100-DAY WHEAT?

A SHORT-SEASON, EARLY-VIGOROUS WHEAT IDEOTYPE FOR ADAPTATION TO A CHANGING GLOBAL CLIMATE

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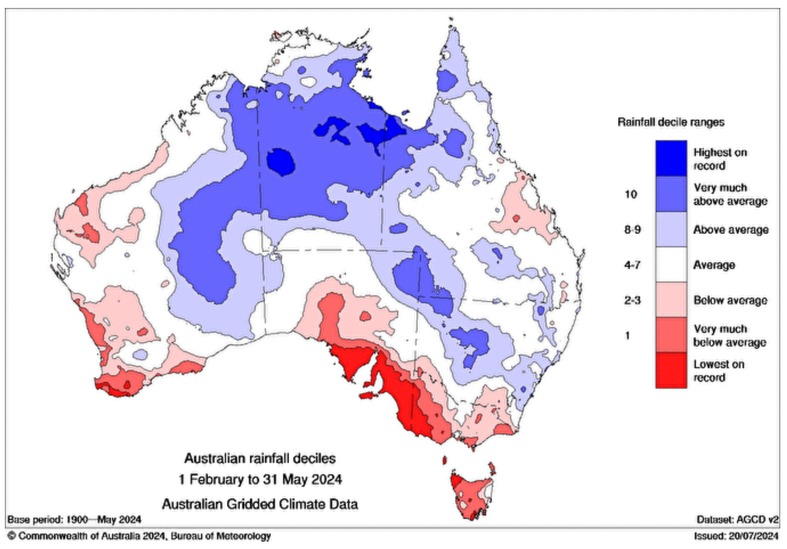
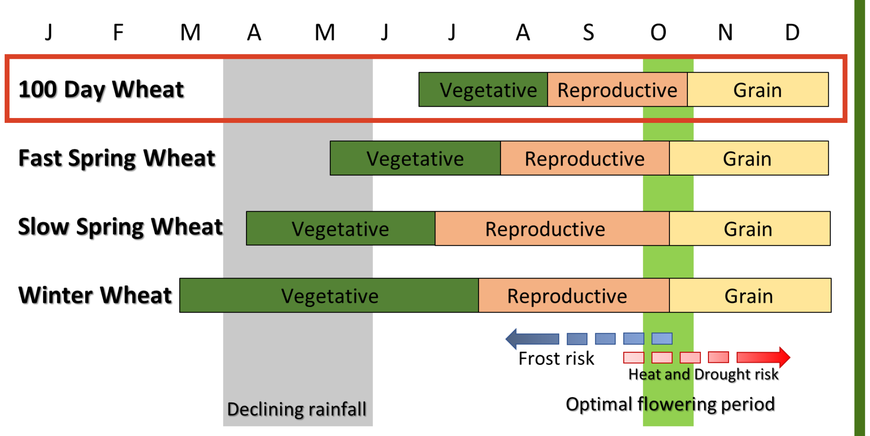
INTRODUCTION

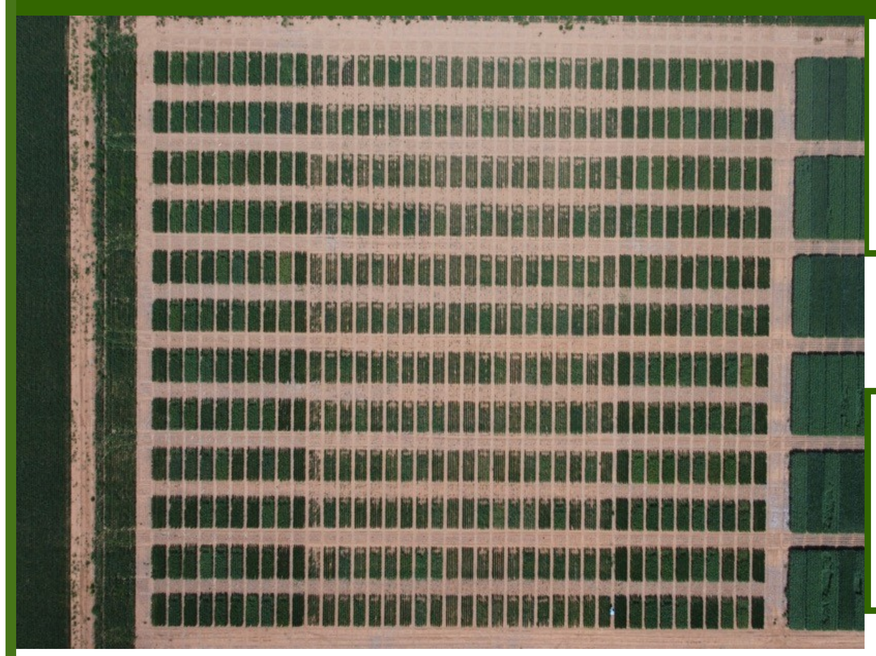
- Australian autumns are becoming **drier**; where main season wheat is sown. This is encouraging growers to **sow dry**, risking poor germination and emergence
- Current varieties cannot be sown outside their optimum time due to **frost and heat risk** at anthesis[1]
- A commercial variety needs to be bred that can be sown later (i.e. **mid-winter**) to opportunistically capture delayed rainfall
- What are the **developmental** and **physiological** drivers that will enable this?





Adapted from Flohr et al. (2018)[1]

METHODS



Drone photograph of 2021 trial at Wagga Wagga

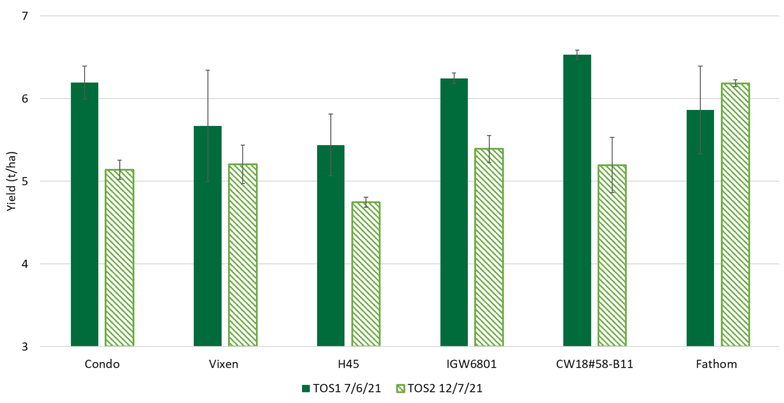
Two years of field experiments at Wagga Wagga Australia using ~100 short-season, high early vigour wheat genotypes varying in phenology and early growth

Multi-environment trial analysis to identify ideal plant traits and define a winter sown Australian ideotype

Two wheat genotypes presenting vastly different physiology with late sowing in the field at Wagga Wagga 2021

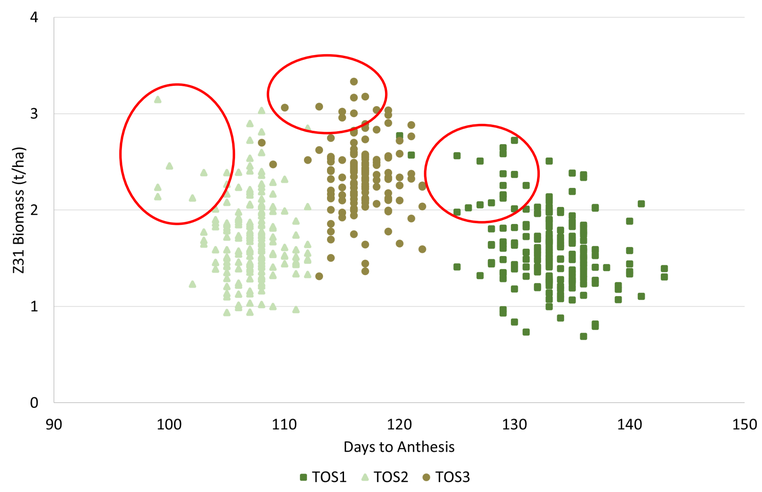
RESULTS

Experimental wheat genotypes bred for early vigour have the potential to **outyield** commercial varieties despite the significant **yield reduction** associated with later sowing



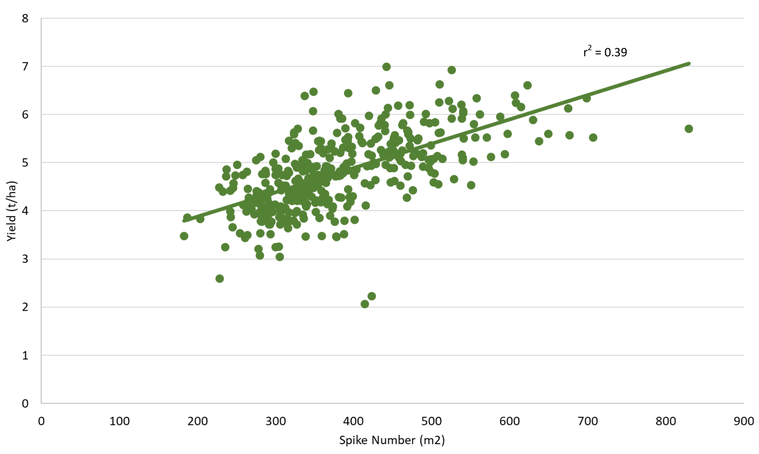
Predicted grain yield from a selection of experimental and commercial wheat genotypes in a field experiment in Wagga Wagga 2021, LSDs 2021 TOS1: 1.29t/ha, TOS2: 0.83t/ha

Combinations of **rapid development** and **high early vigour** were observed in experimental wheat genotypes, ideal candidates for future breeding selection



Days to anthesis and biomass present at Zadok's growth stage 31 for all genotypes across the times of sowing, TOS1 June 7 2021, TOS2 July 12 2021, TOS3 June 28 2022. Red circles highlight ideal combinations of high early vigour and rapid development at each TOS.

In 2021, in both the June and July sowing, grain yield was positively correlated with greater **spike number** per m^2



Spike number (per m^2) at harvest and grain yield for all genotypes across both times of sowing at Wagga Wagga in 2021. The line represents a simple linear regression between the variables.

DISCUSSION

- The well documented yield reduction associated with delayed sowing was observed in 2021[2]
- Selection for fast flowering, high early vigour, and many productive tillers will overcome this yield drop
- Large genetic diversity exists to aid these selections[3]
- More experiments are needed in less favourable years to optimise trait selection

REFERENCES

1. Flohr BM, Hunt JR, Kirkegaard JA, Evans JR, Trevaskis B, Zwart A, Swan A, Fletcher AL, Rheinheimer B (2018). Field Crops Research 223, 12-25.
2. Hunt J, Fettell N, Midwood J, Breust P, Peries R, Gill J, Paridaen A (2012). Proceedings of the 16th Australian Society of Agronomy Conference: Capturing Opportunities and Overcoming Obstacles in Australian Agronomy.' (Australian Society of Agronomy Armidale)
3. Rebetzke GJ, Richards RA (1999). Australian Journal of Agricultural Research 50, 291-302.

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