

Did the application of potassium fertiliser at different timings result in an economic yield response in wheat at Ungarra in 2025?

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Key messages

- Potassium deficiency is becoming an increasing issue on some cropping soil on Eyre Peninsula, particularly on low buffering sands.
- B horizon clays on Eyre Peninsula often contain high amounts of available potassium
- Crop growth response to applied potassium fertiliser can be variable depending on crop access to subsoil reserves of potassium.

Why do the trial

Potassium (K) fertilisers have not historically been applied in Lower Eyre Peninsula broadacre cropping systems, but surveillance soil sampling is identifying sites with K concentrations well below those considered marginal (Colwell K <100 mg/kg). Sandy soils in high rainfall districts are particularly prone to K deficiency, having low capacity to buffer changes in soluble nutrients due to low cation exchange capacity and high leaching potential. Whilst previous work applying potassium fertilisers to broadacre field crops has sometimes resulted in improved crop growth, this has not always translated to an economic yield benefit. Preseason soil sampling on a duplex sand over clay soil at Ungarra as part of the Ag Innovation and Research Eyre Peninsula (AIR EP) “Getting the Crop In 2025” revealed a high variation of surface and subsurface K levels across the paddock. Surface (0-10) Colwell K values ranged from well below those considered marginal for crop production (62 mg/kg) to adequate (160 mg/kg). Deeper soil sampling showed that Colwell K values in the 10-40, and 40-60 cm layers were also highly variable, ranging from 25 mg/kg on the deeper sands to more than 400 mg/kg where B horizon clays were shallower.

As a result, a replicated farm scale (12x30 m plots) trial was established in the area of the paddock where the lowest K levels were measured to investigate whether applying potassium to the site could generate an economic yield increases and whether the timing of application mattered.

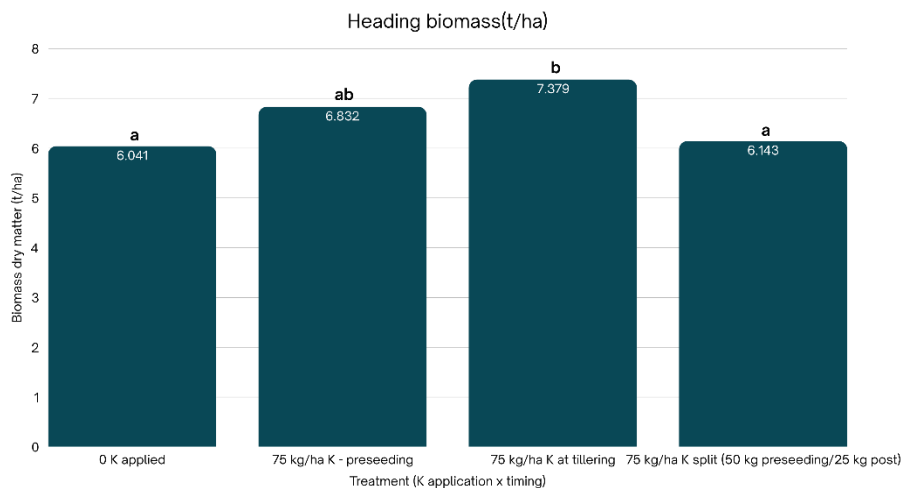
Locality	Ungarra
Rainfall	Av. Annual: 341 Av. GSR: 252 2025 Total: 310mm 2025 GSR: 247mm
Yield	4.08 t/ha paddock average
Paddock History	2024: Lentil
Soil Type	Duplex sand over clay at varying depth sited within a broad sandplain landscape.
Trial Design	12 m x 30 m x 4 replicates, Randomised complete block
Yield limiting factors	Water repellent surface soils, late-dry start. Wet July.

How was it done?

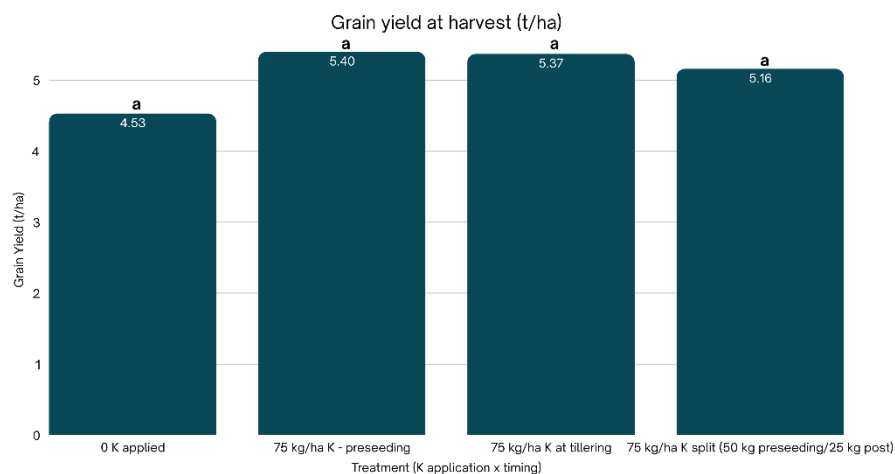
The site was sown with Matador wheat on 3 June 2025. Treatments included +/- potassium (75 kg/ha K applied as 150 kg/ha MOP), with three timings of application which included broadcast on 24 April prior to sowing (incorporated by sowing), split application (2/3 pre-sowing and 1/3 broadcast after sowing on 13 June) and a 'rescue' application at tillering (29 July). Biomass cuts were taken at head emergence in early October with plots harvested using the grower's header on 27 December.

What happened?

Crop growth across the site was highly variable. A dry and late start to the season saw uneven germination on areas of water repellent surface soils particularly in the south and south-western portions of the trial. Assessments of total biomass at head emergence indicated 20% more crop growth (at the 90% confidence interval) where 75 kg/ha K was applied at tillering ($P=0.093$, LSD 1.18), compared to the nil and split application treatments. (Figure 1). Harvest grain yield differences, between the nil K control (which yielded 4.5 t/ha) and the +K treatments were not significant ($P=0.25$).



a)



b)

Figure 1 a) Mean biomass at head emergence (7 October 2025) and b) Harvest grain yield (a different letter indicates a significant difference between treatments).

What does this mean?

Despite having low K potassium in the sandy surface and subsurface layers at this site, the application of potassium fertiliser did not result in predictable increases in crop growth or yield. This echoes previous work, showing variable responses from the application of fertiliser K in broadacre cropping systems in the region. This was further complicated by uneven crop establishment on the site in 2025.

Whilst increased cropping intensity has seen topsoil reserves of K drawn down, B horizon clays in many parts of the region contain extremely high K levels. If crops have sufficient early vigour to enable roots to access these reserves, (i.e. good early growth, no other issues constraining root growth), or commonly used soil amelioration practices deposit clay material into surface layers (i.e. clay spreading and delving), crop growth

responses to the application of potassium fertilisers might be limited and not economically justifiable. However, in situations where potassium concentrations decrease with depth, or significant constraints limit the capacity for deeper crop root growth into the K rich clays, applications of potassium fertilisers might support increased crop health and yield.

Acknowledgements

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