Department of Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

CSIRO

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Long Coleoptile Wheat on Ameliorated Soils

Stephen Davies, Muhummad Javid, Andrew Blake, Ranny Wilkins, Greg Rebetzke

Integrating long coleoptile wheat into Australian farming systems through an integrated understanding of genetics, management and environment. Led by Dr Greg Rebetzke, CSIRO

Stephen.Davies@dpird.wa.gov.au

Constrained ‘sandplain’ soils of south-west WA

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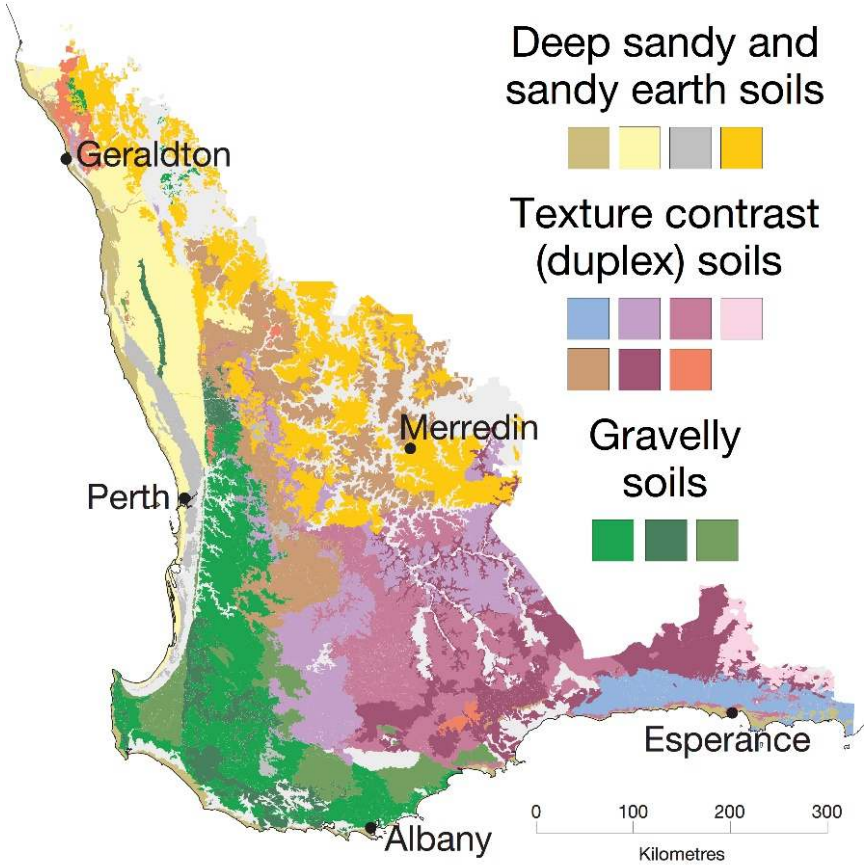
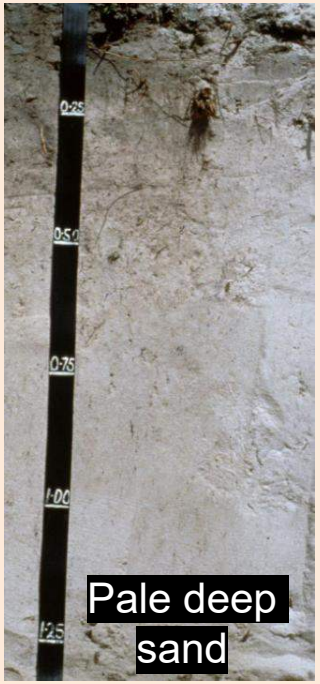
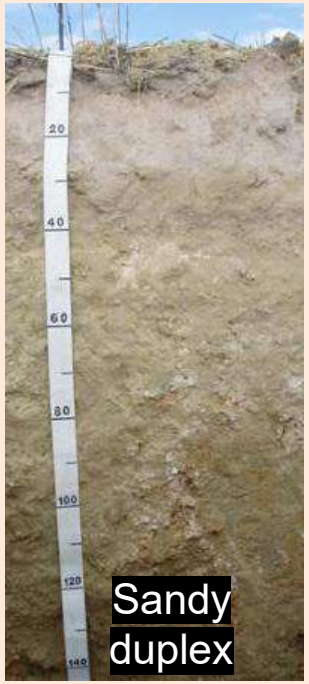


~13M hectares cropping soils





Soil constraints: acidity; compaction; soil water repellence; sodicity; poor water holding; salinity

>$2B grain production lost annually

Dr Stephen Davies DPIRD WA | Stephen.Davies@dpird.wa.gov.au

Strategic Deep Tillage WA

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Rotary Spading

Modified One-way Plough

Mouldboard Plough

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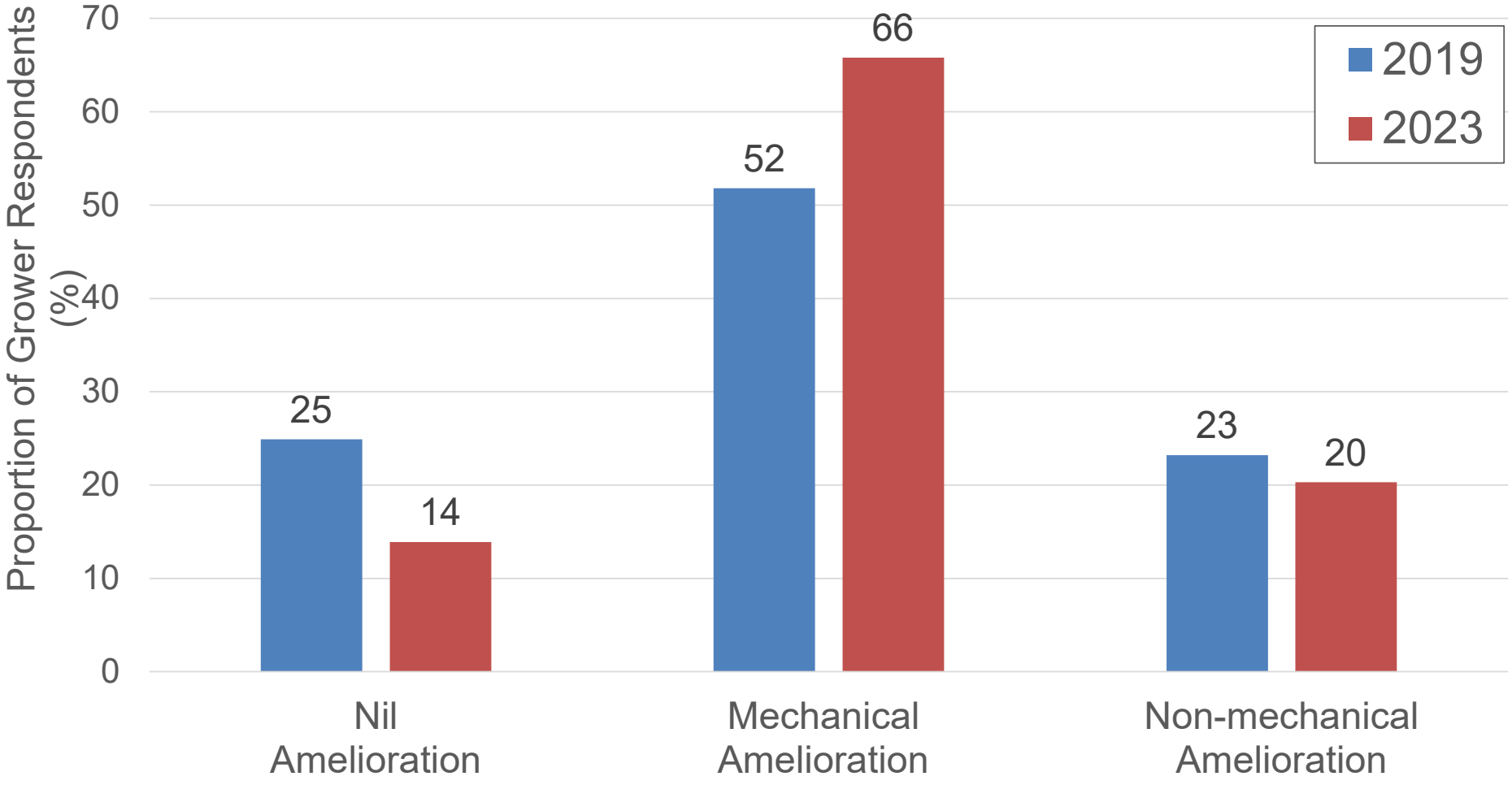
Grower Adoption



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Cereal establishment on freshly ameliorated soils

- Crop establishment risks
  - Seeding depth control
  - Furrow infill
  - Surface crusting/soil strength
  - Herbicide damage
  - Rapid topsoil drying

- Long coleoptile wheat field experiments
  - Ogilvie 2022
  - Merredin and Yuna 2023
  - Merredin and Yuna 2024

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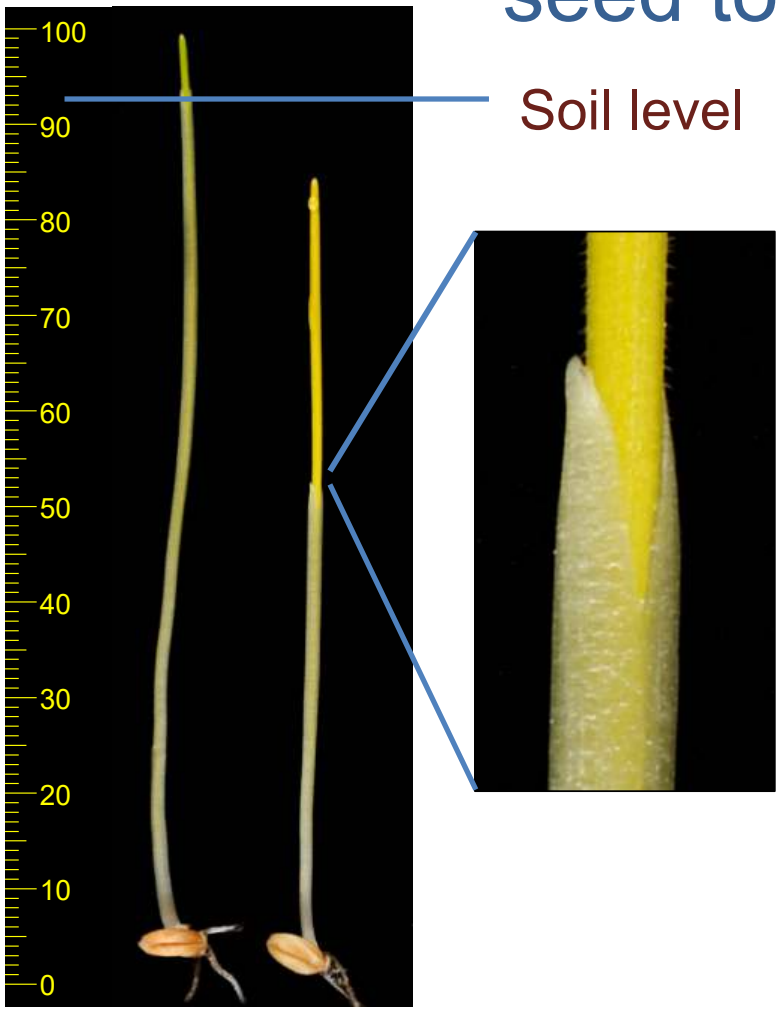
The coleoptile provides the link from seed to soil surface



tall *dwarf*

- Coleoptile length determines how deep seed can be sown.
- Two sets of genes affect coleoptile length:
  - ‘Larger cell and faster growth’ genes
  - Dwarfing genes

Images courtesy Dr Greg Rebetzke, CSIRO

Stephen.Davies@dpird.wa.gov.au

2023 Field Experiments – Merredin and Yuna

Variety	Coleoptile length*	Seeding depths	Soil treatments	Reps
1. Scepter	Short	1. Shallow (4 cm)	1. Nil	4
2. Calibre	Mid-long	2. Deep (10 cm)	2. Ripped	
3. Mace	Medium		3. Spaded	
4. Mace-18	Long			

Sowing date: Merredin – 26 May; Yuna – 2 June

* Indicative coleoptile length classification

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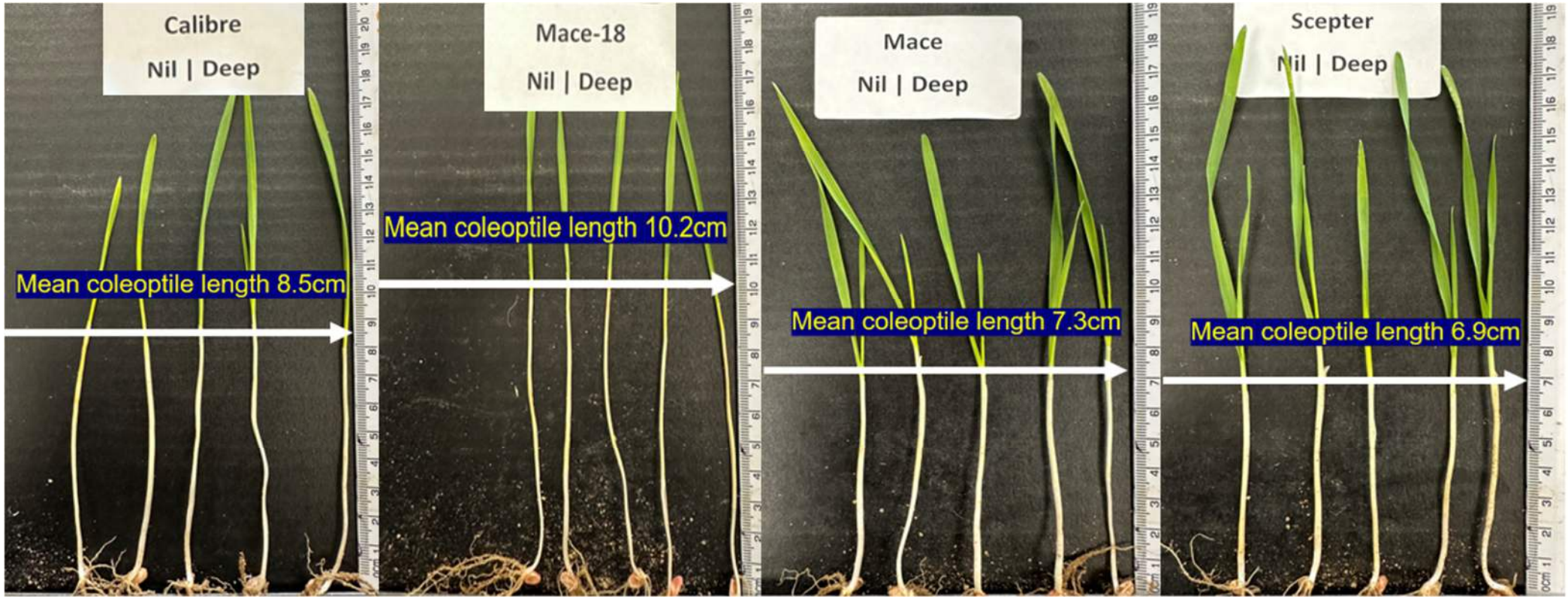
2023 Merredin coleoptile field expression



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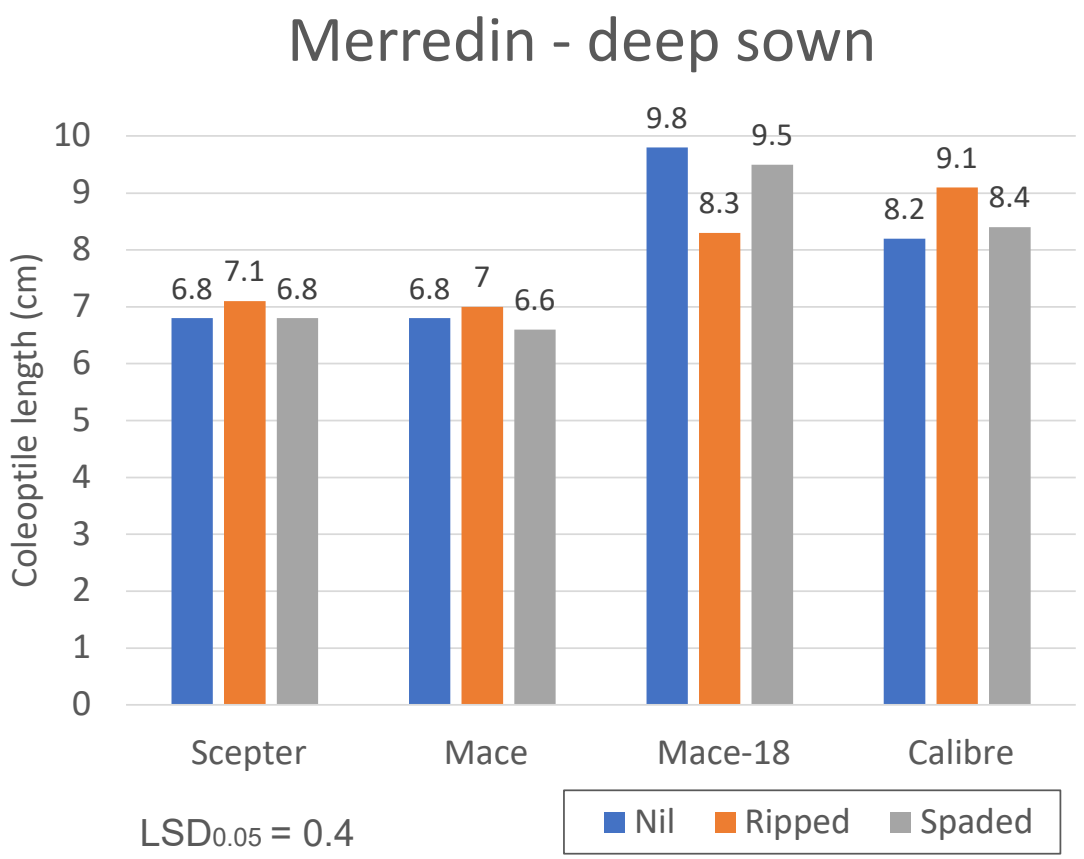
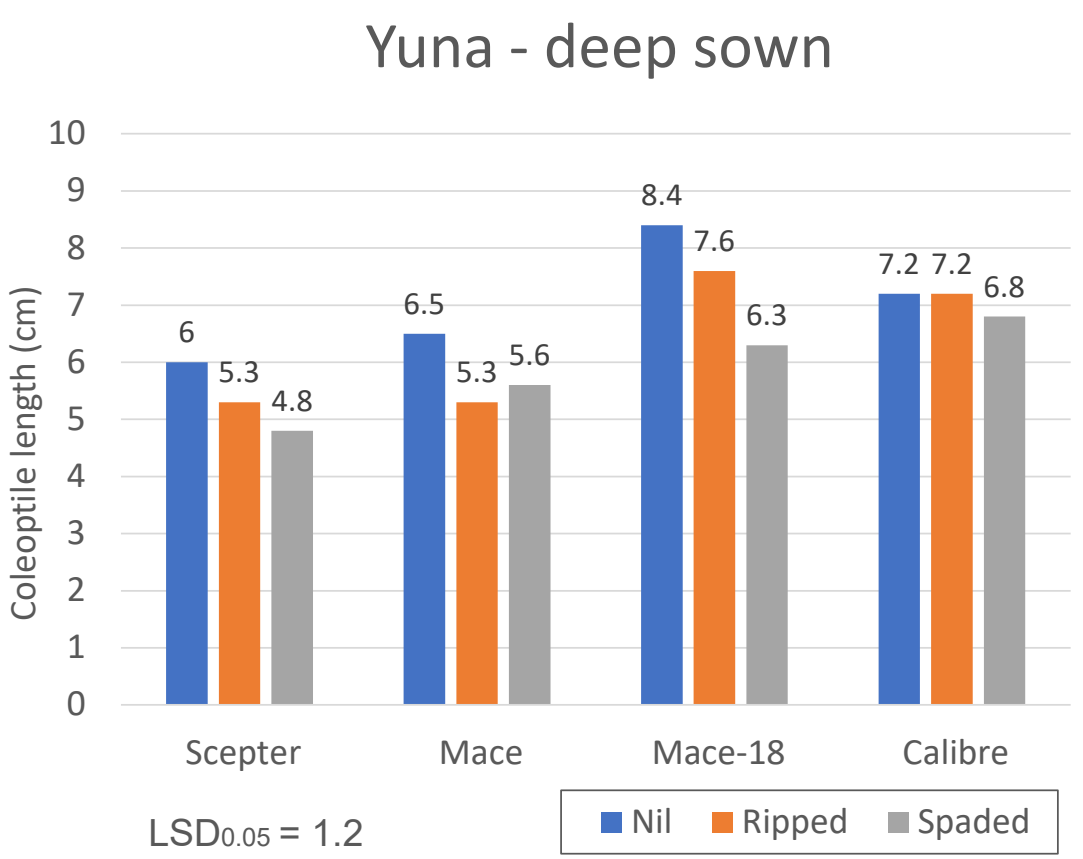
Field expression of coleoptile length – 2023





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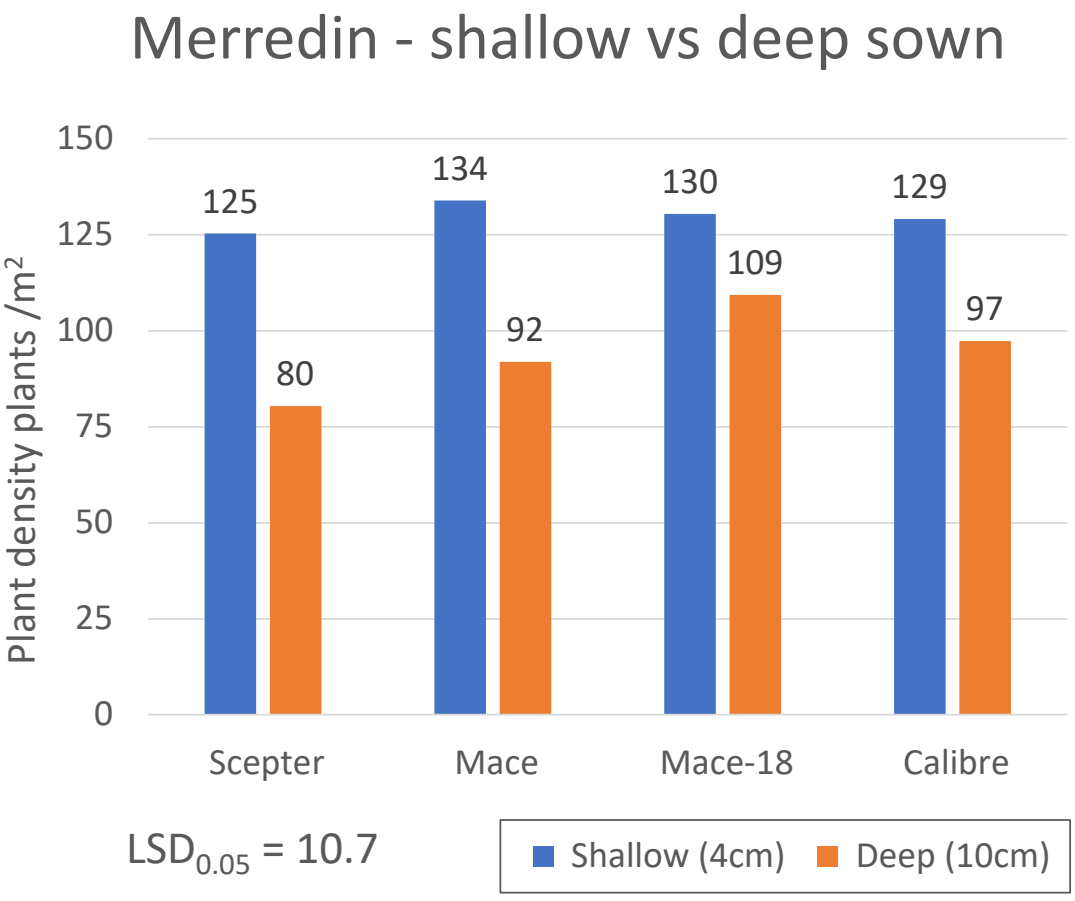
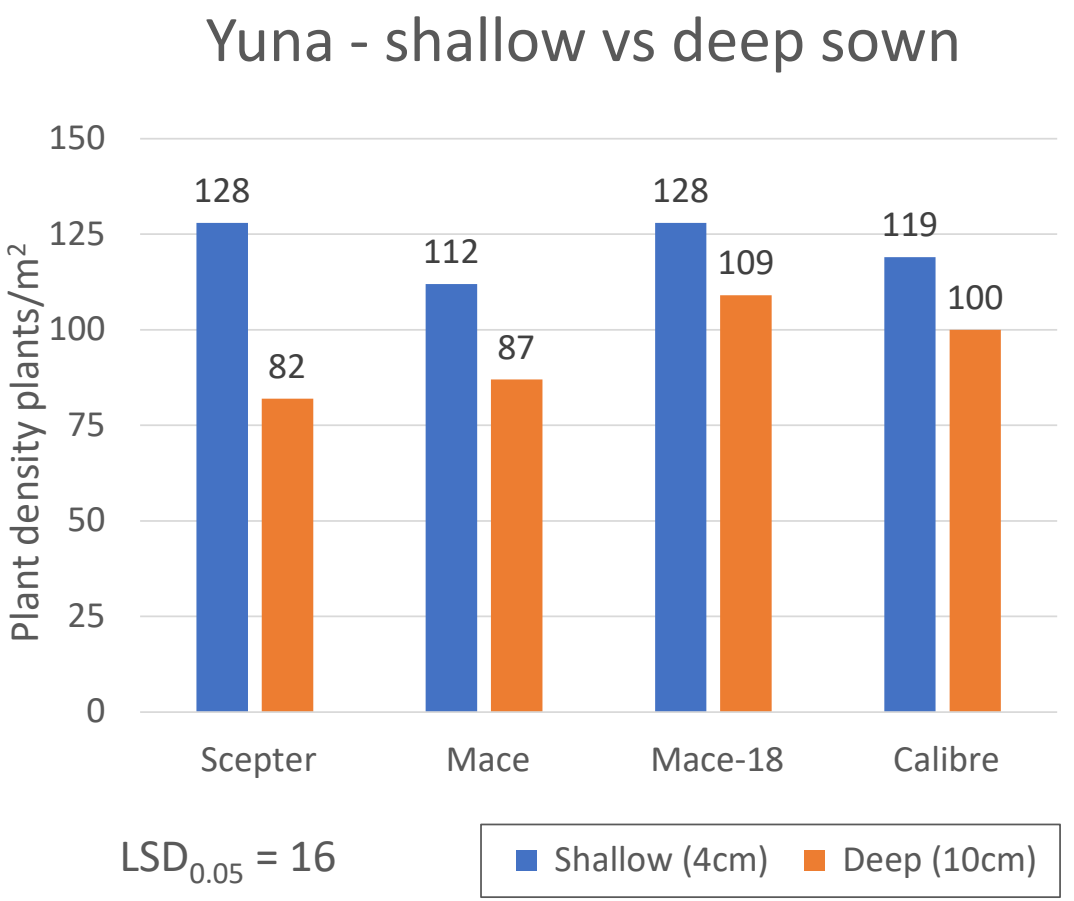
Plant density (no./m^2) – 2023





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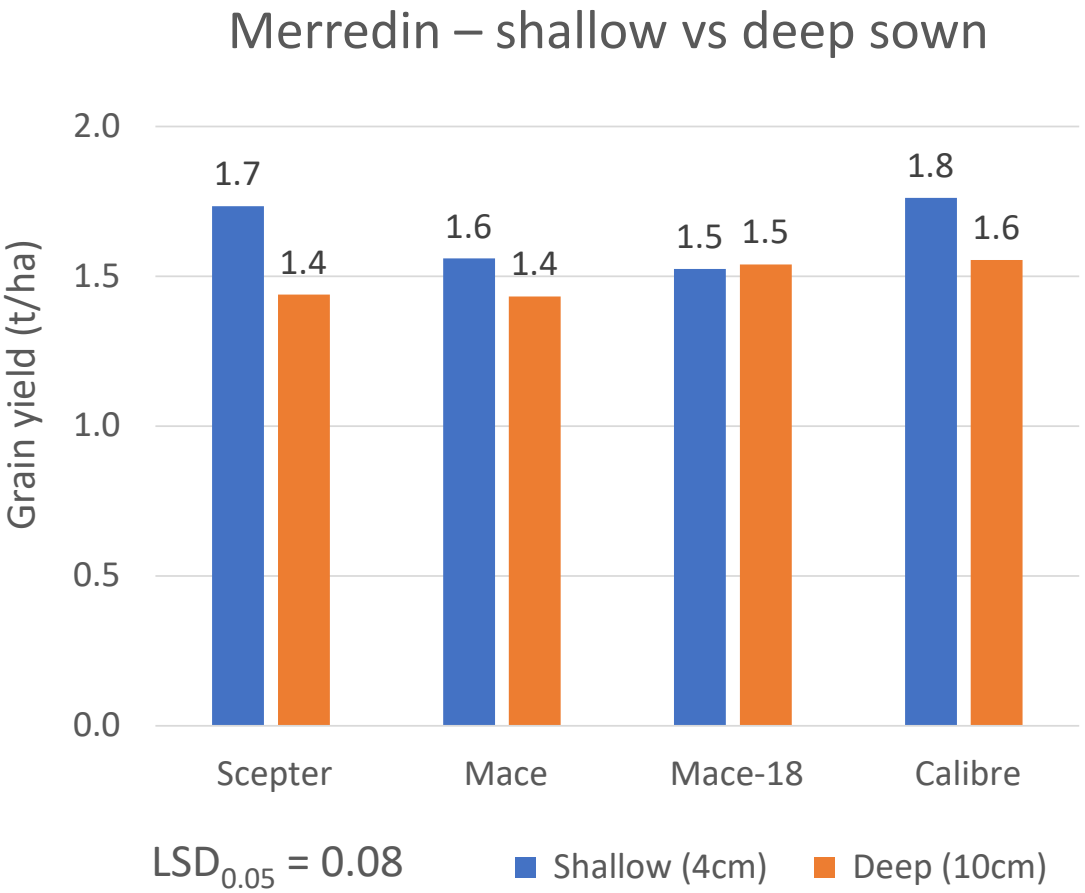
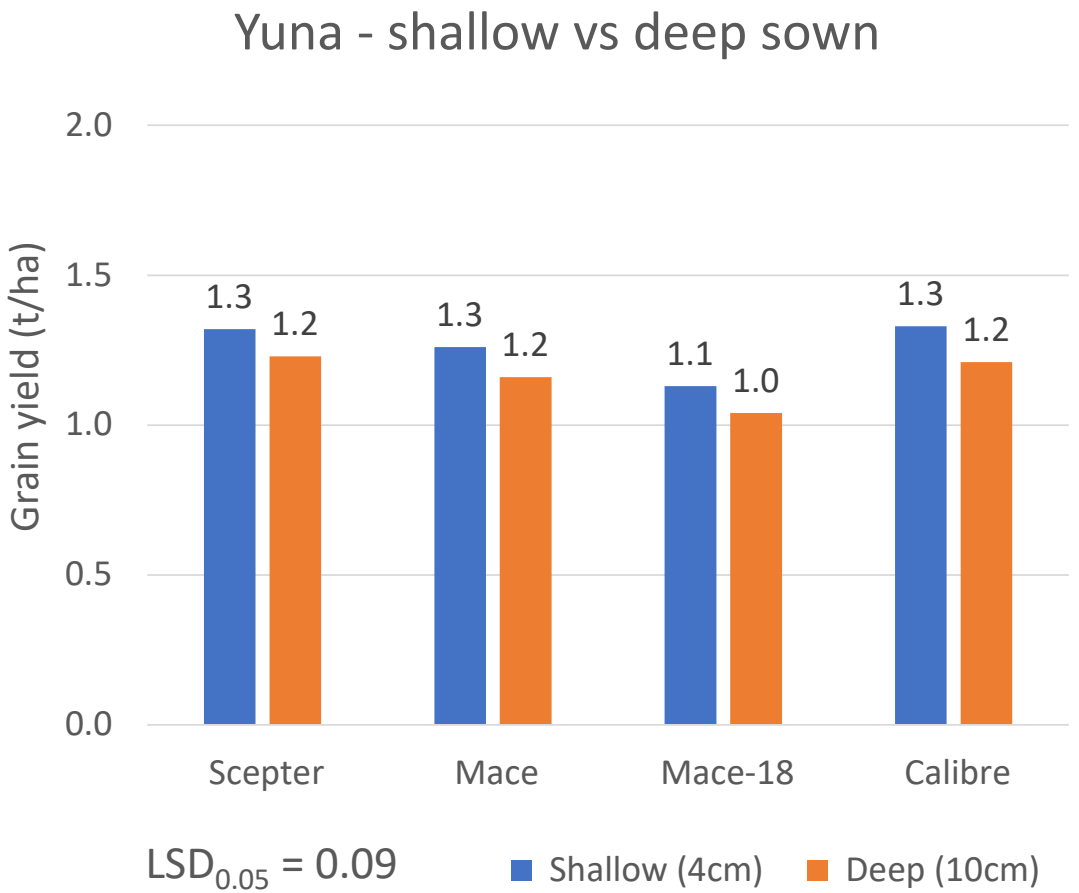
Grain yield response to seeding depth – 2023





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Yuna 2024

12 July 2024

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Long coleoptile wheat can help ensure effective crop establishment on ameliorated soil

The long coleoptile trait for deep sown wheat results in:

1. 20-30 more plants per square metre
2. Nil or reduced yield losses when deep sown compared to shallow sowing
3. More rapid ground cover development
4. Improved crop competition with weeds

Deep Sown on Spaded Soil

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Thank You

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