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7th International Rice Conference

Dr. Werner Nader, Dr. Alexander Zahm & Amar Guberinic
Eurofins Dr. Specht Express Testing & Inspection GmbH

October 6, 2025

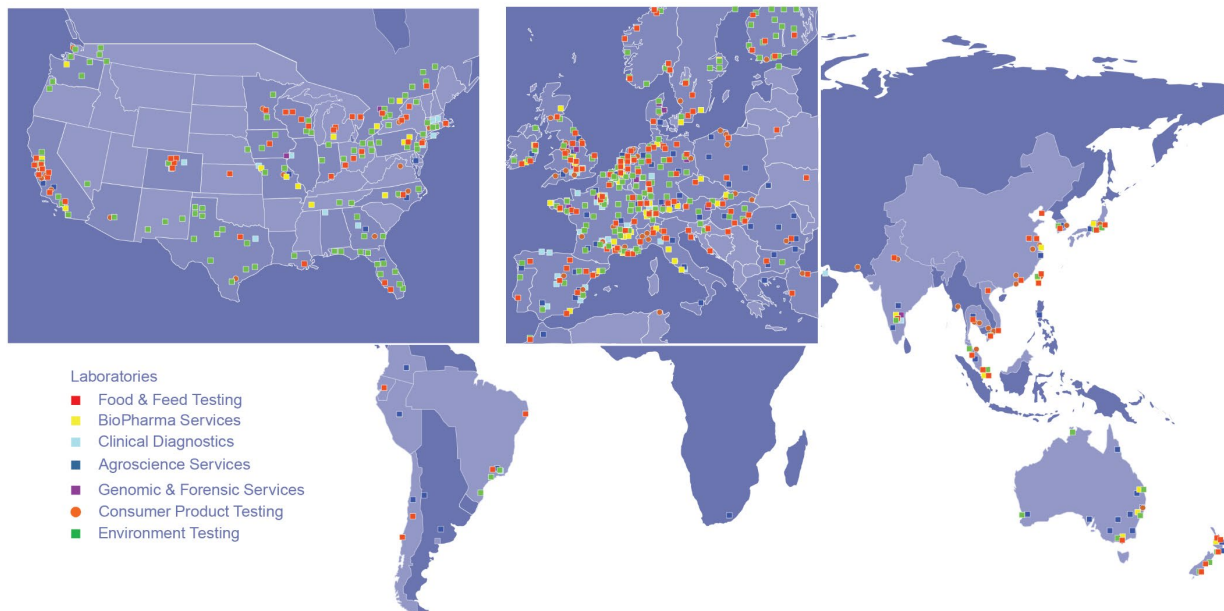


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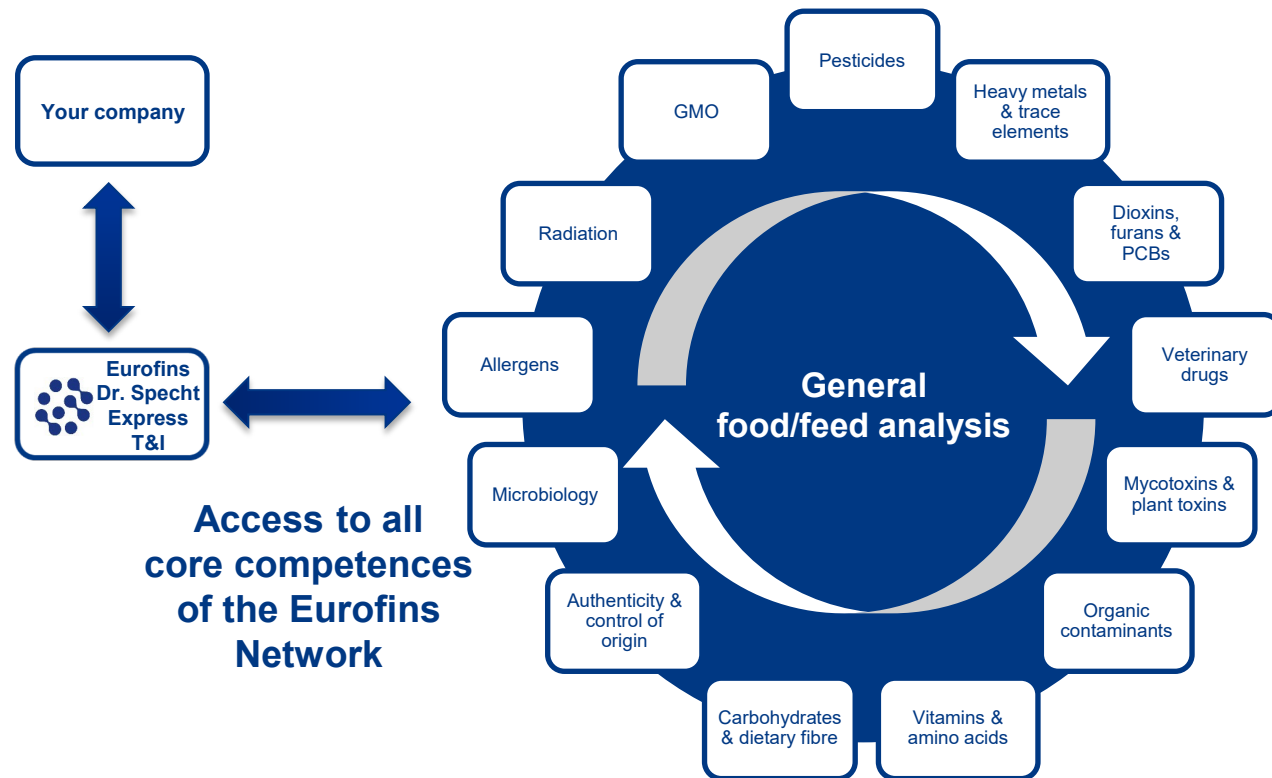


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Oil seeds and Pulse	Nuts and Dry fruits	Feed	Meat	Garden decorations
Herbs and Spices	Milk products	Oil	Lecithin	

Pesticide residue legislations challenge international trade of food and feed

Werner Nader, Michelle Maier, Marco Miebach and Gabriel Linder

Abstract

The diversity of maximum residue levels (MRLs) for plant protection products among the countries worldwide challenges the international food trade. This article describes this diversity and its impacts on the rice supply chain based on the practical experience of an international inspection and analytical company and pesticide testing of 3,392 samples in 2019. Economic impacts of MRLs are illustrated with the example of estimated rice imports into the EU, where Indian rice exporters lost estimated revenues of over 200 million USD from January 2018 to August 2019 due to a drop in the MRL for triazolinol from 1 to 0.01 mg/kg. The article furthermore describes that certain substances in food are frequently interpreted as residues from agricultural practices and fall under the EU MRL regulation for pesticides, although they might be - and frequently are - of natural origin or are contaminants not related to agrochemical applications. Examples are high concentrations of the natural plant hormone indole-3-acetic acid in cereal seeds, accumulation of bromide by Brazil nuts, phthalimide and melipleg generated during food processing involving heat, chlorate from chlorinated water, and nicotine, diethyl-metaltolamide (DEET) and leadin from the hands of workers during harvesting and further handling of the crop. Phosphonate can be introduced into the food by agricultural applications of the fungicide fosetyl or plant strengthening phosphonate salts. But it can be also of natural origin, as microorganisms produce the chemical in biogeochemical phosphorous cycles in various environments. Problems arise not only, when these chemicals exceed the legal MRLs. For organic food they are often interpreted as indicators of forbidden pesticide applications and in infant food they frequently exceed the stringent default MRL of 0.01 mg/kg of the EU. Regarding the occurrence of phthalimide and phosphonate results from the analysis of 9,320 tea and spice samples and 1,417 further food samples are presented, which were obtained in the period of 2017 to 2019.

1. Introduction

Internationally, food safety legislations are diverse and the economic impacts of this diversity have been studied in detail by Bremmers et al. (2011) on the example of meat exports to the USA and the European Union. Melo et al. (2014) describe the burden of regulations and standards on exporting countries with Chilean fruit exports as an example.

García Martínez and Poole (2004) focused on the market barriers created by diverse fresh produce safety standards of the European retail chains on developing Mediterranean exporting countries.

In 2005, the EU implemented harmonized MRLs for plant protection products (Regulation (EC) No 396/2005) followed by stringent enforcement and reporting in the RASFF (Rapid Alert System for Food



Phosphonic acid in plant-based food and feed products – Where does it come from?

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ARTICLE INFO

Keywords:
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 Fosetyl
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 Phthalimide

ABSTRACT

Salts of phosphonic acid (sodium or potassium phosphonate) or its ester fosetyl are highly effective systemic fungicides, which not only exhibit fungistatic activities, but also stimulate the natural defence systems of the plants against pathogens. Since EU legislation has approved potassium and sodium phosphonate as fungicides in 2013 and 2014, they are no longer permitted in organic agriculture. As a result, even minor contents of phosphonate in organic food samples are interpreted as an indication of a not permitted fungicide treatment. A maximum level of 0.01 mg/kg applies for food for infant nutrition. Here we present evidence from the scientific literature that phosphonate is also a natural compound, which occurs in significant amounts in the environment and is produced and consumed by microorganisms within the biogeochemical phosphorous cycle. Further potential sources for this chemical in the environment apart from agricultural fungicide applications are organophosphonates, as phosphonate occurs as a byproduct during their industrial production or during their microbial degradation in effluents from industry and households. An evaluation of Eurofins results from the analysis of phosphonate from 2017 to 2022 with methods achieving a limit of quantification (LOQ) of 0.01 mg/kg reveals that the compound was detected in 40.6% of all samples from organic and 43.4% from conventional agriculture, and in over 90% of organic samples of chickpeas, lentils, buckwheat, peanut and wheat. Furthermore, 97.3% of organic mushroom samples contain the compound and animal manure or compost used for cultivation is a potential source of the chemical. Consequently, other causes for phosphonate in food products than fungicide applications must be taken into account as well. Analysis of the ratio of the stable oxygen isotopes ¹⁸O and ¹⁶O was successfully applied to detect applications of mineral sulphur fertiliser in organic agriculture. Similarly, it might be also a promising tool to differentiate between phosphonate produced industrially and from natural sources.

1. Introduction

Since phosphonic acid was found to be effective against fungal diseases, in particular those caused by oomycetes, the use of its potassium and sodium salts and its ester fosetyl became very popular in agriculture (for reviews see Grent & Grent, 1991; Dunn & McLeod, 2021). It was used as a plant strengthening agrochemical, because it enhances the defence systems of the plant against pathogens. In the EU fosetyl-Al, potassium and sodium phosphonate were approved as fungicides in 2007, 2013 and 2014, respectively. With Commission Regulation (EC) 639/2006 maximum residue levels (MRLs) were defined for fosetyl, expressed as the sum of fosetyl, phosphonic acid and their salts, which

are based on peer review of the pesticide risk assessment of the corresponding active substances by the European Food Safety Authority (EFSA, 2012, 2013 and 2018). With their approval as active plant protection products, phosphonate salts came also into the focus of EU regulation (EC) No 634/2007 on organic production and labelling of organic products and the use of these chemicals is no longer permitted since 2013 in organic agriculture. Residues of phosphonic acid in organic products are interpreted as a possible indication that rules of organic agriculture have been violated. Although the German Association of Organic Producers, Wholesalers and Retailers (BIO, 2023) and the European Organic Certification Council (EOCC, 2019) have defined orientation values for phosphonate, above which checks at farm level

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DNA markers for Basmati authentication have the power to distinguish among other global economically relevant rice varieties and to evaluate their genetic background

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ARTICLE INFO

Keywords:
 Rice authenticity testing
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 Sushi
 Basmati
 Jasmine rice
 UPGMA cluster analysis
 Primary coordinate analysis
 Fragrance gene *gfr*

ABSTRACT

DNA fingerprinting based on 10 SSR (Simple Sequence Repeat) markers was introduced in the early 2000s for authenticity testing of Basmati rice. Subsequently the addition of 5 SNPs and the fragrance gene *gfr* have refined the method for routine use. This study evaluated the applicability of the 15-SSR method for authenticity testing of more diverse types of commercially relevant rice that are traded on an international scale. DNA fingerprints of 158 rice varieties from 14 countries across four continents were obtained with this method. Most had distinct marker profiles except for eight near isogenic lines and eight closely related traditional varieties. The *gfr* marker detected several non-Basmati varieties that were incorrectly labelled as Jasmine fragrance rice, one of which was listed as fragrance and tariff-exempt in the EU Viet Nam Free Trade Agreement. To assess the authenticity of samples obtained from unofficial sources in the trade, UPGMA algorithm and Principal Coordinate Analysis (PCA) were used for marker-based clustering of samples. Most of the unofficially sourced samples clustered according to their expected geographical and genetic origin, supporting their authenticity. The study supports the broader utility of this 15-SSR test, supplemented by the *gfr* marker, for global rice variety authentication.

1. Introduction

DNA analysis is routine procedure in food analysis for the detection of certain species, varieties, pathogens and genetically modified organisms. Species can be differentiated by comparing the sequences of specified 'barcoding' genes (Pisano, 2019) but varieties of plants and breeds of animals can be distinguished by DNA fingerprinting using highly polymorphic mini-satellites (tandem repeats), microsatellites (simple sequence repeats; SSRs) and single nucleotide polymorphisms (SNPs) (Oster et al., 2016). Multi-allelic SSRs have higher discriminatory power compared to SNPs.

Rice (*Oryza sativa* L.) is a globally important staple food with extensive genetic diversity. Over 132,000 rice accessions and wild relatives are maintained in gene banks providing a vital source of traits for breeding, however, only a fraction of them are commercially relevant varieties (International Rice Research Institute, IRRI, 2023). Rice is cultivated on more than 163 million hectares in over 100 countries in

diverse cropping systems and environments (Lahorte et al., 2017). Cultivated varieties are adapted to different climates, soils and resistance to pests. Diversity in grain morphology, starch structure and fragrance gives rice to different culinary uses, such as basmati in Biryani and Pilaf, Jasmine in Curries, and Japonica in Sushi and Risotto.

Commercial rice varieties (except for F₁ hybrids) are genetically homozygous and therefore ideally suited for DNA fingerprinting (Ramakrishna et al., 1994). Almost 20,000 SSRs are listed in the Gramine database (Grimace, 2022; McCouch et al., 2002). Subsets of SSRs have been used to assess genetic diversity and population structure in rice (Choudhary et al., 2015; Goldstein & Pollock, 1997; Jasin Aljammal et al., 2018; Lestari et al., 2009; Ma et al., 2023; Nagaraja et al., 2007; Singh et al., 2013, 2016; Takasaki & Nei, 1996; Thomson et al., 2007; Verma et al., 2019). Other DNA-based methods have been developed for rice authenticity testing (Vieira et al. (2022) while Bradbury et al. (2005a and b) developed a PCR test for a major rice gene for fragrance (*gfr*).

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- I 13:15** Introduction to the conference and the Eurofins rice testing & inspection program, Amar Guberinic, Sales Manager, Eurofins Dr. Specht Testing & Inspection, Hamburg
- II 13:30** SRP's Low-Carbon Rice Module- a cost-effective solution for rice retailers, Jens Soth, Executive Director, Sustainable Rice Platform
- III 14:10** Global rice production sustainability comparison – opportunities for cooperation in a fast-moving trade environment, Mark Isbell, Chairman of USA Rice Sustainability Committee, Fourth Generation Rice Farmer and Partner at Isbell Farms, Arkansas USA
- IV 14:50** Heritage grains, modern solutions: Pakistan's Basmati journey, Shahid Hussain Tarer, CEO, Galaxy Rice Mills (Pvt) Ltd., SRP board member
- V 15:30 – 15:50** Break

- VI 15:50** The update of Cambodia Rice Export and Cultivation, Chhun Hour (Andy) Lay, President Cambodian Rice Federation
- VII 16:30** Stability of vitamins and minerals in fortified rice kernels and fortified rice stored under real-life conditions over two years, Dr. Werner Nader, Consultant, on behalf of the UN World Food Programme
- VIII 16:50** Pesticide residues and contaminants in rice: New developments and an evaluation of the Eurofins analytical result data base, Dr. Alexander Zahm, Managing Director
- IX 17:20** Rice authenticity testing: DNA fingerprinting and genetic clustering analysis of commercially important rice varieties from 14 countries across 4 continents, Dr. Werner Nader
- X 17:45 pm** Final remarks



Wyn Ellis, former executive director (left) with Jens Soth (right)

Jens Soth is an agricultural scientist and environmental engineer with over 20 years of experience dedicated to enhancing the environmental sustainability of agricultural production and processing. His expertise spans sustainable and regenerative agriculture, as well as circular economy principles.

Jens has contributed his knowledge to several international expert committees, including the Sustainability Panel of the International Cotton Advisory Committee, the ISO, and the EU Ecolabelling Board.

He possesses extensive experience working with various value chains and corresponding standards and has successfully facilitated public-private partnerships involving multi-stakeholder collaboration at both farm and landscape levels.

Since mid-2025, Jens has served as the Executive Director of the Sustainable Rice Platform (SRP), where he leads efforts to advance a credible, multi-actor initiative centered on a recognized standard and label for sustainable rice production.

Mark Isbell, Partner at Isbell Farms & Chair USA Rice Sustainability Committee



Mark Isbell

Mark Isbell is a 4th Generation rice farmer from Lonoke County, Arkansas. Isbell Farms is a 3,500 acre, multi-generation operation that is a pioneer in Zero Grade farming, a process begun by Mark's father and grandfather.

Isbell Farms also has a strong relationship with the research community. Their farm hosts an ongoing joint research program by the USDA's Agricultural Research Service (ARS) and the University of Arkansas that uses advanced methane measurement towers and other telemetry tools that have led to research findings of rice production methods that can reduce methane emissions in rice by over 60%.

Mark Isbell is an alumni of the University of Arkansas at Little rock, where he earned two bachelor's degrees and a Masters of Arts and periodically serves as an adjunct instructor.

Mark is an active member of the USA Rice Federation, serving as Chair of the Sustainability Committee and on the Conservation Committees, and has worked widely on sustainability and climate-change solutions within agriculture. He is a member of the Producers Circle for the Ecosystems Services Marketplace Consortium and served on the steering committee for the adaptation of the Sustainable Rice Platform for U.S. rice production, a joint project of the American Carbon Registry and the White River Irrigation District.

Isbell serves on the Field to Market Board of Directors, the Board of Directors for AgHeritage Farm Credit Services, and the Board of Directors for the Ag Council of Arkansas. Isbell is also co-founder of Arva intelligence, a company devoted to using the power of machine learning and artificial intelligence to create new sustainability and carbon market opportunities in agriculture.

Mark resides in North Little Rock, Arkansas, with his wife, Marda, his son, Sam, and his daughter, Nora.

Shahid Hussain Tarer, CEO Galaxy Rice Mill and SRP Board Member



Shahid Hussain Tarer brings nearly 20 years' experience in Sales & Marketing as well as Sourcing, Strategy, Supply Chain Management and Manufacturing.

Shahid has been in the rice export business for over 20 years and 14 years as the Managing Director of Galaxy Rice Mill. Galaxy is a family owned and operated business with a focus on exporting Basmati rice to the European & US market.

For the last seven years Galaxy has managed a local farmer program to grow Sustainable rice. Shahid has also led a team setting up a Seed company as well as Drone and Mechanization services to support farmers.

He has also been on the Board of SRP for the last three years and the Co-convenor of Pakistan Basmati Heritage foundation a non-profit industry consortium that works to build sustainable rice supply chains.

Shahid Hussain Tarer

Chhun Hour (Andy) Lay, CEO City Rice & President of the Cambodian Rice Federation



Chhun Hour (Andy) Lay

Chhun Hour (Andy) Lay was born into the rice business family which parents were a paddy trader back in 1988-1994. They started to establish the first rice mill in 1995.

He was born and raised in Battambang province and grew up with rice environment until I was 16 years old and moved to the capital city of Cambodia, Phnom Penh in 1998 and graduated Sisowath High school in 2000 and continued higher education abroad, New Zealand in late 2000.

He then moved to the United States in 2003 and graduated from University of Wisconsin Superior in 2006 majoring in International Business and Management. In 2010, he did his post graduate study and achieved his MBA in Finance in late 2010 from California State University of Long Beach and moved back to Cambodia to pursue the rice business.

That is when City Rice Import Export was established in 2012 as a rice export company and has become the biggest exporters since 2018. Between 2022 until 2025 City Rice has stood as top 1 exporter and he was elected as president of Cambodia Rice Federation mandate 5th in August 26th 2025. President of Board directors, board directors and he is looking forward to achieve an export target of 1 million tons and beyond per year and also continue to be the premium grade rice exporter to European markets and other parts of the world.



Dr. Werner Nader

Dr. Werner Nader is 73 years old, biologist and was cofounder and until his retirement managing director of Eurofins Global Control GmbH in Hamburg, Germany. Currently he is a senior consultant for food safety and authenticity and lead auditor of food safety management systems and board member of Eurofins Ajal in Riyadh, Saudi Arabia. During 40 years in research and development at the Massachusetts Institute of Technology (MIT), Texas A&M University, ORPEGEN Pharma (Germany's first biotech company), Instituto Nacional de Biodiversidad (INBio) in Costa Rica, GeneScan AG (pioneer in GMO analysis) and Eurofins he published 26 scientific articles, 9 book chapters, one book, and is inventor on 12 patents.

Dr. Nader is on ResearchGate, where further details including his publications (most as full text) are available: www.researchgate.net/profile/Werner_Nader. His current published (peer reviewed) research involves authenticity testing of Basmati, Jasmine and Risotto rice by DNA fingerprinting and the impacts of pesticide residue legislation on the international trade.

Dr. Alexander Zahm, Managing Director of Eurofins Dr. Specht Express Testing & Inspection



Dr. Alexander Zahm

Dr. Alexander Zahm is Managing Director of Eurofins Dr. Specht Express Testing & Inspection GmbH in Hamburg, which was formed in 2023 through the merger of Eurofins Dr. Specht Express and Eurofins Global Control. He previously led both companies, overseeing strategy, business development, and the integration of global services.

His expertise lies in food safety, particularly pesticide analysis (LC-MS/MS, GC-MS/MS), authenticity testing, and regulatory compliance. In the beverage sector, he focuses on raw materials, fruit juices, and concentrates, including method development, isotope analysis, and advisory services on MRLs.

In the rice sector, he leads programs for residue analysis, authenticity, and traceability across the entire value chain—from field application to packaged goods. This includes risk assessments, method development for emerging substances, and international training initiatives.

Zahm studied food chemistry at TU Dresden and earned his PhD with a dissertation on the lipid fraction of coffee beans, focusing on diterpenes and N-alkanoyl-5-hydroxytryptamides. He is also a co-author of numerous scientific publications.



Amar Guberinic

Amar Guberinic is an economist with over 5 years of experience in the Testing, Inspection, and Certification (TIC) sector, specializing in the rice industry. His career has been defined by a deep understanding of global trade dynamics, quality assurance frameworks, and supply chain integrity optimization.

He holds a Bachelor's degree in Economics and International Business from University of Buckingham in the UK, where he developed a strong foundation in market analysis, trade policy, and business strategy.

He later earned a Master's degree in International Business and Sustainability from University of Hamburg in Germany, equipping him with the tools to navigate the evolving international landscape of sustainable agriculture and responsible sourcing.

Currently holding the Sales Manager position at Eurofins Dr. Specht Express Testing & Inspection, part of the world leading Group in the TIC sector, Amar oversees strategic client relationships, market development initiatives, and service innovation across key rice-producing regions. His cross-disciplinary background and international experience allow him to drive impactful solutions that support both business objectives and responsible business practices.

Your Contacts



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