

AUTHENTICATION OF CHICKEN STRAINS USED FOR “LABEL ROUGE” PRODUCTION

The French Label Rouge scheme guarantees poultry produced according to strict specifications designed to ensure superior quality. These include the use of approved slow-growing crossbreeds, lower stocking densities and access to outdoor areas (Fig. 1). While every step of the production chain is carefully documented, no analytical method was previously available to verify, from a meat sample alone, whether a chicken actually originated from one of the authorized genetic crossbreeds. The INTAQT project addressed this challenge by developing a genetic authentication method based on DNA analysis.

The approach relies on a reference database containing DNA profiles of all parental lines currently authorized for Label Rouge production (INAO, 2024). More than 330 reference animals from the two breeding companies SASSO and Hubbard were genotyped using over 7,000 DNA markers distributed across the chicken genome. Before developing the authentication method, we first explored the genetic diversity of the parental lines included in the Label Rouge breeding programme.

An innovative genetic authentication method was developed to verify that Label Rouge chickens originate from approved crossbreeds. Based on the analysis of thousands of DNA markers, the approach compares the genetic profile of a sample with a reference database. Validation results demonstrated a high level of accuracy in distinguishing compliant from non-compliant samples. By strengthening traceability and helping prevent fraud, this method provides a valuable tool to support the integrity of premium poultry production and maintain consumer confidence in quality-certified food products.

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Hierarchical clustering based on genome-wide genetic distances revealed a clear genetic structure, with each parental line forming a distinct cluster (Fig. 2). This high level of genetic differentiation confirms that the breeding lines have maintained their own genetic identity despite decades of selection.



Fig 1: Animal originating from the I657 crossbreed. This crossbreed is authorized for the production of Label Rouge poultry. (Source: hubbardbreeders.com)

Such differentiation is a key prerequisite for reliable genetic authentication, as it provides sufficient information to discriminate between the different parental lines and, consequently, between the crossbreeds derived from them.

These data were used to reconstruct the expected genetic characteristics of every authorized crossbreed through computer simulations. Rather than searching for a single "genetic signature", the method calculates how likely it is that an unknown sample belongs to each authorized crossbreed. Samples are then classified as compliant or non-compliant according to a predefined statistical decision rule (Box 1)

Validation of the method showed excellent performance. No simulated Label Rouge chicken was incorrectly assigned to another authorized crossbreed. A small number of samples were compatible with two different crossbreeds, but these cases only occurred when the parental lines were themselves extremely closely related genetically. Tests performed on non-authorized crossbreeds also demonstrated a high capacity to reject fraudulent samples (Figure 3).

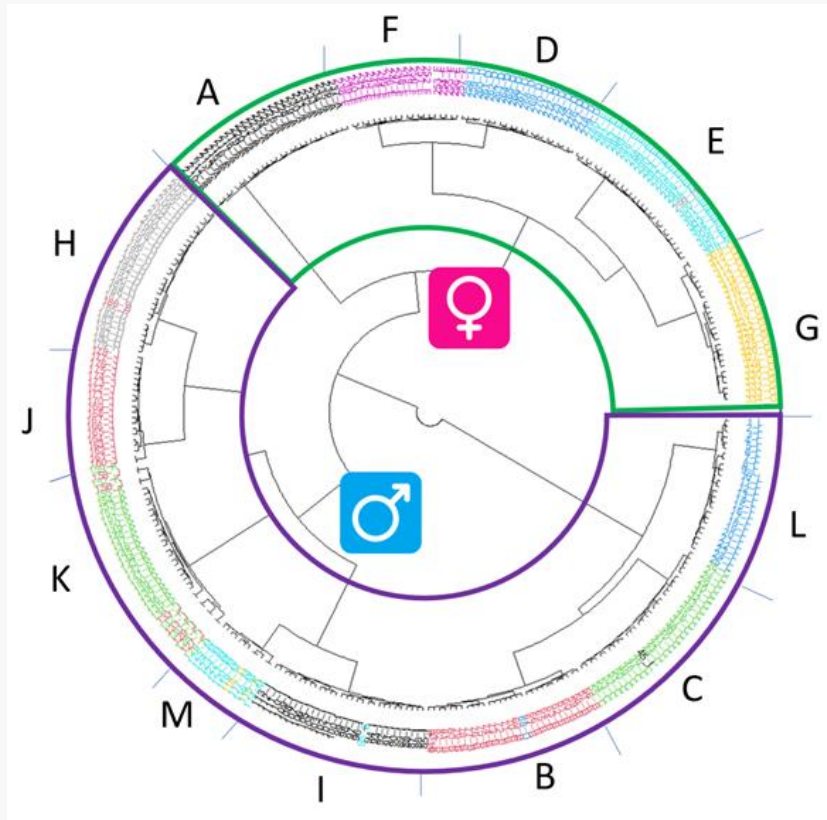


Fig 2: Genetic relationships among the parental lines used in Label Rouge poultry production. Closely related individuals cluster together, revealing the clear genetic differentiation between breeding lines. Purple and green clusters indicate male and female breeding lines, respectively.

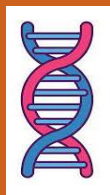
The only false-positive cases involved an exceptional situation in which one parental line was replaced by another that is almost genetically indistinguishable, representing the practical detection limit of the method (Rouger et al., 2026).

Box 1. Simplified workflow for Label Rouge crossbreed authentication

1. Sample collection



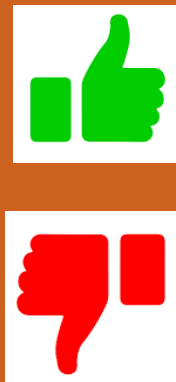
2. Genotyping



3. Comparison to the Label Rouge genotype database



4. Decision rule



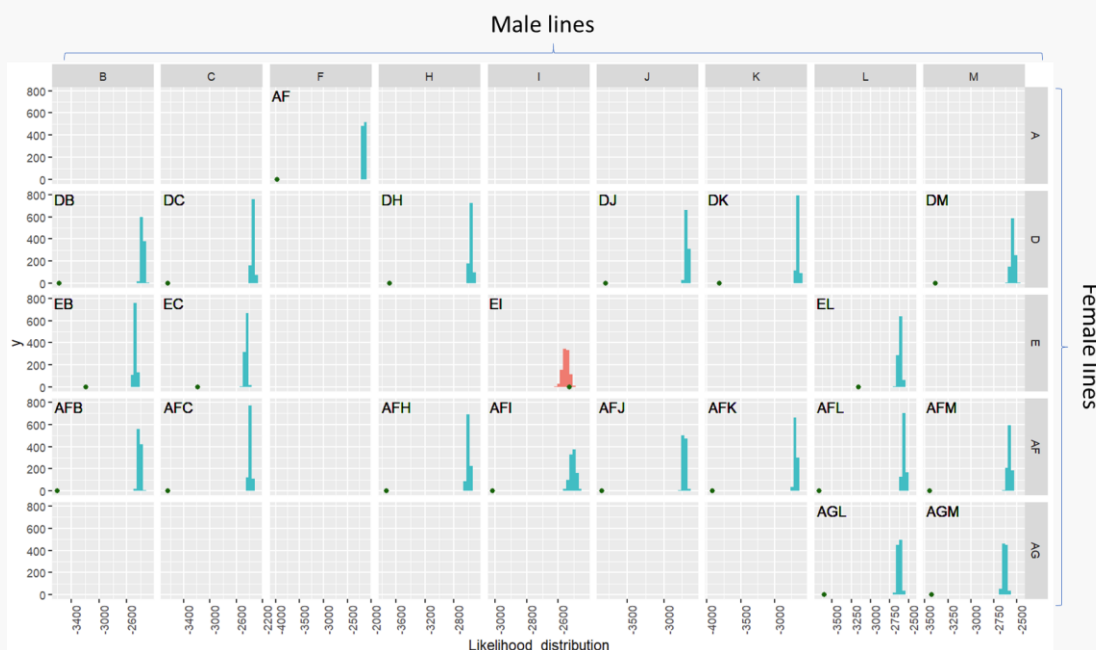


Fig. 3. Likelihood distributions for the authorized Label Rouge crossbreeds. The green dot represents the likelihood of the same unknown sample calculated against each crossbreed. In this example, only the EI distribution is compatible with the sample, indicating that it originates from an E × I crossbreed. Parental line names were anonymized.

The French Label Rouge chicken sector represents a strategic segment of the national poultry industry, involving several thousand farmers and a broad network of stakeholders. Based on an extensive production model and strongly differentiated by quality, it generates significant added value while contributing to the preservation of employment and economic activity in rural areas. The authentication tool developed within the INTAQT project provides a means to guarantee the authenticity of this production system and prevent potential fraud. When implemented on a larger scale, it will help protect consumers while also safeguarding the interests of the stakeholders involved in this prestigious sector.

Although additional work is underway using real commercial samples, these results demonstrate that genetic authentication can become a powerful complement to conventional traceability systems. By providing an independent scientific verification of the genetic origin of Label Rouge poultry, this approach could help strengthen consumer confidence, support certification bodies, and improve fraud prevention throughout premium poultry supply chains. Future developments may also adapt the method for routine testing of production batches while keeping analytical costs under control.

References:

- Institut National de l'Origine et de la Qualité (INAO), 2024. Répertoire des croisements utilisables pour la production de volailles Label Rouge 17pp.
- Rouger R., Le Bihan-Duval E., Berri C. (2026). Développement d'une méthode statistique d'authentification des croisements de poulets Label Rouge par génotypage. 16th Journées de la Recherche Avicole et Palmipèdes à Foie Gras, Tours, France, 18–19 March 2026, 5 pp.