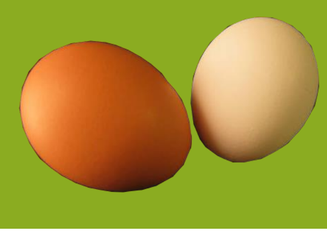
Detection of QTL influencing egg production in layers under various diets



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Introduction

Backgrounds

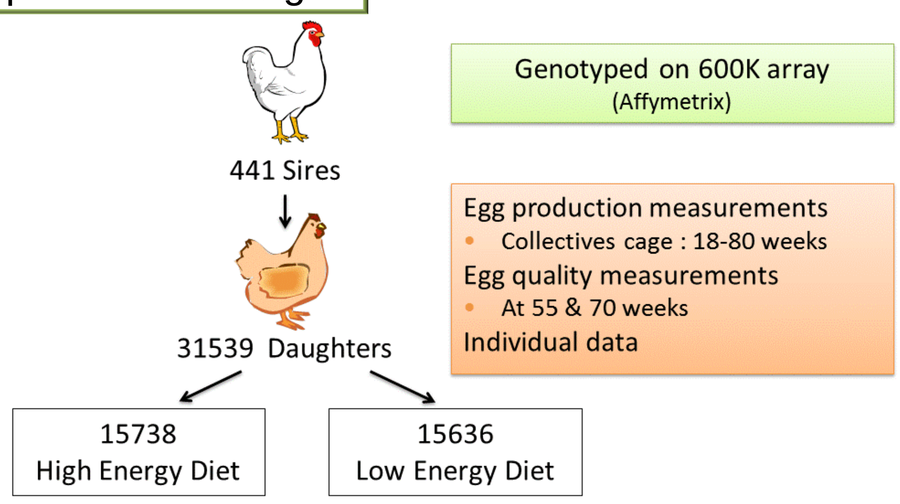
Egg production in layers is affected by different Quantitative Traits Loci (QTL) and by environment element, such as the diet composition. These two components of the phenotype could be in interaction. In the case of a genomic selection in layers, take into account this interaction could be necessary.

Objectives

Identify QTL involved in egg production traits according to the diet composition.
Observe the QTL by environment interaction effects.

Material and Methods

Experimental design



Methods

Phenotypes recorded in 3 hatches in collective cages of 12 hens.

Each sires has two phenotypes, one per diet, which are the mean of daughters displays.

Data adjusted for the hatch effect and for the localization in buildings using the SAS-GLM procedure.

Plink used to filter the genotyping data (Call rate, MAF, HWE). Thus 288,305 SNPs were kept for further analysis.

Plink software used to realize a GWAS analysis.

Results

GWAS - Plink

Quality

		Shell				Internal				Inherent	
		Solidity		Color		Inclusion		Yolk Ratio		Egg weight	
		LE	HE	LE	HE	LE	HE	LE	HE	LE	HE
Nbr of GGA	55 weeks	4		7	33						
	70 weeks				53	1	6		4		1
Nbr of SNP	55 weeks	96		110	1365						
	70 weeks				2791	6	98		39		6

Production

	Production (I3)	
	LE	HE
Nbr of GGA		1
Nbr of SNP		11

Tables :
Majority of traits with significant SNPs are at 70 weeks of age and with a high energy (HE) diet.

I3 : Laying intensity from 50 to 80 weeks
HE : High energy diet
LE : Low energy diet

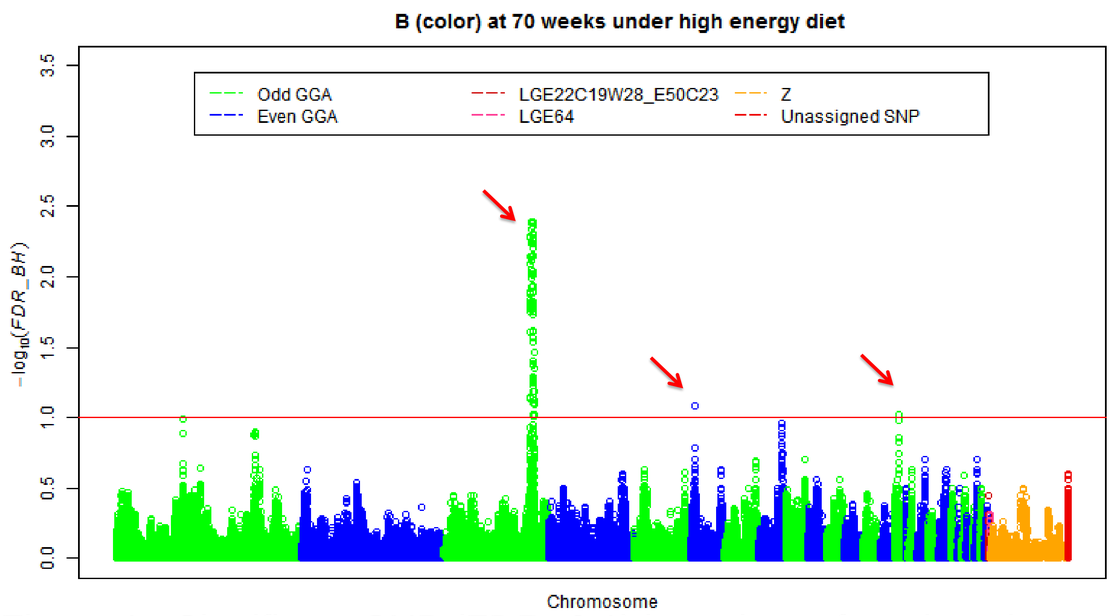


Figure 1 : Significant SNP (FDR<0,1) have been found on three chromosome for the color index B at 70 weeks with a high energy diet

216 SNPs on GGA3 covering 5 groups of Linkage Desiquilibrium.
1 SNP on GGA6
1 SNP on GGA15

No LD found between SNP on GGA6 and GGA15 nor between both of them and GGA3 (r^2<0,7).

Conclusion

Significant QTL were detected in the present study for various egg quality and production traits. Most of them were find under a high energy diet and more especially at 70 weeks of age.

These results highlight the importance of taking into account genetic with environment interactions in genetic evaluation of layers.

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