

HIGHLIGHT

Authentication of grass-fed meat and dairy products from cattle and sheep

Meat and dairy products derived from grassland carry premium values and sensory and nutritional quality attributes that aroused much interest for authentication methods to guarantee grassland origin claims. This paper reviews the current state of knowledge on the authentication of meat and dairy of grassland origin from food analysis in both cattle and sheep. A range of methods alone or combined, involving analysis of elemental or molecular constituents of food product and fingerprinting profiling combined with chemometrics, have been developed to differentiate contrasted feeding regimes then more complex feeding conditions (such in the case of dietary switches or when grass only makes up part of the animal's diet). Our review highlights the possibilities and limitations of these methods, the latter being chiefly posed by variations in the quantity, characteristics and composition of grassland feedstuffs consumed by animals and variations in animal responses. It also highlights a number of issues for consideration, points of caution and caveats in applying these methods. Scientists agree that much of the research carried so far has been a 'proof of concept' type and that efforts should be made in the future to develop more databases to help gain genericity and robustness.

The authentication of grassland origin of meat and dairy products interests the actors of the food chain for several reasons. Grass feeding of animals meet consumer demands for healthy products produced in a 'natural' way. Consumers actually show growing interest in the method of production of their food and the environment, and grass feeding carries positive values in this regard (farming practice which is natural, respectful towards animal welfare and the environment, which enables landscape preservation and the valorization of areas that are not suitable for crops but are favourable to biodiversity). Furthermore, a number of scientific studies demonstrated the nutritional advantages of grassland-based meat and dairy products (higher content of nutritionally valuable compounds like specific fatty acids, vitamins and antioxidants).

Finally, farmers who are committed to complying with specific production conditions seek protection against abusers who may be tempted to benefit from the price premium without bearing the corresponding constraints (heavier exposition to climatic, sanitary and predation hazards; workload, seasonality of production). In view of the potential added value and the additional costs of products, farmers and consumers are thus concerned about the potential risks of fraud, which prompted the development of analytical authentication methods that go beyond on-farm inspection (self-inspection or on-farm audits by independent agencies) to guarantee that a product is effectively standards-compliant.



Legend: Author : M. Coppa

The literature shows that it is possible to discriminate contrasted feeding regimes using analytical methods that quantify specific compounds or more global fingerprinting methods, such as those based on product optical properties. However, discrimination can become performance-limited when the methods are used separately, and there are often synergies between different methods and different tissues. Results obtained in less-contrasted and diet-switched feeding regimes, which are harder to characterize, further argue for combining different tracers (and different tissues for meat products) due to their observed latency and/or persistency profile differentials. Spectral fingerprint methods (especially visible, near-infrared and/or mid-infrared spectroscopy) which are typically based on product optical properties—and therefore product global composition—offer promising performances, even in more complex diet-switching scenarios. However, these methods do not inform precisely on the underlying reasons for differences, so research needs to push ahead on both fronts: on the single-compound analytical approaches and on the global spectral analysis-based fingerprinting approaches. Back-authentication of animal's dietary history through animal products, and particularly authentication of grass-fed meat and dairy, faces challenges inherent to i) inter-variability in animals' response and ii) variations in animal's feeding regimen over the course of its productive life.

Much of the research led to date is still at the 'proof-of-concept' stage, as studies are often based on contrasted feeding regimes and on a limited number of samples. To gain genericity and robustness, it is now necessary to develop larger databases and to test these methods under challenging conditions (for example, in case of dietary switches, or when grass only makes up part of the animal's diet).

Learn more:

Prache S., Martin B., Coppa M. 2020. Review : Authentication of grass-fed meat and dairy products from cattle and sheep. *Animal*, 14 :4, 854-863.

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