

Assessing resistance to *Septoria tritici* blotch in a multi-parent advanced generation inter-cross (MAGIC) population of wheat (*Triticum aestivum* L.)

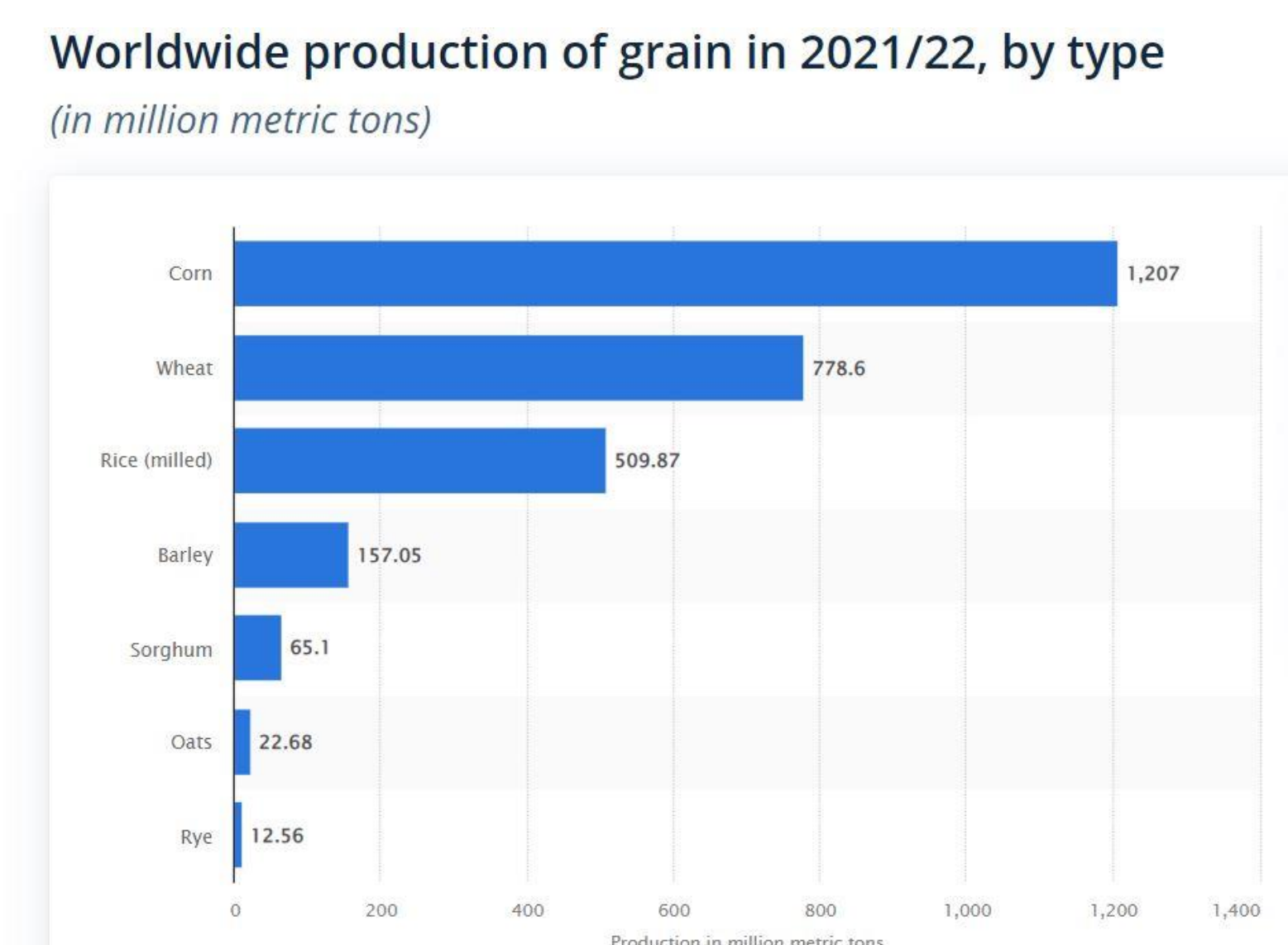
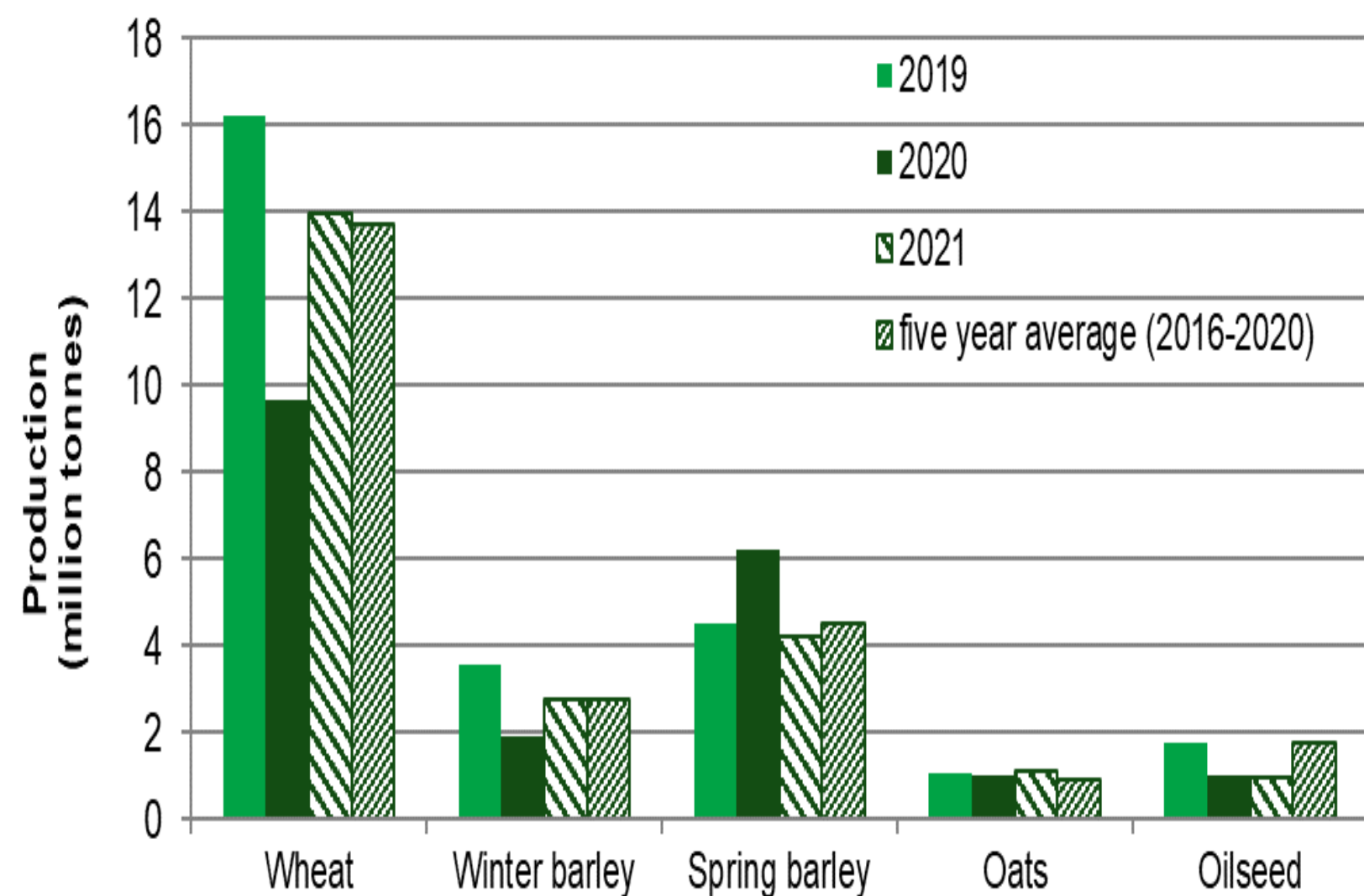
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Background & aim



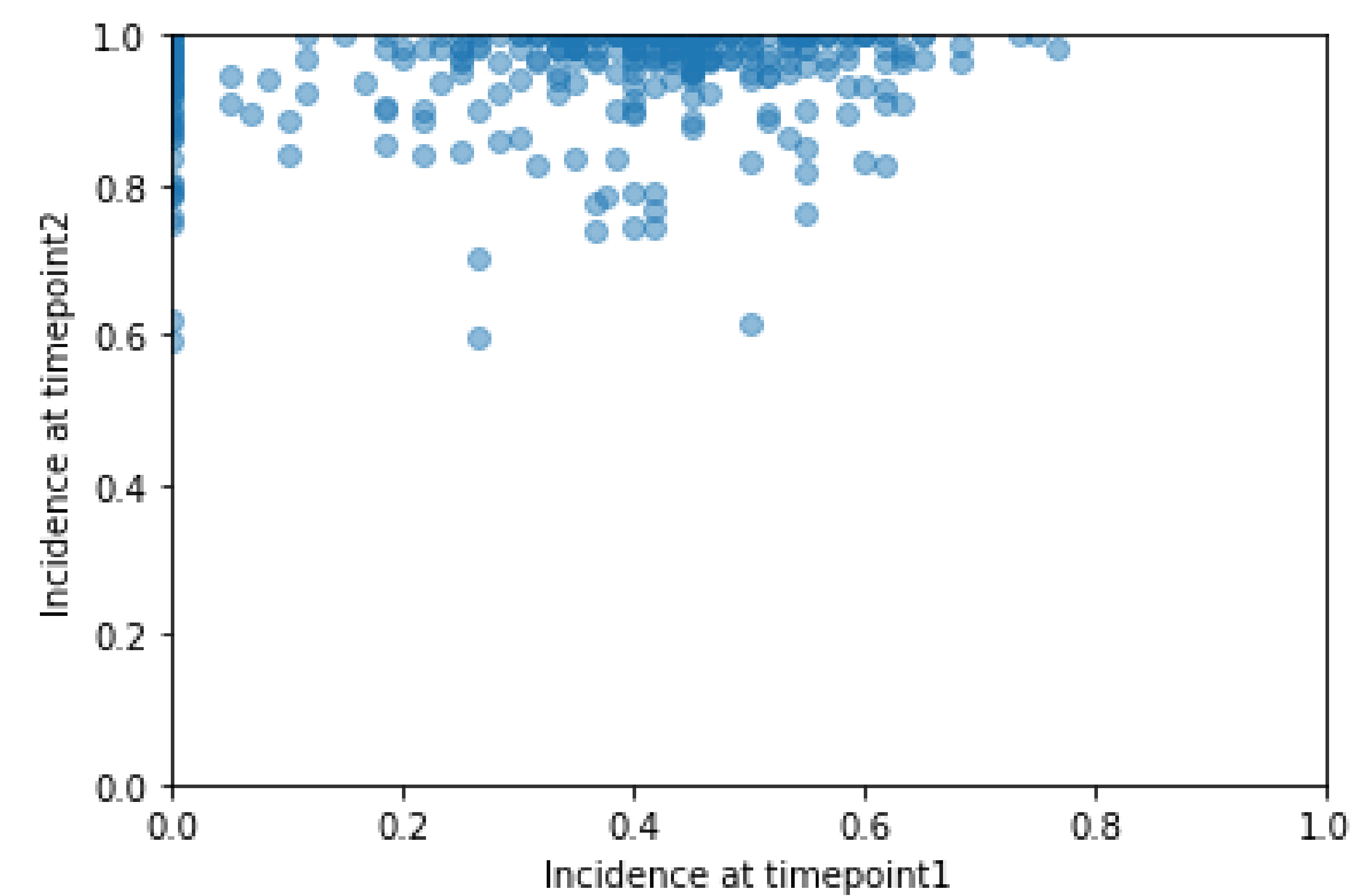
Septoria tritici blotch (STB) caused by *Zymoseptoria tritici*, is the most economically important fungal disease of wheat in the UK and it is majorly controlled by using fungicides and resistant cultivars.

However, the pathogen rapidly adapts to fungicides and resistant varieties which makes it difficult to control. Thus, there is constant effort to develop new sources of resistance against *Z. tritici*, one of which is the use of multi-parent advanced generation inter-cross (MAGIC) wheat populations.

This study conducted accurate measurements of disease incidence and severity of STB using automated image analysis and visual assessment, on a UK MAGIC wheat population.



Visual assessment - Incidence



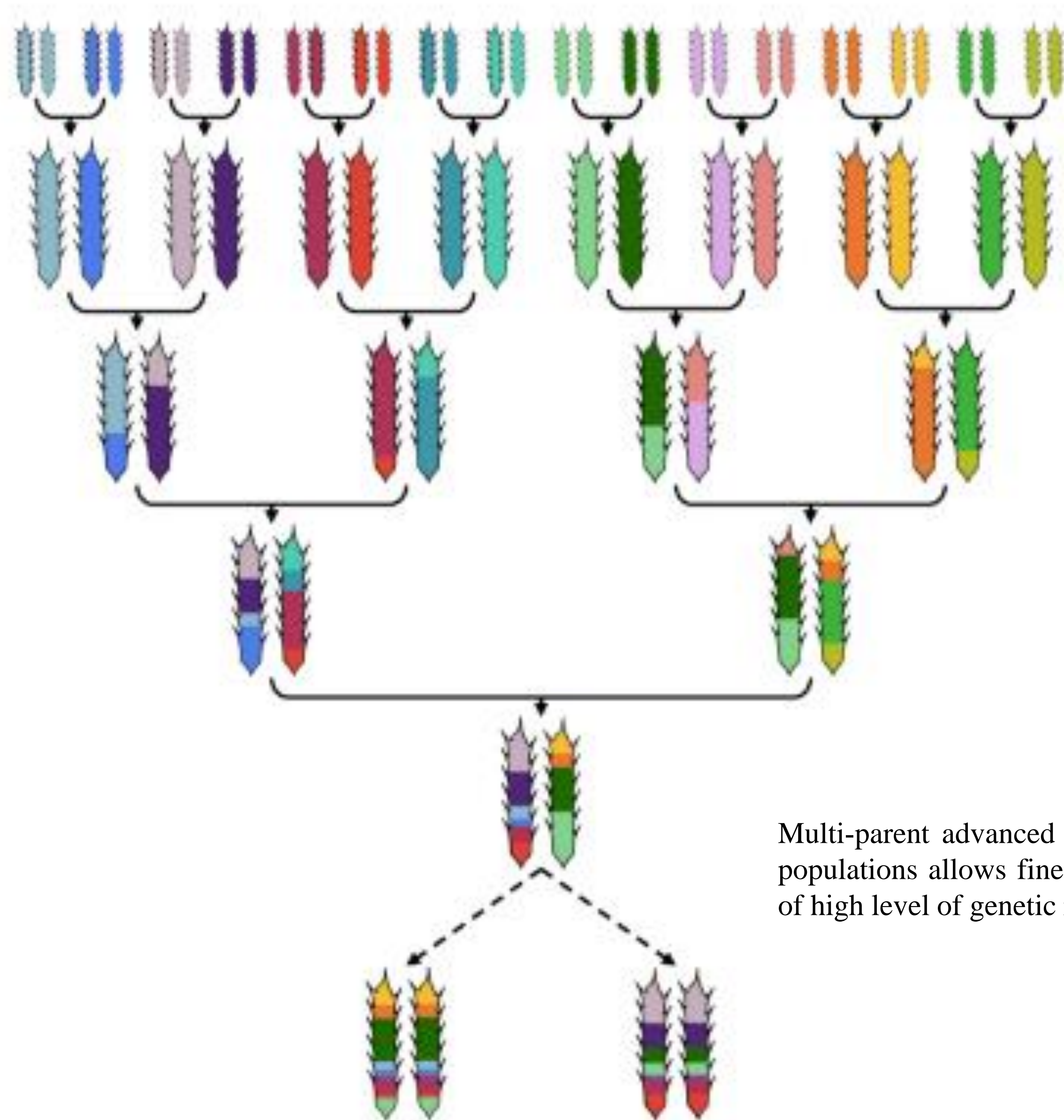
Result showed that correlation between STB mean incidence at T1 and T2 was weak with $r_s = 0.25$, $p = 6.1 \times 10^{-6}$ while heritability (H^2) values of 0.6866 (T1) and 0.4738 (T2) showed that STB resistance is largely heritable.

$$H^2 = \frac{V_g}{V_x}$$

where V_g is the genetic variance and V_x is the phenotypic variance

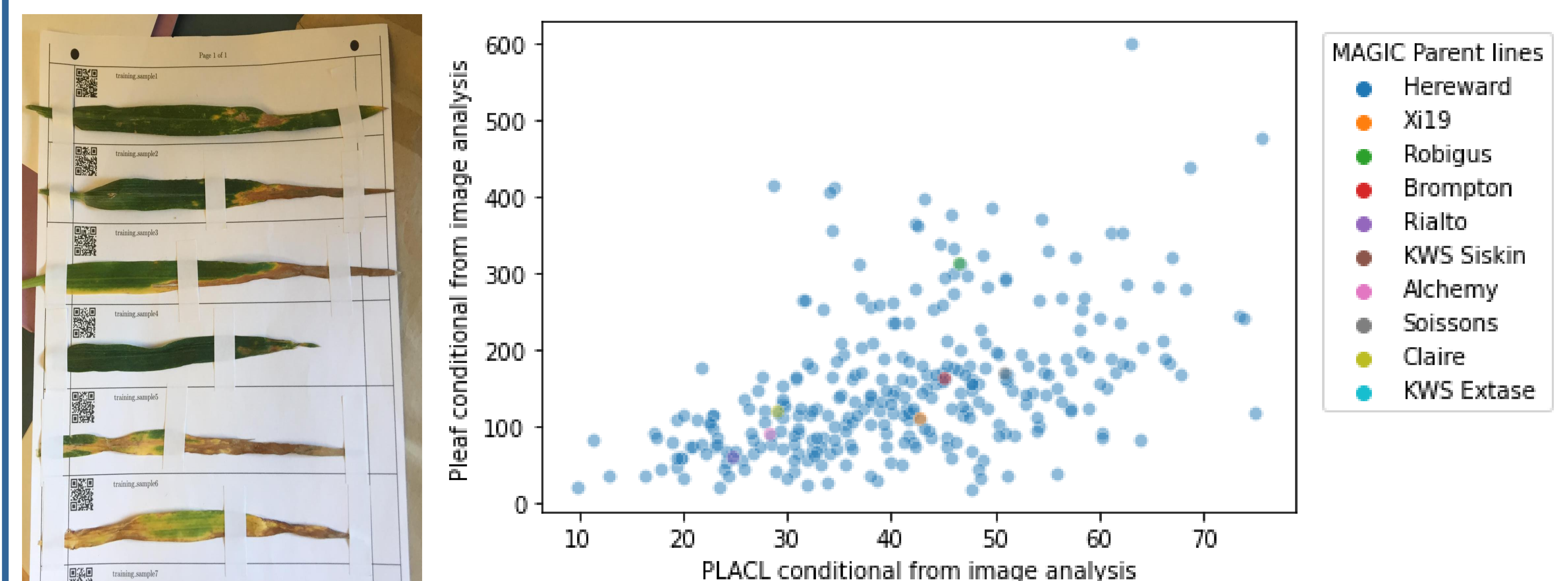
MAGIC Population WHY?

Multi-parent Advanced Generation Inter-Cross (MAGIC)



Multi-parent advanced generation inter-cross (MAGIC) wheat populations allows fine mapping of resistance traits as a result of high level of genetic recombination.

Image analysis - Severity



Comparing the percentage leaf area covered by lesions (PLACL) with the density of pycnidia per unit total leaf area (pleaf) from the image analysis using the Spearman correlation coefficient, showed a moderate correlation between the two components of severity ($r_s = 0.52$, $p = 4.5 \times 10^{-22}$).

STB severity measured as the PLACL ranged from 9.78% to 75.58%. PLACL was used as a quantitative resistant factor to measure severity.

Conclusions

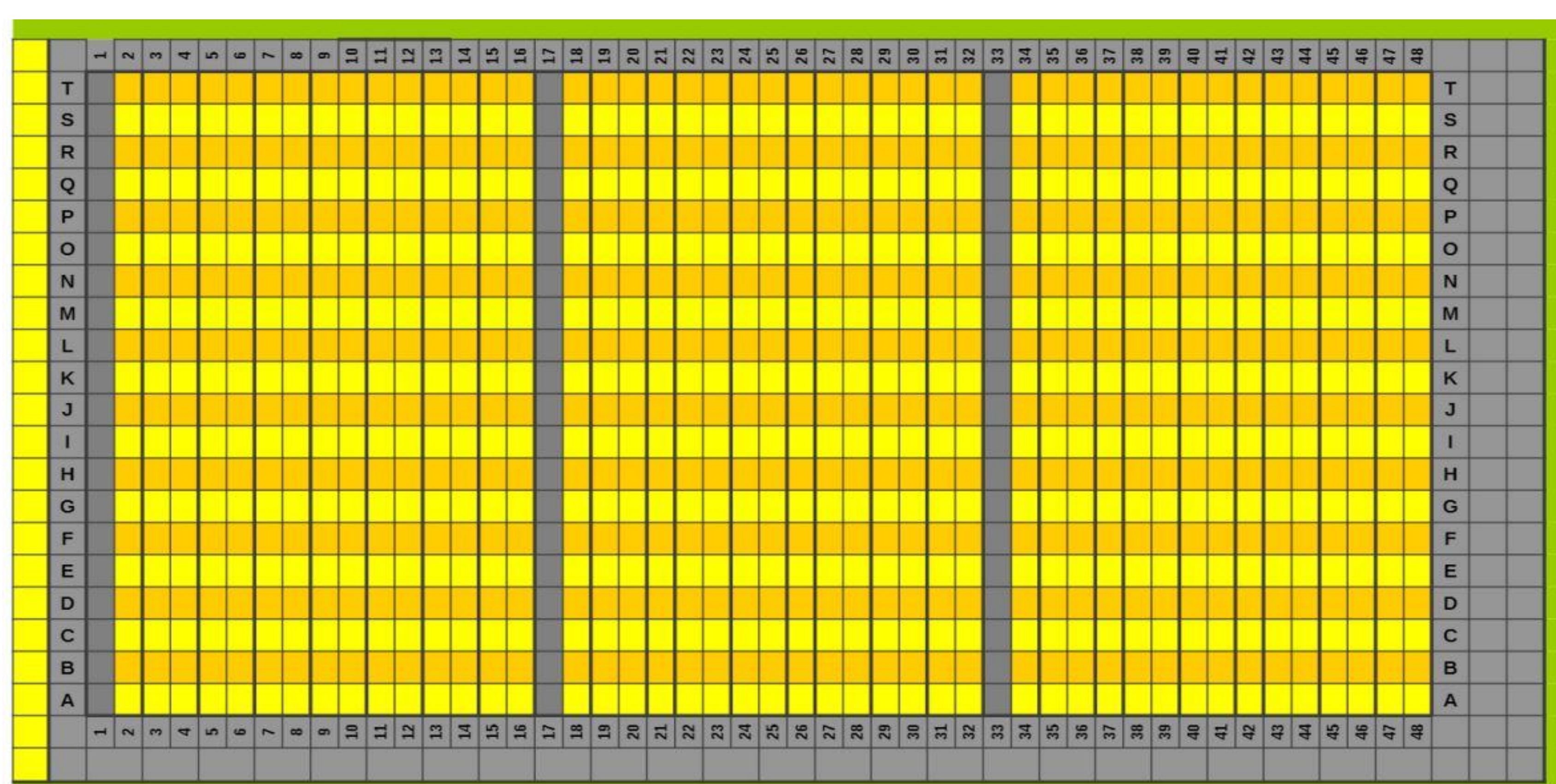
Progenies showed better resistance to STB than the founder cultivars, this is an evidence of ransgressive segregation.

Yellow rust (YR) incidence was recorded on the field and there could have been interaction between YR and STB (pathogen-pathogen interaction) that can influence STB resistance or susceptibility in wheat.

The result will aid quantitative trait loci mapping in order to locate genetic markers correlating with STB resistance, to inform wheat breeding for sustainable STB control.

References

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Plot size 2.0m x 0.675m

A replicated field experiment using 300 wheat lines was carried out at the University of Reading Crops Research Unit, Sonning. The population was evaluated under natural STB infection at two time points (T1 and T2) separated by 56 days