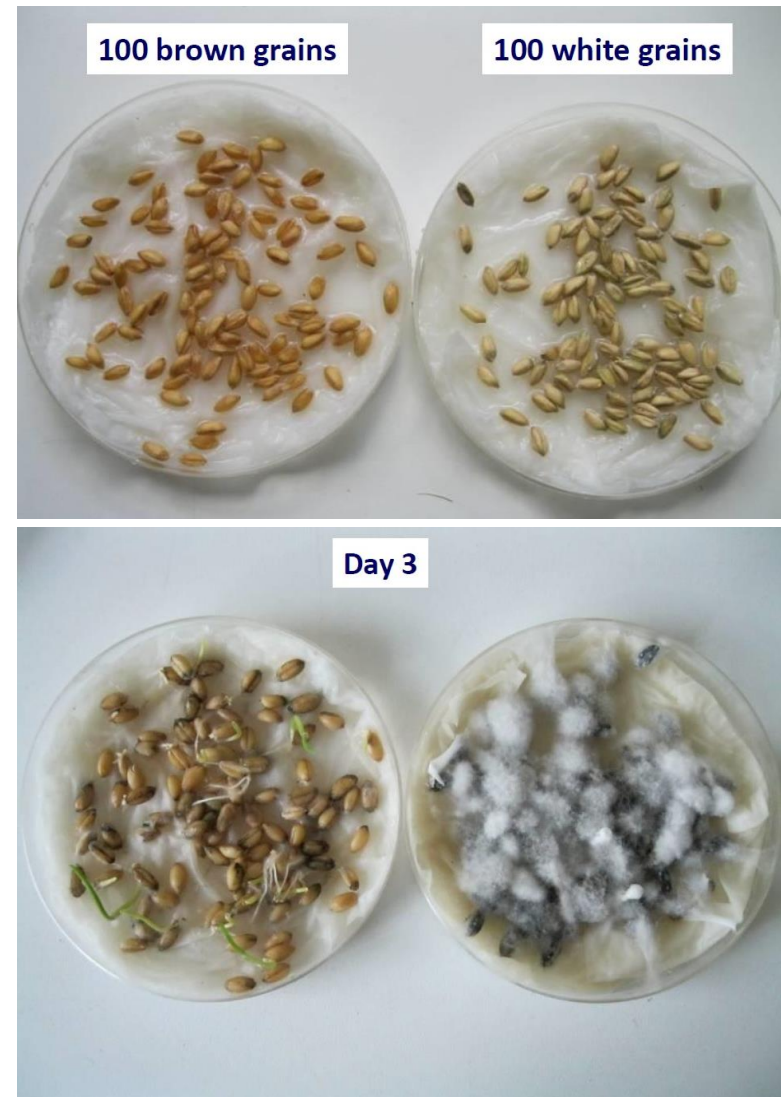
Photos: M. Evans

Symptoms

- a. bleached florets at early grain filling
- b. greyish-white affected grains
- c. fruiting bodies on stubble
- d. perithecia
- e. upper peduncle browning

Economic impact

- white grains will not germinate
- similarity in visual symptoms with FHB, white grains might be perceived to contain toxins, thus affecting Australia's grain export markets
- wheat is downgraded to feed if >80 white grains litre sample are detected
- the direct loss in yield can be severe (>50%)



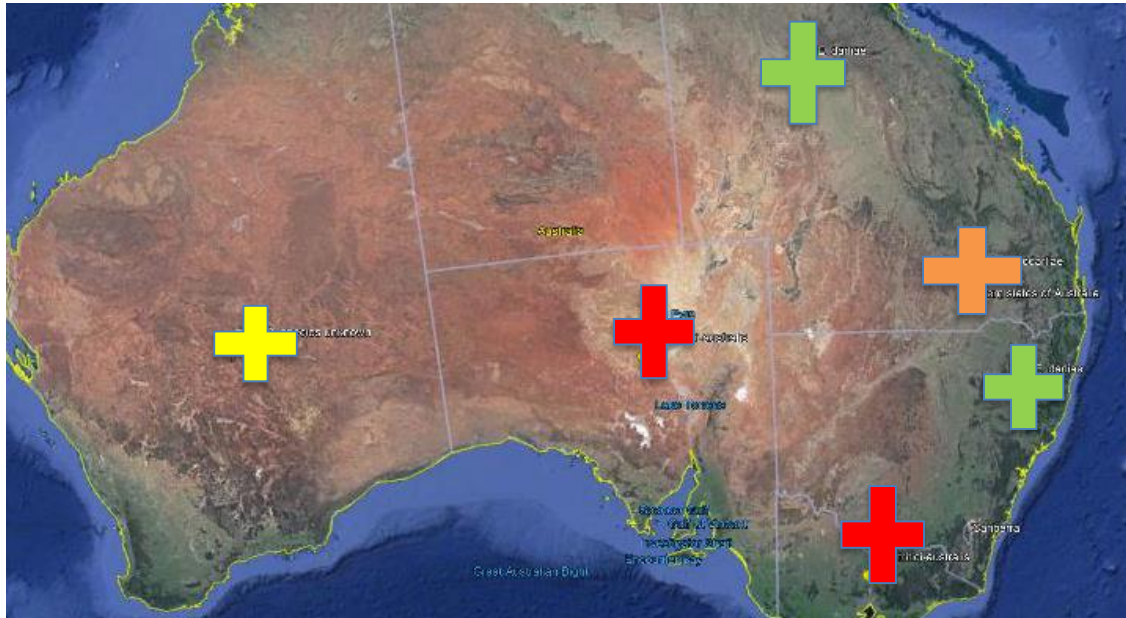
Photos: S. Simpfendorfer

Economic impact

- 2010/11 & 2011/12, caused rejection and downgrading of 174,370 tonnes of WGD affected wheat grain loads at receival points in SA
- losses estimated to be \$100M



Source: agric.wa.gov.au



GoogleMaps

Distribution

- *Eutiarosporella tritici-australis* - observed in South Australia and Victoria
- *E. darliae* - observed in Queensland and Northern NSW
- *E. pseudodarliae* - observed in Eastern Australian states
- WGD species unknown – observed in WA

Host Range

- bread wheat
- durum wheat
- barley
- triticale



Source: DAFF BHB Factsheet

Known to exhibit WGD symptoms, but the host ranges of each of the fungi associated with WGD are poorly understood.

Biology

- survive on infected stubble for at least 2 years
- pycnidia produce pycnidiospores in a sticky matrix, suggesting spores are rainsplash distributed
- ascospores most likely to be wind distributed and the main cause of grain infection

Management

- stubble management and crop rotation could provide useful levels of control
- adjust harvester settings to reduce the affected grain going into the bin, as white grain is lighter than healthy grain.

Stubble management still a burning question -GRDC



Source: GRDC.com.au



STUBBLE MANAGEMENT FACT SHEET

GRDC
Grains Research & Development Corporation

MARCH 2011

Strategies to manage winter crop stubbles without reaching for the matches

Conservation farming combines minimum or no tillage, full stubble retention and diverse crop rotations. This has resulted in some challenges at seeding and for crop performance, especially when the stubble load is greater than four tonnes per hectare of dry matter. There are a number of techniques, other than burning, which can be employed to deal with heavy stubble loads.

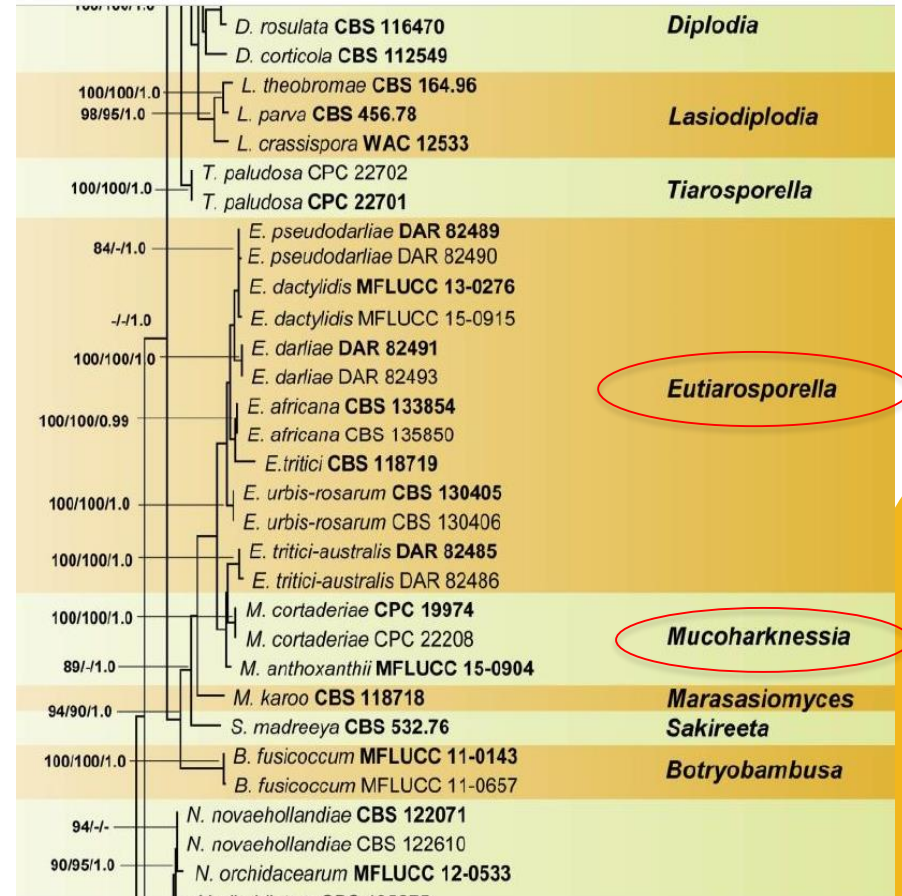
Source: GRDC.com.au

What we do not know

- host ranges of each of the WGD fungi
- resistance in commercial cultivars needs to be verified
- methods for culturing the pathogen and inoculum production
- disease rating scale to assess germplasm for resistance
- fungicide efficacy
- life cycle, especially related towards host specificity

What we do not know

- origin of these pathogen species
- distribution of the species across Australia; knowledge gap as to what is in Western Australia
- *E. tritici-australis* might be reassessed as *Mucoharknessia* (Dissanyake et al., 2016)



Current researches

- Resistance screening and fungicide efficacy being examined (SARDI)
- Developing an efficient and reliable screening methodology based on artificial inoculation (SARDI)
- Understanding source and behaviour of the disease in WA environment (DAFWA and SA)
- The value of seed treatments is currently under investigation (CropPro VIC)

Available resources

BRIP collection mostly collected and deposited
by SNeate (Yu Pei Tan)

| | |
|-----------------------------|------------|
| <i>E. darliae</i> | - Qld, 125 |
| <i>E. Pseudodarliae</i> | - SA, 15 |
| <i>E. tritici-australis</i> | - VIC, 1 |
| | - SA, 89 |
| | - NSW, 1 |

Total = 231

Summary

The disease has been in existence for almost 20 years and yet we know very little about the:

- host range
- infection process
- exact conditions that lead to disease
- distribution of the disease in the region
- resistance status of cultivars
- cultural control methods
- effectiveness of fungicides

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