

Drought tolerance

WGIN-2 SG meeting
Rothamsted Research 21 Feb 2012



WGIN Sub-Contract Update

Chemical analysis in WGIN drought tolerance trial in 2009/10 & 2010/11

Samples (per year) on 18 cultivars x 2 Irr trts x 3 reps
(=108 plots)

	Chemical analysis			Total
No. samples	13C	18O	Ash%	
Flag leaf @ GS61	108	108		216
Grain @ harvest	108		108	216

Core funding

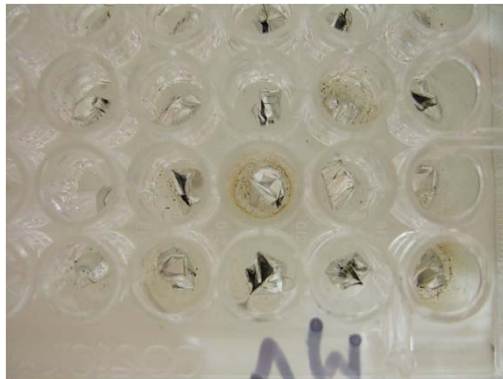
Sub-contract funding

Isotope analysis, sample submission: :Weighing and encapsulate of milled samples samples for 13C and O18 isotope analysis

Encapsulation of 2 mg sample



Submit samples to Mylnefield Isotope lab at JHI

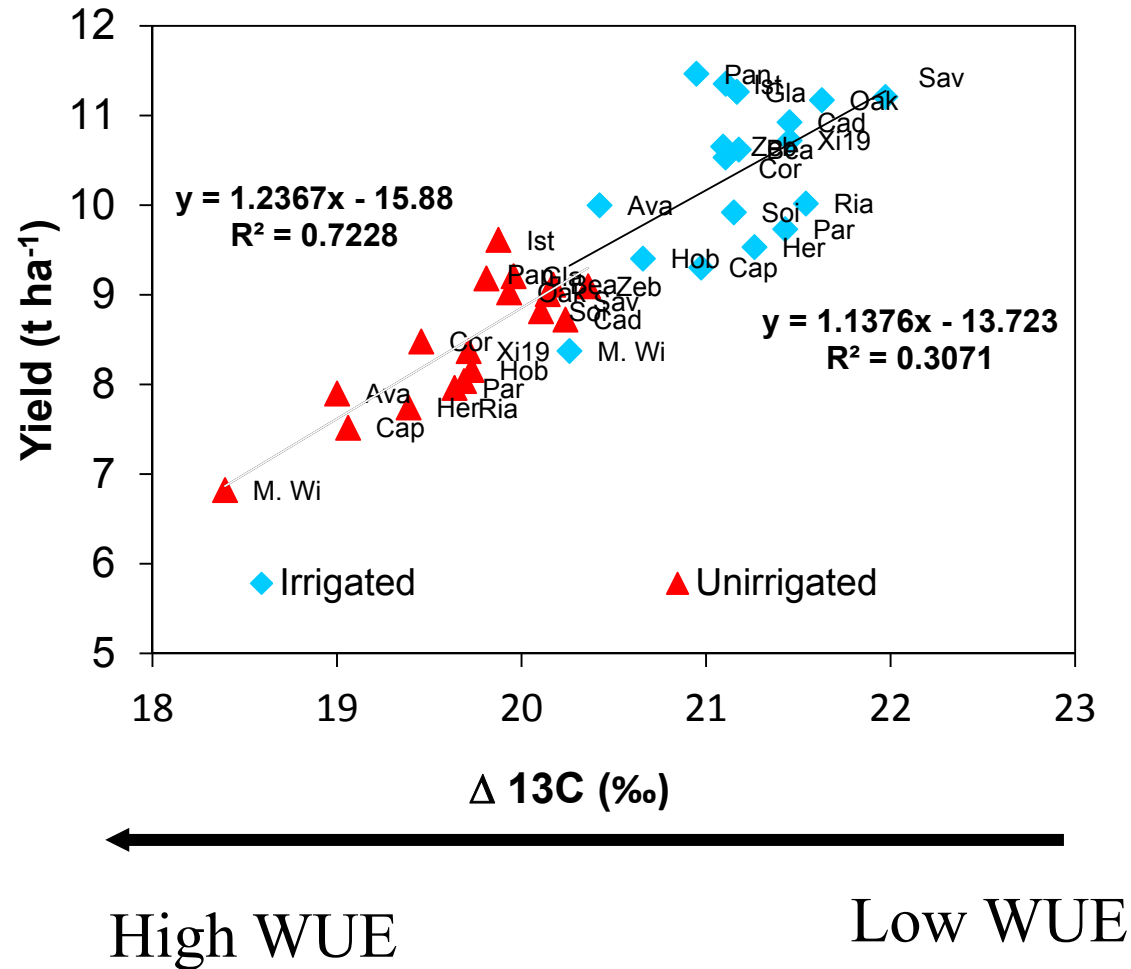


All 2009/10 samples submitted 25 Jan 2011 (data returned Mar 2011)

2010/11: 18 cv grain 13C and S x R DH grain 13C submitted to lab on 5 Jan 2012 (data returned Feb 2012)

2010/11: 18 cv FL 13C and 18O submitted on 15 Feb 2012

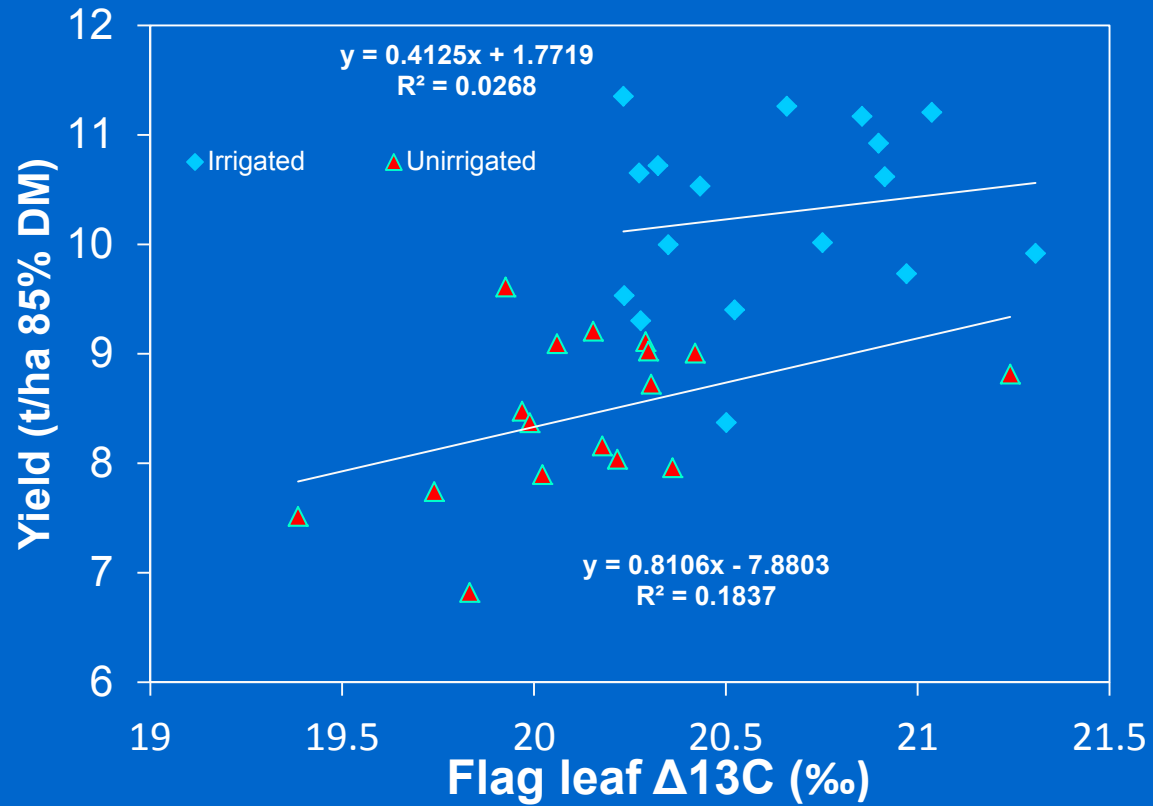
$\Delta^{13}\text{C}$ vs grain yield in 18 wheat cultivars



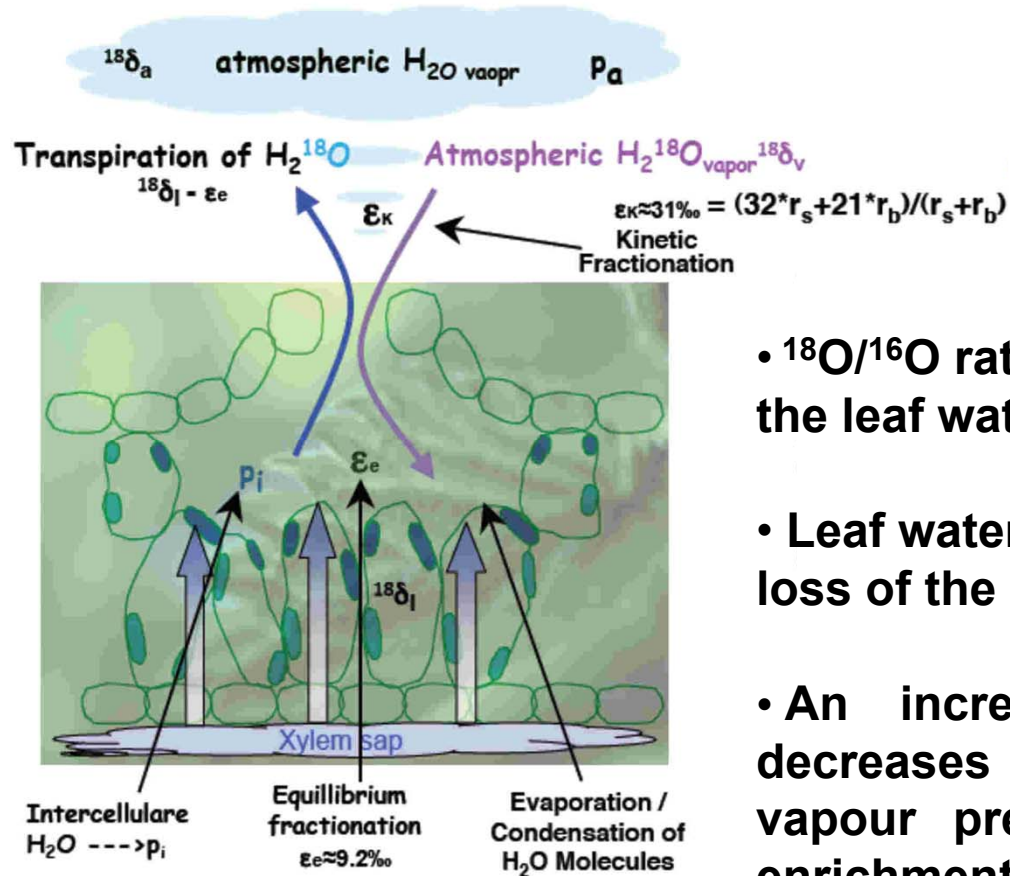
Sutton Bonington 2009-10



Flag leaf $\Delta^{13}C$ vs Grain Yield 2009-10



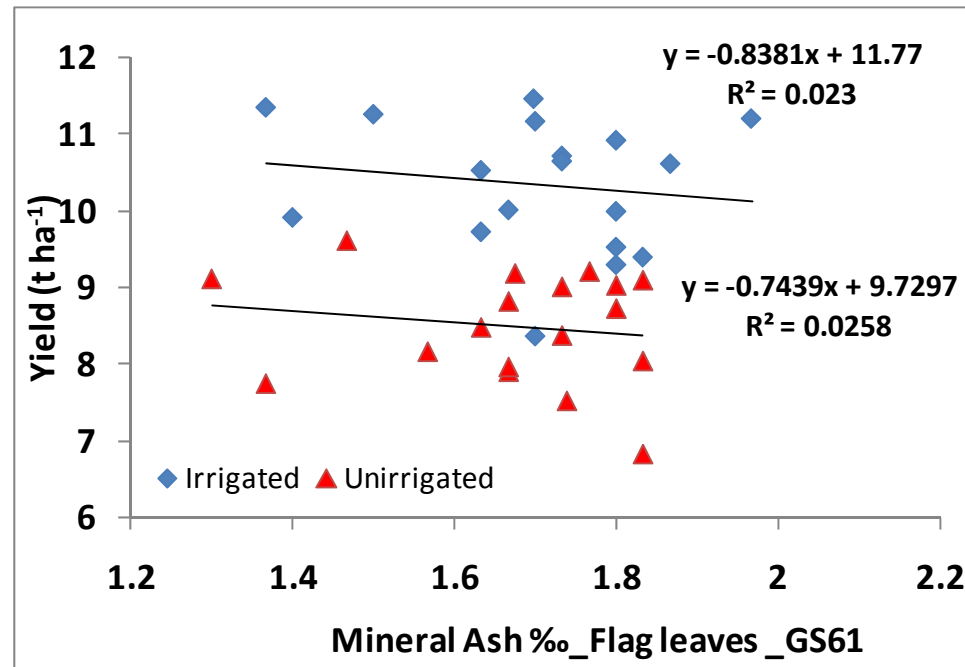
Techniques: Oxygen isotope ratio ~ leaf transpiration



- $^{18}O/^{16}O$ ratio determined by enrichment in the leaf water due to transpiration.
- Leaf water enriched due to the preferential loss of the lighter $H_2^{16}O$ during evaporation.
- An increase in stomatal conductance decreases leaf $T^\circ C$ (hence intercellular vapour pressure) resulting in less $H_2^{18}O$ enrichment at the evaporating site.

Mineral ash content ~ water use

- Total leaf ash content of plant tissues is suggested as a useful tool to predict yield under drought.
- The mechanism of mineral accumulation in plant tissues appears to be explained through the passive transport of minerals via xylem driven by transpiration.
- Ash content measured provides an indicator of the total water transpired.
- Analysis of mineral ash content is less expensive than $\Delta^{13}\text{C}$ or $\Delta^{18}\text{O}$.

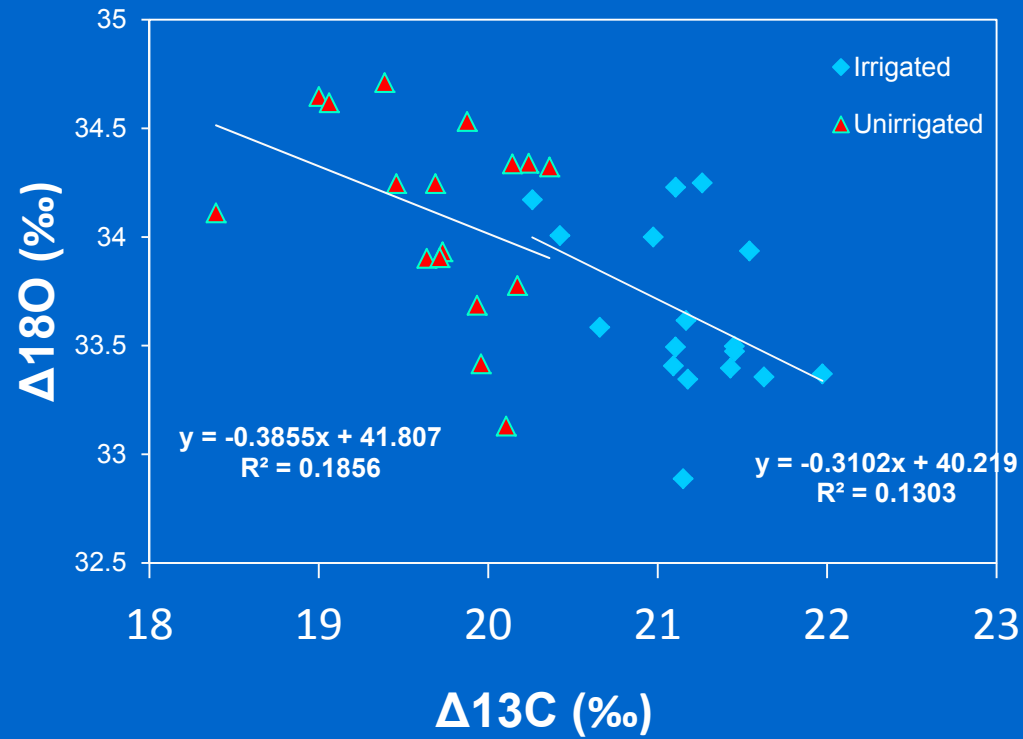


Flag leaf $\Delta^{13}\text{C}$ vs Flag leaf $\Delta^{18}\text{O}$ 2009-10

Low Transp.



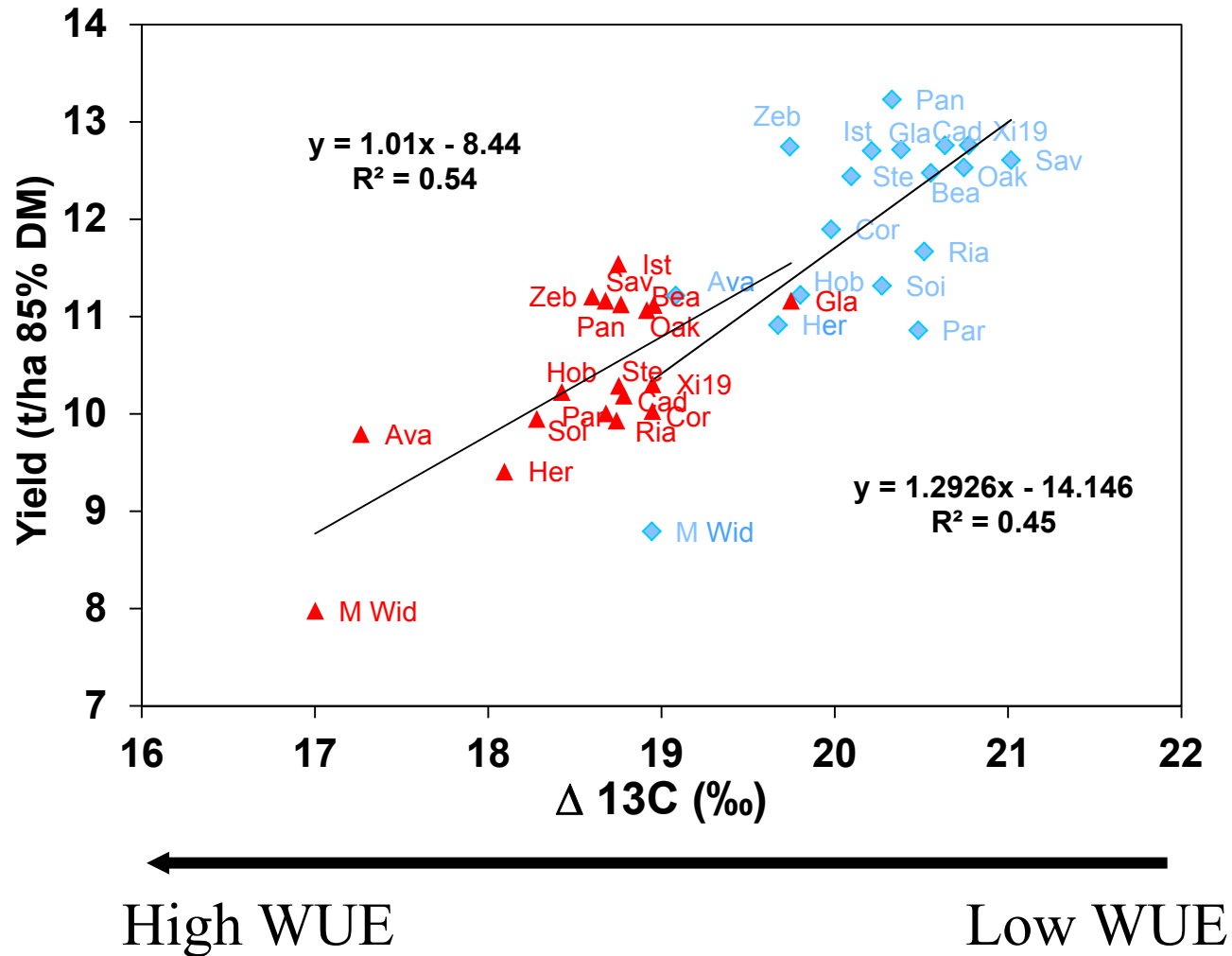
High Transp.



High WUE

Low WUE

$\Delta^{13}\text{C}$ vs grain yield in 18 wheat cultivars



Acknowledgments:



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