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Detection of QTL influencing egg production in layers receiving various diets

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Introduction

Egg production in layers is affected by different **Quantitative Trait Loci (QTL)** and by environment, such as the diet composition. These **two components of the phenotype could be in interaction**. In the case of a genomic selection in layers, take into account this interaction could be necessary.

Objectives

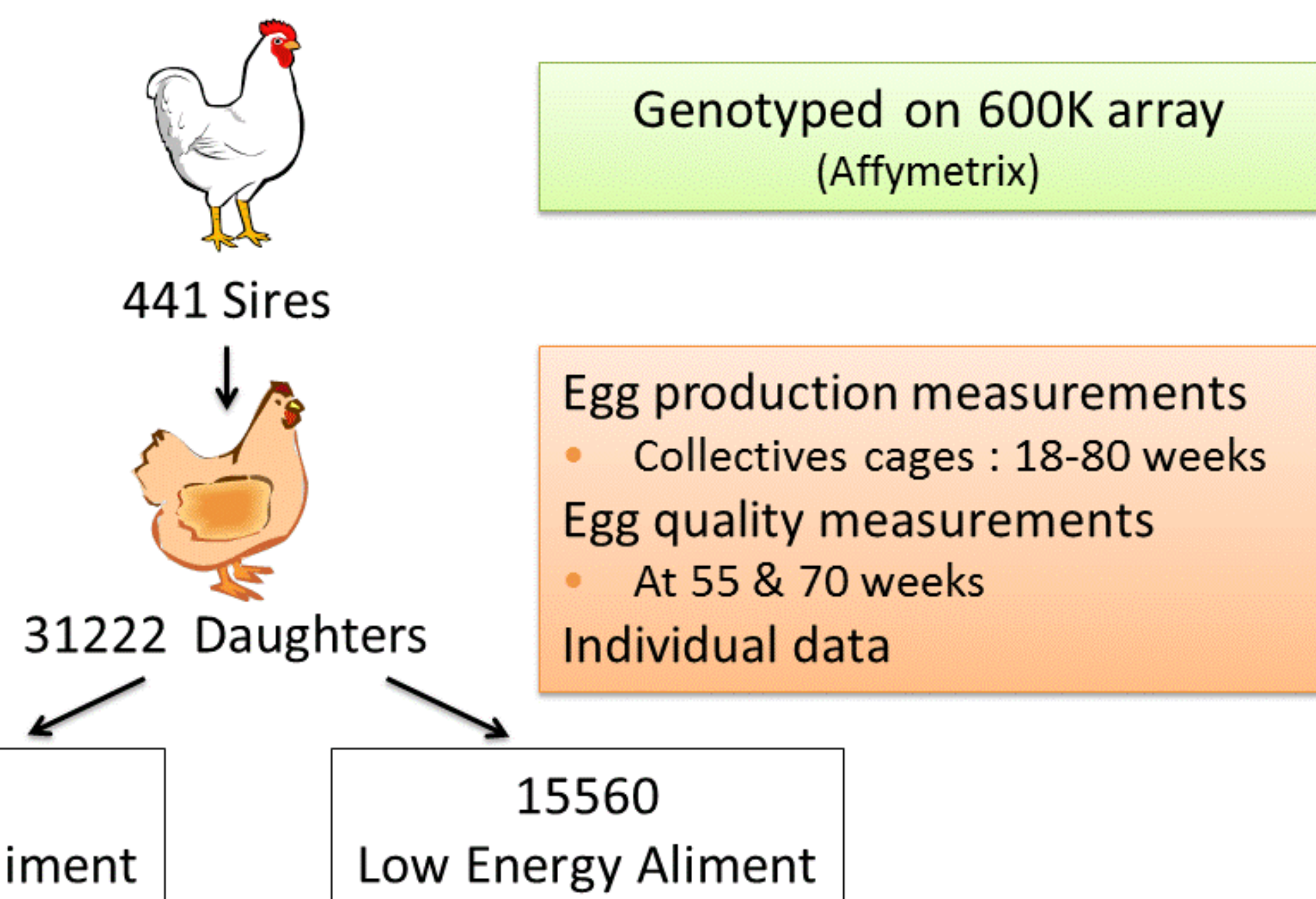
- Detect QTL involved in egg production and egg quality traits
- Use **different GWAS methods** and **compare** the results
- Observe the existence of **QTL by environment interaction**

Conclusion

- Significant QTL have been detected in the present study for various egg production and egg quality traits
- QTL detected depend on diet
- **Take into account underlying kinship in GWAS** influence QTL detection
- **Take into account genetic by environment interactions** in genomic evaluation of layers could be necessary

Material and Methods

Experimental design



Methods

- Phenotypes were recorded in 3 hatches in collective cages of 12 hens.
- Data were adjusted for the hatch effect and for the localization in buildings using the **SAS-GLM procedure**.
- Each sire has **two phenotypes**, one per diet, which were the means of his daughters adjusted performances.
- **PLINK** software was used to filter the genotyping data (Call rate, MAF, HWE). Thus **288,305 SNPs** were kept for further analyses.
- **SNP regression** and **Gblup** methods were used to realize GWAS analyses.

Results

Existence of different QTL according to the diet

GWAS - Plink

- | | |
|----------------------------|---------------------------------------|
| Low energy : 12 QTL | High energy : 98 QTL |
| 4 for Egg shell solidity | 88 for Egg shell color |
| 7 for Egg shell color | 6 for Inclusion |
| 1 for Inclusion | 1 for Egg weight |
| | 1 for Egg production (50 to 80 weeks) |

A*(color) at 55 weeks under low energy diet

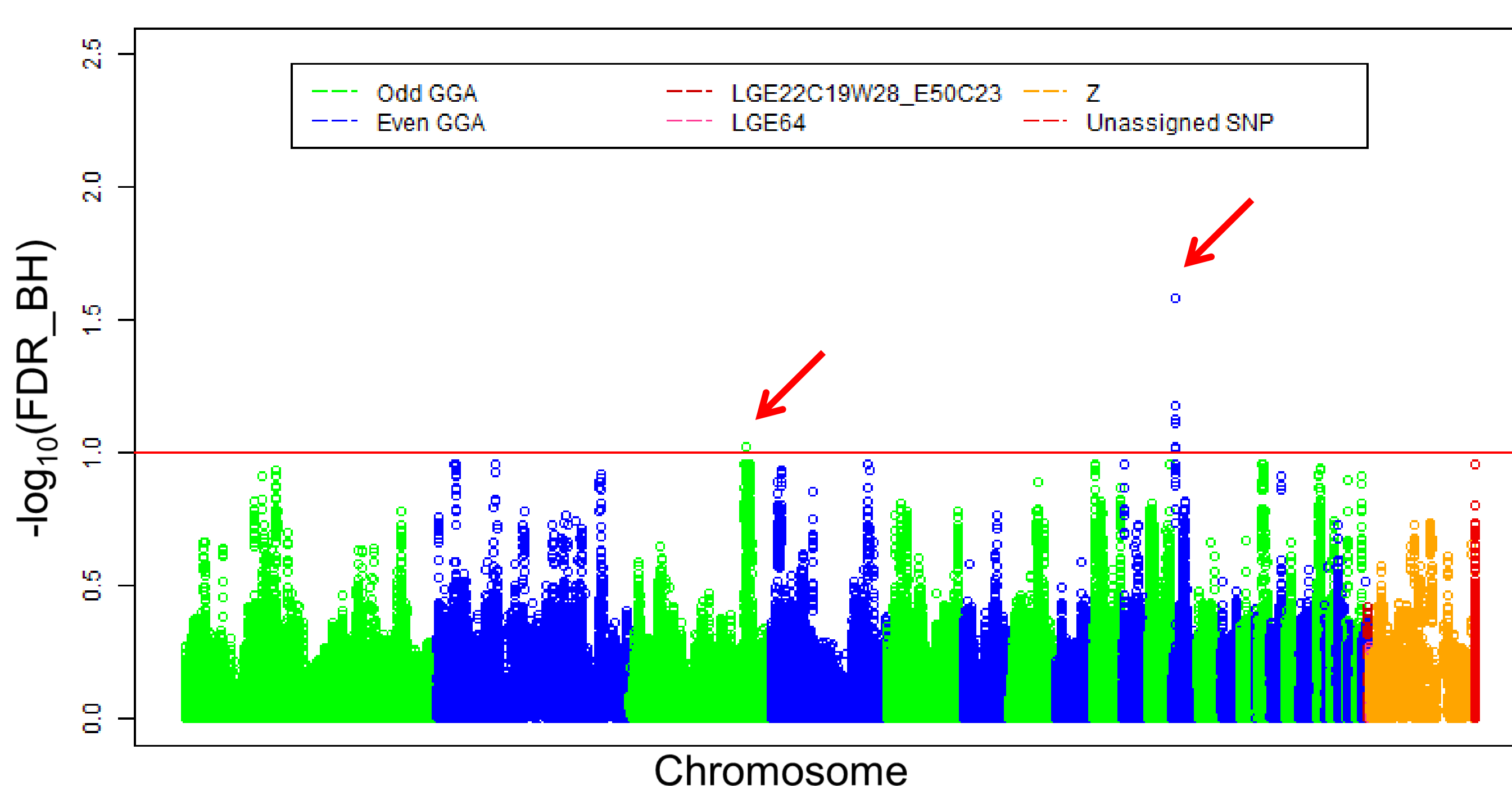


Figure 1 : Significant SNP (FDR<0,1) have been found on chromosome 3 and 12 for the color index A at 55 weeks with a low energy diet using the PLINK software.

GWAS - Gblup

A*(color) at 55 weeks under low energy diet

GGA 3

GGA 12

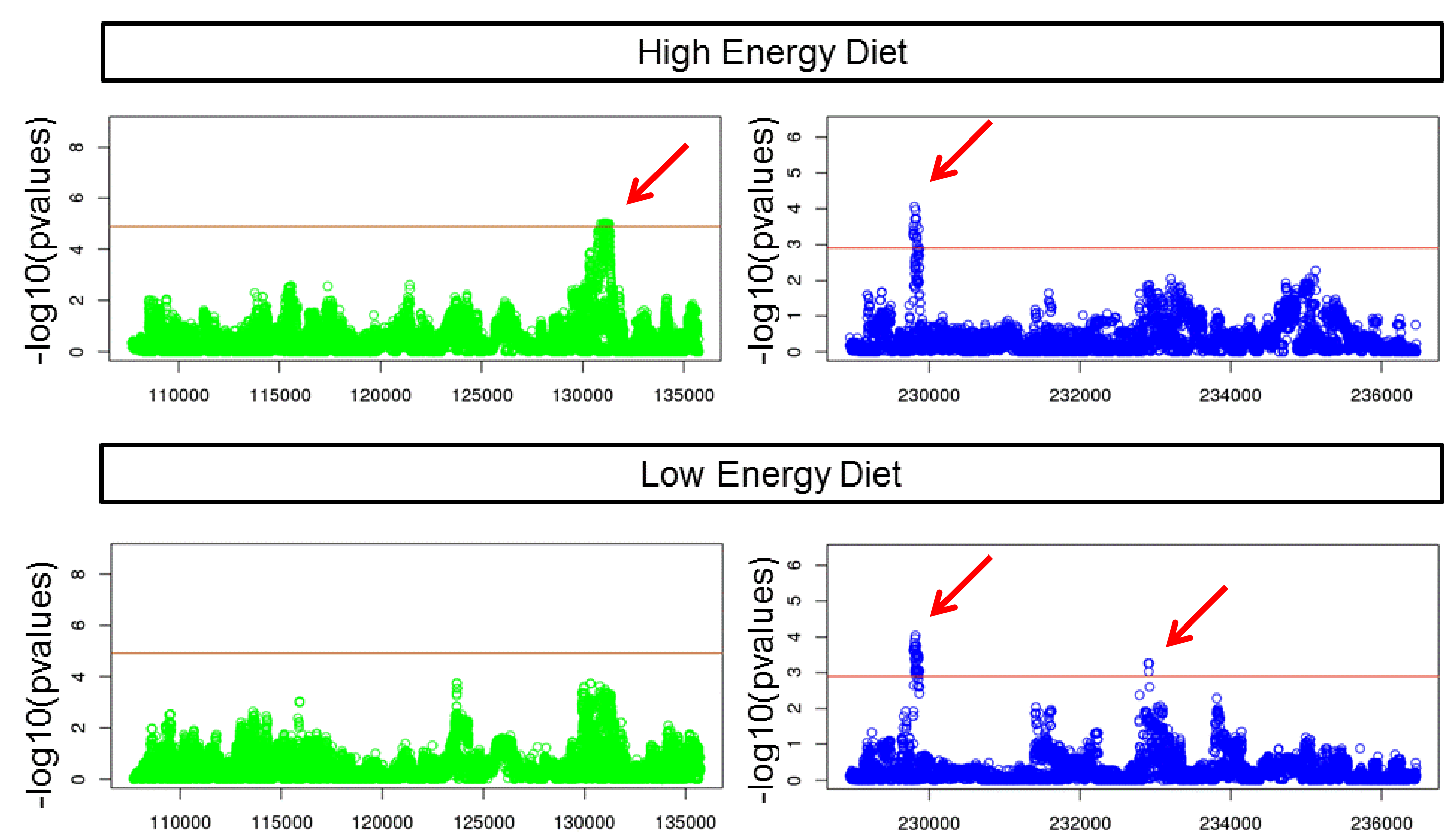


Figure 2 : Significant SNP (Muller<0,1) have been found on chromosome 3 for high energy diet. On the chromosome 12: two QTL for low energy diet and one for high energy have been found (Muller<0,05).

