



SA grain growers funding research solutions

S419 Improving the Early Management of Dry Sown Cereal Crops
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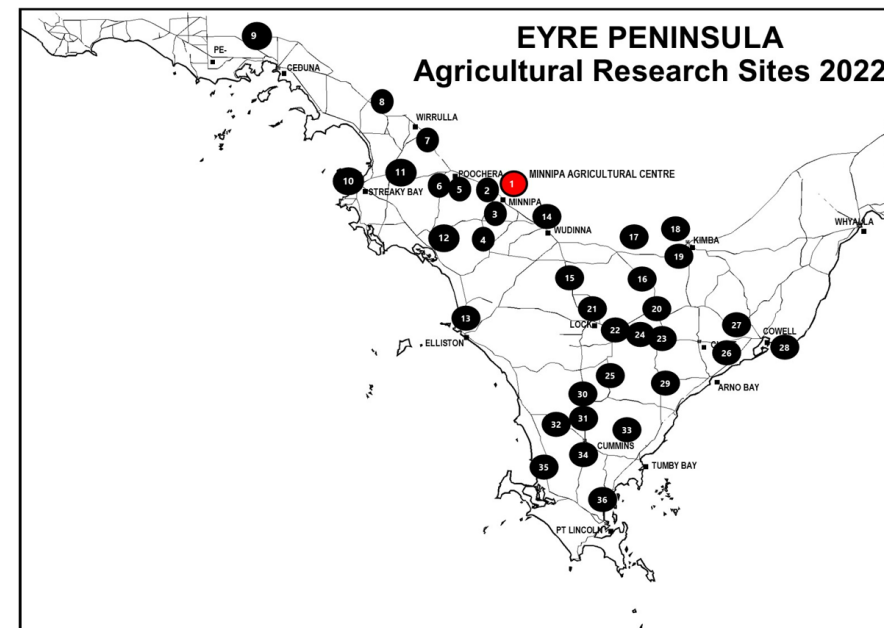
July 5, 2023



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SARDI Minnipa Agricultural Centre

- 1100 hectare property, established in 1915 - 108 years of working with growers
- Combines commercial broad-acre cropping and livestock programs with research activities
- Delivers agricultural research across Eyre Peninsula
- 15 staff plus casual staff
- Annual rainfall of 325 mm, growing season rainfall of 242 mm



S419 Improving the Early Management of Dry Sown Cereal Crops

Why do the research?

- With larger seeding programs more growers are trying dry sowing.
- On upper EP in 2017 and 2018, limited soil moisture at seeding resulted in lower plant establishment.
- This raised questions about the soil factors which reduce germination and establishment.
- This research assessed the impact of management on wheat seed establishment on three different soil types in field trials and pot experiments for the impact of;
 - Nitrogen and Phosphorus fertiliser type and fertiliser placement
 - herbicides
 - seed dressings.



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From 2019 to 2021 replicated field trials were undertaken each year at Minnipa

- red loam and sand

and at Streaky Bay and Cungena

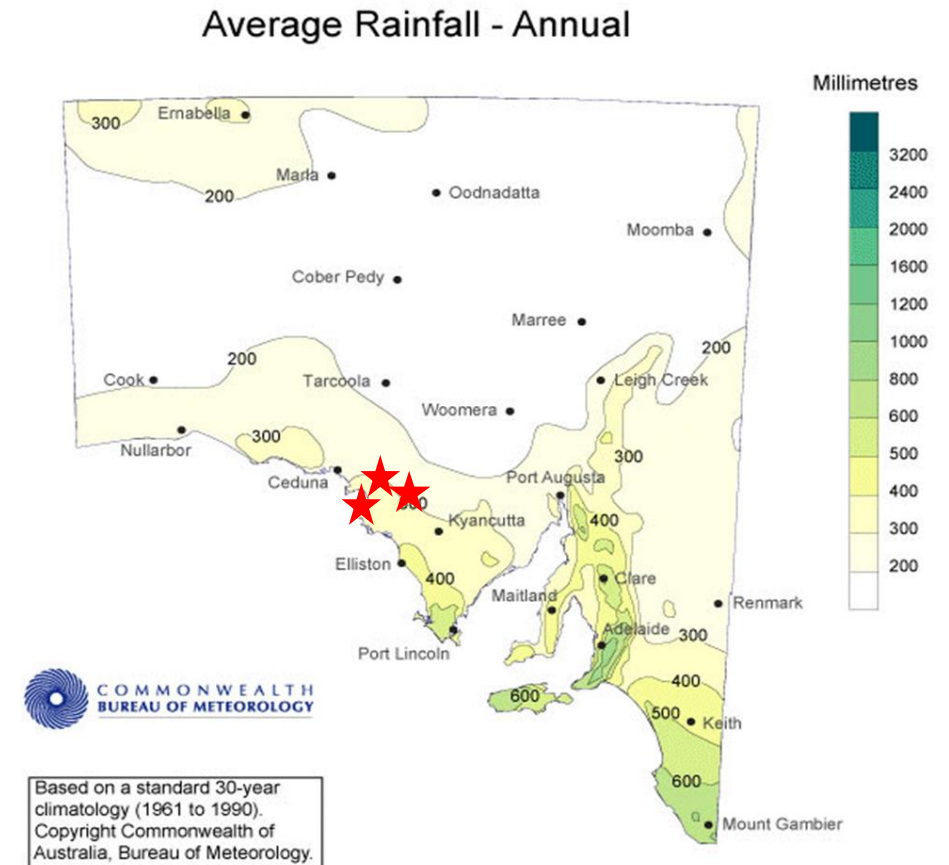
- grey calcareous sandy loam

- Each site had two trials (fertiliser placement and management)
- Razor CL Plus wheat aiming for 180 plants/m².

- Different fertiliser treatments were applied in field trials to assess the impact of nitrogen and phosphorus fertiliser type and fertiliser placement on dry sown cereals.
- The management trial at each site assessed the impact of herbicides and seed dressings on dry sown cereals.

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- The trials were sown with a small plot seeder on 25.5 cm (10") row spacing with Harrington points and press wheels.
- The seeder had the ability to sow the fertiliser either with the seed or deeper (3 cm separation), or the fertiliser could be split (50% with seed: 50% below the seed) or delivered as a fluid fertiliser system.



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2020-21 Sowing (dry sown vs break /wet conditions) x fertilisers (9 treatments)

- Nil – Control (no fertiliser)
- 60 kg/ha DAP (diammonium phosphate, 18:20:0:0) with the seed
- 60 kg/ha DAP below the seed
- 80 kg/ha DAP with the seed
- 80 kg/ha DAP below the seed
- 54.5 kg/ha MAP (monoammonium phosphate, 10:22:0:1.5) and urea (5.35 kg N/ha to balance nitrogen with 60 kg/ha of DAP) with seed
- 54.5 kg/ha MAP with seed and urea below the seed (5.35 kg N/ha to balance nitrogen)
- 60 kg/ha DAP split; 30 kg/ha with the seed and 30 kg/ha below the seed (deep)
- Phosphoric acid (12 kg P/ha) and urea (10.8 kg N/ha) with the seed.



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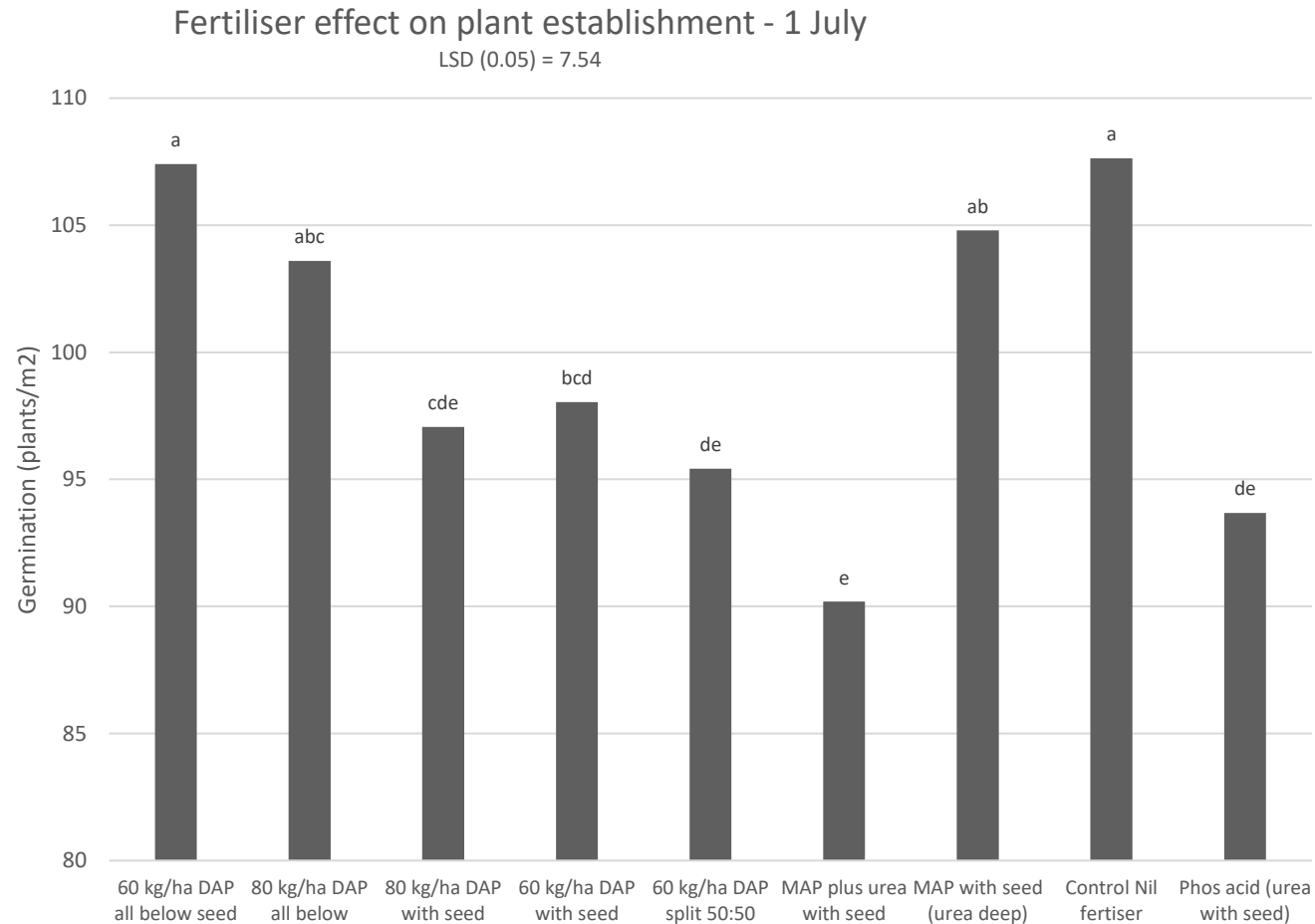
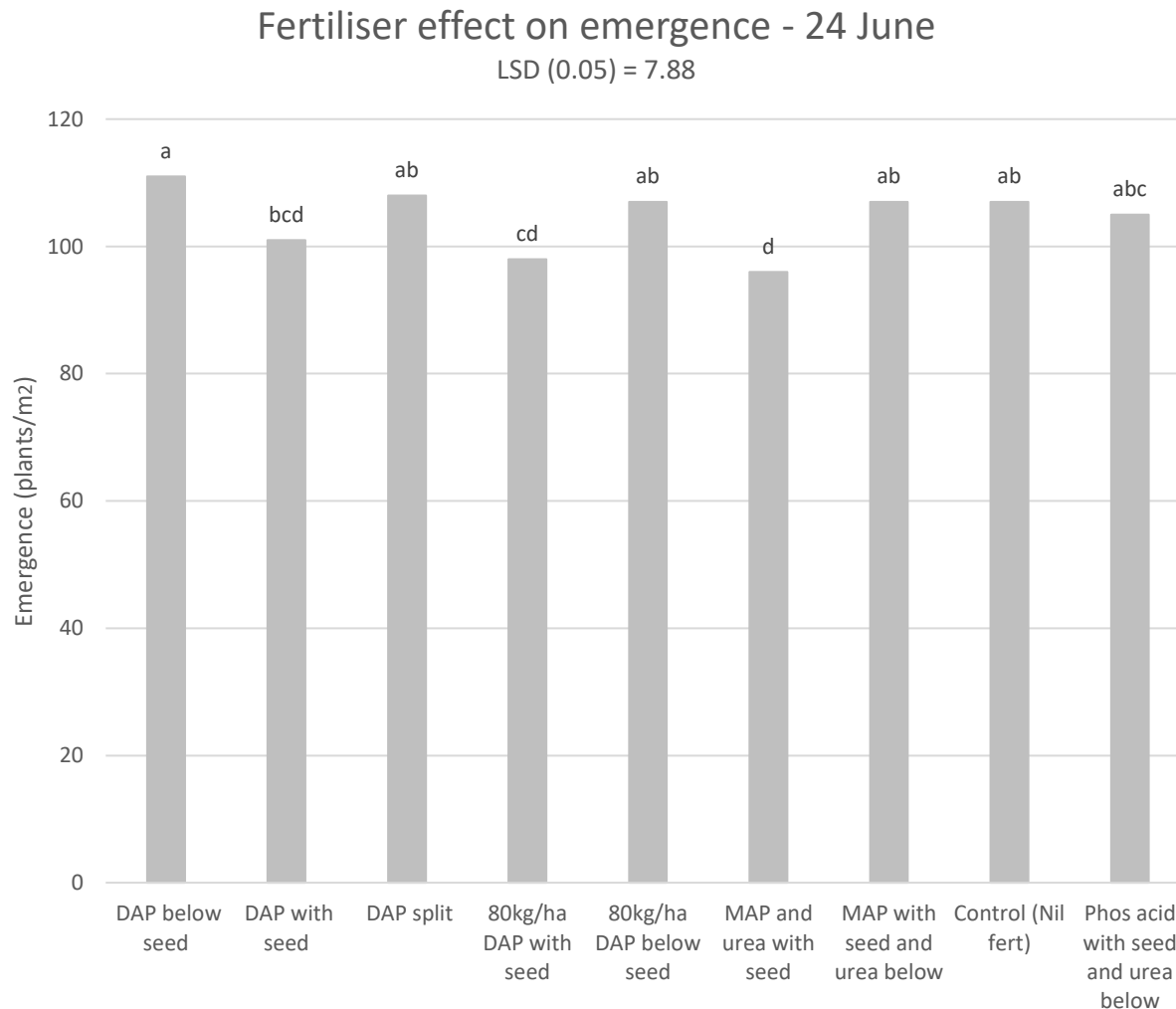


Figure 2. Plant establishment of CL Razor wheat over the three trial site locations with given fertiliser treatments on 1 July, 2020. (LSD (P=0.05) = 7.5).



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- Overall plant establishment was lower than the targeted 180 plants/m²
- Placing urea with the seed reduced plant establishment.
- Greater plant establishment was achieved with fertiliser placed 3 cm below the seed.
- Dry sowing improved early dry matter but not necessarily grain yields.

Figure 1. Plant establishment of CL Razor wheat over the three trial site locations with fertiliser treatments on 24 June 2021. (LSD (P=0.05) = 8).



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The management trial at each site assessed the impact of herbicides and seed dressings on dry sown cereals.

- Razor CL wheat and 60 kg/ha DAP with the seed and management options;
- Spartacus CL barley
- Nil – Control (no fertiliser)

Herbicides

- Trifuralin @ 2 L/ha
- Boxer Gold @ 2.5 L/ha
- Sakura @ 118 g/ha

Fungicides

- Baytan
- EverGol
- Uniform plus EverGol
- Tebuconazole @ 50ml/100kg seed
- Flutriafol on fertiliser @ 166ml/100kg DAP

Seed placement and rates

- shallow sowing (2-3 cm)
- deep sowing (6-7 cm)
- higher seeding rate (100 kg/ha)



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- Most herbicides and fungicides evaluated did not impact on plant establishment when dry sowing, with the exception of Trifluralin and Boxer Gold in the sandy soil in 2020 (wind).
- Dry sowing early with barley is a good management option for early plant establishment.
- Sowing seed at a depth to utilise soil moisture for germination is important.
- New long coleoptile wheats may provide an option where soil moisture is available up to 10 cm deep for early plant establishment and vigour.

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Pot experiment 2019 - Fertiliser type and placement

Soil 0-10cm from same paddocks as trial site

Four fertiliser placement treatments were imposed using Diammonium phosphate (DAP, 18:20:0:0) were

- Nil Control (no fertiliser)
- 60 kg/ha DAP with seed
- 60 kg/ha DAP 3 cm below the seed
- split application with 30 kg/ha DAP with seed and 30 kg/ha of DAP 3 cm below the seed.

The equivalent of 60 kg/ha of CL Razor wheat seed was sown at 3 cm below the soil surface, at the equivalent of 22.5 cm (9") row spacing.



2020 DAP at 60 kg/ha with the seed spread in a 3 cm ribbon to replicate a splitter boot system



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Pot experiment 2019 - Fertiliser type and placement

Table 1. Soil type and fertiliser placement effect on % seedling emergence after 11 days.

Fertiliser Placement	Soil		
	Cungena	Streaky Bay	Minnipa
Nil	81	0	88
DAP below seed	63	5	94
DAP split	31	1	70
DAP with seed	10	1	71
LSD (P=0.05)	17		

Table 2. Soil type and fertiliser placement effect on % seedling emergence after 16 days.

Fertiliser Placement	Soil		
	Cungena	Streaky Bay	Minnipa
Nil	97	96	96
DAP below seed	93	97	100
DAP split	89	85	90
DAP with seed	68	58	93
LSD (P=0.05)	10		



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2020 Pot experiment - Fertiliser type and placement on red loam, white sand and grey calcareous sand

- Nil Control (no fertiliser)
- 60 kg/ha DAP with same treatments as 2019
- 60 kg/ha DAP with the seed but spread in a 3 cm ribbon to replicate a splitter boot system
- 54.5 kg/ha MAP with seed and urea (5.35 kg/ha) 3 cm below the seed
- 54.5 kg/ha MAP and urea (5.35 kg/ha) all 3 cm below the seed
- Split application MAP with 27.25 kg/ha MAP with seed and 27.25 kg/ha of MAP and urea (5.35 kg/ha) 3 cm below the seed.
- 32 seeds planted per pot, 3 cm below the soil surface at the equivalent of 22.5 cm row spacing.
- Water was applied at a rate equivalent to 5 mm of rain one week after sowing (23 June), followed by the equivalent of 25 mm of rain two weeks later (1 July).
- To encourage further germination, 50 mm was applied on 6 July and a final 25 mm on 20 July to ensure all viable seed germinated.



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2020 Pot experiment - Fertiliser type and placement

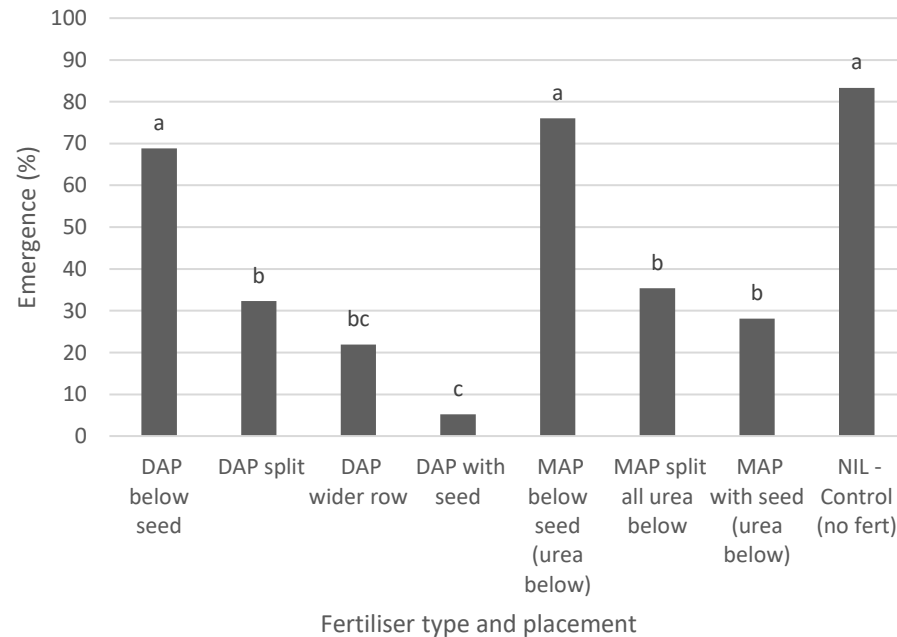


Figure 1. Emergence of wheat 8 days after seeding (% of seeds planted) in a white sand with different fertiliser types and placement. Columns with the same letter are not statistically different at $P=0.05$.

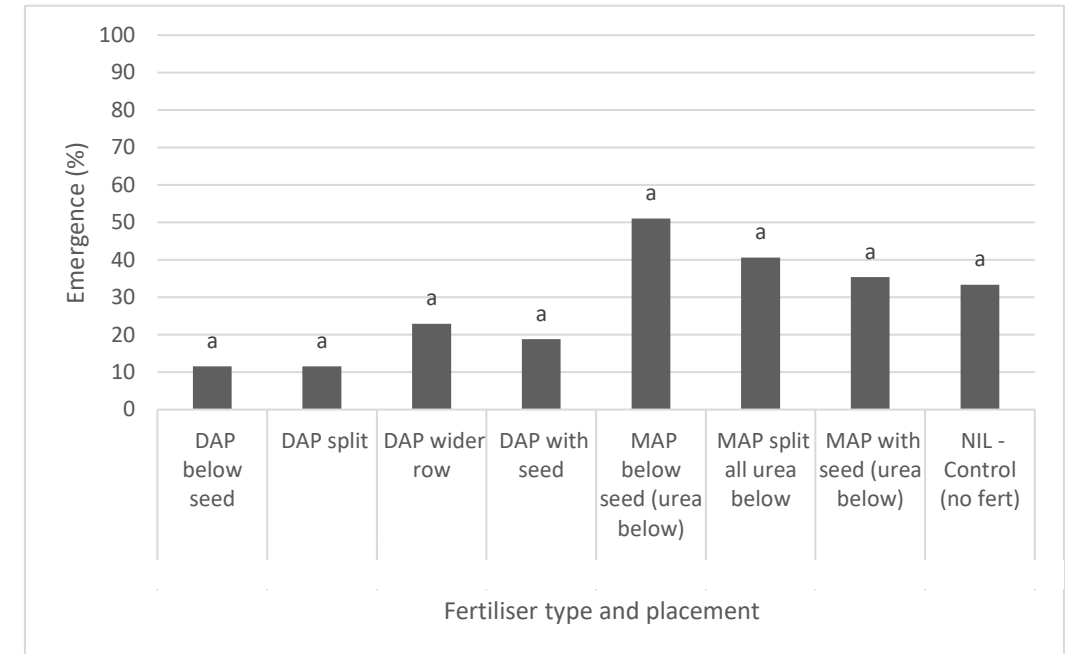


Figure 2. Emergence of wheat after 16 days in a red loam (% of seeds planted) with different fertiliser types and placement. Columns with the same letter are not statistically different at $P=0.05$.

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2020 Pot experiment - Fertiliser type and placement

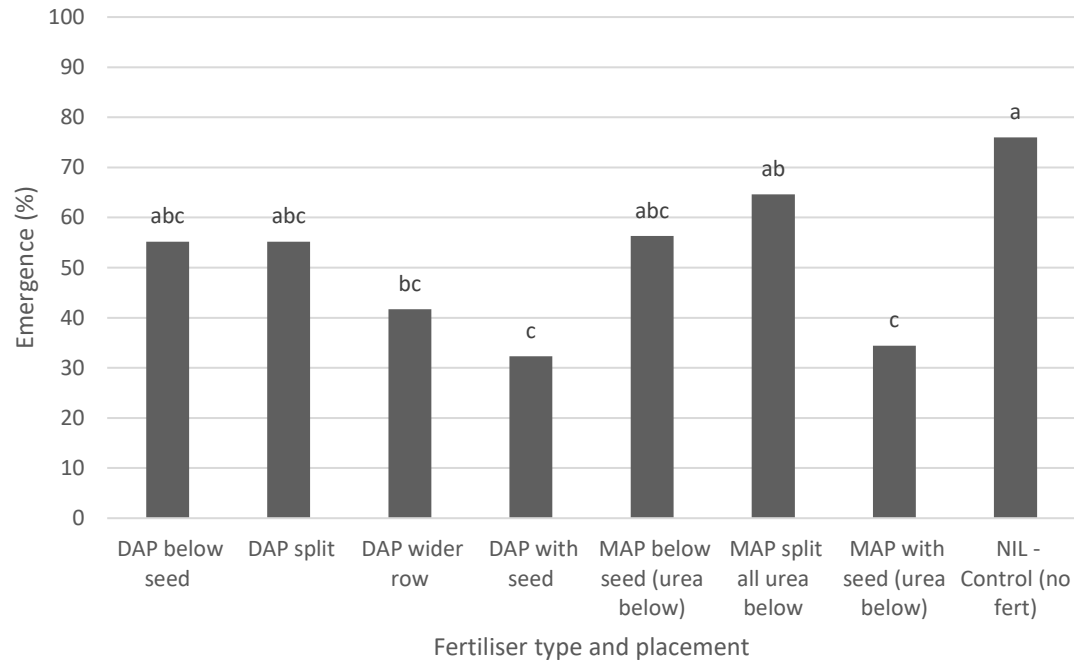


Figure 3. Emergence of wheat 14 days after first emergence (Day 49) in a grey calcareous soil (% of seeds planted) with different fertiliser types and placement. Columns with the same letter are not statistically different at P=0.05

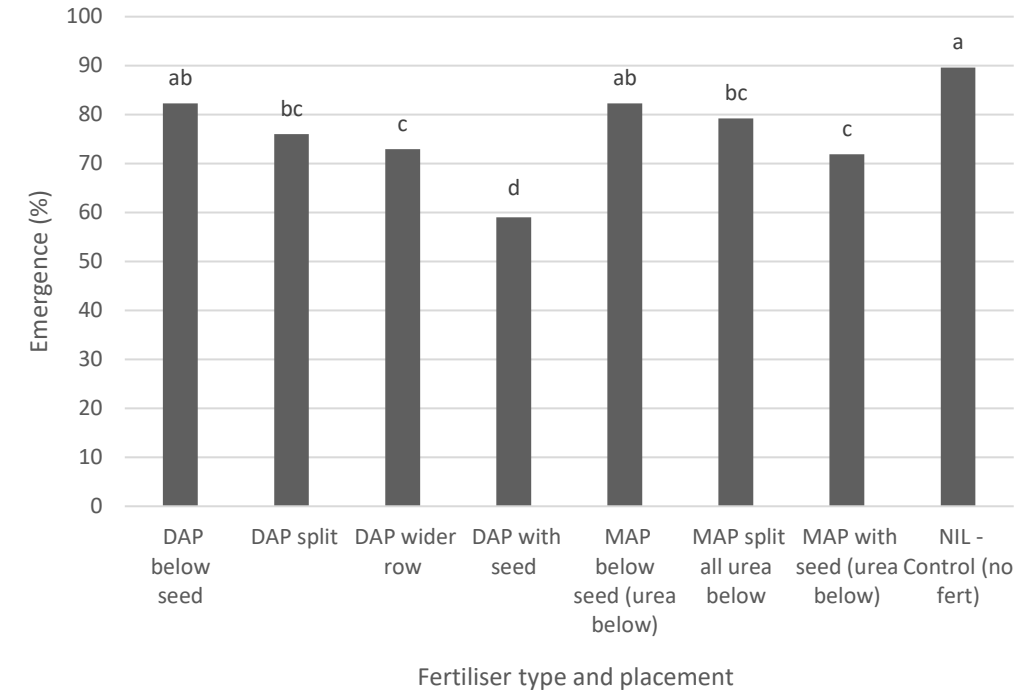


Figure 4. Effect of fertiliser type and placement on wheat emergence (% of seeds planted) averaged for all three soil types together after 56 days. Columns with the same letter are not statistically different at P=0.05.

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Pot experiment - Fertiliser type and placement

- Seedling germination and emergence was faster in a Minnipa sand and red loam compared to a grey calcareous soil.
- Germination percentages for the different soil types were sand 91%, red loam 87% and grey calcareous soil 53%.
- Fertiliser placed with the seed reduced wheat emergence on calcareous soils.
- It may be beneficial to move fertiliser away from the seed if this is an option.



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Overall Conclusions

- Lower plant establishment occurred with urea placed with the seed.
- Greater plant establishment was achieved with fertiliser placed 3 cm below the seed.
- Despite targeting 180 plants/m² the average plant establishment in field trials was 108 plants/m² over the three seasons.
- Dry sowing improved early plant dry matter but did not necessarily result in better yields than seeding on the break.
- Having no fertiliser resulted in lower yields in all seasons.



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Overall Conclusions

- Most herbicides and fungicides did not impact on plant establishment when dry sowing, with the exception of Trifluralin and Boxer Gold in the sandy soil in 2020.
- Dry sowing early with barley is a good management option for early plant establishment.
- Sowing seed at a depth to utilise soil moisture for germination is important.
- New long coleoptile wheats may provide an option where soil moisture is available up to 10 cm deep for early plant establishment and vigour.

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Industry implications

- Growers on upper EP, especially those on grey calcareous soils could increase seeding rates to achieve the desired plant numbers of 180 plants/m².
- Better plant establishment was achieved by separating fertiliser to 3 cm below the seed with similar establishment to nil fertiliser.
- Applying urea with the seed caused lower plant establishment, so apply urea away from the seed or by spreading pre or post seeding.

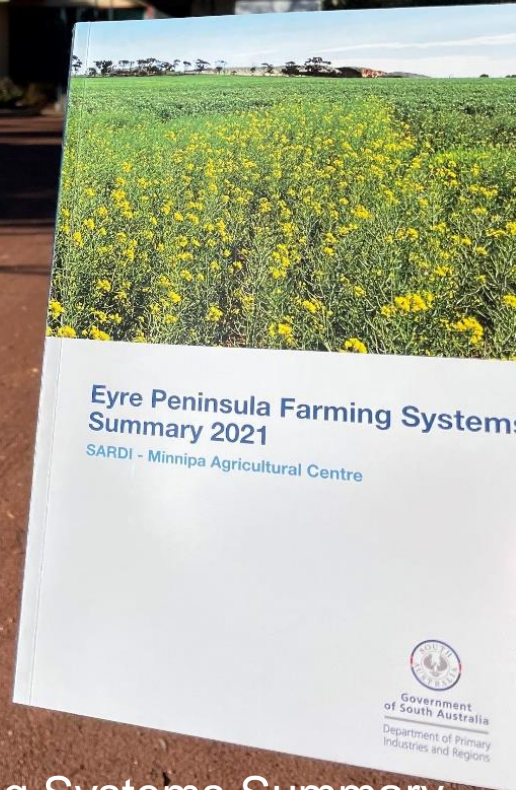
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Industry implications

- If fertiliser separation cannot be achieved due to seeding system limitations, then MAP is a safer option than placing DAP with the seed, especially in drier seasonal conditions. These effects were most severe in grey calcareous soils, less in red loams.
- Spartacus CL barley had improved establishment and early dry matter so is an early dry sowing option.
- Most herbicides and fungicides evaluated did not impact on establishment when dry sowing except in sands due to wind erosion and soil movement of herbicides into the furrow.

EP Farming Systems Summary

Annual publication since 1999 distributed to EP farmers and online that showcases the research conducted at the Minnipa Agricultural Centre and appreciate SAGIT funding to produce the Summary.



[Eyre Peninsula Farming Systems Summary 2021 \(pir.sa.gov.au\)](http://pir.sa.gov.au)



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Acknowledgements

SAGIT

MAC Crop Agronomy team

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- Nigel Wilhelm

Save the date

MAC FIELD DAY - 13 SEPTEMBER 2023





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