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GWAS analysis identifies 138 QTL for egg quality variance in layers receiving various diets
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The variance of traits is more often studied, due to the wish to canalize some traits. At this time only one study has identified QTLs for the variance of egg quality trait. The development of a high density chip for chicken by Affymetrix, the 600K Affymetrix® Axiom® HD genotyping array, allows today to narrow the localization of QTL with a higher accuracy. Furthermore, this high density chip should also allow going beyond the classical hypothesis of additivity, between QTL effects or between QTL and environmental effects. Thus, the aim of the present study was to search for QTL influencing the variance of egg quality traits using the 600k SNP chip and to observe if the QTL detected could be different according to various environments. For this, a population of 438 sires from a pure line was genotyped. Their 31,381 F1 crossbred daughters were phenotyped for egg quality traits at 50 and 70 weeks of age. Moreover, to observe the putative existence of QTL by environment interactions, these layers were divided into 2 groups, fed ad libitum with two different diets. The egg shell color and its components (redness, yellowness, and lightness), the egg shell strength, stiffness and shape, the short length of egg and the egg weight were recorded. GWAS analysis was performed using a linear regression model. Thus, 138 QTL for the variance of egg quality traits, spread over all marked chromosomes except the chromosome 16 have been detected. Only two QTL was common to a previous study on mean of traits. Variances and mean are two different traits, which should be considered separately. Among them, 94 QTL had a significant difference of effect depending on diet. The correlation between estimates of SNP effects for both diets was between -0.06 and 0.25. To sum up, this study showed that numerous loci influence variance of quality traits. These traits seem to be highly dependent on diets, more than the mean. This shows the capacity of laying hens to adapt to their environment.