CONCORSO PUBBLICO, PER ESAMI, PER N. 1 POSTO DI CATEGORIA D, POSIZIONE ECONOMICA D1, AREA TECNICA, TECNICO-SCIENTIFICA ED ELABORAZIONE DATI, CON CONTRATTO DI LAVORO SUBORDINATO A TEMPO DETERMINATO, DELLA DURATA DI DODICI MESI (COD. RIF. 2315), IN ATTUAZIONE DEL PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) E IN PARTICOLARE DEL PROGETTO DI RICERCA *STRENGTHENING OF THE ITALIAN RESEARCH INFRASTRUCTURE FOR METROLOGY AND OPEN ACCESS DATA IN SUPPORT TO THE AGRIFOOD*-METROFOOD-IT - CODICE IR0000033 - CUP I83C22001040006, RELATIVO ALLA *MISSIONE 4, "ISTRUZIONE E RICERCA" - COMPONENTE 2, "DALLA RICERCA ALL'IMPRESA" - LINEA DI INVESTIMENTO 3.1, "FONDO PER LA REALIZZAZIONE DI UN SISTEMA INTEGRATO DI INFRASTRUTTURE DI RICERCA E INNOVAZIONE",* BANDO INFRASTRUTTURE DI RICERCA - AVVISO N. 3264/2021 DEL MUR (COD. RIF. 2315), INDETTO CON DECRETO DEL DIRETTORE GENERALE N. 1129 DEL 29.09.2023

GRUPPO QUESITI ESTRATTI PROVA ORALE DEL 13.12.2023

GRUPPO QUESITI 2

1 Illustrare i principi di funzionamento di uno spettrometro al plasma accoppiato induttivamente (ICP-MS o ICP-OES)

2 Calcolare media, mediana e deviazione standard del contenuto di fosforo nel suolo e nel frutto di pomodoro in diverse parcelle sperimentali, e calcolare il coefficiente di correlazione (R) tra i contenuti nel suolo e nel frutto delle diverse parcelle.

	P suolo mg/kg	P pomodoro µg/kg
parcella 1	42	2882545
parcella 2	540	3965736
parcella 3	2710	4087622
parcella 4	4342	4602673
parcella 5	6829	5200496

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Stable isotope techniques for verifying the declared geographical origin of food in legal cases

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ABSTRACT

Background: Consumers are increasingly interested in the provenance of the foods and European laws require protection against the mislabelling of premium foods. Methods for testing authenticity require robust analytical techniques that can be utilised by the various regulatory authorities. Of the many techniques, the most widely-used method is stable isotope ratio analysis.
Scope and approach: Focus is on the use of stable isotope ratios of H, C, N, O, S and Sr for verifying the geographical origin of food, cross-referencing it with examples of legal cases. State of the art including rules for building an authentic sample reference database (commonly called databank) and for interpreting the results obtained in actual cases is described. The overall objective is to provide stakeholders and competent authorities dealing with fraud, with a best-practice guide for its use.
Key findings and conclusions: Stable isotope ratios can differentiate foods on the basis of their geographical origin and, especially for light elements, can be measured reliably in routine work in different matrices and compared successfully between different laboratories. Examples of legal applications are grape products, orange juices, olive oil, cheese, butter, caviar. Sometimes, the cases are not brought directly to the court, but before further verifications (e.g. paper traceability, forensic accounting) are conducted. The system can satisfy the court when a robust databank of authentic samples exists, the methods used are officially recognized, validated and accredited, and the expert demonstrates that the conclusions are sufficiently robust and reliable to stand up to the required level of proof.

1. Introduction

Consumers are increasingly interested in the provenance of the foods they consume. The reasons include patriotism; specific culinary or organoleptic qualities associated with regional products; decreased confidence in the quality and safety of products produced outside their local region, country, the EU, or those of unknown provenance. Consequently, products from highly esteemed geographical origins can be sold at markedly higher prices than similar products of other or unknown provenance. For certain products, such as wines, indicating geographical origin has been an established practice for many years, but for other foods and drinks this kind of marketing is more recent. In some European countries, marking certain products with geographical indication or brand has a long tradition (e.g. French and Italian cheese). Today in Europe a number of products with a specific geographical origin and production method are officially protected (Protected Designation of Origin = PDO; Protected Geographical Indications = PGI) and this number is increasing annually, reaching a total number of 1328 registered products at the beginning of March 2016. As these products may obtain higher prices on the market, it is possible that unscrupulous producers might buy cheaper raw materials from other regions and illegally sell the product with the PDO or PGI

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GRUPPO QUESITI 4

1 Descrivere un esempio di analisi statistica multivariata di dati analitici.

2 Calcolare media, mediana, deviazione standard e coefficiente di variazione dei contenuti di macronutrienti di campioni di pomodoro, e rappresentare in un grafico a torta il contributo dei singoli elementi al totale complessivo.

µg/kg	Na	Mg	P	K	Ca
pom 1	301040	1760873	5200496	39608969	607059
pom 2	294792	1435894	3063485	29357743	526597
pom 3	312194	1725554	4544379	38311546	500711
pom 4	319418	1671879	3411877	33441688	478628
pom 5	347769	1801065	4634582	38794728	468360
pom 6	348604	1850890	4948278	44380286	561888

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Food traceability using the $^{87}Sr/^{86}Sr$ isotopic ratio mass spectrometry

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Abstract Today, food traceability needs to develop suitable "robust" analytical methods, in terms of the precision and of the reliability of results, which can support modern legislative tools, aimed at guaranteeing food authenticity and origin and trying to avoid possible frauds. This review paper highlights the most recent results obtained with the use of the $^{87}Sr/^{86}Sr$ isotopic ratio technique, when applied to the traceability of the origin of different foods for human consumption, such as vegetables, beverages, dairy products, and meat and fish products. The instrumental techniques, with the relative methodologies and the quality of the final results, will be examined and commented.

Keywords $^{87}Sr/^{86}Sr$ isotope ratio · Food traceability · Mass spectrometry · MC-ICP-MS · TIMS

Introduction

Food traceability, intended as precise information about the "certain" geographical origin of a food or a food chain, has been the object of increasing interest for some time. The environmental impact caused by anthropization has not only modified the natural attributes of food, but it has also weighed, often heavily, on the long food chain that starts and ends with man. The environment–food interaction is clear, and the production of safe and quality food is an indispensable condition for human health. The globalization of the markets, in particular of food markets, means that a greater variety of food is proposed to consumers who want to know more about its geographical origin and characteristics. For this aim, food traceability is a tool of primary importance because it acts on both food safety and quality, in order to satisfy the needs of a demanding consumer, who is interested in the quality of the food he eats and in the controls about the veracity of the brands which protect it [1, 2]. The production of high-quality food is the first step to satisfying other important aspects, such as the development of a productive but sustainable agriculture and the control of marketing. Frequently, all this is delegated to the "labelling", which is incomplete by nature or easily manipulated. Only the use of a scientific method of identification and control of the geographical origin, independent of the "labelling" and therefore of the producer, enables us to answer in full important questions concerning food safety, food quality and consumer protection. In order to achieve good results in this field, a basic mandatory condition is to develop suitable "robust" analytical methods which can support modern legislative tools, aimed at guaranteeing food authenticity and origin and trying to avoid possible frauds; the latter are fuelled by the modern ease of transport and conservation of products in world markets. Numerous chemical, biological and genetic methods have been developed over time in order to verify the origin of foods [3]. In this paper, we will focus on mass spectrometry, in particular on the $^{87}Sr/^{86}Sr$ isotopic ratio measurement, in that it is a "robust" analytical technique, able to fulfil the requisites needed for traceability, both to satisfy the veracity of the geographical origin and to trace possible contaminated foods back to their origin. In particular, due

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Per ordine del Presidente
Il segretario
F.to sig. Nicola Gianniello