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## Detection of QTL influencing egg production in layers receiving various diets

Hélène Romé, A. Varenne, Frédéric Herault, Hervé Chapuis, C. Alleno, Patrice Dehais, Alain Vignal, T. Brulot, Pascale Le Roy

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H. ROMÉ<sup>1</sup>, A. VARENNE<sup>2</sup>, F. HÉRAULT<sup>1</sup>, H. CHAPUIS<sup>3</sup>, C. ALLENO<sup>4</sup>, P. DEHAIS<sup>5</sup>, A. VIGNAL<sup>5</sup>, T. BURLOT<sup>2</sup>, P. LE ROY<sup>1</sup>

<sup>1</sup>INRA UMR1348 PEGASE 35590 SAINT-GILLES; <sup>2</sup>NOVOGEN 22800 LE FOEIL; <sup>3</sup>SYSAAF 37380 NOUZILLY; <sup>4</sup>ZOOTESTS 22440 PLOUFRAGAN; <sup>5</sup>INRA UMR0444 LGC 31326 CASTANET-TOLOSAN; FRANCE



## 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

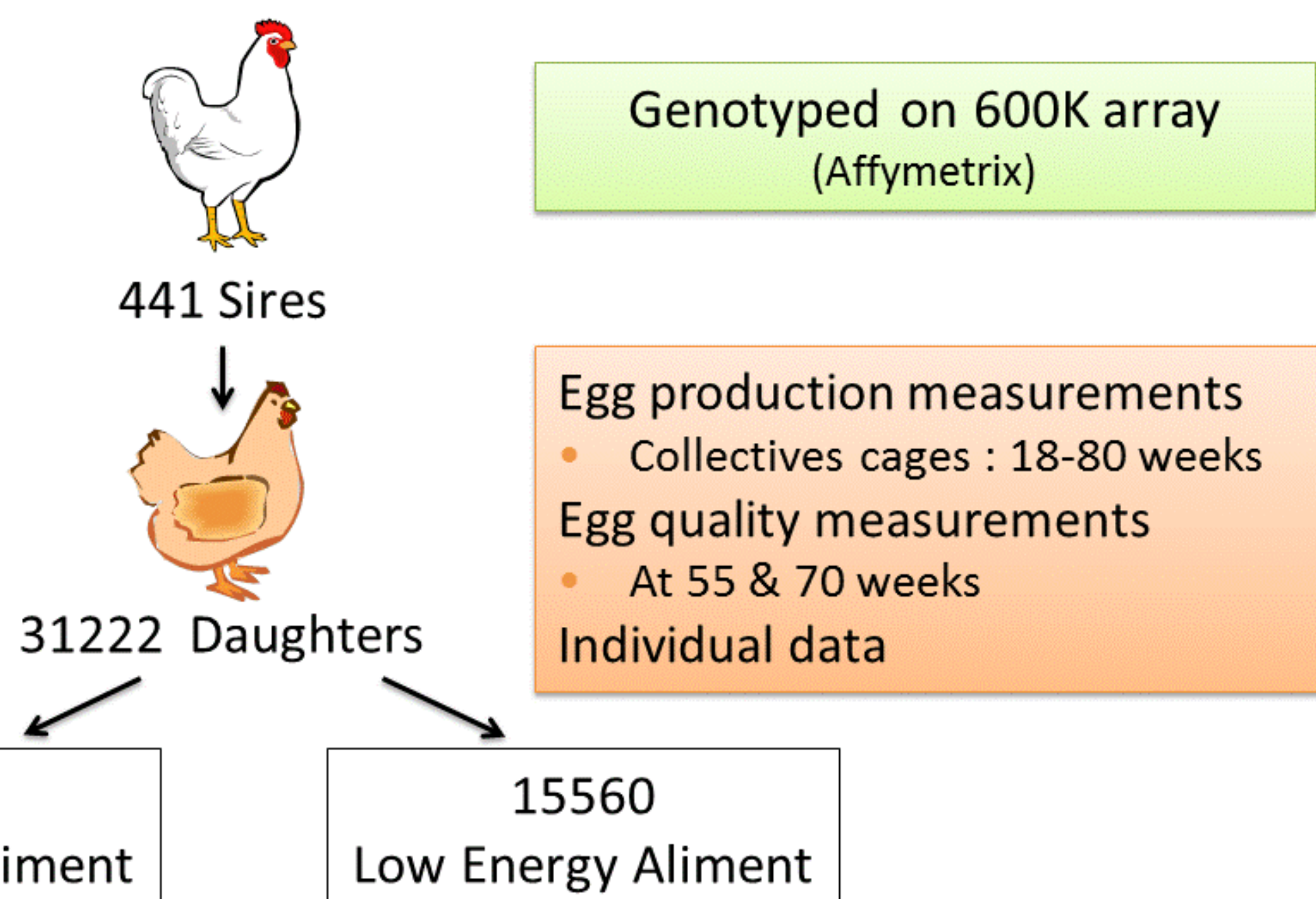
- Detect QTL involved in egg production and egg quality traits
- Use **different GWAS methods** and **compare** the results
- Observe the existence of **QTL by environment interaction**

## 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

- |                            |                                       |
|----------------------------|---------------------------------------|
| <b>Low energy : 12 QTL</b> | <b>High energy : 98 QTL</b>           |
| 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

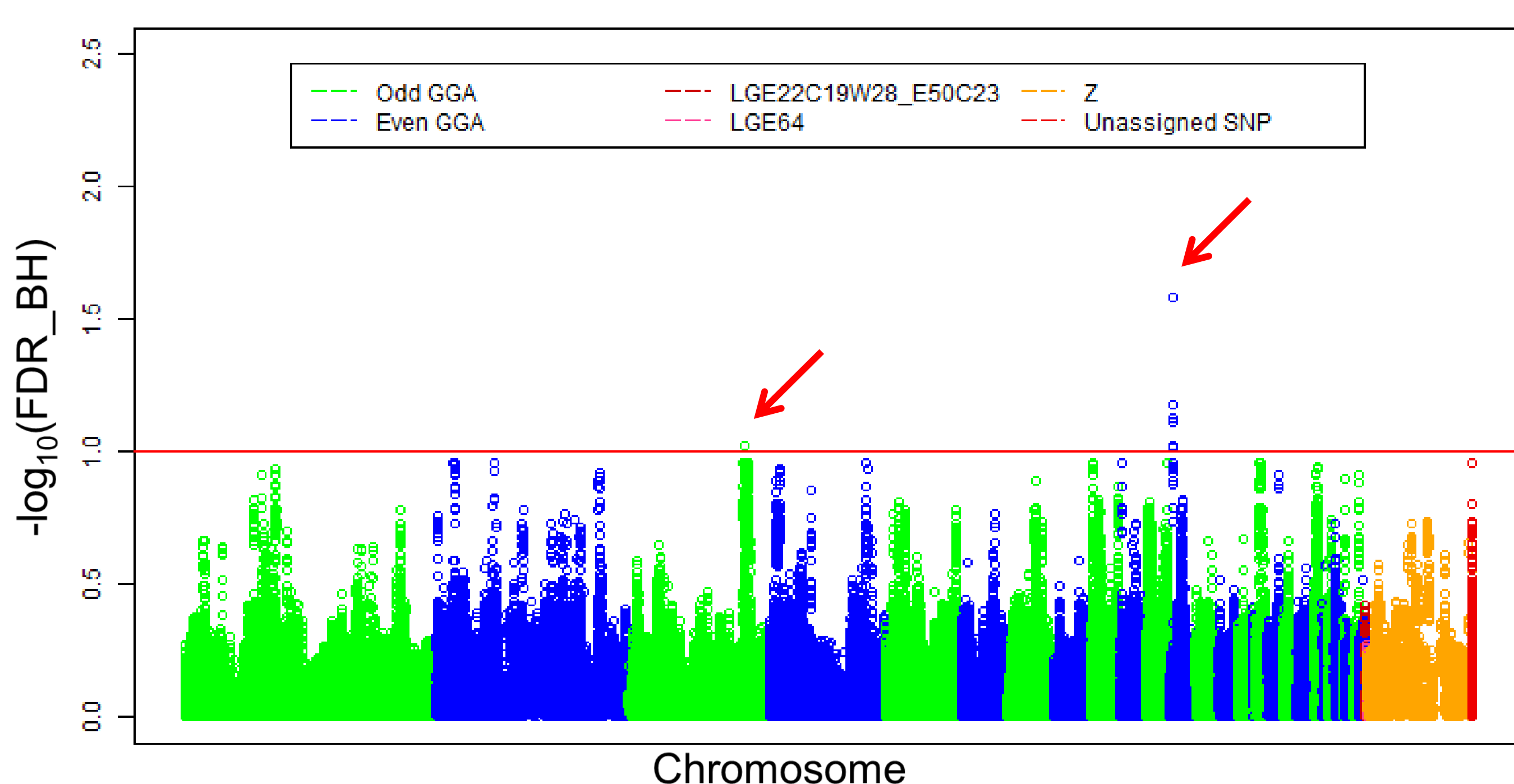


Figure 1 : Significant SNP (FDR<0,1) have been found on chromosome 3 and 12 for the color index A at 55 weeks with a low energy diet using the PLINK software.

#### GWAS - Gblup

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

GGA 3

GGA 12

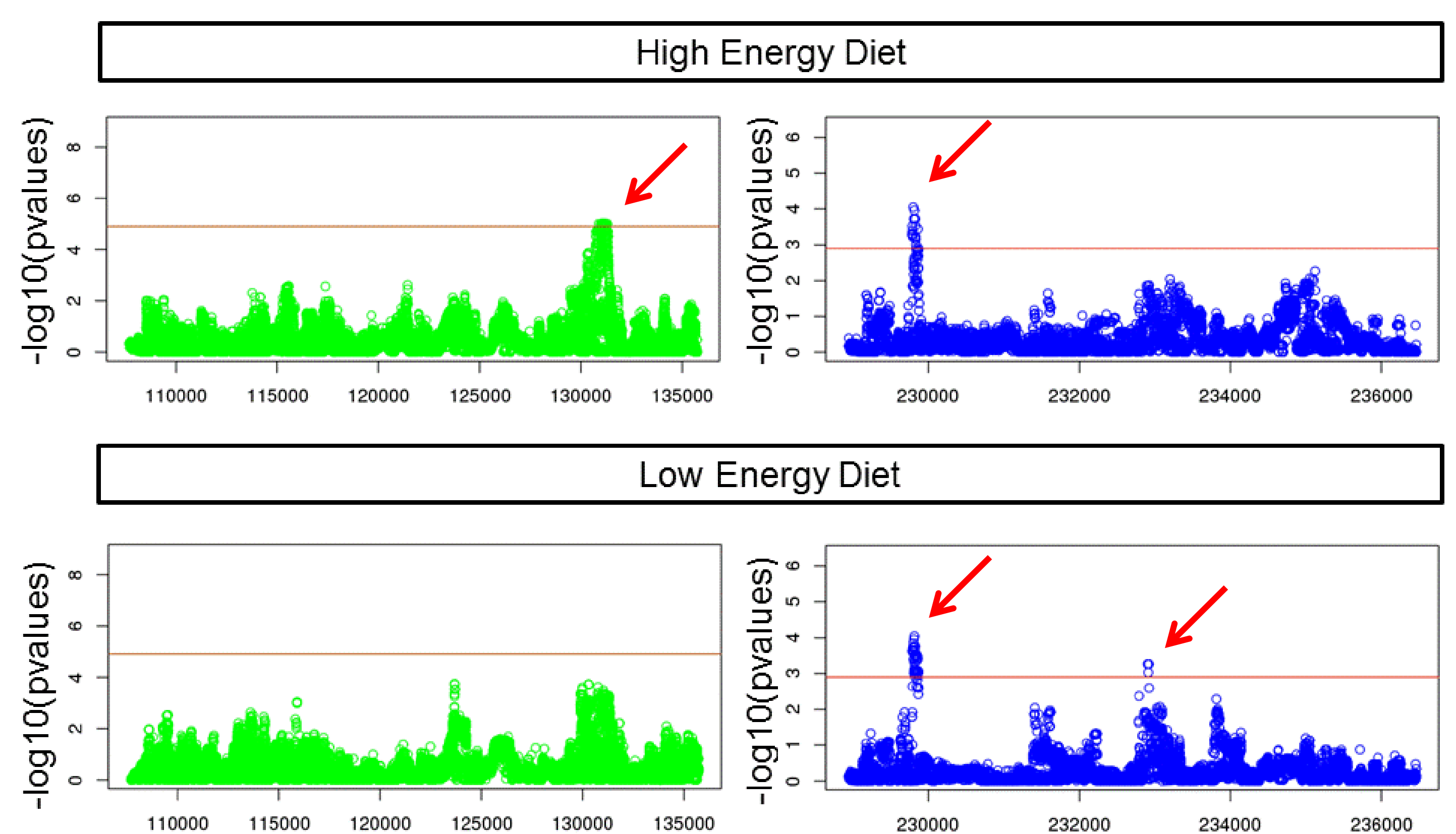


Figure 2 : Significant SNP (Muller<0,1) have been found on chromosome 3 for high energy diet. On the chromosome 12: two QTL for low energy diet and one for high energy have been found (Muller<0,05).

