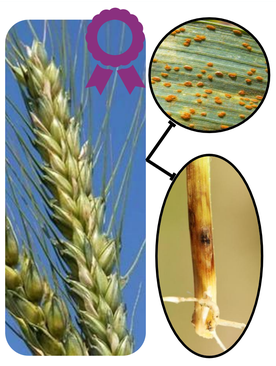
Breaking the Silence : Understanding Recombination Suppression in Wheat Wild Gene Introgressions

Floriane Chéron , Luxi Yan, Isabelle Nadaud, Pierre Sourdille

INRAe, UMR1095 INRAe - Université Clermont Auvergne Genetics, Diversity & Ecophysiology of Cereals, 63000 Clermont-Ferrand, France

floriane.cheron@inrae.fr

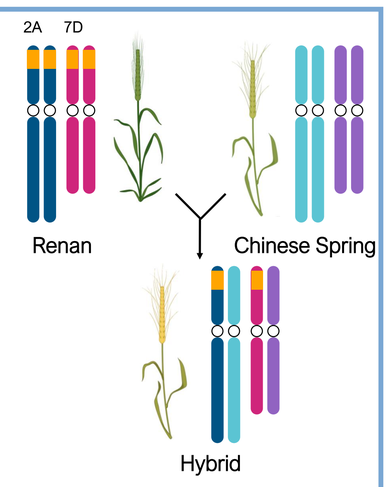
Introduction

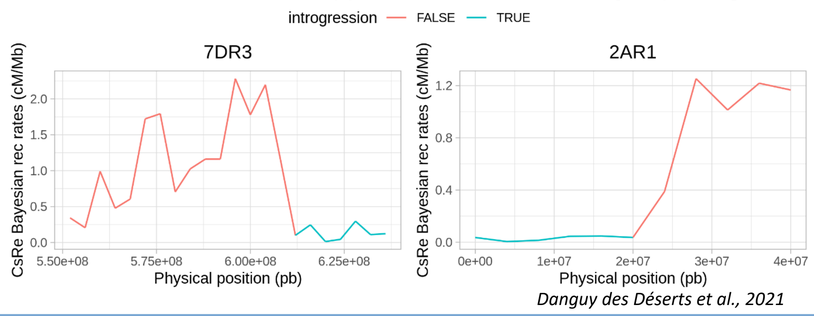


Climate change is adversely affecting wheat yields by facilitating the spread of fungal diseases, including rusts and eyespot. Elevated temperatures, altered precipitation patterns and milder winters create favorable conditions for these pathogens. Fortunately, the wheat variety *Renan* exhibits strong resistance to these major diseases, a trait conferred by two introgressions of resistance genes from the wild species *Aegilops ventricosa*. This genetic composition positions *Renan* as a valuable resource for sustaining wheat production under changing climatic conditions.

To transfert these resistance genes into additional wheat varieties, *Renan* was crossed with *Chinese Spring* variety to produce a hybrid plant. In plant breeding, generating new allele and gene combinations relies on meiotic recombination, a key process driving genetic diversity. However, analysis of the hybrid revealed an absence of recombination within the introgressed regions.

Understanding the mechanisms underlying this meiotic recombination suppression is critical to fully exploiting these resistances genes in wheat breeding programs.



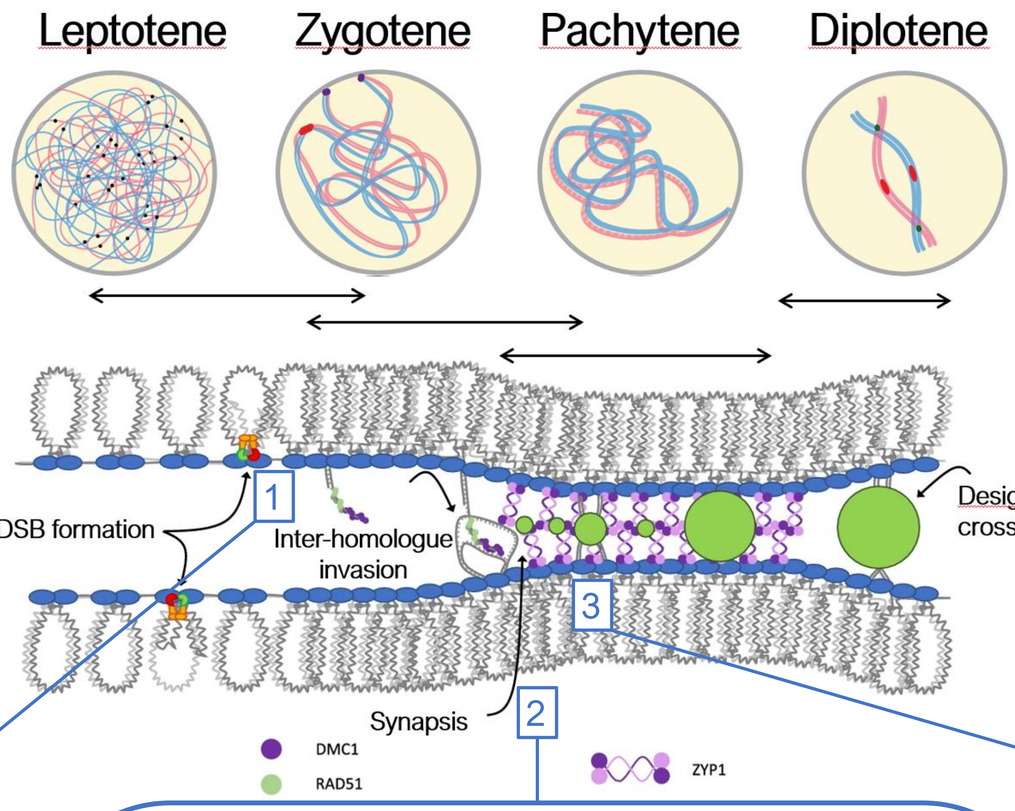


Danguy des Déserts et al., 2021

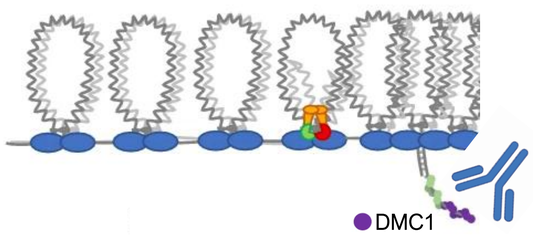
Objective :

➡ Elucidate the molecular mechanisms underlying meiotic recombination failure in introgressed regions

Strategies

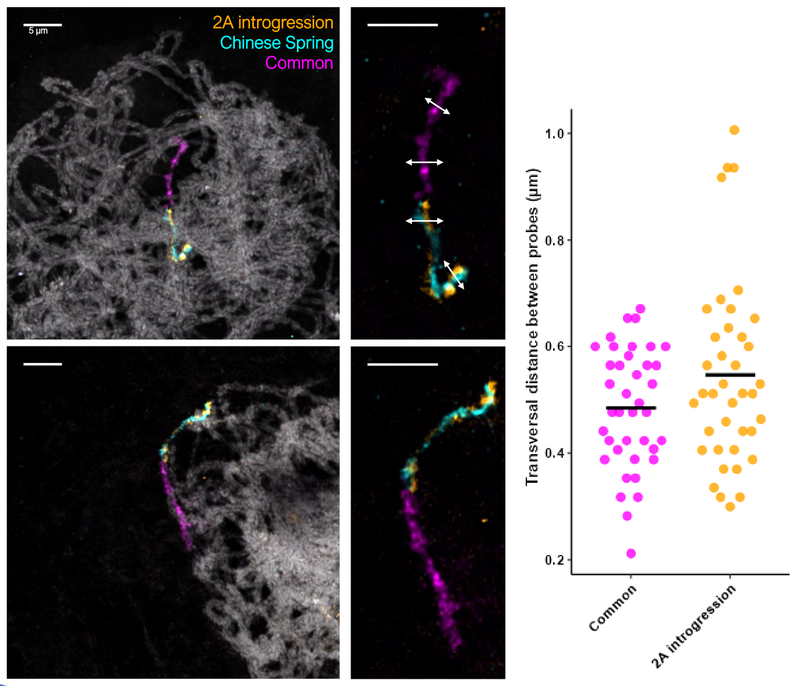


1- Investigate recombination events within *Ae. ventricosa* introgressed regions

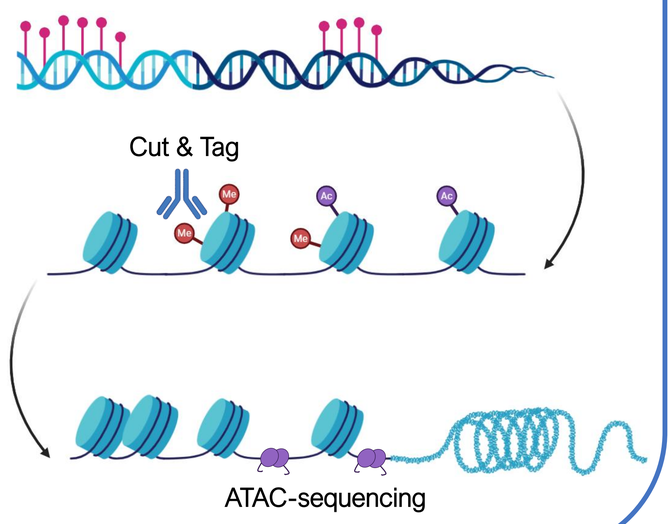


ChIP-sequencing of the meiotic recombinase DMC1 to map homologous recombination sites in *Aegilops ventricosa* introgressions (2A, 7D).

2- Chromosome alignment is maintained in CSRe hybrids carrying *Ae. ventricosa* introgressions



3- Exploring how epigenetic modifications and chromatin accessibility may contribute to recombination suppression



Expected outcomes

By integrating these complementary approaches, this project aims to **uncover mechanisms limiting recombination in *Aegilops ventricosa* introgressions**, facilitating targeted transfer of resistance genes for improved wheat breeding strategies.