



Department of  
Agriculture and Food



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# *Pratylenchus teres*- WA's home grown Root Lesion Nematode (RLN) and its unique impacts on broadacre crops

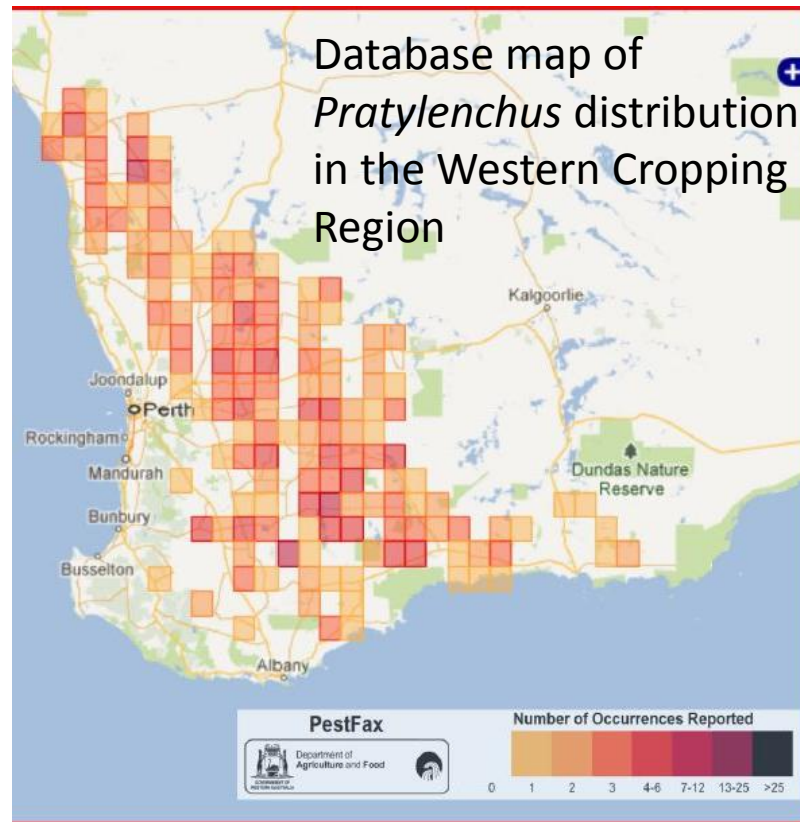
Sarah Collins

25/02/13



# Root Lesion Nematode (*Pratylenchus*) in WA

- RLN in **~60%** of paddocks....
- **5.3M** ha!
- Yield limiting in 40%
- Yield penalties can be **\$20-60/ha**
- **\$190 million** p.a. across SA & WA



# Root Lesion Nematode (*Pratylenchus*) in WA

If RLN is in at least 65 % of paddocks what is the breakdown ?



- 89 % - *P. neglectus*
- **22 %** - ***P. teres***
- 12 % - *P. thornei*
- 20 % - mixed RLN species
- *P. penetrans* rare but damaging

According to more recent data gained from 'focus paddocks' in 2010-2011

# Why should you care if RLN is in a paddock?



- Very wide host range
- Numbers can become yield limiting quickly where conditions are right
- RLN is not effectively managed with one break crop if numbers are high
- Cannot be controlled but can be managed
- No effective nematicides



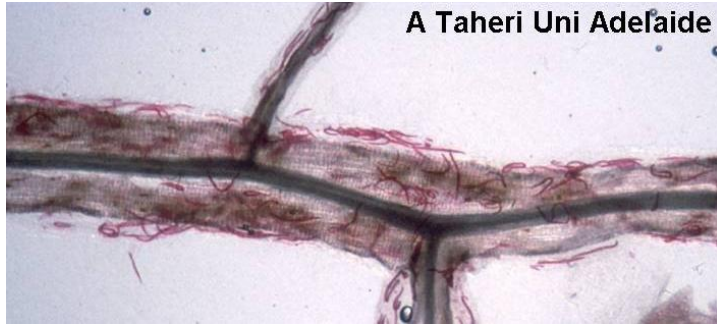
# RLN...Where is it? What is it?

- concentrated in top 15cm
- Dehydrate and survive over summer in dry soil & roots
- Become active after rain and invade roots
- Multiple breeding cycles per season (at least 3)



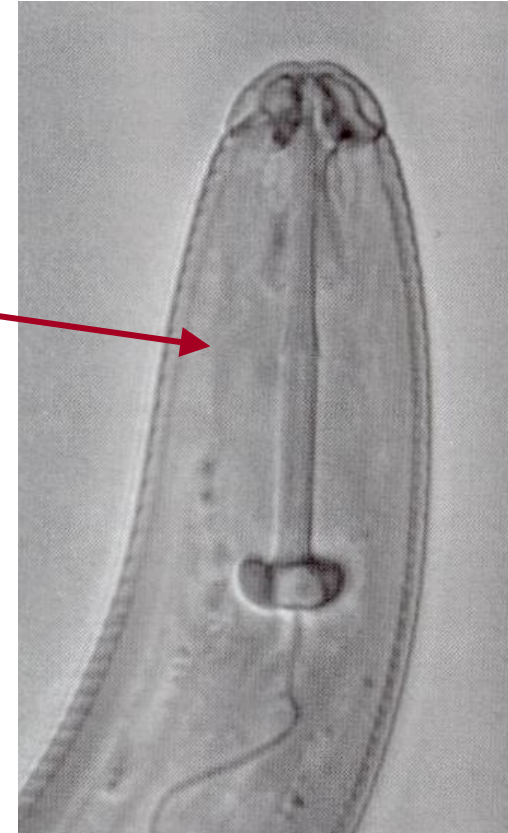
S Kelly DAFWA

# *Pratylenchus* in plant roots



**HEAD**

**Stylet** or  
“spear” for  
puncturing  
root cells  
and  
extracting  
contents



**Eggs**      **Female**



**Root**





# Crop symptoms

**WAVY  
UNEVEN**



**CHLOROTIC  
STUNTED**



**PATCHY**



# Factors increasing *Pratylenchus* in soil

- Susceptible crops in succession
- Reduced soil disturbance ?
- Below average rainfall ???
- Volunteer hosts / weeds ?
- Early sowing ?





# Crop losses caused by RLN

**Losses: 10-30% *P. neglectus***

**15-20% *P. thornei***

**May be even higher for *P. teres***

But variable and depends on:

- Nematode level
- Nematode species
- Rotation
- Crop tolerance / variety
- Seasonal & paddock conditions (e.g. moisture, nutrition, time of sowing)



A Taheri Uni Adelaide

# Why should you care which **species** of RLN is in a paddock?



- Two main RLN species in WA = *P. neglectus* (65%) & *P. teres* (15%)
- Symptoms identical BUT hosts and rotations are NOT
- Very wide host range
- Cannot be controlled but can be managed

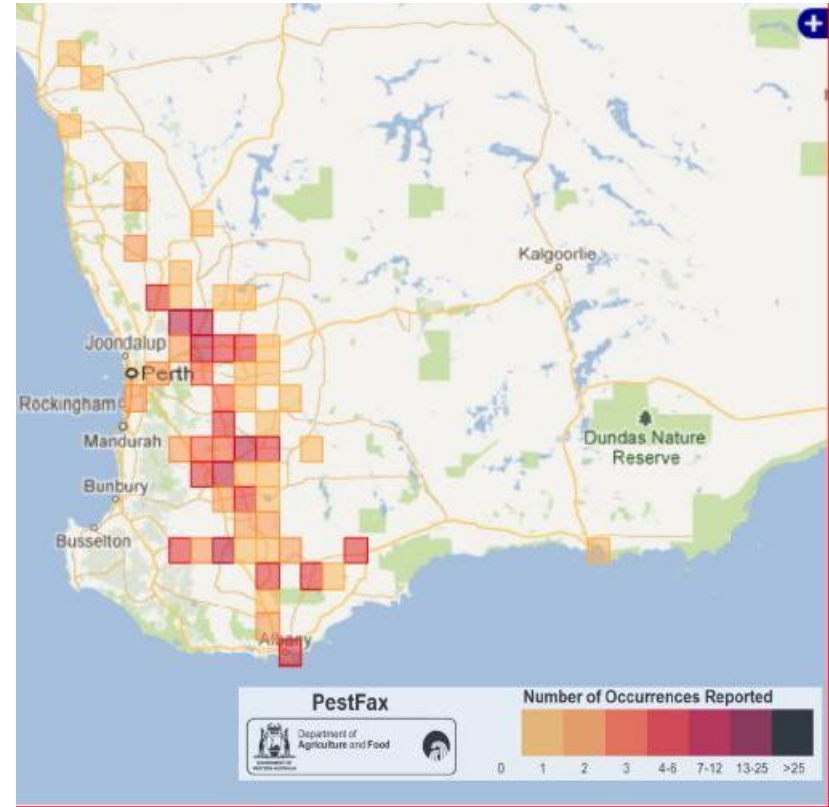


# Hosts

| Hosting ability | <i>P. neglectus</i>   | <i>P. teres</i>               |
|-----------------|---|-------------------------------|
| Susceptible     | wheat, canola,<br>chickpea, mustard   | wheat, barley, oat,<br>canola |
| Moderate        | barley, oat,<br>durum wheat, vetch  | narrow-leaved lupin           |
| Resistant       | field pea, narrow-<br>leaved lupin, faba<br>bean, triticale, lentil,<br>serradella, sulla | ?                             |

# *P. teres*...Where is it? What is it?

- RLN research began in earnest in WA during the mid 90's
- *P. teres* was grouped with *P. thornei* until 2001
- Unique WA nematode





# DAFWA research – Field trials

- 2009, Resistance to *P. teres* assessed at Katanning
  - 22 wheat, 21 barley and 12 canola cultivars
- 2011/12, Resistance/tolerance trial near Toodyay
  - 1<sup>st</sup> yr – *P. teres* resistant and susceptible cultivars were sown in plots to manipulate nematode levels to produce ‘high’ and ‘low’ populations
  - 2<sup>nd</sup> yr – 24 wheat cultivars were compared for resistance and tolerance



# Tolerance vs. Resistance

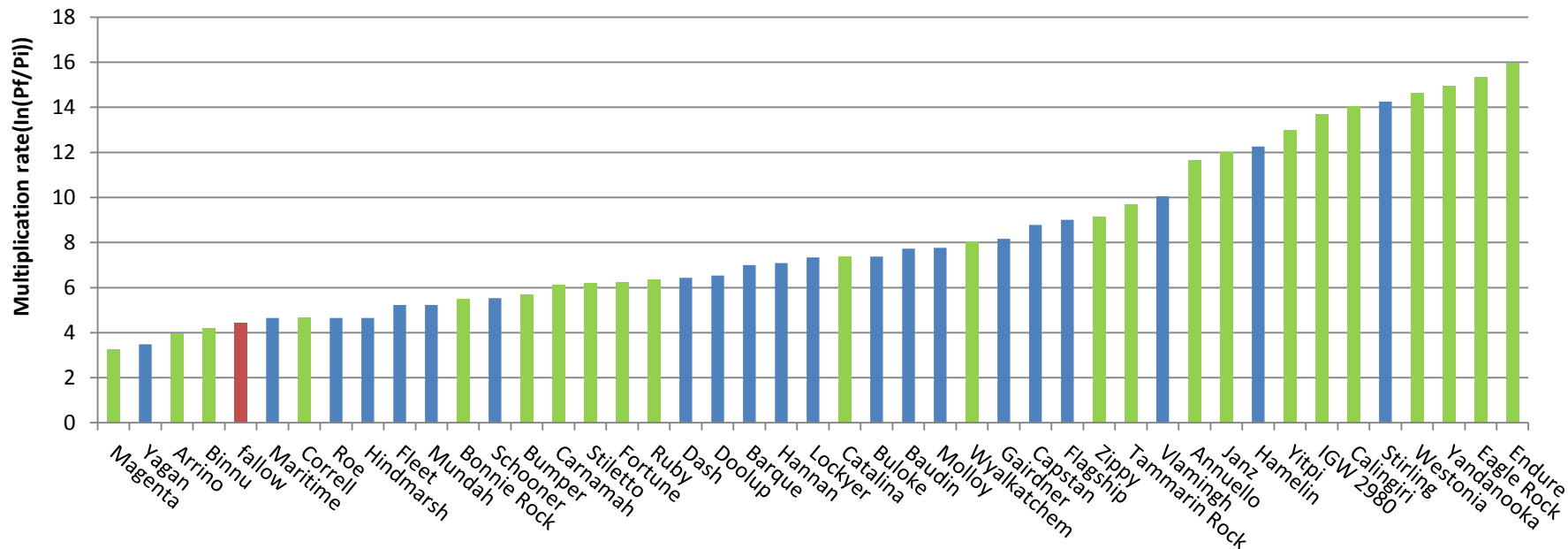
- **Resistance = effect of the plant on the nematode**
  - so resistant plants inhibit nematode reproduction, resulting in declining nematode numbers (multiplication  $>1$  indicates a susceptible cultivar)
- **Tolerance = effect of the nematode on plant growth**
  - larger the yield difference, the more intolerant the cultivar
  - Tolerant varieties have little difference in yield between the 'high' and 'low' nematode populations



# DAFWA research – Katanning 2009

- 22 wheat, 21 barley – the bad news...increases in *P. teres* across the board

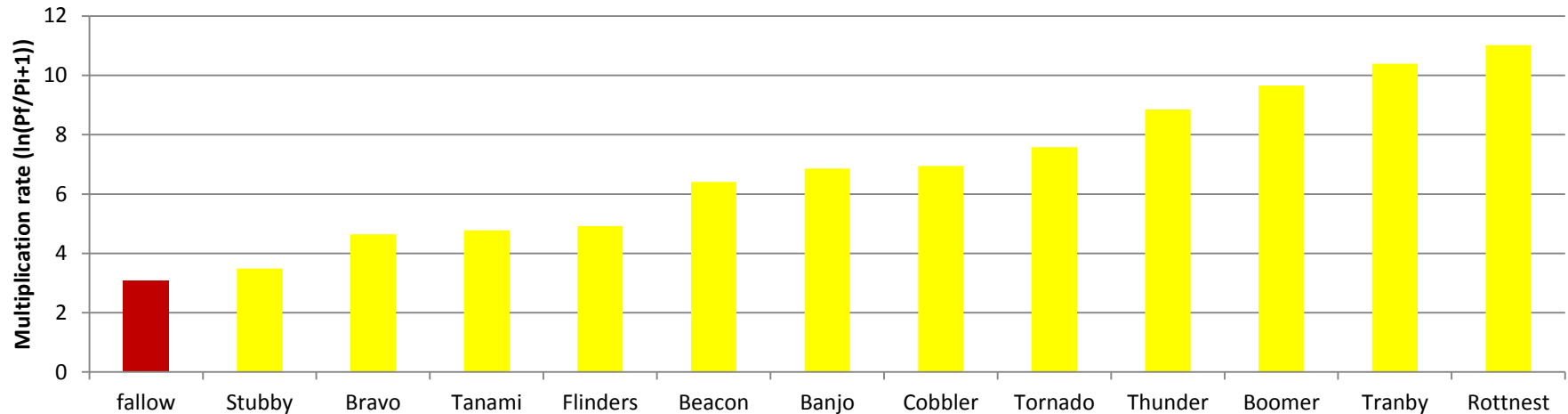
Multiplication of *P. teres* on cereal varieties (2009)



# DAFWA research – Katanning 2009

- Canola – similar news...increases in *P. teres*

Multiplication of *P. teres* on canola varieties (2009)





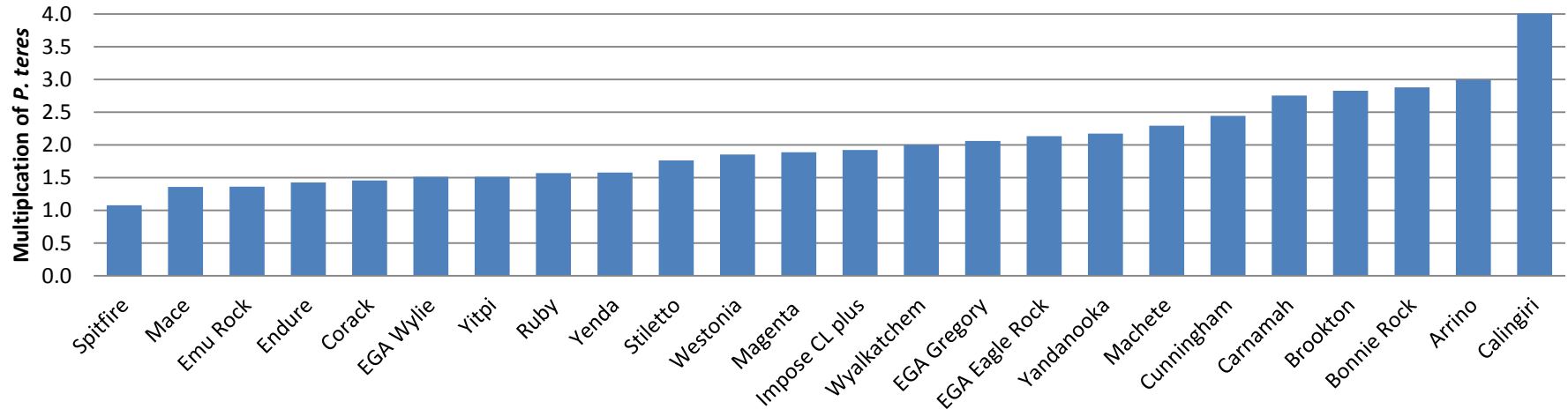
# *P. teres* resistance and tolerance trial 2012:

## Resistance results

- AVERAGE YIELD = 4 t/ha
- Dry July – 14mL compared to 102mL in average year
- 150mL less rainfall for season than average



*P. teres* multiplication on wheat at Resistance/tolerance trial Toodyay 2012



# *P. teres* resistance and tolerance trial

## 2012: Tolerance results

- 8 of 24 varieties tested were intolerant to *P. teres*
- Calingiri, Brookton, Carnamah, Arrino, Machete susceptible/ intolerant varieties
- Emu Rock may be only moderately susceptible but very intolerant to *P. teres*
- Yitpi and Mace may be more resistant and tolerant

| Cultivar    | Percent yield loss<br>(P-value >0.01) |
|-------------|---------------------------------------|
| Arrino      | 12                                    |
| Carnamah    | 24                                    |
| Emu Rock    | 24                                    |
| Mace        | 0                                     |
| Magenta     | 0                                     |
| Westonia    | 12                                    |
| Wyalkatchem | 0                                     |
| Yitpi       | 0                                     |

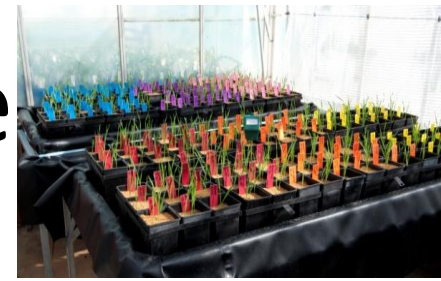


# DAFWA research - Glasshouse

- Testing new & current varieties
- Controlled environment
- Reproduction of *P. teres* is assessed for wheat, barley, canola, field pea and lupins
- Ongoing assessments



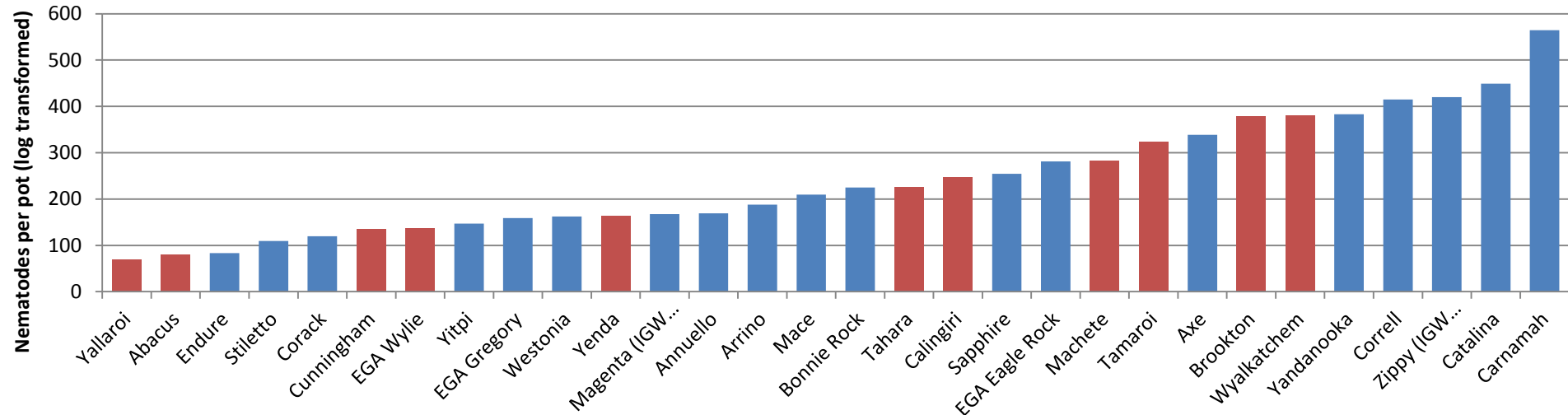
# DAFWA research - Glasshouse



*P. teres* resistance trial for 30 wheat varieties

- DESIGN: 20 wheat varieties + *P. neglectus* 10 standards x 6 reps

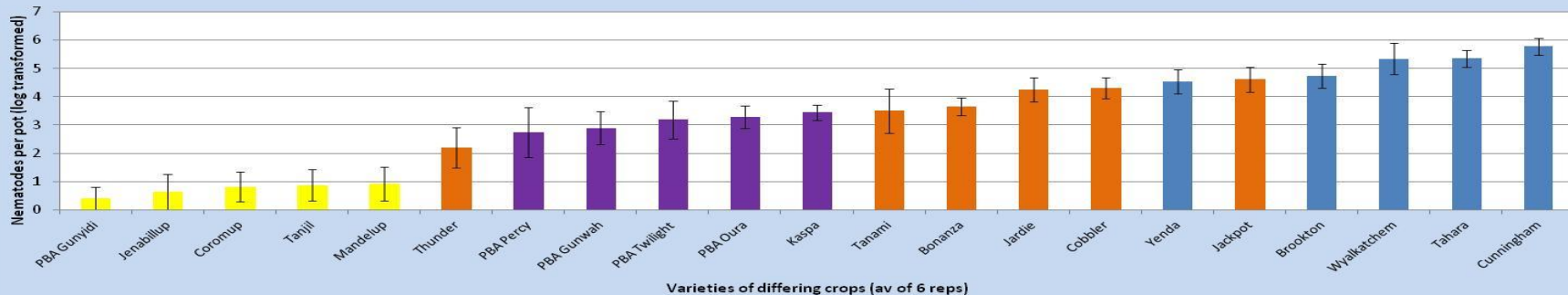
Glasshouse assessment wheat variety resistance to *P. teres* conducted in 2012



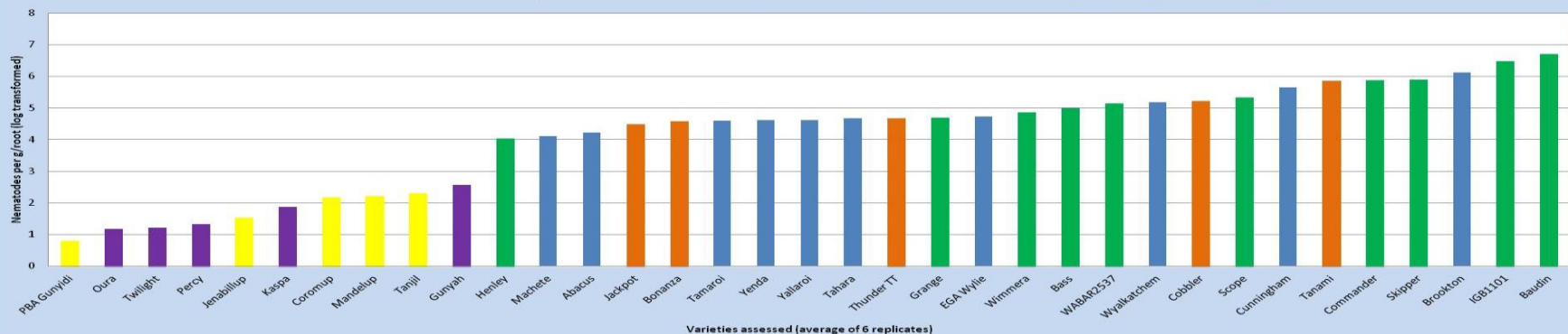


# DAFWA research - Glasshouse

Glasshouse assessment *P. teres* multiplication for wheat, lupin, field pea and canola varieties



Glasshouse assessment of multiplication of *P. teres* on varieties of canola, field pea, lupin, barley and wheat



# DAFWA research - Glasshouse

‘Most resistant’ and ‘most susceptible’ cultivars of common crops to  
*Pratylenchus teres*

| Crop      | Resistance | ‘Most resistant’ cultivars tested                              | ‘Most susceptible’ cultivars tested                                    |
|-----------|------------|--|--|
| Lupin     | R          | -  | -  |
| Field pea | R - MR     | -  | -  |
| Canola    | S          | -  | -  |
| Barley    | S          | Mundah <sup>n</sup>  | Stirling <sup>n</sup> , Vlamingh <sup>n</sup> , Baudin <sup>n</sup>    |
| Wheat     | S          | Mace <sup>Δ</sup> , Yitpi <sup>Δ</sup> , Stiletto <sup>Δ</sup> | Calingiri <sup>Δ</sup> , Carnamah <sup>Δ</sup> , Catalina <sup>Δ</sup> |

Note: Provisional results based on: 2 trials = <sup>n</sup>, 3 or more trials = <sup>Δ</sup>



# Key messages

- Root Lesion Nematode has a broad distribution WA
- *Pratylenchus Teres* is also broadly distributed, is unique to WA, has a wide host range and is capable of causing significant yield damage
- Need to know which species of RLN are present as cultivar resistance varies between nematode species
- Crop rotation and resistant cultivar selection are the keys to management
- Ongoing DAFWA research is needed to develop rotational recommendations through the characterization of cultivar and crop resistance & tolerance levels





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# Questions?

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