

Realising the Potential - Staygreen Wheat and Senescence Regulation

17th WGIN Stakeholders Meeting

Thursday 14th November 2019

Liz Chapman

Introduction

- Why Study Senescence?
- Utilisation of WGIN developed cv Paragon EMS population
- Staygreens with Agronomic Potential
- Greener for Longer & Grain Filling Relationship
- Senescence Scoring: Quantitative to Qualitative
- Genetic & Agronomic Insights

Why Study Senescence?

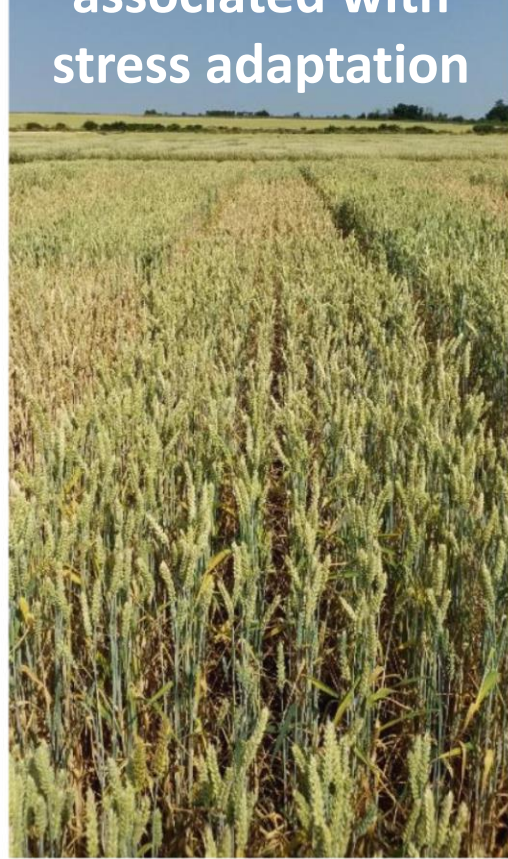
Terminal stage in
wheat
development



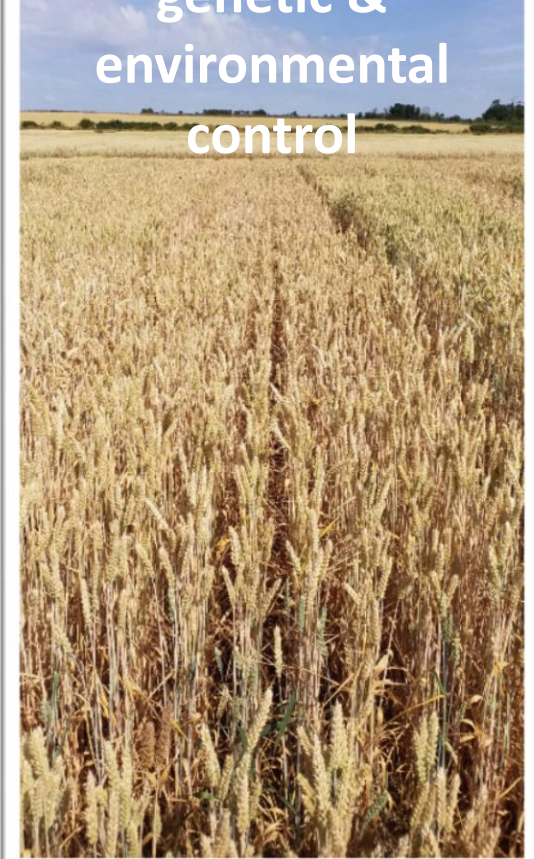
Remobilisation of
resources into
developing grain



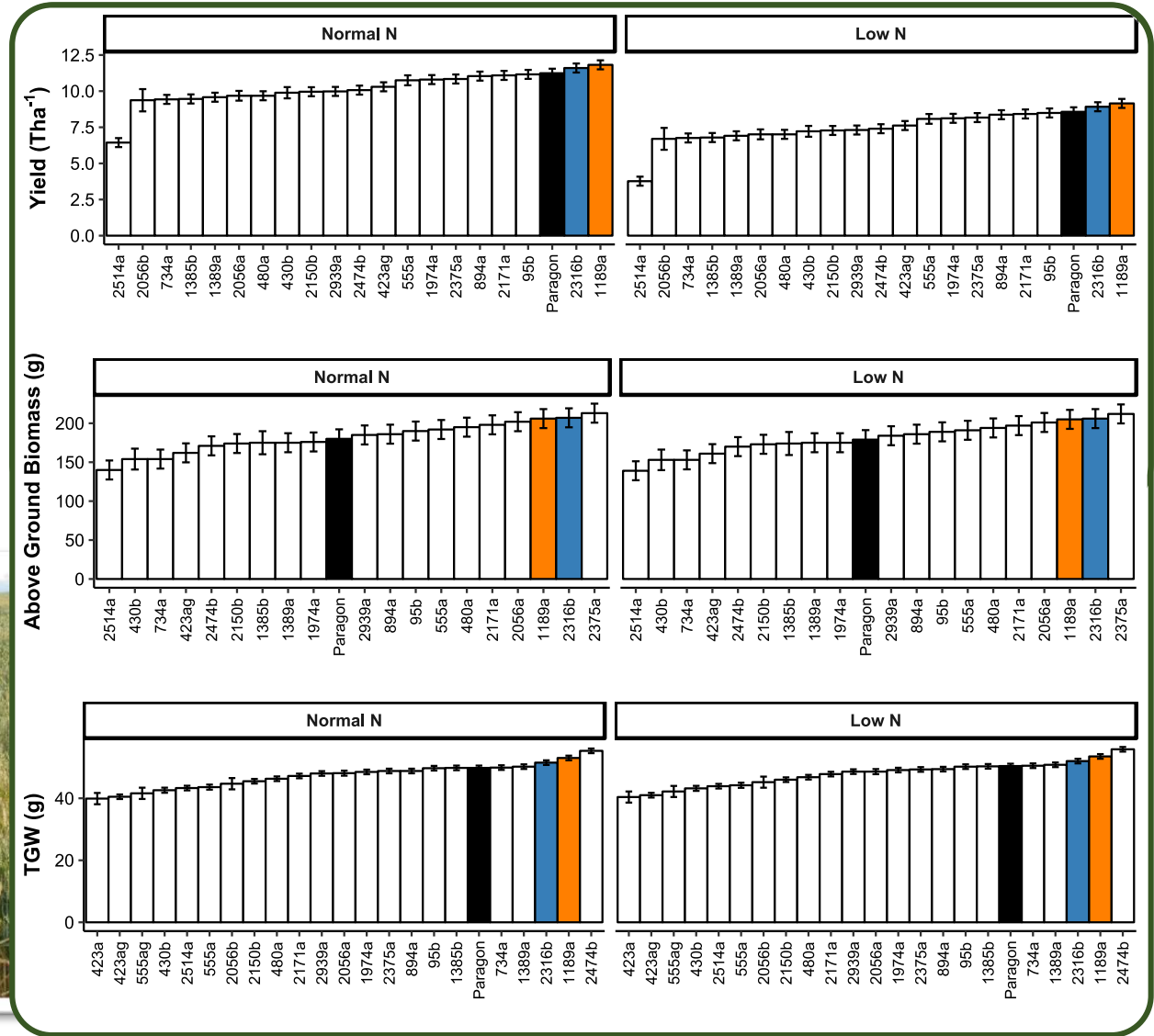
Staygreen traits
associated with
stress adaptation



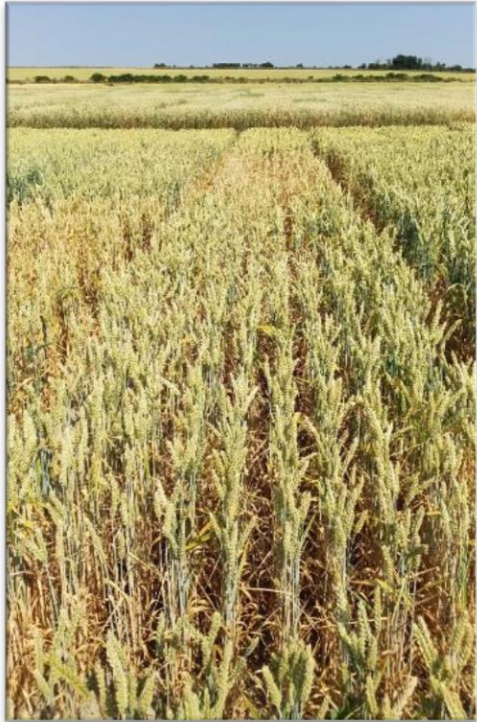
Under strong
genetic &
environmental
control



Novel Staygreens...with Agronomic Potential



Novel Staygreens...Mild to Extreme



Paragon

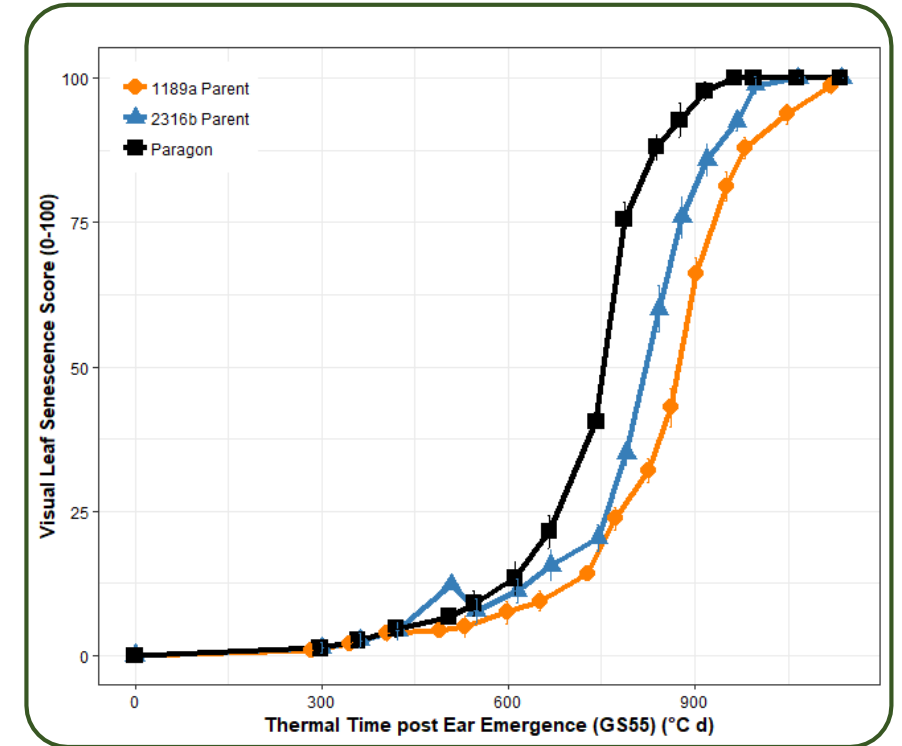


2316b



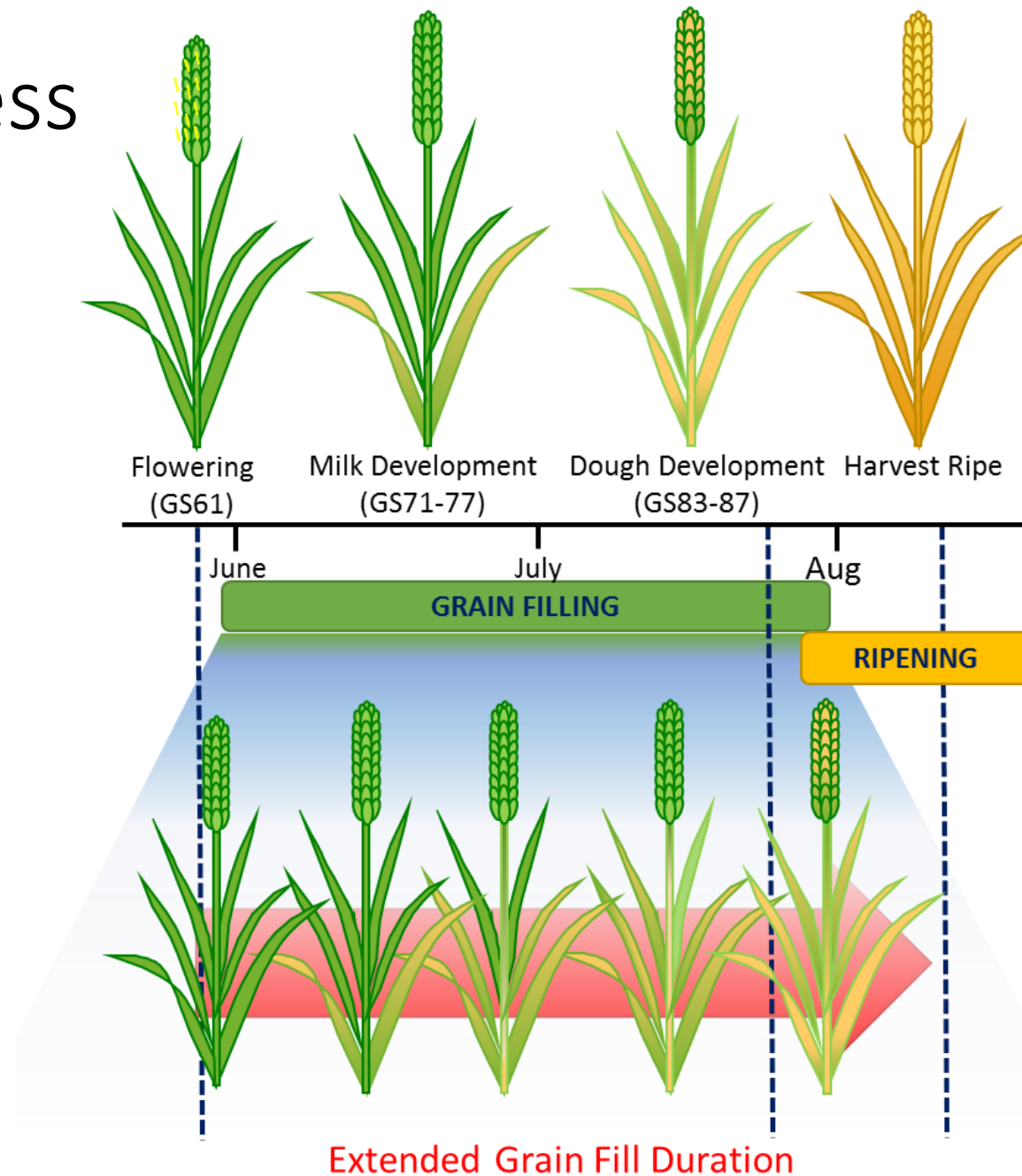
1189a

Senescence of staygreen EMS mutant parents relative to parental cv Paragon (05/07/18)



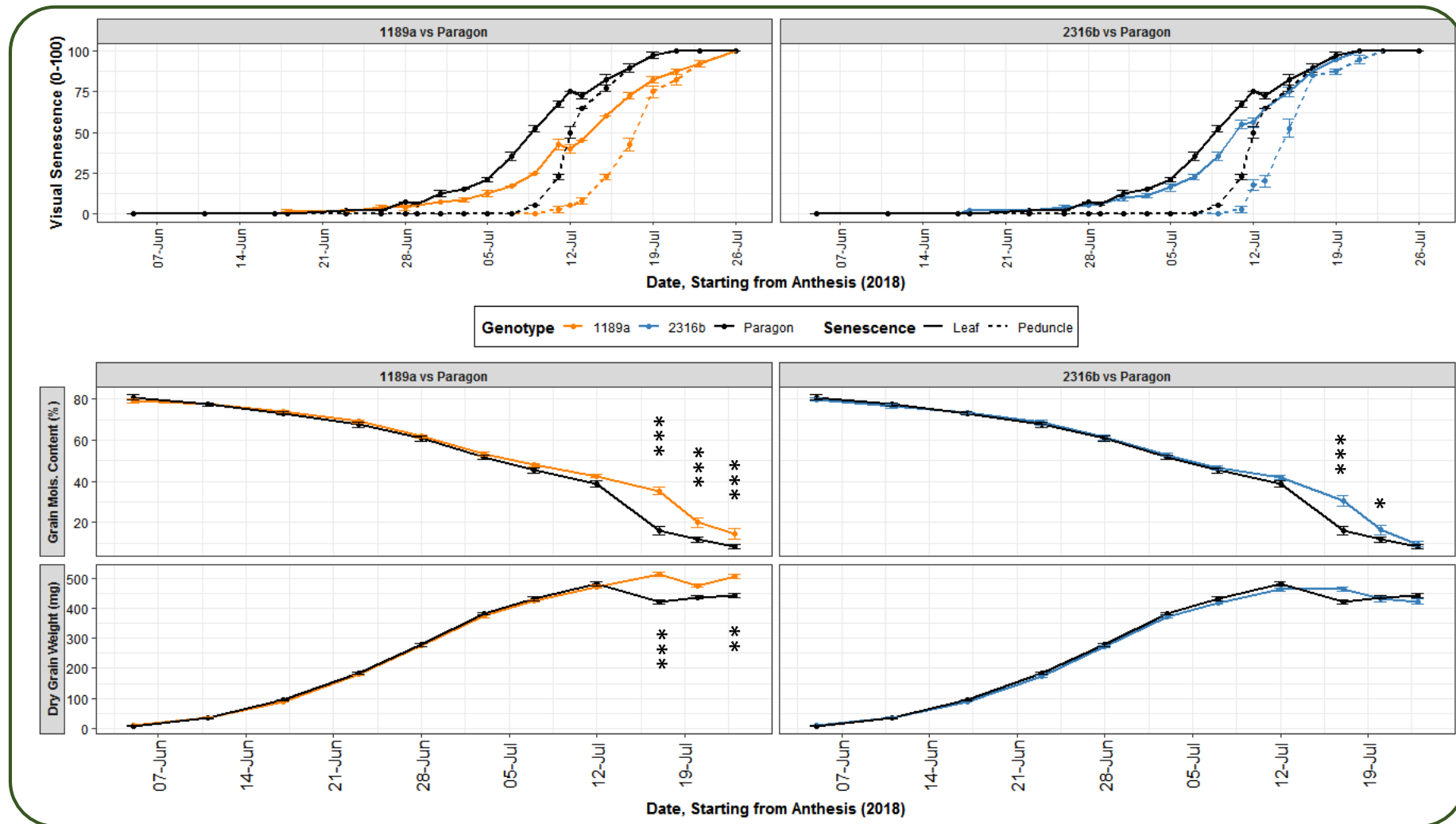
Leaf Senescence Profiles

Is Greenness Duration...

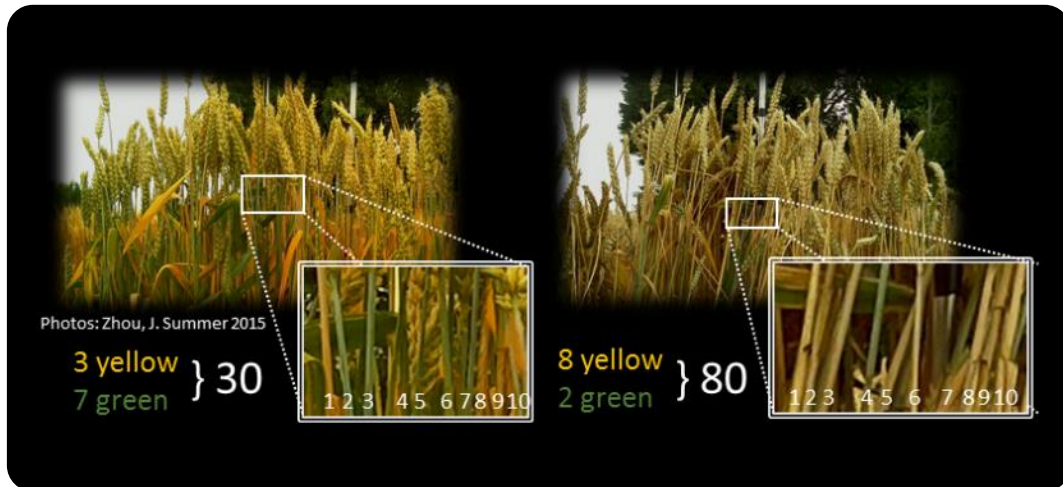
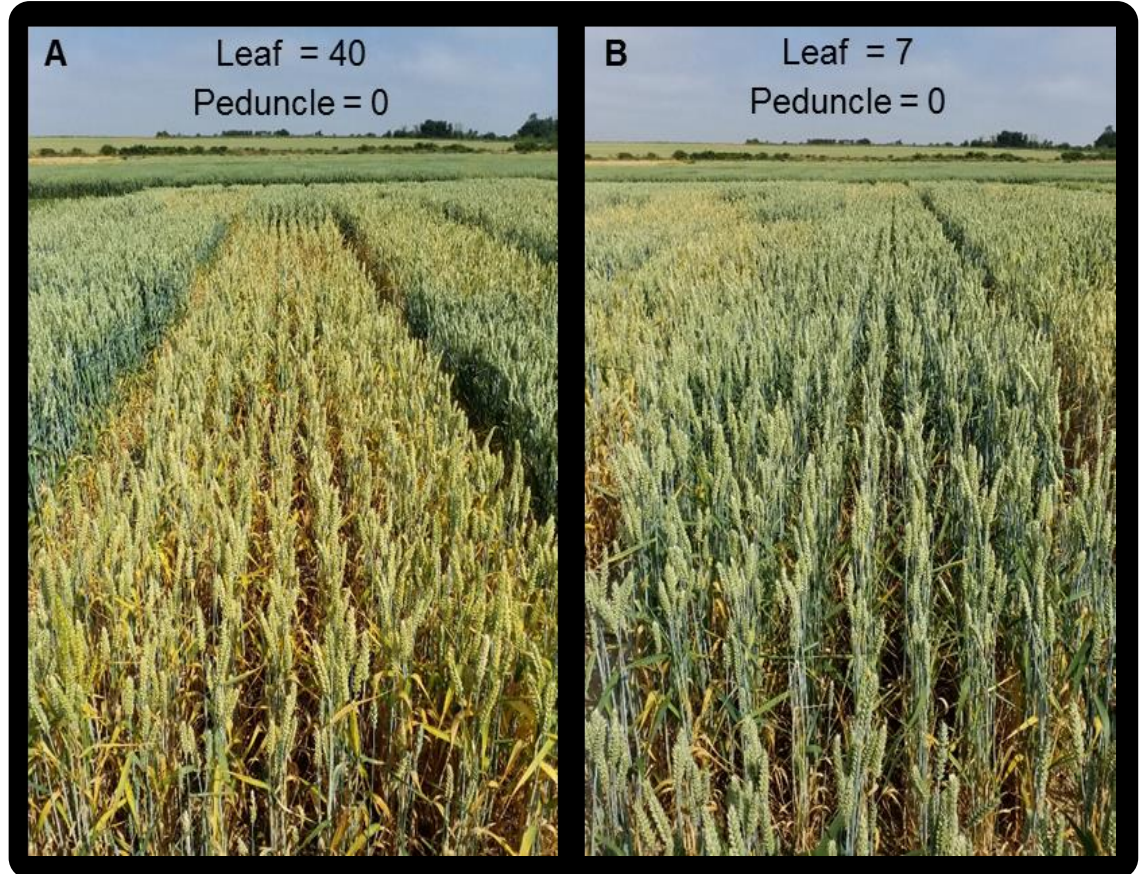
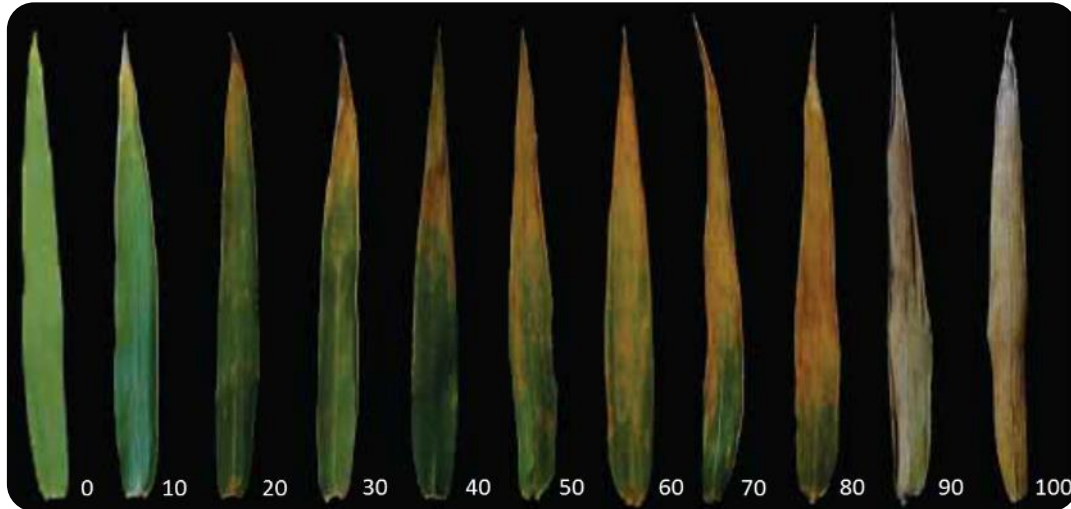


...a Proxy For
Grain Fill
Duration?

Grain Filling Duration Mirrors Senescence Phenotypes of 1189a & 2316b



Senescence: More than Just Leaves...

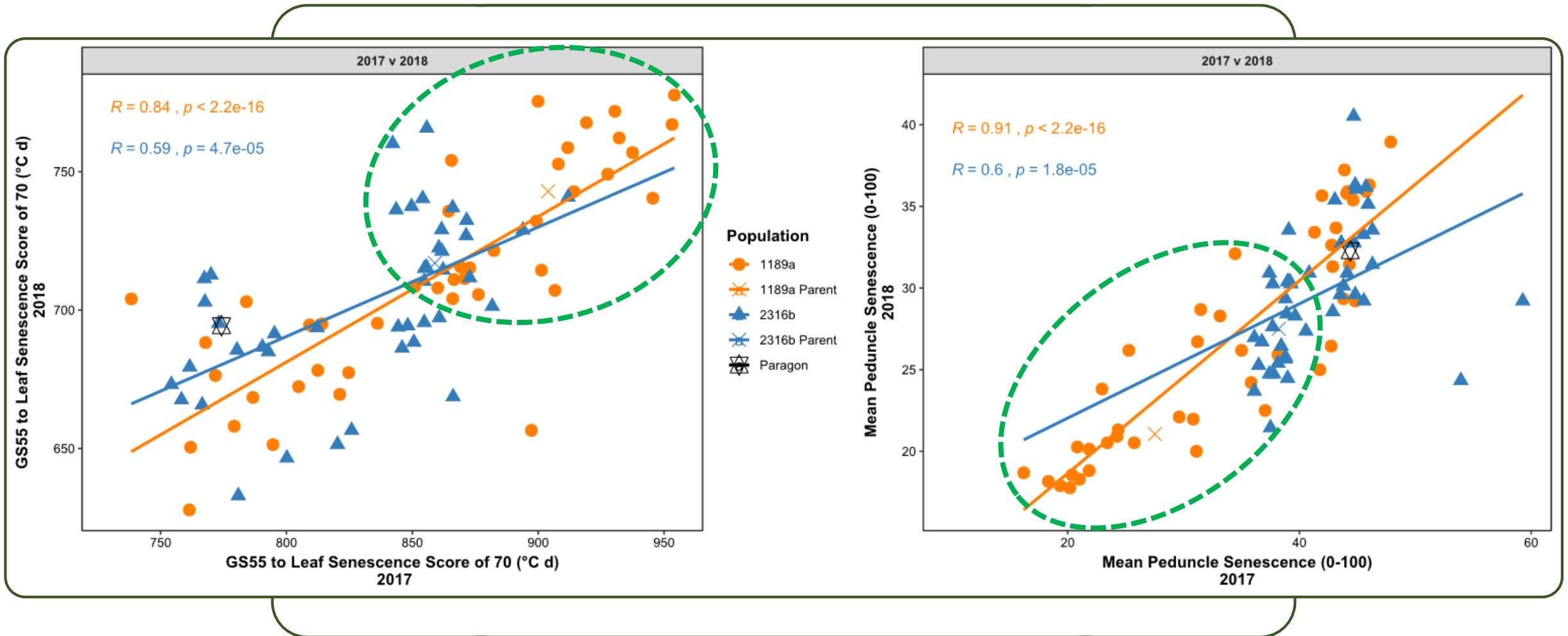


...And Grain Maturity Scoring

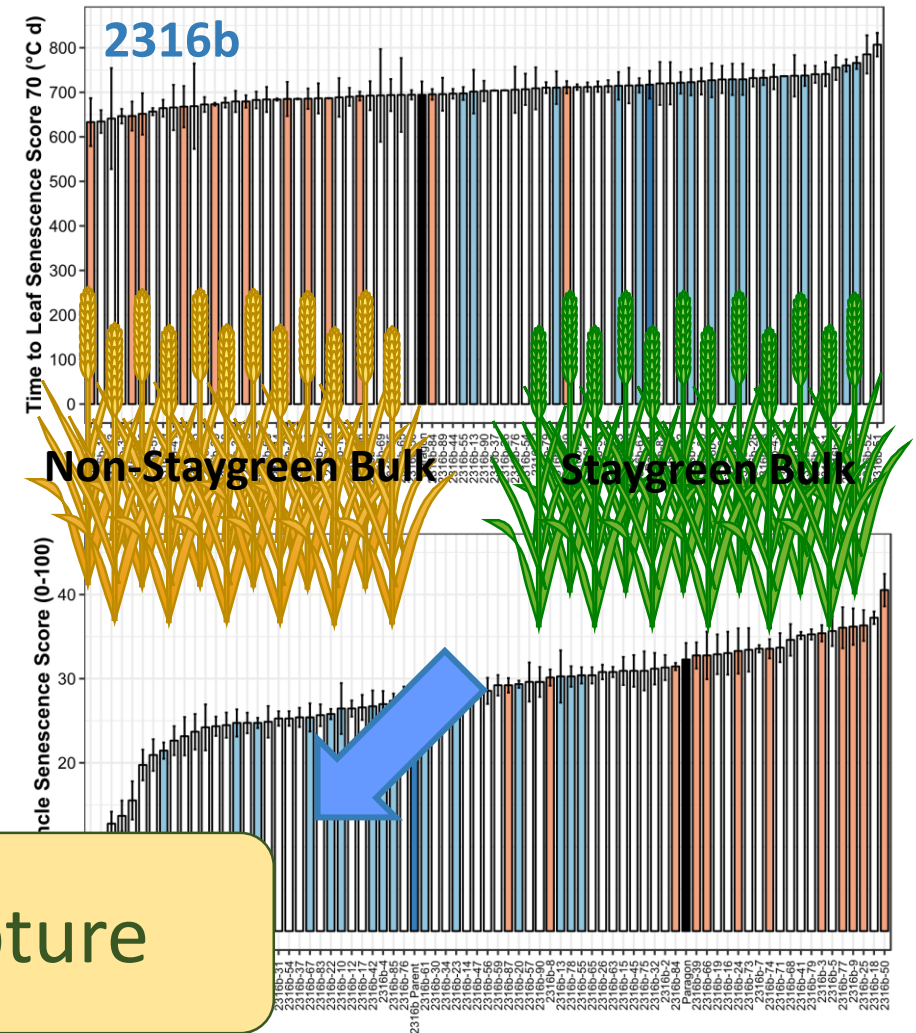
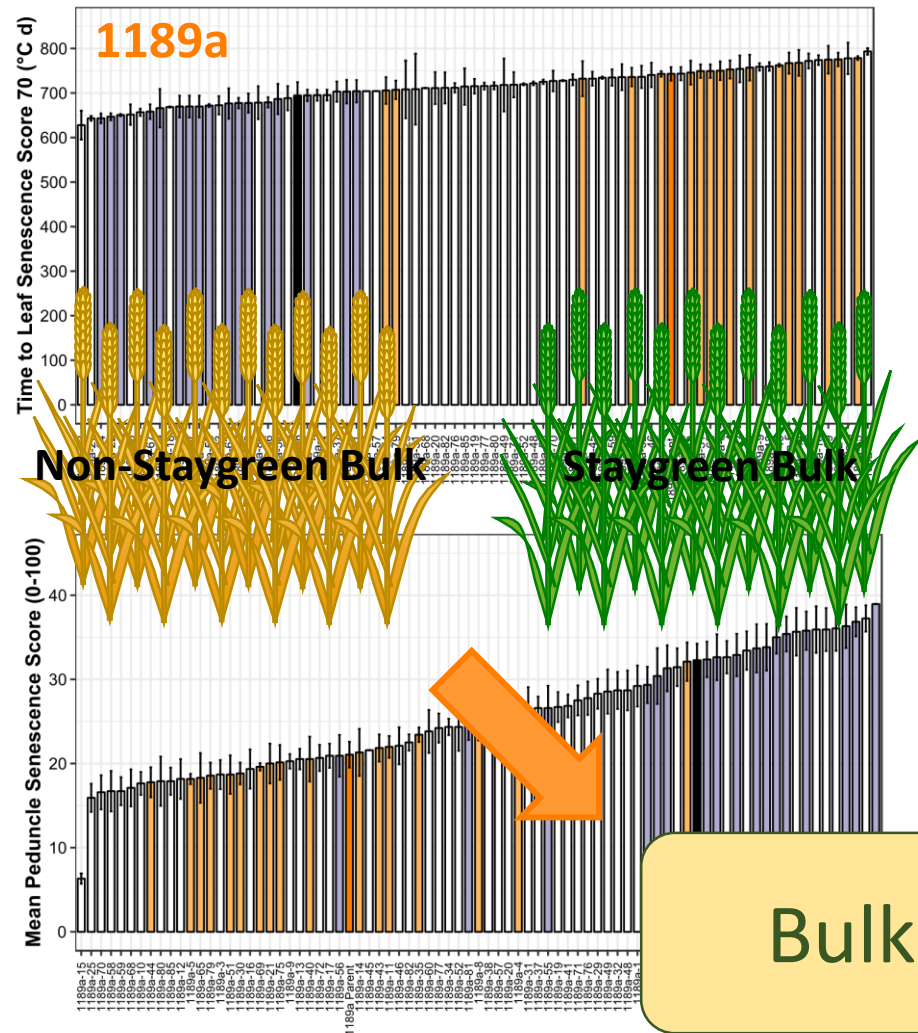
Top Left: Pask, A. J. D., *et al.*, Physiological breeding II: a field guide to wheat phenotyping. (2012).

Other Figures: Chapman *et al.* *in preparation*

Capturing & Quantifying Senescence Variation



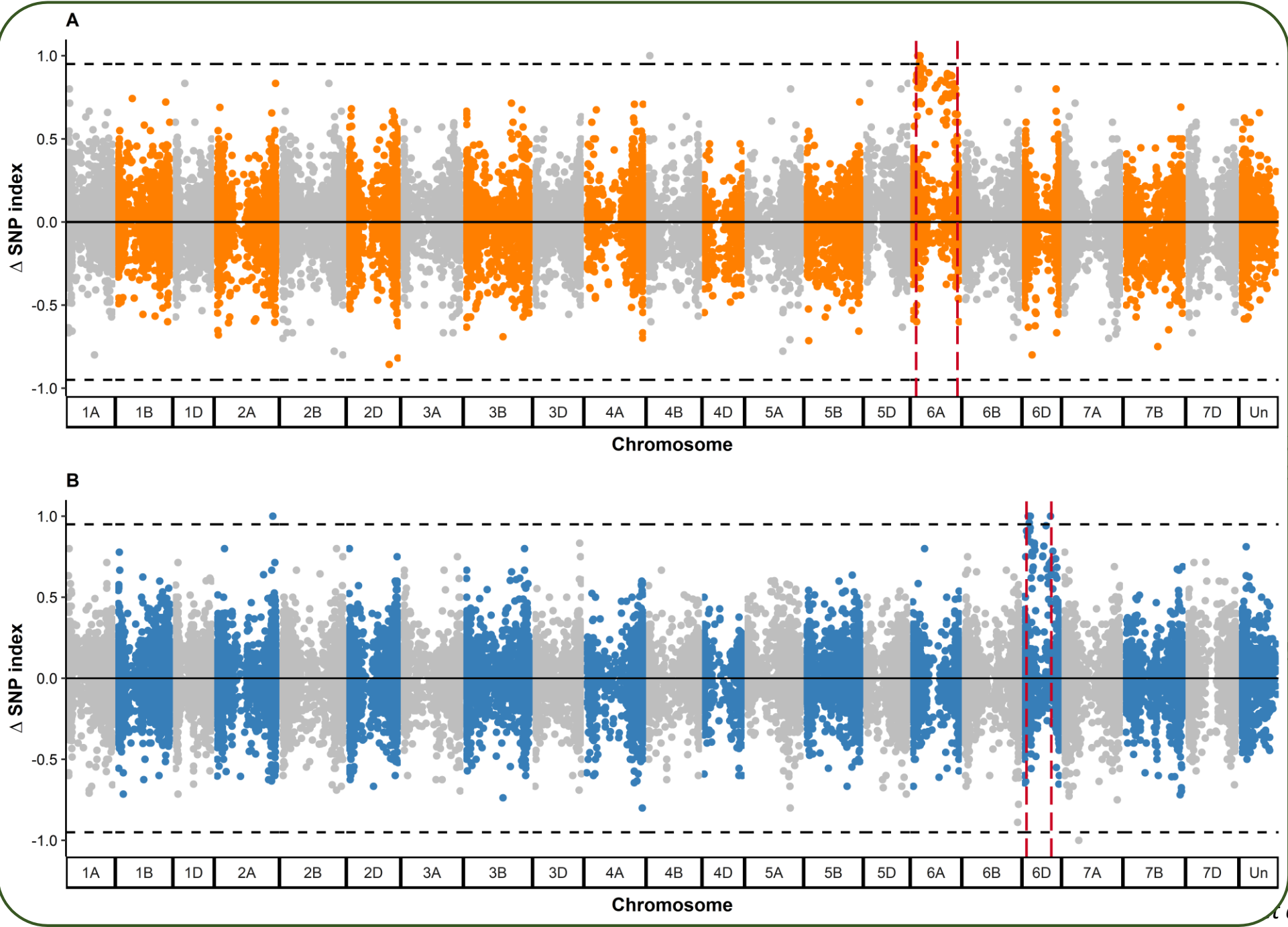
Mapping Through Bulk Segregant Analysis: Identifying the Extremes



Pre

Positio

chrX_po
chrX_po
chrX_po
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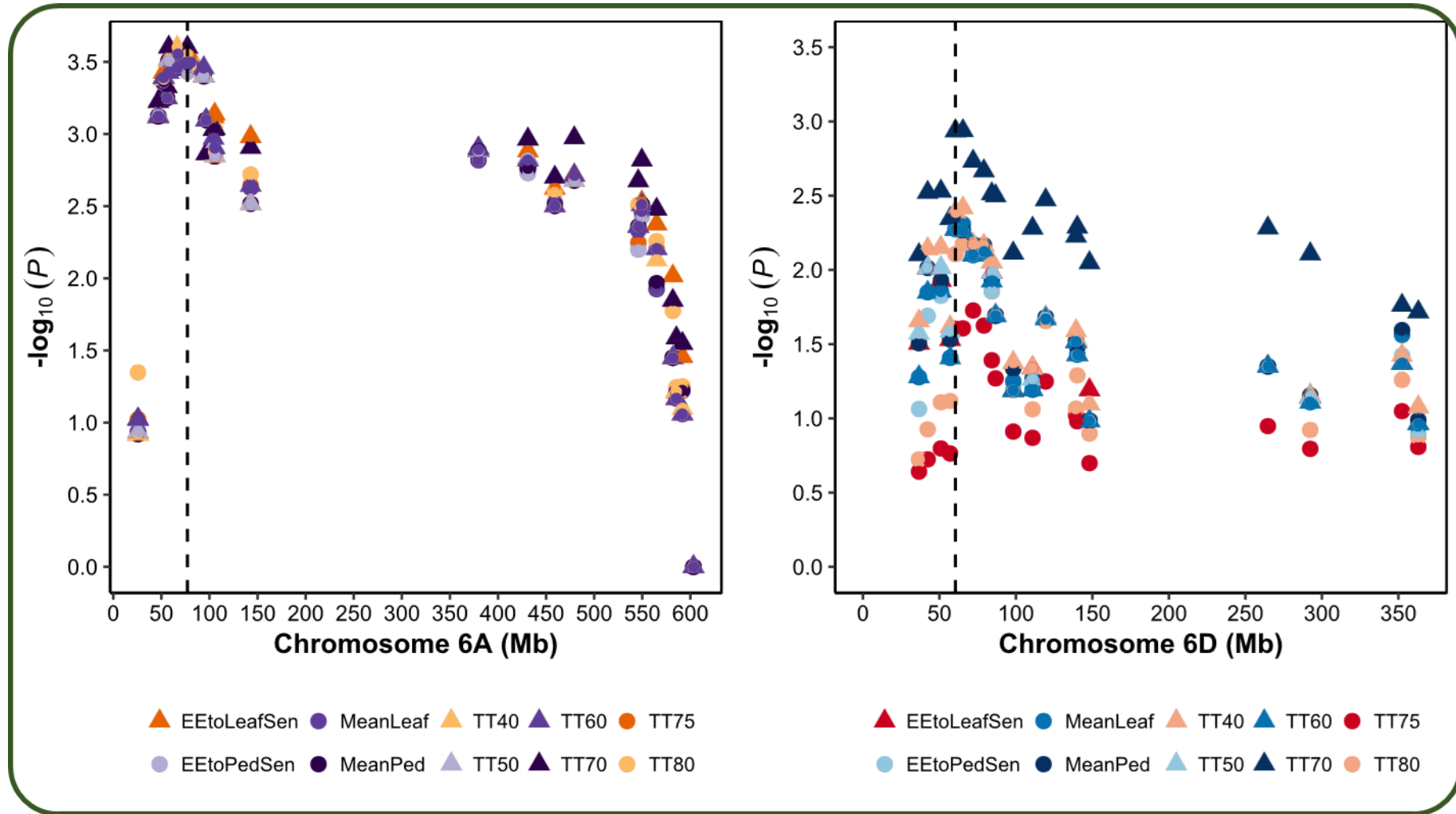


Alt. Allele
l Depth

dex₁

al. In preparation

Staygreen Green Genetics



Novel Staygreens with Yield Potential?



Norwich	1189a	2316b
2017	-0.86	+1.40
2018	+5.23	+9.09

Germany	1189a	2316b
2017	+3.05	+1.40
2018	-1.49	+0.65

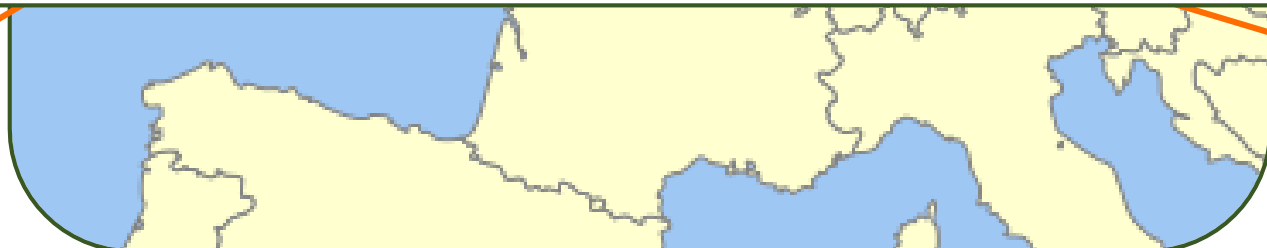
Thousand Grain Weight (Norwich sites)

1189a Staygreen vs Non-SG

2016 -1.35%, P-value = 0.9977
2017 +2.16%, P-value = 0.8712
2018 +5.84%, P-value < 0.0001

2316b Staygreen vs Non-SG

-1.23%, P-value = 0.9998
+3.64%, P-value = 0.1732
+3.10%, P-value = 0.0532



Cal	1189a	2316b
2016	-0.8	0
2017	+4.19	-0.93
2018	+5.23	+9.09

Germany	1189a	2316b
2017	+3.05	+1.40
2018	-1.49	+0.65

In Summary

- Successful utilisation of WGIN genetic resources
- Senescence Traits: Subjective but heritable
- Selecting Staygreens: Mean Peduncle & TT70
- Identified novel senescence alleles
- Staygreen Traits Display Agronomic Potential via Grain Fill Extension

Thank you for Listening & Acknowledgments

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KWS Field Trial Teams
(UK, France, Germany)



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norwich research park

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