

# Exploring yield and malting quality stability through genome-wide association in an elite barley mapping population

Maximiliano Verocai<sup>1</sup>, Gastón Quero<sup>1</sup> Silvina Baraibar<sup>2</sup>, Lorena Cammarota<sup>3</sup>, Lucía Gutiérrez<sup>4</sup>, Fernanda Pardo<sup>5</sup>, Ariel Castro<sup>1</sup>

<sup>1</sup> Facultad de Agronomía, Universidad de la República, Uruguay. <sup>2</sup> Instituto Nacional de Investigación Agropecuaria, <sup>3</sup> Maltería Uruguay S.A., <sup>4</sup> University of Wisconsin-Madison, <sup>5</sup> Maltería Oriental S.A.

## Takeaways

In the context of Elite x Elite crosses genetic differences are more subtle and the ability to detect relevant QTLs is reduced.

The germplasm used in this research is representative of regional breeding programs, thus the results are applicable.

## Introduction

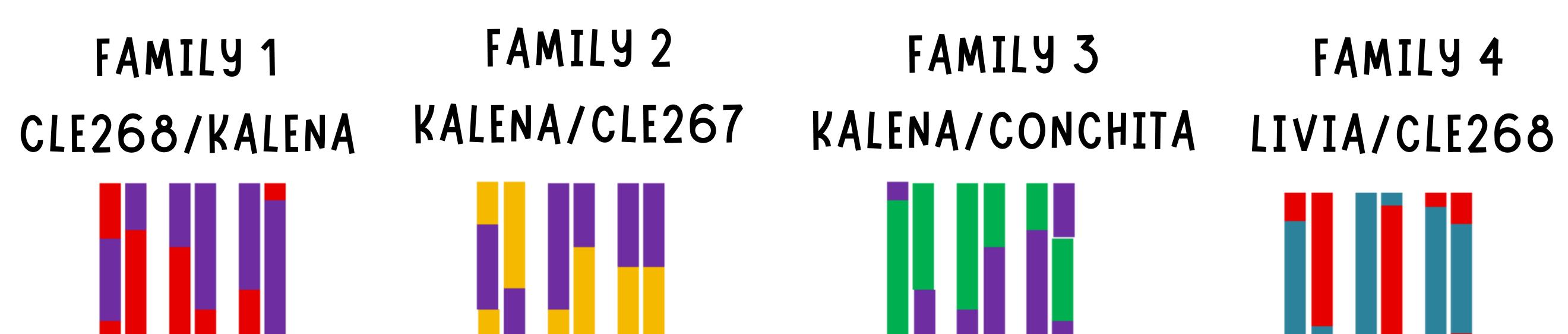
Barley production in South America's Southern Cone relies heavily on modern European germplasm known for high yield and malting quality, but with limited stability and adaptation in this region.

**Our goal is to identify QTLs for yield and malting quality stability in South American (specifically Uruguayan) environmental conditions using germplasm representative of the crosses used in local breeding programs.**

## Materials and methods

We used a NAM population of 150 DH lines derived from crosses between modern European cultivars and local well-adapted germplasm.

6,340 SNP markers were obtained using Barley Illumina 50K array (1).



Phenotypic data for yield was obtained from 13 experiments conducted over 4 years (2015-2018). Malting quality data (beta-glucan content, malt extract and soluble nitrogen) was obtained from three locations in 2016.

We calculated stability indices to describe genotype and environment interactions, including the FW index, (1) genotypic superiority index (2), stability variance (3), ecovalence (4), and deviation mean squares (5).

Genome-wide association studies were conducted using K+P model implemented in the rrBLUP R package (6).

## Results

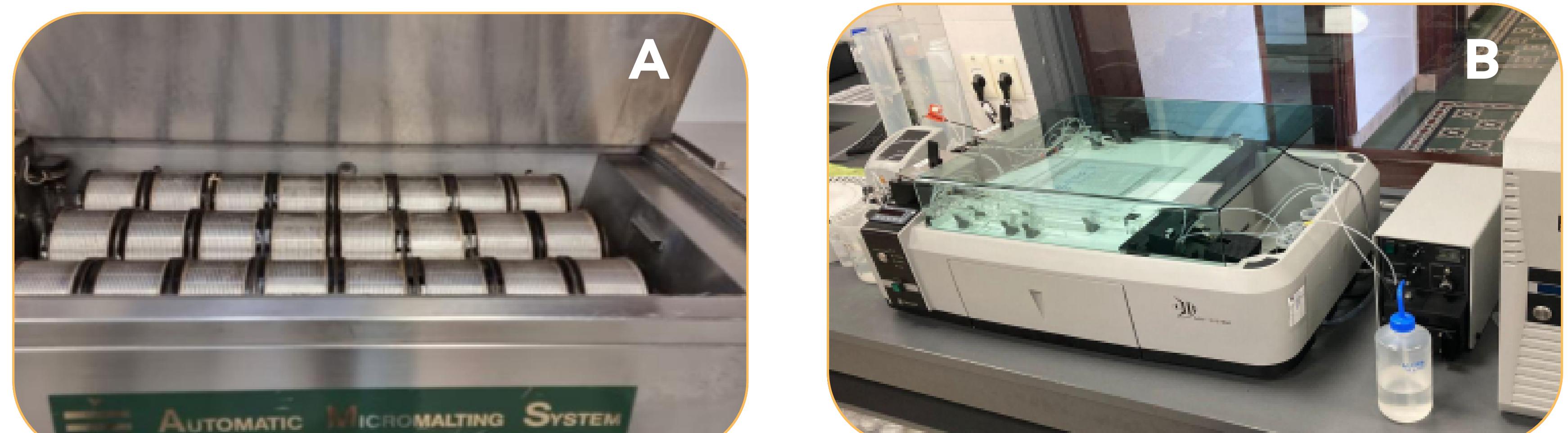


Figure 1. A) Automatic Micromalting System (LATU). B) Skalarmodel SAN++ equipment (with module to measure BG, samplerSA1000, fluorometerSA6310) in Malteria Oriental S.A.

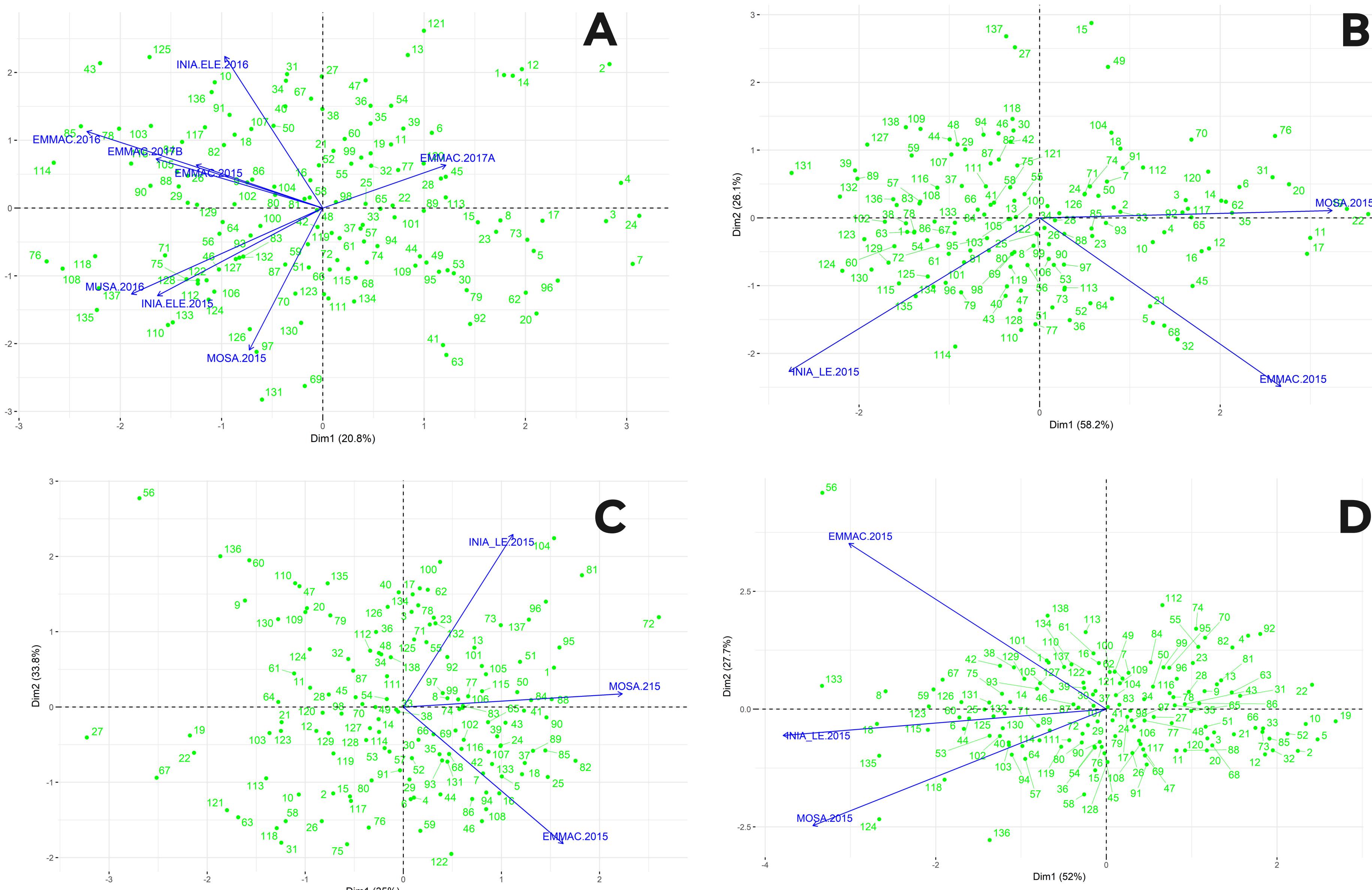


Figure 2. Principal component analysis of A) Grain yield, B) Beta-Glucan content, C) Extract, and D) Soluble nitrogen

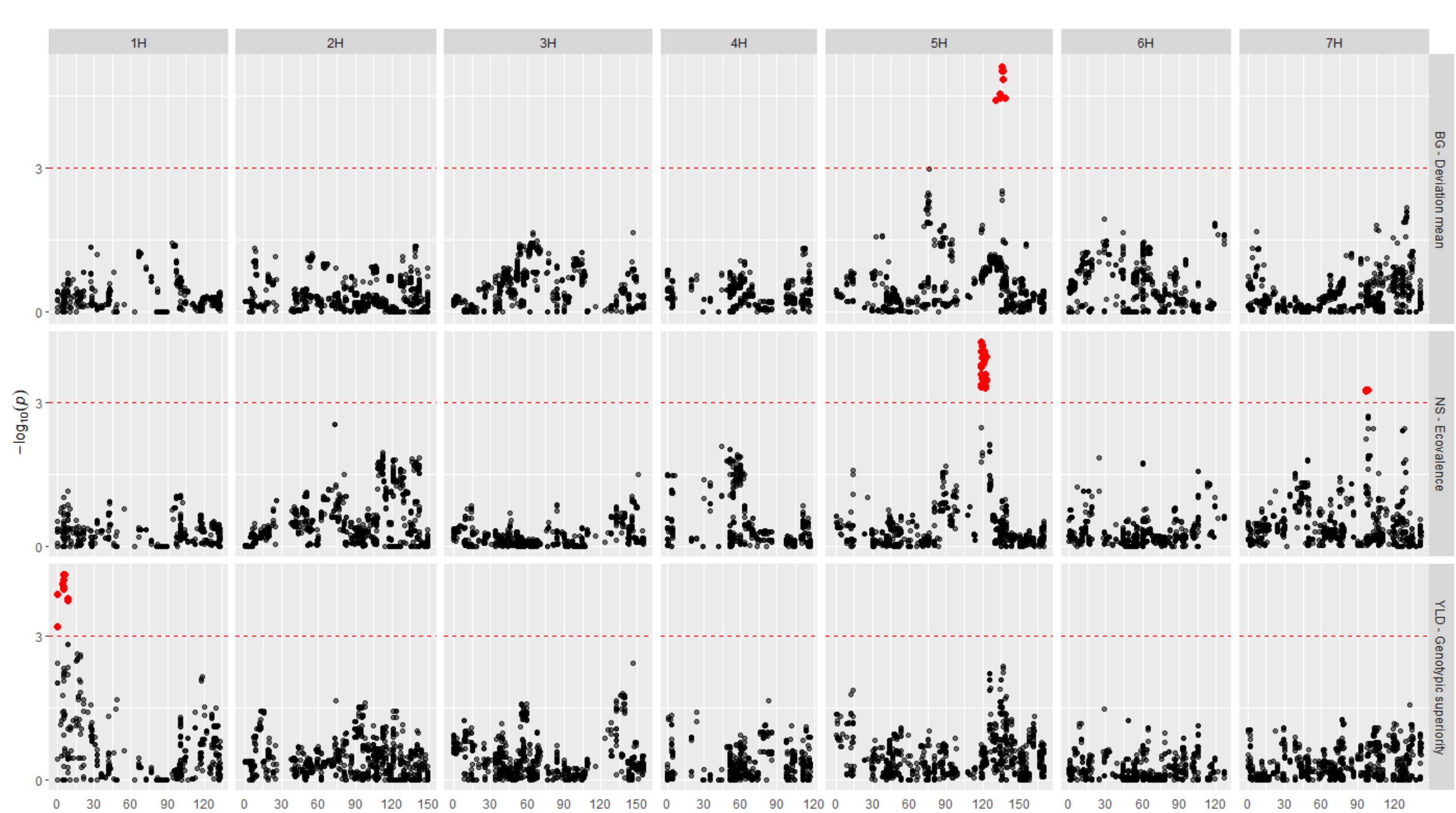


Figure 3. Manhattan plot of GWAS results showing significant QTL associations.

## References

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