

GENETIC TOOLS FOR GERMPLASM CONSERVATION

A case study of landrace black rice in Australia

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1. BACKGROUND

- Black rice has been cultivated throughout Asia for centuries, although its exact origin remains a subject of debate.
- **Black color trait** is attributed to **anthocyanins** accumulation in the pericarp.
- The effects of **Ultra-violet (UV) radiation**, which is prevalent in Australia, on the expression of black colour trait are unknown.
- A diversity panel was established with **320 genotypes** from 12 countries.

2. QUESTIONS

WHAT IS THE LEVEL OF **GENETIC DIVERSITY** WITHIN THE GERMPLASM COLLECTION OF BLACK RICE?

DOES UV RADIATION AFFECT **ANTHOCYANIN** ACCUMULATION IN THE PERICARP?

IS THERE ANY NOVEL SIGNIFICANT **QUANTITATIVE TRAIT LOCI (QTL)** FOR UV-DEPENDENT ANTHOCYANIN ACCUMULATION?



Watch this video to find out more

3. RESULTS

Cluster analysis presented two major population clusters within the diversity collection

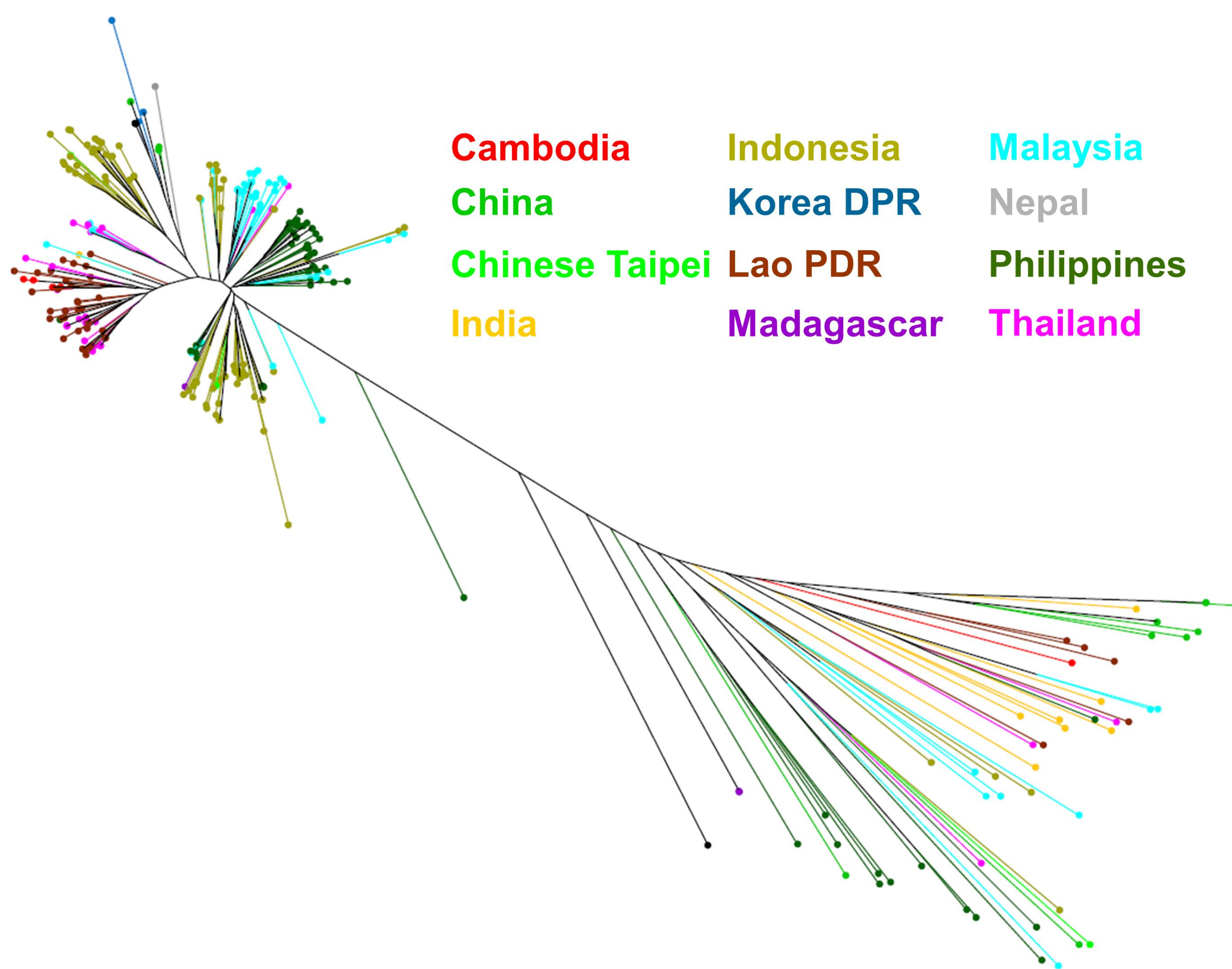


Figure 1: Cluster analysis based on genetic distance of 320 genotypes. An Unweighted neighbour-joining tree was constructed on DARwin with branches coloured by country of origin.

Population structure and PCA confirmed two clusters

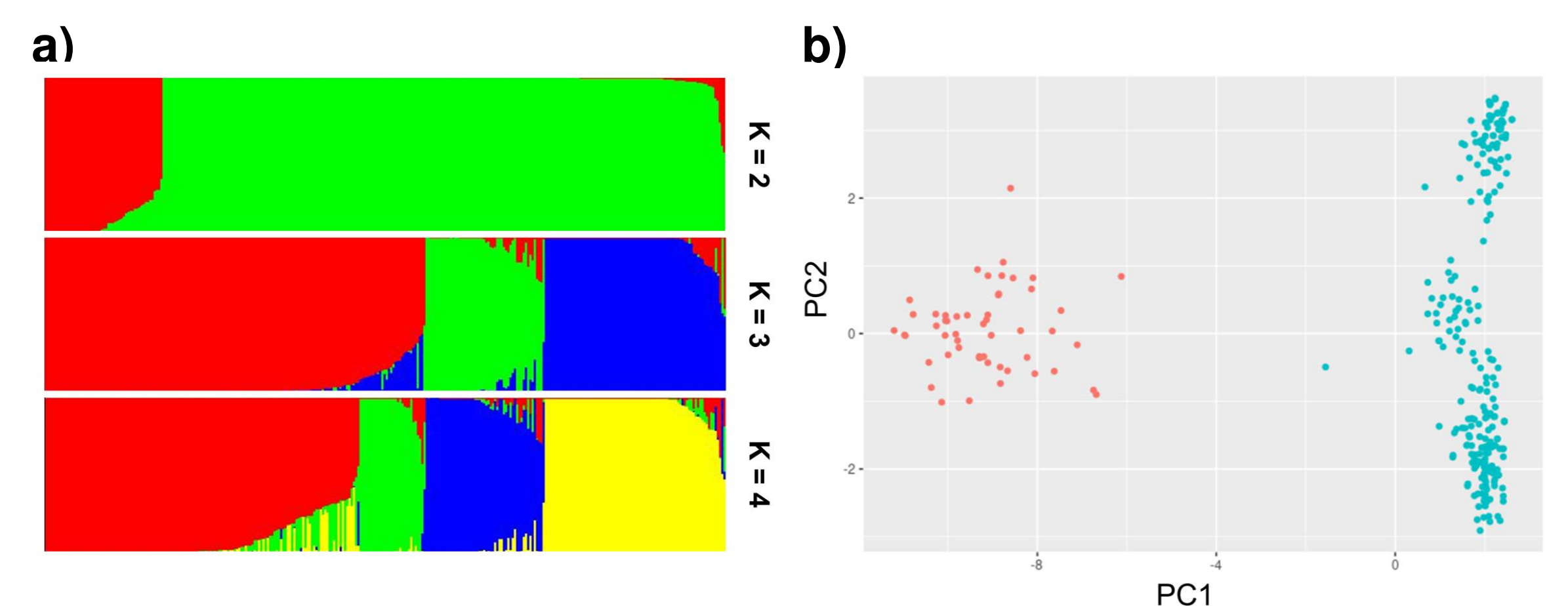


Figure 2: a) Population structure with $K = 2 - 4$ in STRUCTURE; b) Principal Component Analysis performed on TASSEL and plotted in R

Several significant SNPs found for black colour traits in response to UV conditions

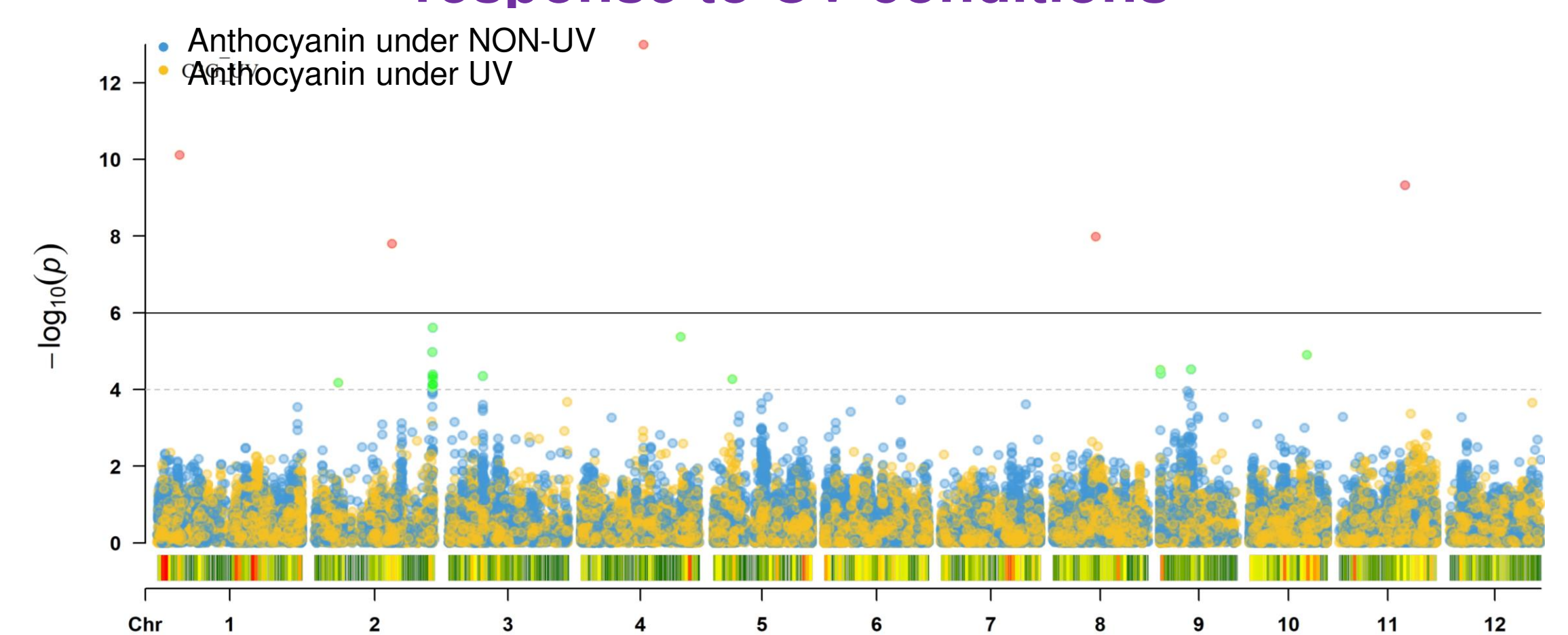
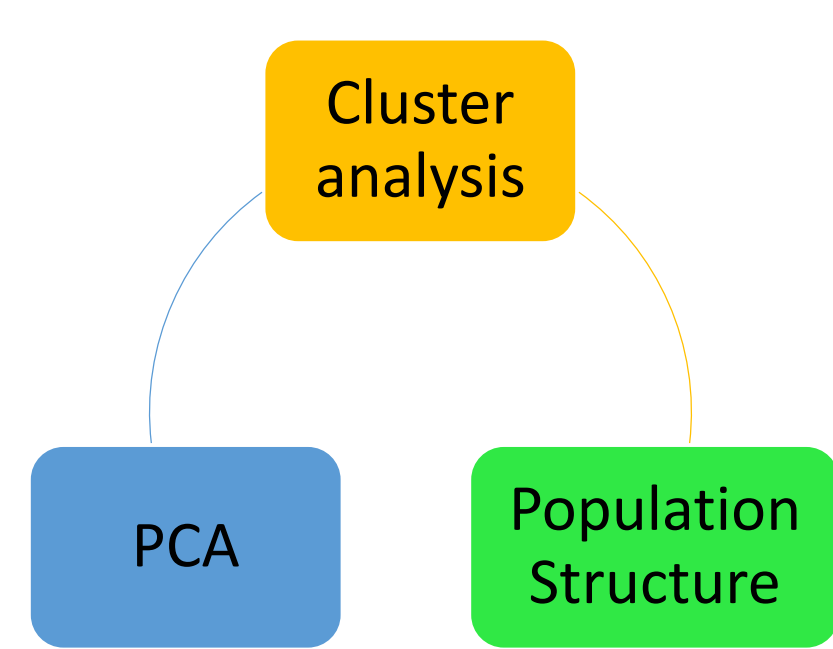


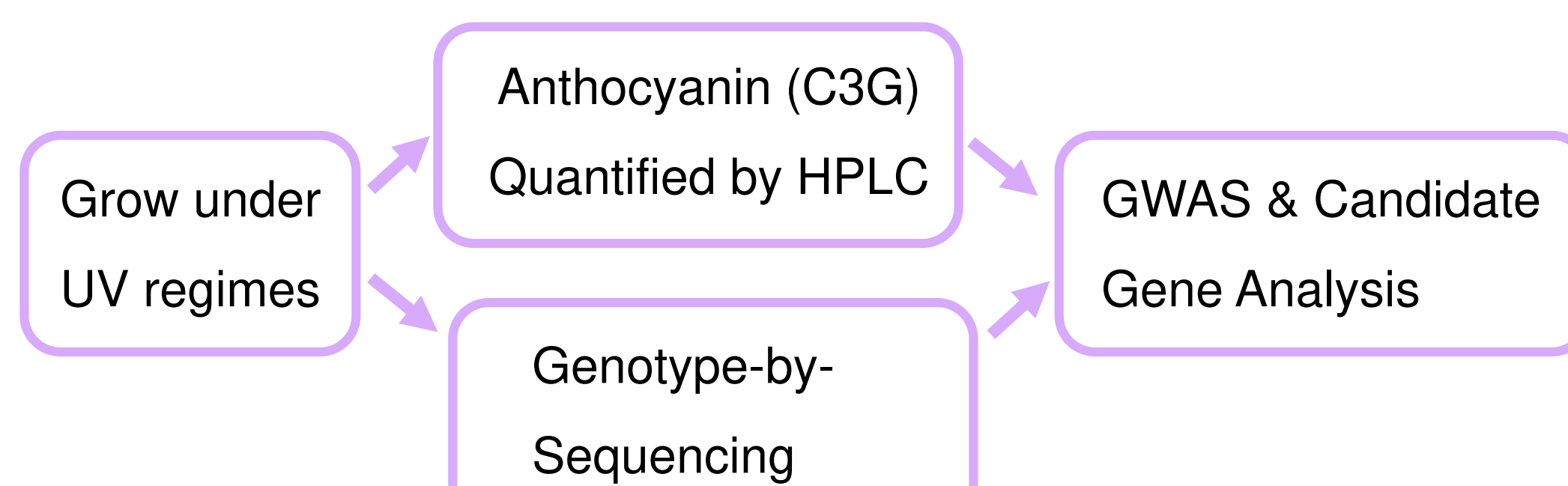
Figure 3: Manhattan plot GWAS BLINK model of anthocyanin under UV regimes

4. METHODS

Population Genetics



Pipeline of Genome-Wide Association Mapping



Experiment Under Two UV Regimes



The left block is UV treatment and the right block is non-UV treatment.