

# Genome-wide association study of resistance to late blight based on JKI pre-breeding potato clones (*Solanum tuberosum*)

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## Background

Until today, late blight (*Phytophthora infestans* Mont. de Bary) is an enormous burden to potato growers worldwide (Fig. 1). This is a problem especially for organic farming, where effective plant protection is almost impossible. Genetic resistance is, thus, an important option. At JKI, a gene pool of highly resistant pre-breeding clones has been developed over 60 years.

## Methods

To localize resistance loci in the genome, 39 varieties and 141 pre-breeding clones were used for an genome-wide association study (GWAS).

A detached leaf assay (Fig. 2) and a tuber slice test (Fig. 3) were used for assessing resistance. DNA samples from pre-breeding clones and cultivars were genotyped using Genotyping by Sequencing (GBS).

The reference genome has been the *S. tuberosum* group ‘Phureja’ clone, which was sequenced in 2011. After filtering for minor allele frequency (5 %) and missing values (30 %), 28,055 SNPs were used for GWAS.

## Main Results

In the first project year, quantitative trait loci (QTL) for foliage blight resistance were detected on chromosome 9 and 11 (Fig. 4) and for tuber blight resistance on chromosome 11 (Fig. 5).

## Summary and Outlook

Two chromosomes (9, 11) were shown to carry QTL for late blight resistance in the JKI potato gene pool. In the following two project years, results will be checked and refined by generating additional GWAS data points.



Fig. 1 Highly resistant (left) and susceptible (right) potato clones



Fig. 2 Leaves of susceptible (left) and resistant (right) potato pre-breeding clones in a detached leaf assay



Fig. 3 Tuber slices of susceptible (left) and resistant (right) potato pre-breeding clones in a tuber slice assay

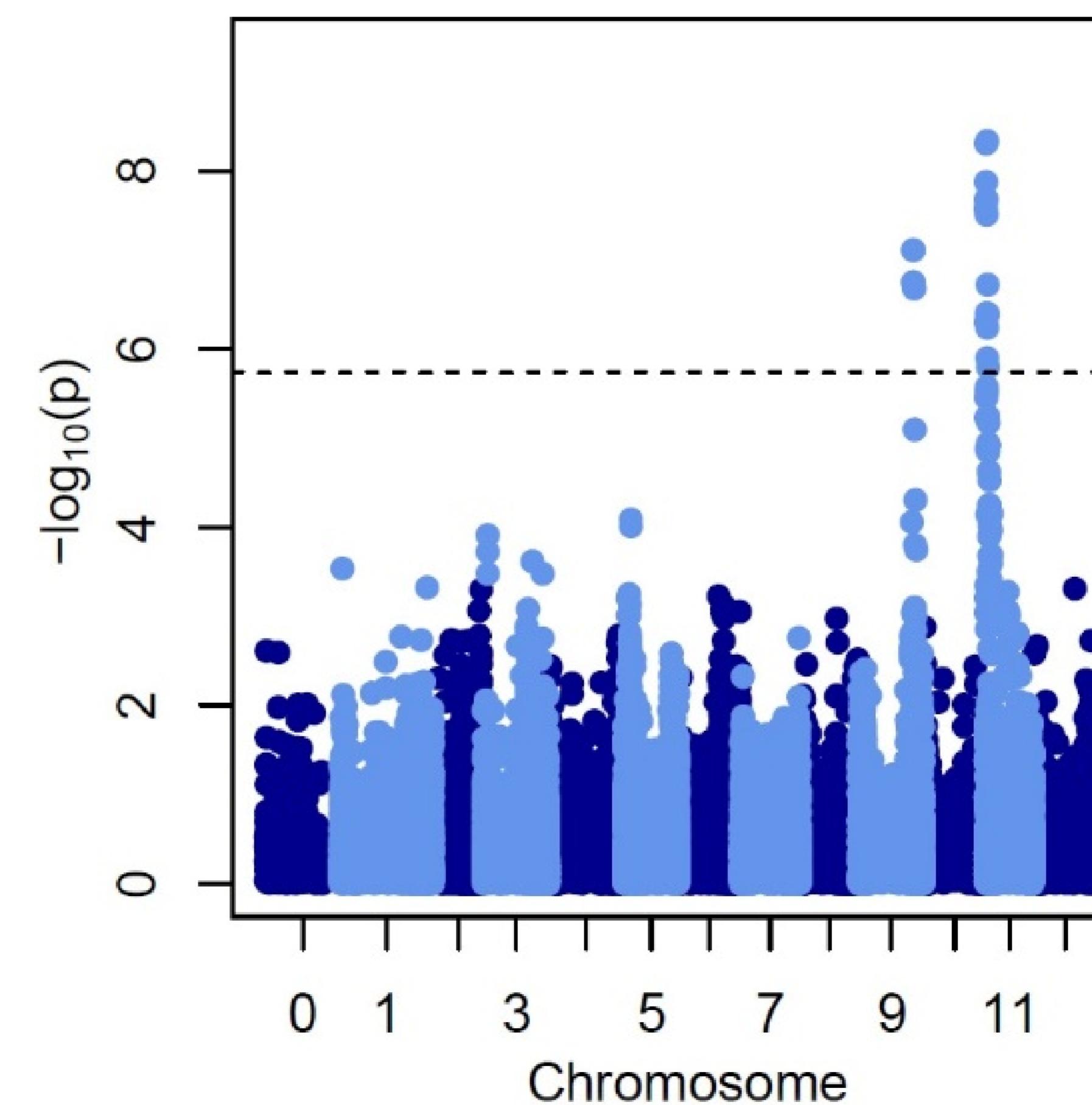


Fig. 4 Manhattan plot for foliage blight resistance of potato

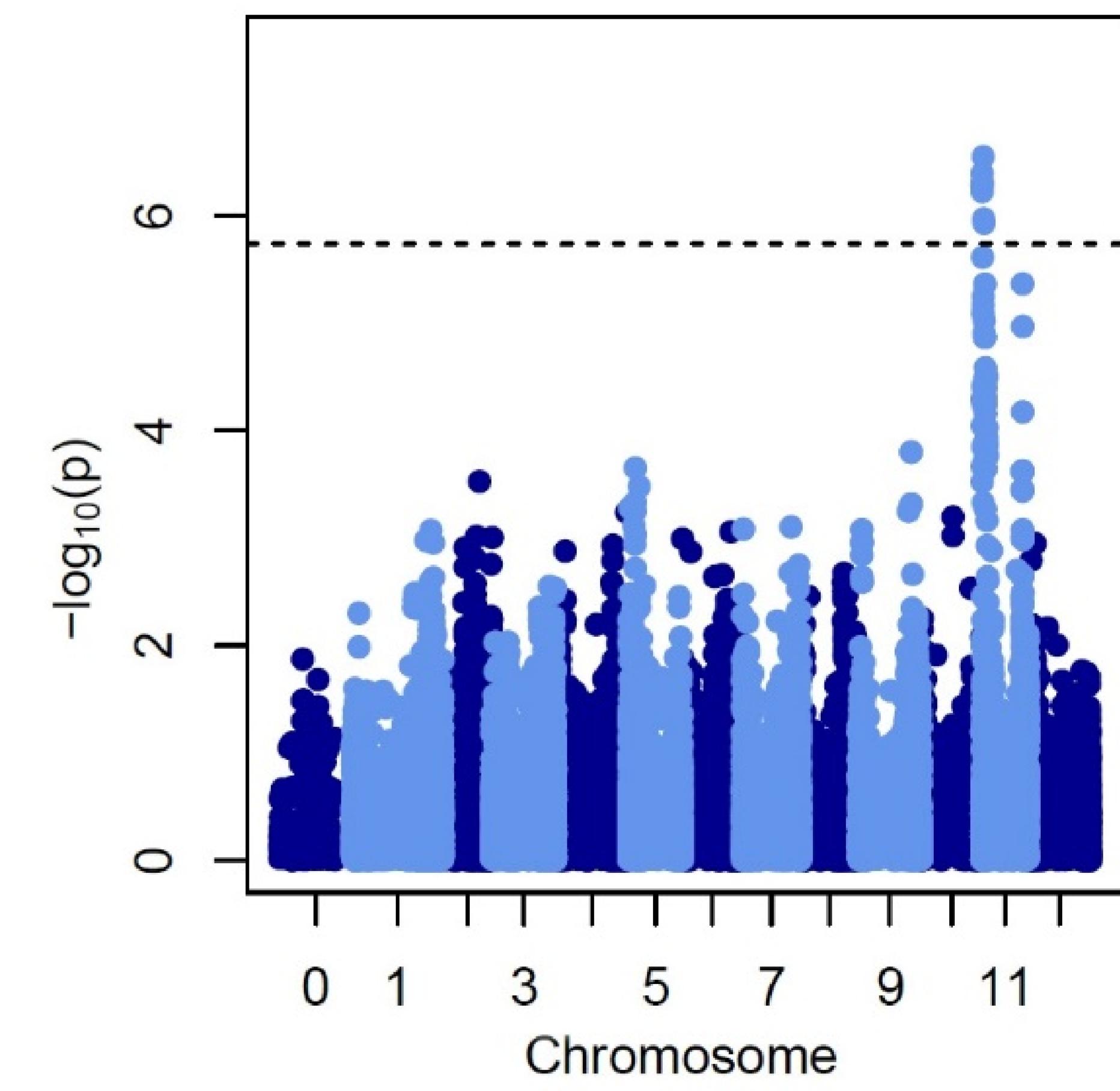


Fig. 5 Manhattan plot for tuber blight resistance of potato

