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AUTHENTICATION OF FOOD PRODUCTS IN ROMANIA: PUBLIC CROSS-BORDER VISIBILITY, DOCUMENTED CAPABILITIES AND EUROPEAN CONTROL CONTEXT

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Abstract

Food authentication is a core component of official controls, consumer protection and fair trading in the European Union. This paper reassesses food authentication in Romania through a documentary case-study design and a comparative European perspective, using only public cross-border visibility signals, publicly documented institutional capabilities and peer-reviewed analytical studies. The analysis is explicitly not a prevalence assessment and does not rank national control performance. European evidence was structured through the Alert and Cooperation Network, monthly agri-food fraud-suspicion reports, EU legal instruments and Joint Research Centre materials, while Romanian evidence was interpreted as public visibility in cross-border reports and capabilities indicated by public documents. The results separate European patterns from Romanian cases and show that honey, meat, fish and dairy products remain analytically relevant matrices because they combine vulnerability to misdescription, substitution, adulteration or traceability failure with a need for validated laboratory and documentary evidence. The revised framework highlights the importance of Regulation (EU) 2017/625, Implementing Regulation (EU) 2019/1715, Directive 2001/110/EC, EN 17972:2024 and PRISMA-based reporting transparency for a publishable assessment of Romanian food authentication within the EU control architecture.

Key words*: Alert and Cooperation Network, food authentication, food fraud, Romania, traceability.*

INTRODUCTION

Food authenticity concerns the agreement between the characteristics of a food product and the explicit or implicit claims attached to it. In the European regulatory environment, authenticity problems are linked to official controls, traceability, consumer information and the prevention of deceptive practices. EN 17972:2024 is especially relevant because it standardises concepts, terms and definitions used for food authenticity and food fraud, thereby reducing ambiguity in the description of non-authentic products and fraudulent practices (CEN, 2024).

At EU level, the legal and operational framework is anchored in Regulation (EU) 2017/625 on official controls and other official activities, and in Commission Implementing Regulation (EU) 2019/1715, which establishes the functioning of the Information Management System for Official Controls and its components, including iRASFF, RASFF, AAC, the Food Fraud Network and TRACES (European Parliament and Council, 2017; European Commission, 2019). For honey, Directive 2001/110/EC remains a central compositional and labelling reference because it defines honey and composition criteria, including the absence of added ingredients (Council of the European Union, 2001). In practice, honey adulteration may involve the addition of sugar syrups and other undeclared substances intended to increase volume or modify composition. Common adulterants include glucose syrup, invert syrup, high-fructose corn syrup, rice syrup, beet syrup, and cane sugar syrup. Besides the direct addition of foreign substances, indirect adulteration methods may also occur, such as overfeeding bees with industrial sugar syrups during nectar flow periods, which can alter the natural composition of the honey while making adulteration more difficult to detect. Other indirect practices include excessive heating or improper storage conditions that modify

enzymatic activity, hydroxymethylfurfural (HMF) levels, and other quality parameters associated with authentic honey (Zhang et al., 2023).

Romania is assessed in this article only through two cautious categories: public cross-border visibility and capabilities indicated by public documents. Therefore, references to Romanian cases do not represent estimates of national fraud prevalence, market incidence, enforcement performance or exhaustive system capacity. They indicate only that Romanian operators, products, destinations or authorities were visible in selected public EU cross-border information flows, or that public institutional documents describe analytical and control capabilities.

The objective of the review paper (Figure 1) is to identify how Romanian food authentication can be positioned within the EU control architecture without over-interpreting public datasets. The paper therefore distinguishes: European-level patterns of agri-food fraud suspicion; Romanian public cross-border visibility; analytical matrices and methods relevant to authentication; and the governance link between laboratory evidence, documentary controls and digital traceability.

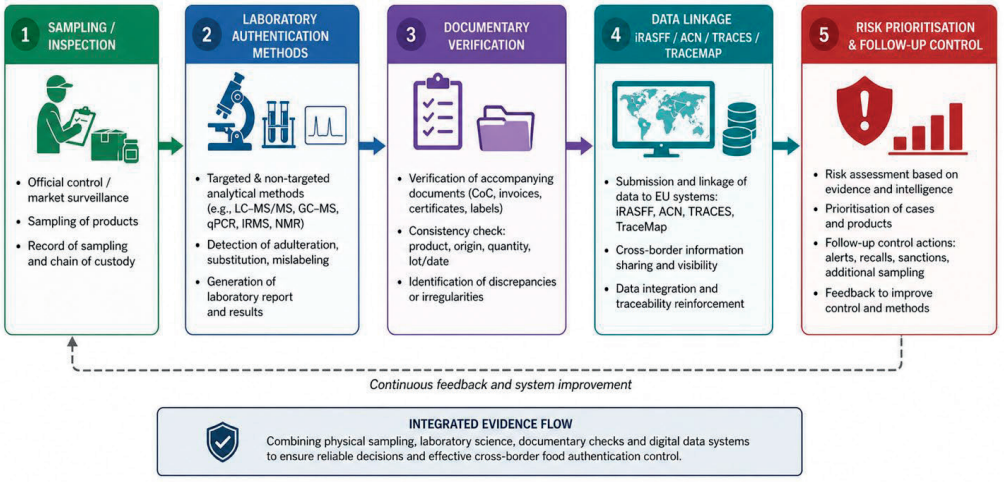

Figure 1. Objective and interpretive limits of the study

MATERIALS AND METHODS

The study used a documentary case-study and structured review design. The evidence base consisted of EU legislation and standards, European Commission and Joint Research Centre documents, ACN/FFN public reports, EFSA materials on traceability-data standardisation, Romanian public institutional documents and peer-reviewed papers on analytical food authentication. The method was revised to follow PRISMA 2020 and PRISMA-S reporting principles for transparency of search strategy, screening and inclusion (Page et al., 2021; Rethlefsen et al., 2021).

The last search was conducted on 26 April 2026. Searches were performed in EUR-Lex, European Commission Food Safety webpages, the Publications Office of the European Union, JRC publications, EFSA webpages, ANSVSA public materials, Scopus, Web of Science, PubMed and Google Scholar. The exact search strings, eligibility criteria and PRISMA counts are PRISMA counts used for the revised documentary corpus: records identified from databases and public sources, n = 86; duplicate records removed, n = 12; records screened, n = 74; records excluded at title/abstract or document-title level, n = 37; reports sought for retrieval, n = 37; reports not retrieved, n = 3; reports assessed for eligibility, n = 34; reports excluded after full assessment, n = 13; documents included in the qualitative synthesis, n = 21. The included corpus comprised EU legislation/standards and institutional documents, n = 14, and peer-reviewed analytical studies or methodological reporting guidelines, n = 7. The structure of the

documentary corpus and its analytical role are summarised in Table 1.

Eligibility was limited to documents that could support one of four analytical functions: legal framing; European public cross-border notification patterns; Romanian public cross-border visibility or publicly documented capabilities; and matrix-specific analytical interpretation. Publications were excluded when they discussed food fraud generically without relevance to authentication evidence, lacked a public source, or could not be linked to one of the selected product groups: honey, meat, fish/seafood and dairy products.

The analysis separated results from interpretation. Results were reported in two distinct blocks: European patterns and Romanian public cross-border visibility. Discussion then interpreted the analytical implications of the documentary evidence, with explicit limits on inference. ACN values were treated as public notification counts and visibility indicators, not as direct measures of national risk, prevalence, enforcement quality or market integrity.

Table 1. Documentary corpus and analytical role

Source group	Exact source examples	Role in analysis	Limitation
EU legislation and standards	Regulation (EC) No 178/2002; Regulation (EU) 2017/625 on official controls; the CEN/CENELEC framework for food-sector standardisation	Provides the legal basis for official controls, traceability, integrity, and the use of analytical evidence in conformity assessment	It does not always provide product-specific authenticity thresholds and does not replace analytical validation on real matrices
ACN/FFN	The European Commission's monthly reports on agri-food fraud suspicions; the ACN network, including RASFF, AAC, and FFN	Indicates fraud typologies, vulnerable sectors, and cross-border trends; useful for justifying the choice of the analytical domain	It covers only cross-border cases communicated through the network and may omit purely national irregularities
JRC/EFSA	The JRC page on food authenticity and quality; JRC materials on reference materials; the report on the suitability of analytical methods for assessing food authenticity	Supports methodological selection, choice of reference materials, and assessment of whether methods are suitable for screening or confirmation	These are mainly guidance and methodology documents, so they must be complemented by validation on local products and contexts
Romanian public documents	ANSVSA legislative pages; Law No. 150/2004 on food safety; orders and public documents on control, traceability, and supervision	Anchors the analysis in the Romanian institutional and regulatory framework, including control responsibilities and national implementation	They are dispersed across institutions and are sometimes more procedural than analytical; updating may be uneven
Peer-reviewed analytical studies	Studies on food authenticity assessment, analytical methods, reference materials, and Romanian consumer contexts	Provides empirical support for method performance and for scientific contextualisation of fraud and authenticity	Results may vary significantly across products, laboratories, and experimental designs; transferability is not always direct

RESULTS AND DISCUSSIONS

European patterns in public fraud-suspicion data

European public fraud-suspicion data show that authenticity-related non-compliances are structurally relevant across the agri-food chain. The ACN Overview 2023 reported categories such as grey-market issues, misdescription, mislabelling, misbranding, adulteration, product tampering, document forgery and counterfeit (European Commission, 2024a). Monthly agri-food fraud-suspicion reports for 2024-2026 continued to show that public cases are distributed across multiple product groups, including fruits and vegetables, supplements, cereals, honey, meat, fish and dairy products (European Commission, 2024b, 2025a, 2025b, 2025c, 2026a) (Table 2).

The European pattern should be understood as visibility in public cross-border suspicion reporting. It does not provide full market prevalence and does not include all domestic cases, private findings, unresolved investigations or non-public enforcement information. Within this limit, the public data are useful for identifying recurrent vulnerabilities and for benchmarking the kinds of evidence needed for authentication.

Table 2. ACN notification counts (2024) as visibility indicators rather than measures of national risk

Member State	ACN notifications in 2024	Source	Indicator definition	Interpretive note
Germany	1,907	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	High visibility in the ACN does not equal highest national risk; it may also reflect stronger reporting, control intensity, and cross-border trade exposure food.europa+1
Netherlands	1,155	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	A high count reflects visibility in the network, not an exhaustive measure of fraud prevalence or enforcement performance food.europa+1
Italy	965	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	Comparable only as a network-based visibility indicator, not as a direct national prevalence rate food.europa+1
Belgium	863	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	Cross-country comparisons should be read cautiously because notification levels depend on trade routes and control/reporting practices food.europa+1
France	742	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	A lower count than the top-ranked states does not necessarily mean lower underlying risk food.europa+1
Poland	689	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	The indicator reflects publicly visible notifications in the ACN, not the full burden of control issues food.europa+1
Spain	671	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	Useful for visibility ranking, but not for estimating market-wide fraud prevalence food.europa+1
Romania	<261 / not listed in public Top 10	European Commission, 2025d, *Alert and Cooperation Network Annual Report 2024* europa+1	Public notification/visibility count in the ACN for 2024 europa+1	Romania is not listed in the public Top 10, so the available public figure is below the threshold of that ranking; this should not be interpreted as zero or negligible risk europa+2

Romanian public cross-border visibility

Romanian public cross-border visibility appears in selected EU monthly fraud-suspicion reports through product-specific cases. These include lamb meat associated with document forgery, whole lamb carcasses without health marks, seafood cases involving water addition or lower net weight, and crackers associated with a traceability defect involving an unauthorised operator (European Commission, 2025a, 2025b, 2025c, 2026a).

These Romanian examples are not treated as prevalence estimates. They indicate that Romania can appear as country of origin, destination or notifying country in public cross-border reporting (Table 3). The analytical implication is that Romanian authentication work should prioritise evidence chains linking laboratory testing, documentation and digital traceability, especially for product groups where EU reports and scientific studies indicate recurrent vulnerabilities. At the same time, these cases illustrate the operational relevance of integrating compositional analysis with administrative and traceability controls, as cross-border notifications often reflect combined analytical and documentary non-compliances rather than isolated laboratory findings.

Table 3. Romanian cross-border visibility in ACN/FFN reports: selected 2024 cases and interpretive limits

Product/category	Month/year and source report	Romanian role	Reported issue	Interpretive limit
Feed materials: sunflower and rapeseed oils (feed)	March 2024, Monthly report on EU Agri-Food Fraud suspicions studocu	Originating country; notified by the Netherlands studocu	Fluazifop-P residues not compliant with EU MRLs; one case also reported orthophenylphenol studocu	This is a public cross-border visibility case, not a direct estimate of the full Romanian feed-control burden food.europa+1
Feed materials: sunflower and rapeseed oils (feed)	March 2024, Monthly report on EU Agri-Food Fraud suspicions studocu	Originating country; notified by the Netherlands studocu	Repeated non-compliant pesticide-residue findings linked to the same commodity group studocu	The report aggregates non-compliances with fraud suspicions and does not establish final fraud confirmation food.europa+1
Fruits and other food categories under ACN visibility	2024 monthly reports, ACN/FFN public reports food.europa+2	Romania appears as origin or involved Member State in cross-border notifications food.europa+2	Cross-border non-compliances with fraud suspicions shared through ACN components food.europa	The monthly reports exclude purely national cases and therefore underrepresent non-shared domestic incidents food.europa

Analytical interpretation by matrix and fraud type

Honey remains a demanding authentication matrix because adulteration can involve sugar syrups designed to mimic genuine honey. The EU coordinated action From the Hives highlighted the need for advanced methods such as EA/LC-IRMS, LC-HRMS and NMR because conventional compositional criteria may be insufficient in complex adulteration scenarios (European Commission, Joint Research Centre, 2023a). Romanian honey studies based on comprehensive profiling and UV-Vis spectroscopy coupled with chemometrics indicate relevant national analytical research, but these studies should be interpreted as matrix-specific scientific evidence rather than national prevalence estimates (Geană and Ciucure, 2020; Geană et al., 2024). These analytical characteristics and associated fraud risks are positioned within the broader matrix-fraud typology presented in Figure 2.

Meat and fish vulnerabilities are linked to substitution, misdescription, documentary irregularities and compositional discrepancies. DNA barcoding and PCR-based approaches can support species authentication, while HPLC-UV fingerprinting coupled with chemometrics is also relevant for meat-species and quality-attribute authentication. Documentary and traceability evidence remain necessary when the issue concerns origin, health marks, operator identity or net weight (Popa et al., 2017; Santomá-Martí et al., 2025; Food Safety Authority of Ireland, 2024).

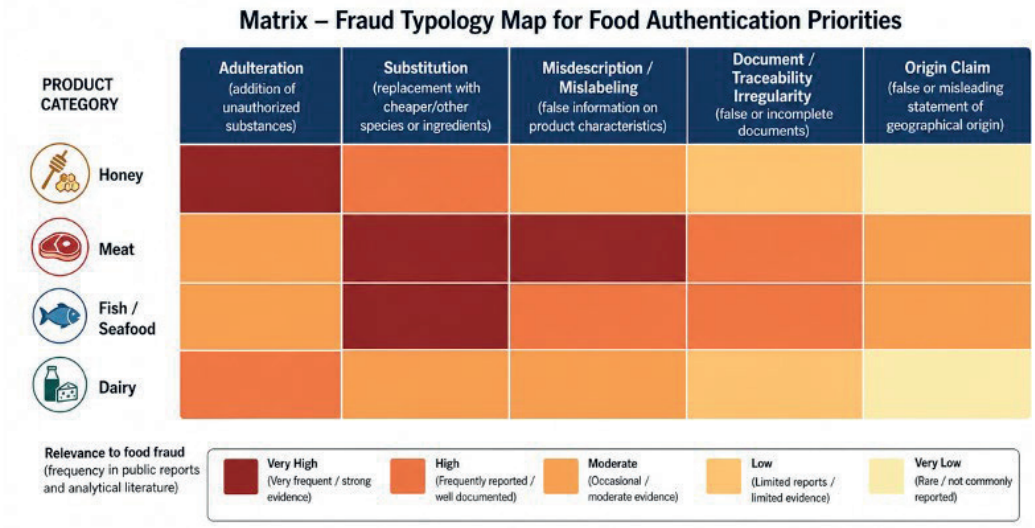

Figure 2. Matrix-fraud typology map for food authentication priorities

Dairy authentication combines compositional integrity, species origin, denomination protection and farm-level vulnerability. Romanian public documents indicate analytical capabilities including LC-MS/MS, GC-MS/MS, atomic absorption spectrometry, HPLC, PCR species determination, QTOF analysis for milk-species origin and testing for vegetable fats in dairy products. DNA-based evidence from dairy authentication studies confirms the relevance of targeted molecular methods for detecting undeclared milk species in processed dairy products. These are capabilities indicated by public documents and supporting scientific literature, not an exhaustive audit of national laboratory performance (Autoritatea Nationala Sanitara Veterinara si pentru Siguranta Alimentelor, 2016, 2023; Roumani et al., 2026).

Governance interpretation

The governance issue is not only analytical. Regulation (EU) 2017/625 requires competent authorities to consider possible intentional violations of agri-food chain rules, while Implementing Regulation (EU) 2019/1715 provides the digital infrastructure for cross-border information exchange. In this context, laboratory findings, documentary controls and digital traceability should be treated as complementary evidence layers rather than isolated tools.

The JRC technical report on Article 9(2) of Regulation (EU) 2017/625 emphasises the need for coherent approaches to fraudulent and deceptive practices, while EFSA materials on traceability-data standardisation point to the importance of interoperable and machine-readable information flows (Winkler et al., 2023; European Food Safety Authority, n.d.). For Romania, this supports a policy direction in which publicly documented laboratory capability is connected more explicitly with operator records, consignment documentation, TRACES/iRASFF data flows and targeted authentication testing.

This also implies a shift towards risk-informed and intelligence-led control strategies, where cross-border notifications, historical operator profiles and commodity-specific vulnerabilities are used to prioritise inspections and analytical testing. Strengthening interoperability between national databases and EU-level systems can enhance the timeliness and consistency of information exchange, while improving the evidentiary value of combined datasets in fraud-suspicion cases. At the same time, clear protocols for data integration and interpretation remain necessary to ensure that analytical results, documentary evidence and digital signals are assessed coherently and proportionately within official control systems.

CONCLUSIONS

The revised analysis supports a set of interrelated conclusions. Romania should be characterised through public cross-border visibility and capabilities indicated by publicly available institutional and scientific documents, rather than through unsupported estimates of prevalence or system-wide performance. European ACN and monthly fraud-suspicion data provide a useful basis for identifying patterns of public visibility, but they do not constitute direct indicators of national food fraud risk and must be interpreted within clearly defined analytical limits.

The matrices examined - honey, meat, fish/seafood and dairy products - remain analytically relevant because they combine recurring visibility at EU level with distinct authentication challenges that require matrix-specific methodological approaches. At the same time, the interpretation of documentary evidence benefits from a clear separation between reported results and analytical inference, particularly in cross-border contexts where notification data reflect reporting practices, trade exposure and control intensity as much as underlying irregularities.

The findings also underline the importance of integrating laboratory-based analytical methods with documentary and traceability evidence, especially in cases where fraud suspicion involves both compositional anomalies and administrative inconsistencies. Public ACN/FFN reporting should therefore be understood as a structured visibility system rather than a comprehensive surveillance dataset, which implies that conclusions at national level must remain cautious and explicitly qualified.

Finally, the analytical framework applied in this study - combining matrix-specific authentication methods with transparent documentary review - offers a reproducible approach that supports both scientific robustness and policy-relevant interpretation. Its value depends on methodological transparency, including explicit search strategies, PRISMA-based reporting, clearly defined indicators and a consistent distinction between European-level patterns and Romanian cross-border visibility.

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