

# **Mycotoxins in Forages and Feeds: Insights from the AgriSearch Study and International Research**

Webinar 14<sup>th</sup> April 2026



*Bringing Science and  
Farming together*

- An independent farmer-led levy body
- **PURPOSE:** To make the NI ruminant livestock sector more competitive, profitable and sustainable
- Strong emphasis on-farm research and innovation



# Why did we look at this topic?

- The Dairy Advisory Committee raised this as a topic of concern
- Increased reports of mycotoxins being an issue in silage (in particular in the dairy sector)
- On occasion this has led to antibiotic failures in milk
- Negative effects can also be seen in cow health, fertility and production efficiency.
- Lack of independent evidence

| Time  | Speaker                               | Topic  |
|-------|---------------------------------------|--|
| 12:30 | Norman McMordie                       | Welcome & Introduction   |
| 12:35 | Dr Sinclair Mayne                     | What did the AgriSearch Mycotoxin Study Find?  |
| 12:50 | Prof. Rudi Krska and<br>Dr Nick Birse | International research on mycotoxins in feed crops and silage                                |
| 13:10 | Dr Keith Agnew                        | Food Fortress monitoring programme and mitigating the risks of mycotoxins in purchased feeds |
| 13:25 | Ian McCluggage                        | Panel Discussion   |
| 13:45 | Ian McCluggage                        | Summary and Close  |

# AgriSearch Mycotoxin Screening Survey

## Background

- Mycotoxins are natural substances produced by moulds and fungi in the field, or during storage (over 500 mycotoxins have been identified)
- Reports of increasing incidence of contamination in grass silage:
  - Negative effects on cow health, fertility and production
  - Risk of antibiotic failures due to *Penicillium fungi*.



# AgriSearch Mycotoxin Screening Survey

## Reasons for increasing incidence:

- **Plant stress – silage made in very wet or very dry conditions;**
- **Slurry and/or soil contamination**
  - **increased tedding;**
- **LESSE – trailing hose with slurry in narrow bands?**
- **Poor compaction or sealing of silos**



- **AgriSearch study examined level of mycotoxins present in grass silages across 13 farms**
- **Full details of slurry, fertiliser, ground conditions, silage harvesting , additive use were recorded**
- **43 silage samples were obtained from the 13 farms in winter of 2024/25 (samples taken from across silo face, core samples and feed passage)**
- **Samples frozen and analysed by Queen’s University in Spring 2025**



# Results (1)

- 9/13 farms had reported previous issues with mycotoxins (7/13 used binders)
- First cut slurry applied from 3 February to 30 March
- 9 farms used LESSE, 2 splashplate and 2 LESSE/splashplate
- 8 farms observed slurry lines in sward at harvest – LESSE
- First cut from 25 April to 18 May (12-24 hour wilt on 9 farms and 48-hour wilt on 4 farms)
- No additive used on 8 farms, inoculant additive on 5 farms



## Results (2)

- Majority (21 out of 23 silages) had very low levels or no mycotoxin present
- Where low levels of mycotoxin were detected, these could mainly be attributed to Fusarium fungi – associated with soil and dead/dying grass – ensiled along with grass
- Two silages had moderate levels of mycotoxin present



# Results (3)

- One silage contained 134 ppb Mycophenolic acid/kg FW
  - First cut silage cut on 9 May, 24-hour wilt
  - Slurry applied by splash-plate on 20 February.

**Silage analysis: 33.4 % DM and 11.6 MJ ME/kg DM**  
**pH 4.2      14% Protein**

# Results (4)

- One silage contained 40 ppb Penicillic acid – borderline level which may have impacted intake and milk yield
  - Third cut silage cut on 16 August, 12-hour wilt
  - Slurry applied by splash-plate on 26 June

**Silage Analysis: 21.9 % DM and 12.1 MJ ME/kg DM**  
**pH 3.5      12% Protein**

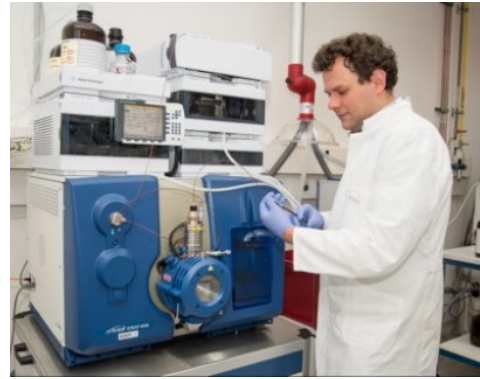
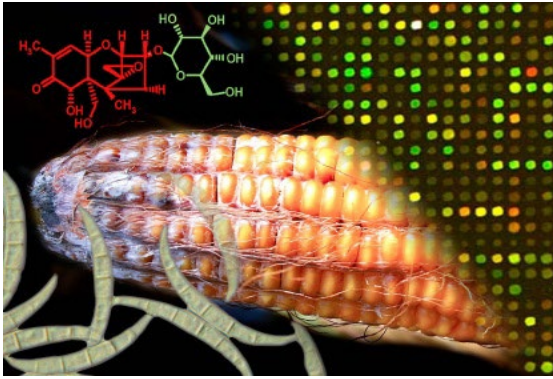
**Silage heated at silo-face**

# Overall Summary

- Majority of silages had very low or no mycotoxins present in this survey
- Two silages out of 23 had borderline mycotoxin level, due to Penicillic acid and mycophenolic acid (penicillium mycotoxins) which may have impacted animal performance, but very unlikely to have been at a level detectable in milk.
- Both silages had used splash plate to apply slurry
- No mycotoxins detected in silages where slurry was applied by LESSE, even though slurry bands visible at harvest in 8 of the 9 farms that used LESSE
- Further monitoring needed to determine extent and causes of mycotoxin contamination at farm level

# Acknowledgements

- **13 farms that participated in the study**
- **Courtney Colgan (Farm Liaison Officer) for sampling and data collection**
- **Dr David Davies Silage Solutions Ltd, Aberystwyth (scientific advice)**
- **Queen's University, Belfast for mycotoxin analysis**



# International research on mycotoxins in feed crops and silage

Rudolf Krska, N. Birse, R. Schuhmacher, F. Berthiller, M. Sulyok

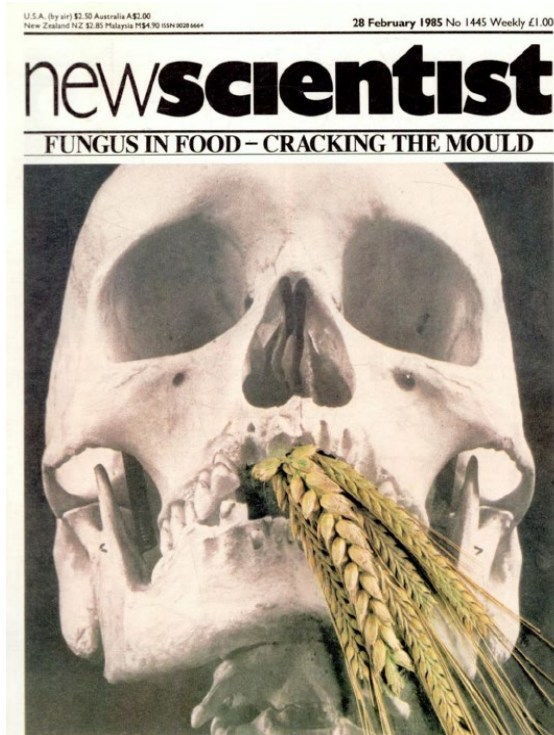




25 % of all food crops are contaminated with mycotoxins => worldwide problem



## Source for the 25%? Unclear!



Dear Rudolf,

Thanks so much.

After I sent the email to Eleonora I actually remembered that I tried to chase this down at some earlier time too (and thanks to google's memory this reference hence came up so quickly in my search results), but this is as far as I got.

**Unfortunately, the exact origin of this statement remains unclear to us.**

**As none of the people involved at the time are still with FAO, I am unable to assist with any more details.**

Thanks and regards

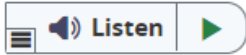
Markus

Markus Lipp, Ph.D.

FAO

JECFA Secretariat, Scientific Advice

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Reviews

# Worldwide contamination of food-crops with mycotoxins: Validity of the widely cited 'FAO estimate' of 25%

Mari Eskola , Gregor Kos , Christopher T. Elliott , Jana Hajšlová, Sultan Mayar  & Rudolf Krska  

Pages 2773-2789 | Published online: 03 Sep 2019

 Download citation

 <https://doi.org/10.1080/10408398.2019.1658570>

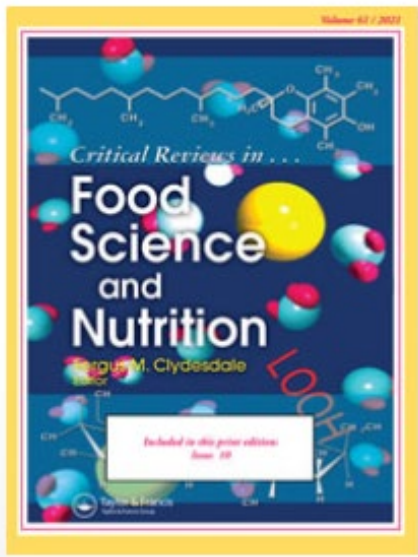
 Check for updates

47,073

Views

1,141

CrossRef  
citations to date



*Current mycotoxin occurrence above the EU and Codex limits confirm the FAO 25% estimate, while this figure greatly underestimates the occurrence above the **detectable levels of (up to 80%)**. The high occurrence is likely explained by a combination of the **improved sensitivity of analytical methods** & **impact of climate change**.*

Based on

**EFSA** data from  
**175.000 food samples**  
& **Biomin** data from  
**1.900 feed samples**

Worldwide **most cited paper** in the area of mycotoxins in the last 5 years (**>770 citations**):

# World Overview

## dsm-firmenich World Mycotoxin Survey – January to December 2023

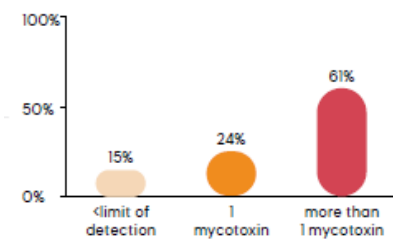


23 808  
Samples

113 558  
Analyses

95  
Countries

### Co-contamination



Number of mycotoxins per sample based on samples tested for 3 or more mycotoxins.

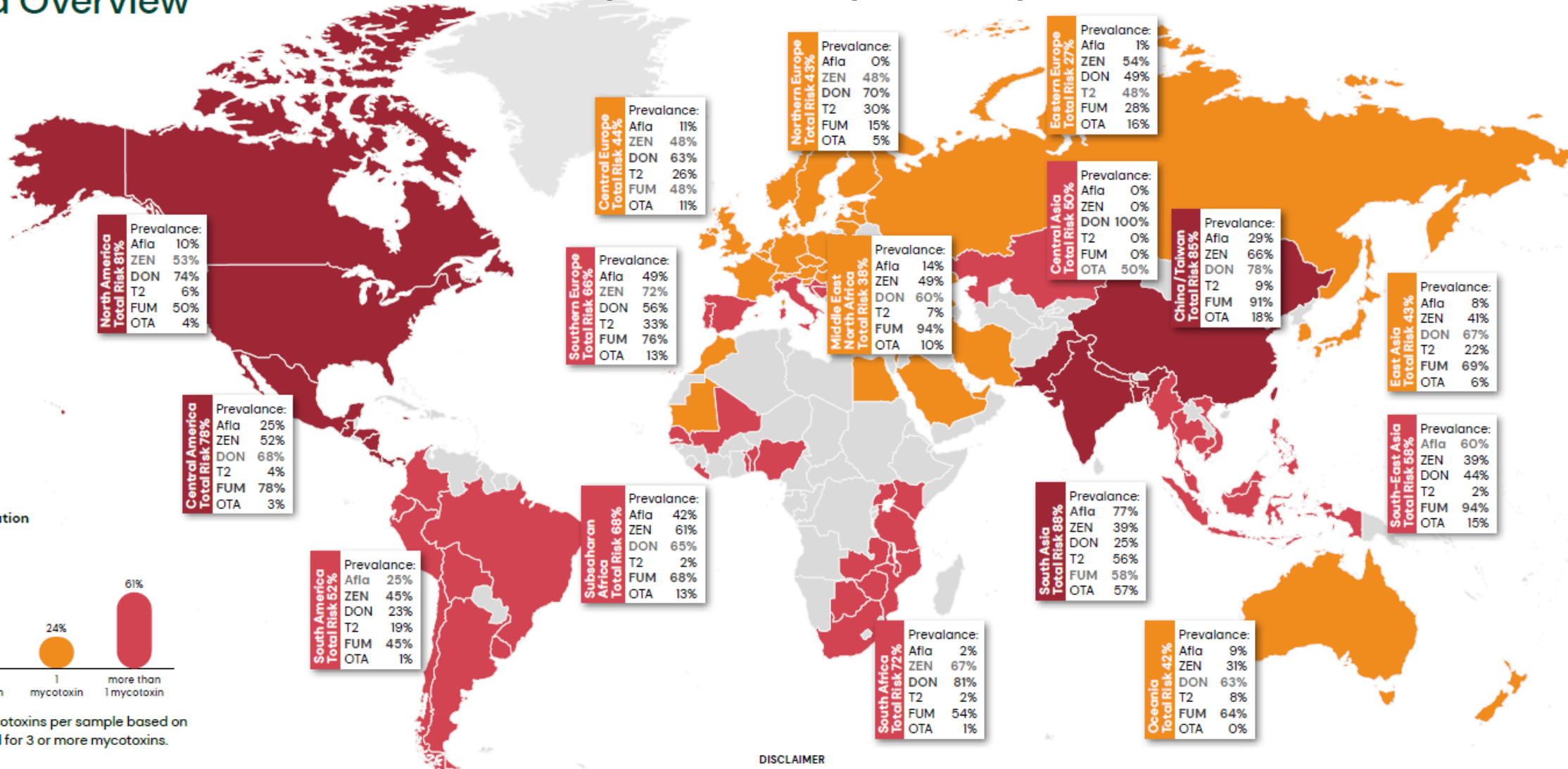
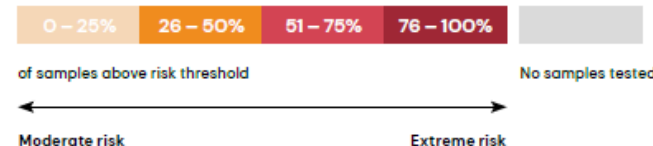
### Risk Level

The risk level expresses the percentage of samples testing positive for at least one mycotoxin above the threshold level in parts per billion (ppb).

Recommended risk threshold of major mycotoxins in ppb

| Afla | ZEN | DON | T2 | FUM | OTA |
|------|-----|-----|----|-----|-----|
| 2    | 50  | 150 | 50 | 500 | 10  |

Figure 1. Global map of mycotoxin prevalence and risk in different regions.



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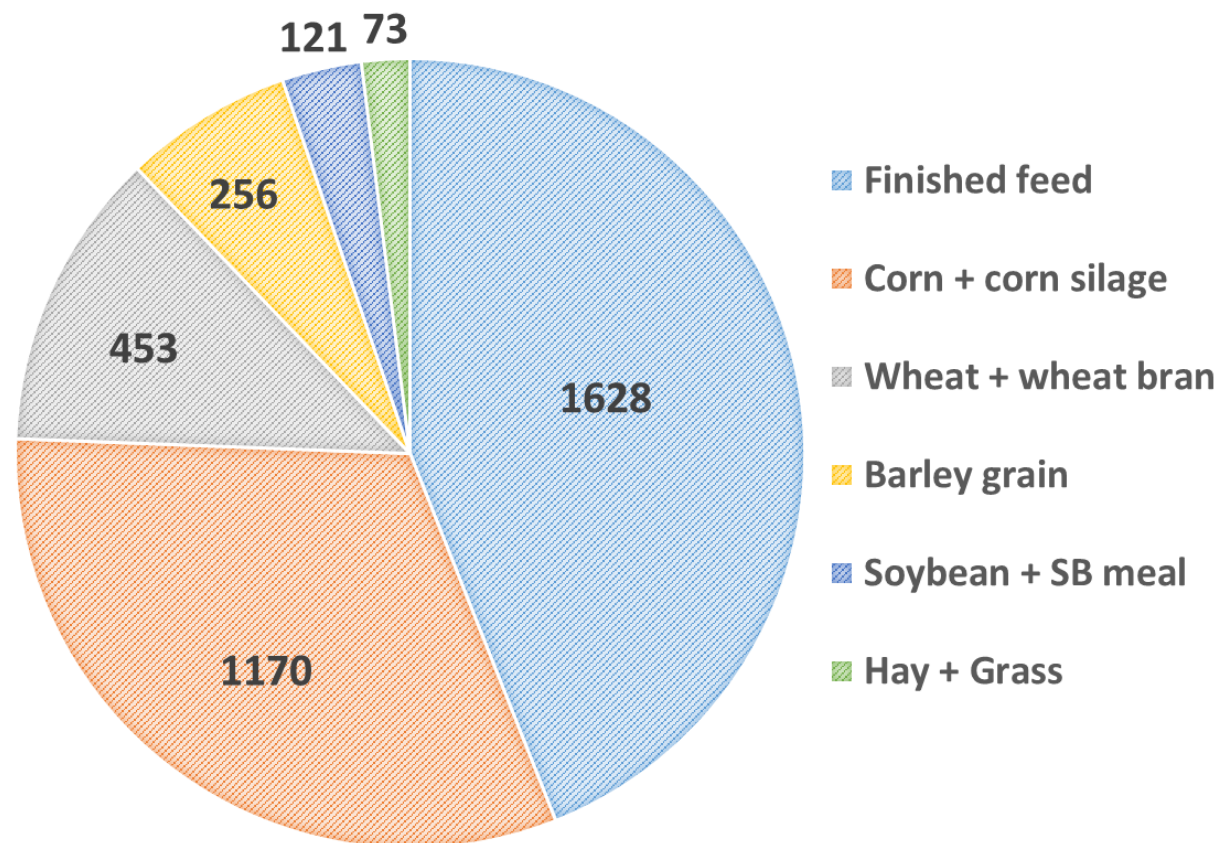
### ACKNOWLEDGEMENTS

Special thanks go to Biofarma Feedlab Argentina and Anita Mengyan, Tiergesundheitsdienst Bayern e.V. for sharing their mycotoxin analysis results as part of this survey. Mycotoxin Report is published by DSM Austria GmbH, Erber Campus, 3131 Getzersdorf, Austria, Tel: +43 2782 8030, www.dsm.com/anh

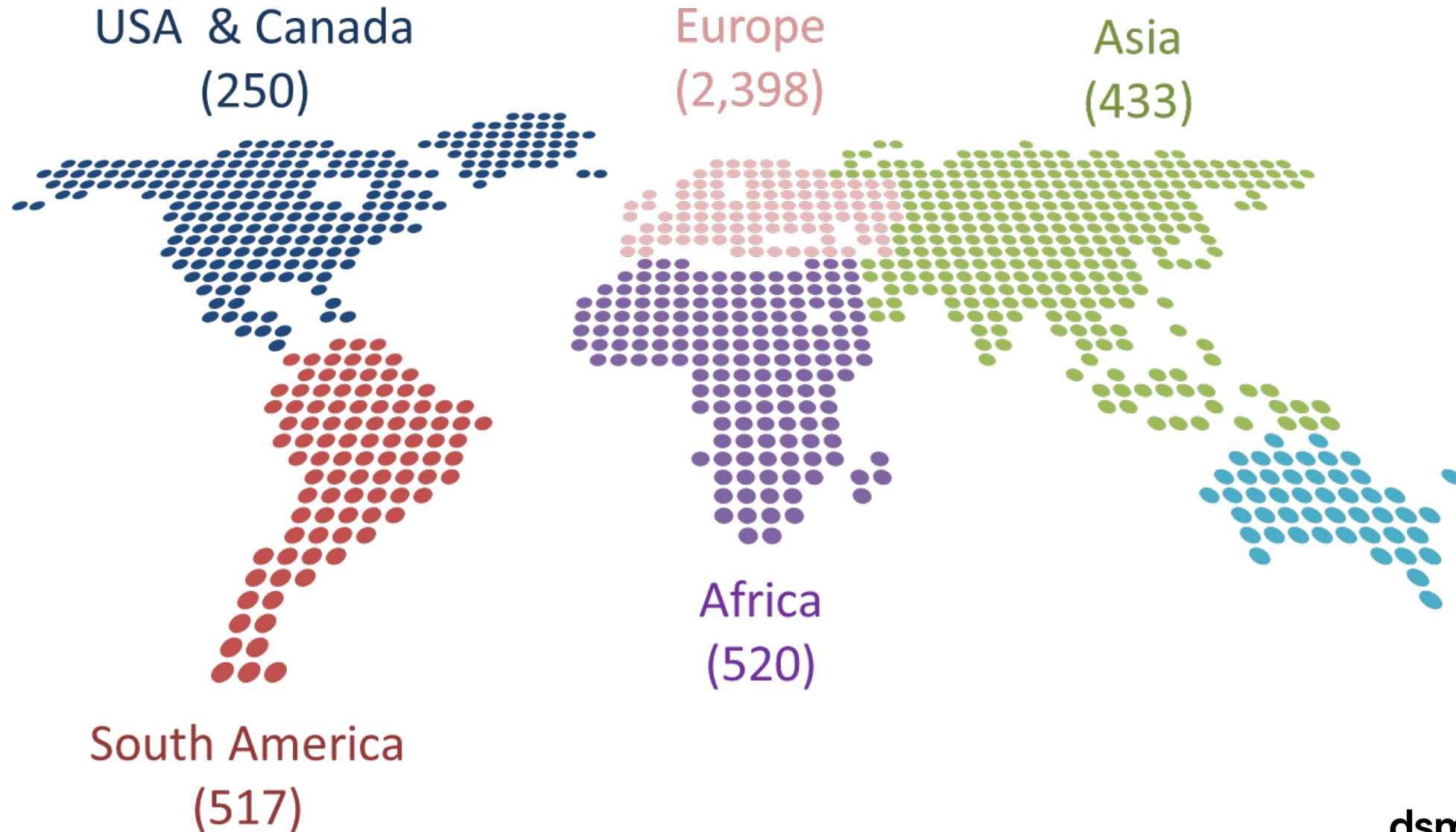
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# Analyzed commodities

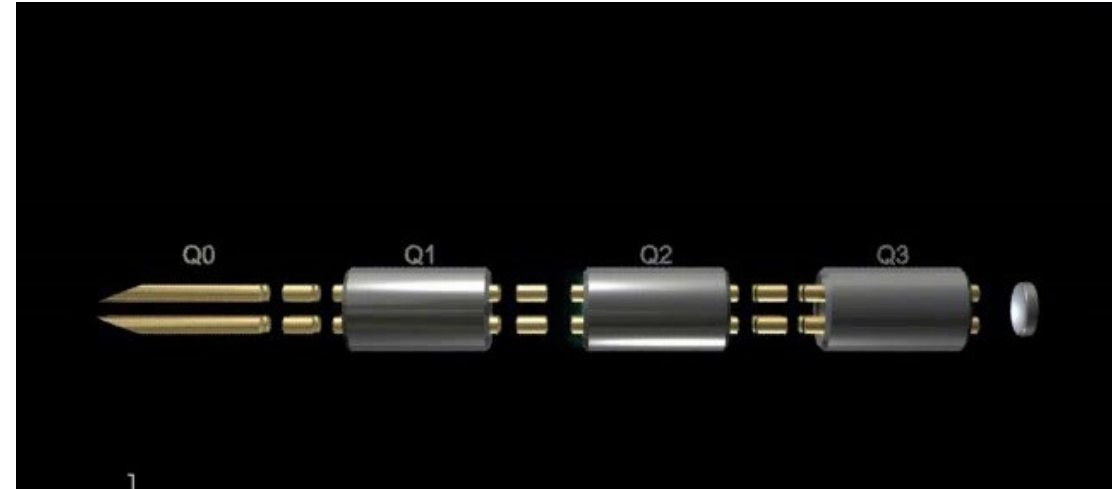


# Sample origin (Number of samples)

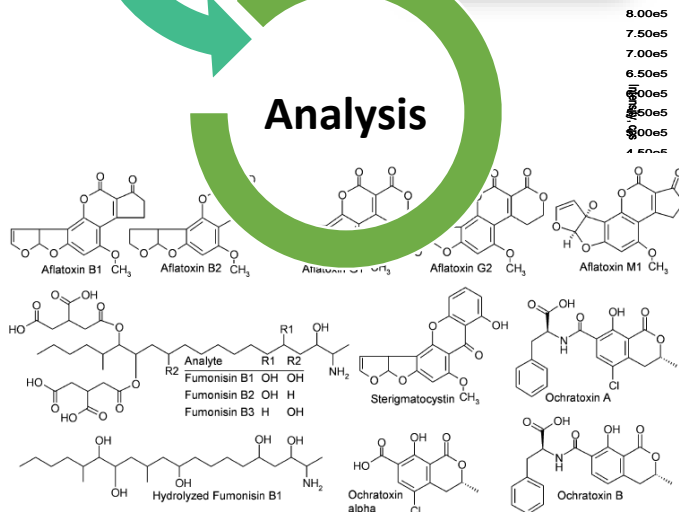
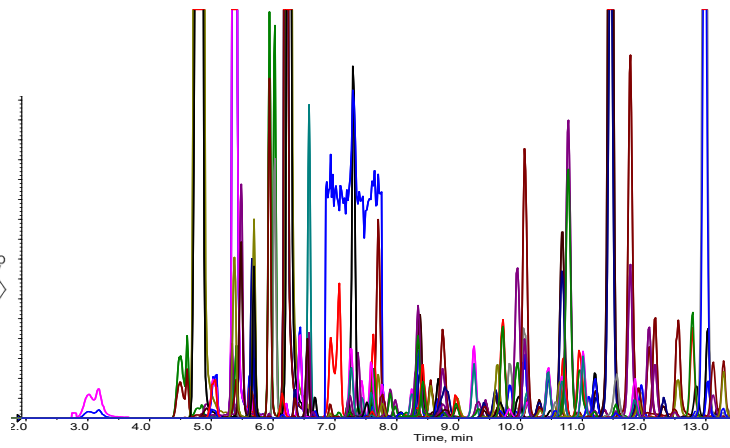
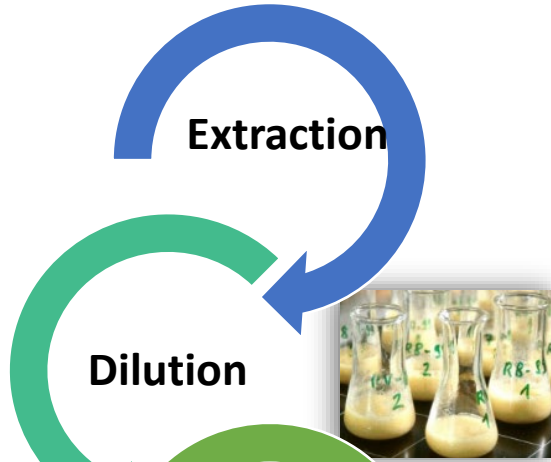




# Multi-Class-Analysis by LC-MS/MS: Dilute and shoot approach



Journal of Chromatography A 1629 (2020) 461502



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

**Journal of Chromatography A**

journal homepage: [www.elsevier.com/locate/chroma](http://www.elsevier.com/locate/chroma)



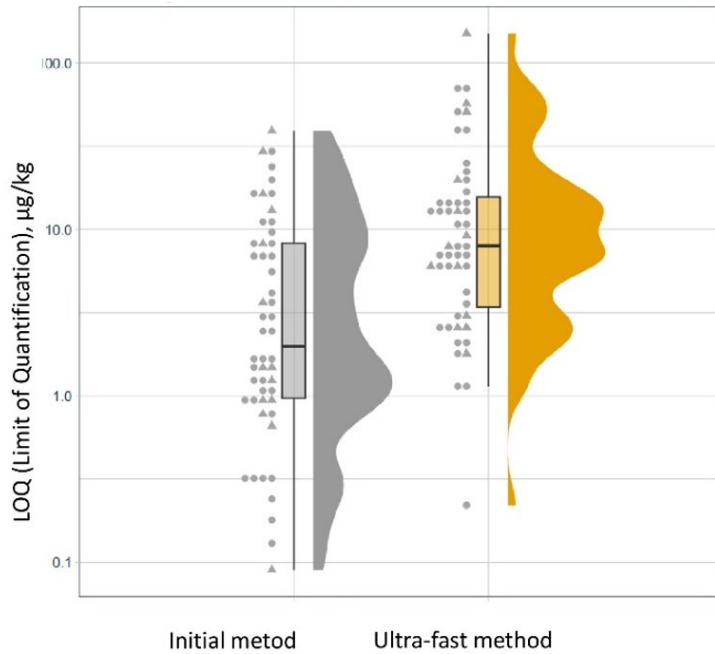
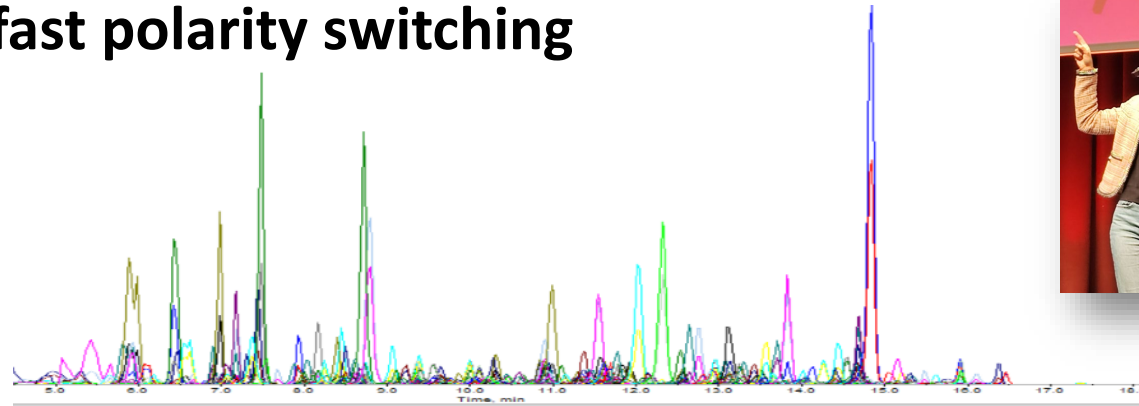

Realizing the simultaneous liquid chromatography-tandem mass spectrometry based quantification of >1200 biotoxins, pesticides and veterinary drugs in complex feed

David Steiner<sup>a</sup>, Michael Sulyok<sup>b,\*</sup>, Alexandra Malachová<sup>a</sup>, Anneliese Mueller<sup>d</sup>, Rudolf Krška<sup>b,c</sup>

**>1.200 contaminants in 45 min**

# Accelerating multi-toxin LC-MS/MS

UPLC + fast polarity switching



➤ **Quantification of 931 secondary metabolites in 11 min**



Journal of Food Composition and Analysis

Volume 151, March 2026, 108908



Exploring the limits of UHPLC-MS/MS with polarity switching towards the quantification of 931 mycotoxins and other secondary metabolites in cereal-based food

Lidija Kenjeric <sup>b</sup> ✉, Michael Sulyok <sup>b</sup>, Christoph Bueschl <sup>b</sup>, Alexandra Malachova <sup>a</sup>, Rudolf Krška <sup>b c</sup>

regulated • Not regulated ▲ Regulated

# Grass silage analysis

- Modified 'Dilute and Shoot' approach that integrates with the existing ISO/IEC:17025 method in use at Queen's University Belfast for the Food Fortress program.
- LC-MS/MS method is unchanged, sample preparation for grass silage is specialised but enables silage to be incorporated within sample runs which also analyse animal feeds.



# Protocol for grass silage analysis

- Sample is collected and immediately stored in a plastic 'zip-lock' bag and frozen to -20°C in a domestic (or industrial freezer) as quickly as possible after collection.
- Samples are transferred to a -80°C freezer overnight in readiness for sample preparation to begin.
- -80°C samples are transferred to a waiting freeze drier (lyophiliser) and dried to remove water content from the silage samples.
- Freeze drying continues for around 36 to 48 hours to facilitate removal of the bulk of water from the samples.
- Dried samples are then milled using a Retsch PM200 (or similar) ball mill under controlled circumstances to ensure a consistent particle size is achieved across all samples.
- Milled samples then enter the conventional 'Dilute-and-shoot' sample preparation process at the same point as powdered animal feed samples.

# FEED ingredients frequently contaminated with mycotoxins with regulated mycotoxins

## Cereal Grains:

1. **Corn:** A significant risk for aflatoxins, fumonisins, deoxynivalenol and zearalenone.
2. **Wheat:** Deoxynivalenol and zearalenone
3. **Barley:** DON and ZEN
4. **Oats:** Can be contaminated with ochratoxin A and DON.
5. **Sorghum:** Susceptible to aflatoxins and fumonisins.

## Protein Sources:

1. **Soybean Meal:** Risk of contamination with aflatoxins and zearalenone.
2. **Cottonseed Meal:** Can be contaminated with aflatoxins

# Publications on mycotoxin occurrence and trend analysis

**Review** 

Received: 4 December 2012    Revised: 12 April 2013    Accepted article published: 13 May 2013    Published online in Wiley Online Library: (wileyonlinelibrary.com) *Journal of the Science of Food and Agriculture*

## Mycotoxin occurrence in feed and feed raw materials worldwide: long-term analysis with special focus on Europe and Asia

Elisabeth Streit,<sup>a</sup> Karin Naehrer,<sup>b</sup> Inês Rodrigues<sup>c</sup> and Gerd Schatzmayr<sup>a\*</sup>

**Abstract**

During an 8-year period, 17 316 samples of feed and feed raw materials from all over the world were analysed for contamination with aflatoxins, ochratoxin A, zearalenone, deoxynivalenol and fumonisins. Overall, 72% of the samples tested positive for at least one mycotoxin and 38% were found to be co-contaminated. Mycotoxin concentrations were generally low and the majority of the samples were compliant with the most stringent EU guidance values or maximum levels for mycotoxins in feed. However, in their present state these regulations do not address co-contamination and associated risks. Long-term trends are difficult to establish as strong yearly variations were observed regarding mycotoxin prevalence and contamination levels. In some cases unusual weather conditions can be linked with high observed mycotoxin loads. An exception to this rule is South-East Asia, where a steady increase of aflatoxin prevalence has been observed. The percentage of aflatoxin-positive samples in this region rose from 32% in 2005 to 71% in 2011.

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Supporting information may be found in the online version of this article.

**Keywords:** mycotoxins; feed; long-term survey



Article

## Co-Occurrence of Regulated, Masked and Emerging Mycotoxins and Secondary Metabolites in Finished Feed and Maize—An Extensive Survey

Paula Kovalsky<sup>1,†</sup>, Gregor Kos<sup>2,†</sup>, Karin Nährer<sup>1</sup>, Christina Schwab<sup>1</sup>, Timothy Jenkins<sup>1</sup>, Gerd Schatzmayr<sup>1</sup>, Michael Sulyok<sup>3,\*</sup> and Rudolf Krška<sup>3</sup>

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  - 2 Department of Atmospheric and Oceanic Sciences, McGill University, Montreal QC H3A 0B9, Canada; greg@meteo.mcgill.ca
  - 3 Department of Agrobiotechnology (IFA-Tulln), University of Natural Resources and Life Sciences, Vienna 1180, Austria; rudolf.kraska@boku.ac.at
- \* Correspondence: michael.sulyok@boku.ac.at; Tel.: +43-2272-66280  
† These authors contributed equally to this work.

Academic Editor: Aldo Laganà

Received: 10 August 2016; Accepted: 21 November 2016; Published: 6 December 2016



Article

## Global Mycotoxin Occurrence in Feed: A Ten-Year Survey

Christiane Gruber-Dorninger<sup>\*,†</sup>, Timothy Jenkins<sup>†</sup> and Gerd Schatzmayr<sup>1</sup>

BIOMIN Research Center, Technopark 1, 3430 Tulln, Austria

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† These authors contributed equally to this work.

Received: 5 June 2019; Accepted: 25 June 2019; Published: 27 June 2019



*World Mycotoxin Journal*, August 2013; 6 (3): 213-222



## Global occurrence of mycotoxins in the food and feed chain: facts and figures

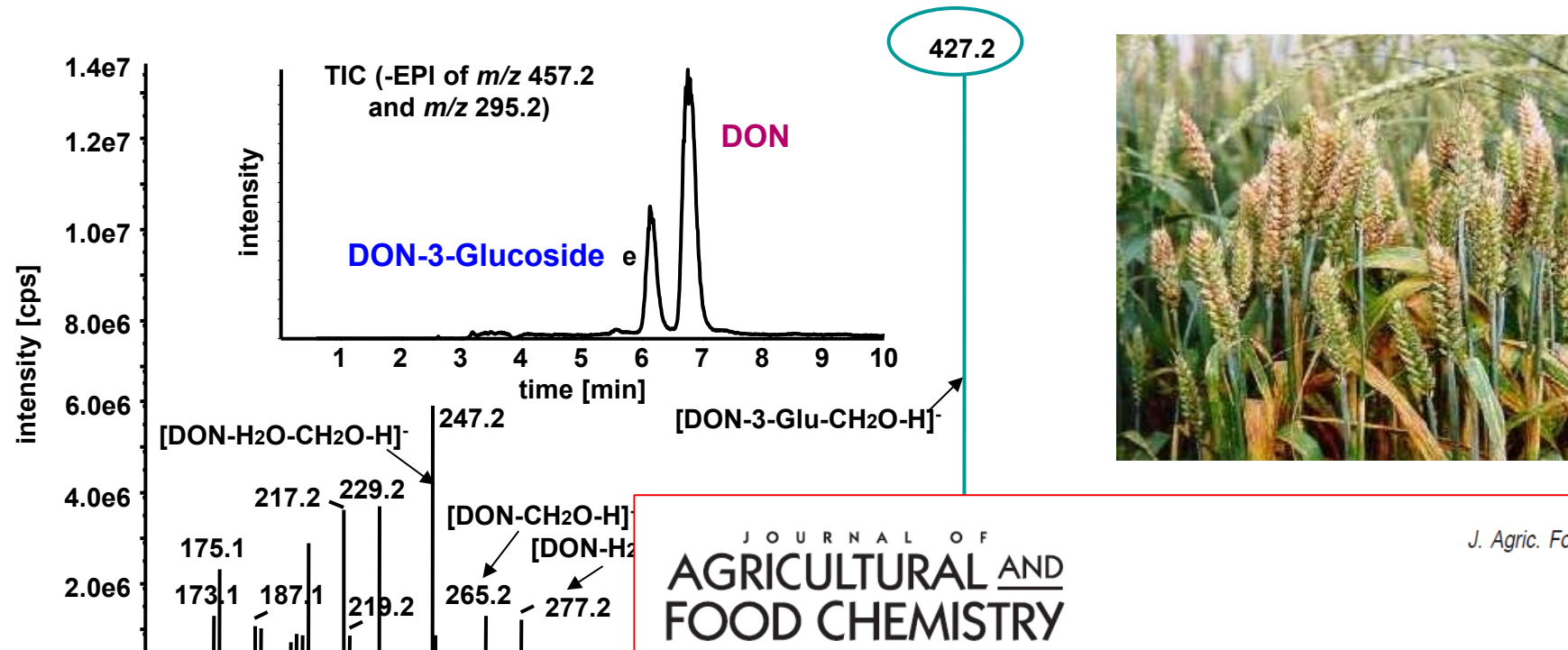
G. Schatzmayr and E. Streit

BIOMIN Research Center, Technopark 1, 3430 Tulln, Austria; [gerd.schatzmayr@biomin.net](mailto:gerd.schatzmayr@biomin.net)

Received: 18 March 2013 / Accepted: 15 June 2013

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# First report on the natural occurrence of conjugated DON in wheat (2005)



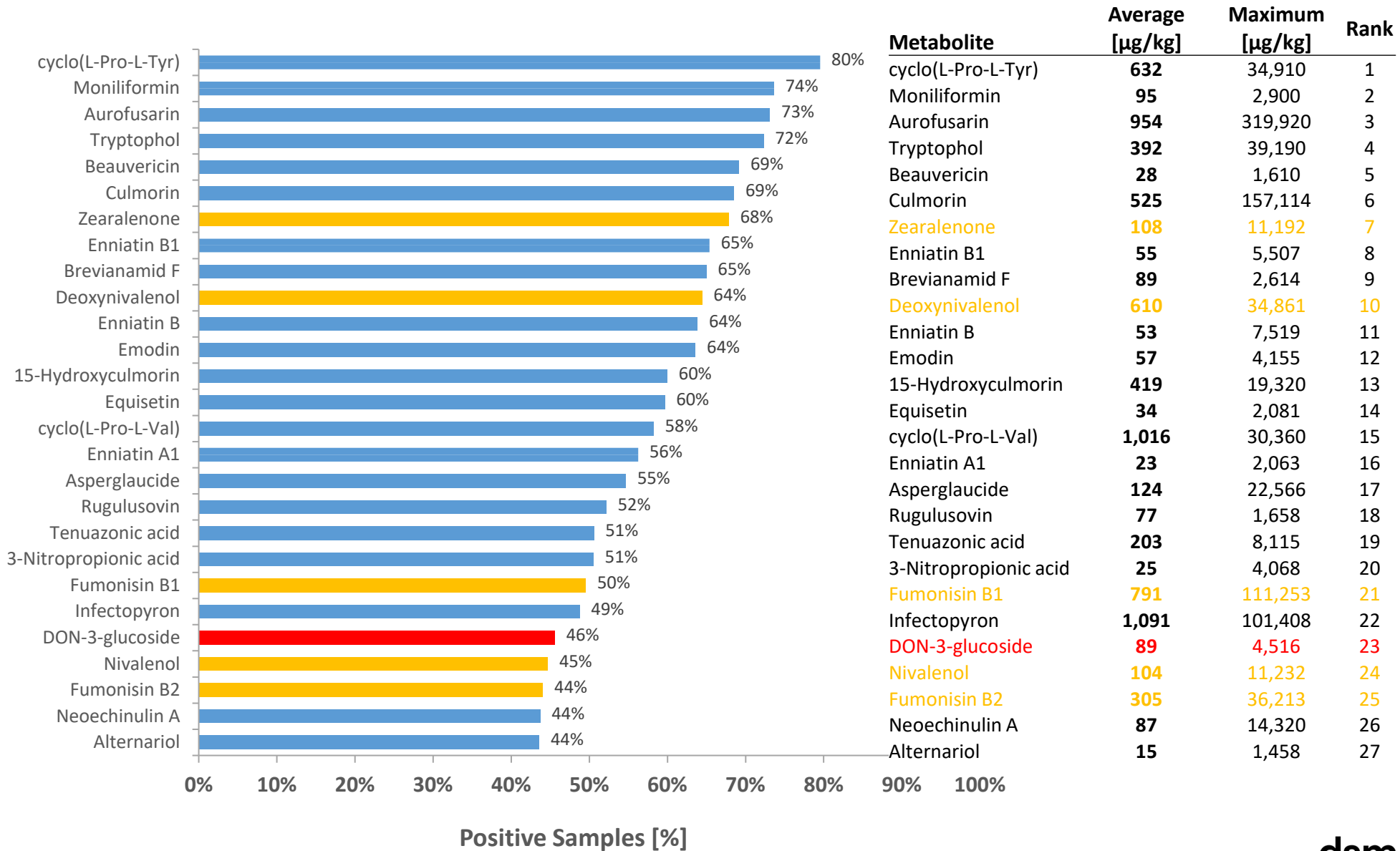
*J. Agric. Food Chem.* 2005, 53, 3421–3425 3421

**EFSA conclusion, 2024:** Group-TDI of 1 µg/kg bw per day for the sum of DON, 3-Ac-DON, 15-Ac-DON and DON-3-glucoside.

**Masked Mycotoxins: Determination of a Deoxynivalenol Glucoside in Artificially and Naturally Contaminated Wheat by Liquid Chromatography–Tandem Mass Spectrometry**


FRANZ BERTHILLER,<sup>†</sup> CHIARA DALL'ASTA,<sup>†</sup> RAINER SCHUHMACHER,<sup>\*,†</sup> MARC LEMMENS,<sup>‡</sup> GERHARD ADAM,<sup>§</sup> AND RUDOLF KRŠKA<sup>†</sup>

# Multi-mycotoxin – all (4,332 samples)



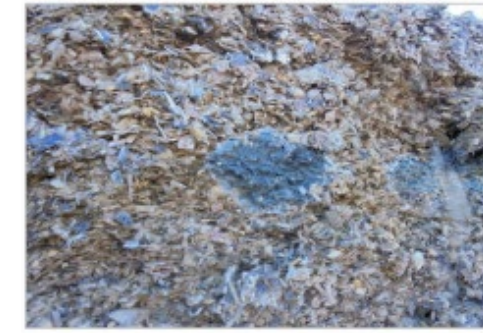
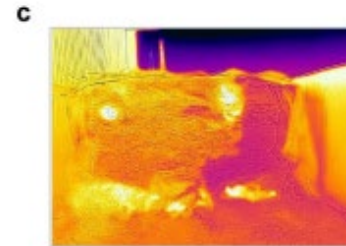
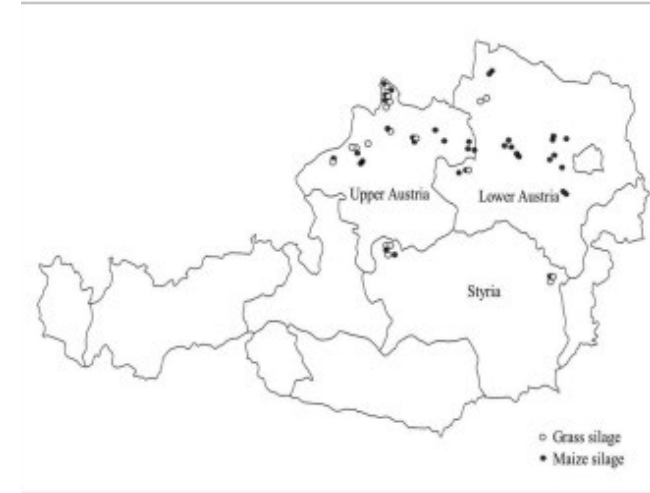
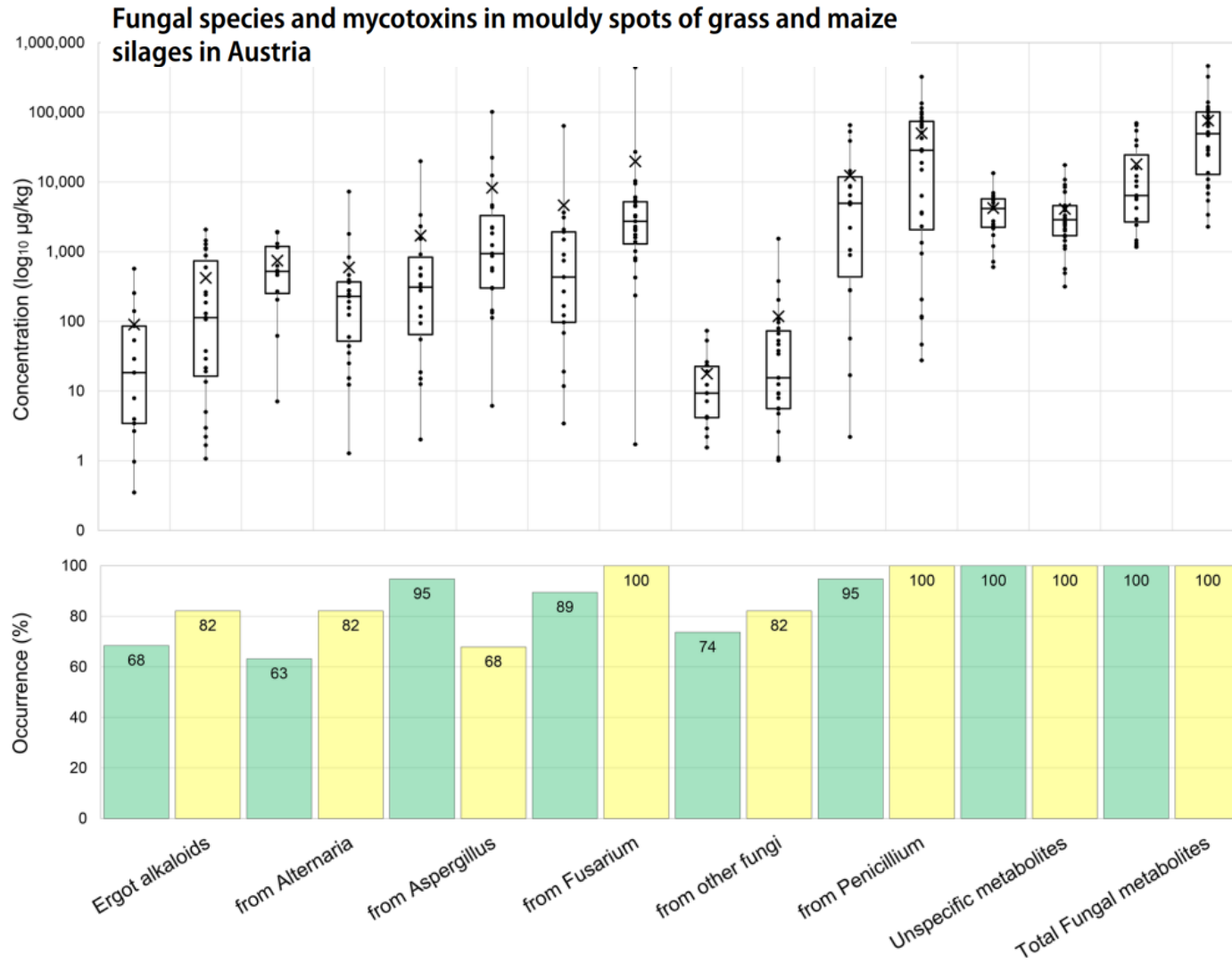


## Fungal species and mycotoxins in mouldy spots of grass and maize silages in Austria

Felipe Penagos-Tabares<sup>1</sup> · Ratchaneewan Khiaosa-ard<sup>1</sup>  · Marlene Schmidt<sup>1</sup> · Cátia Pacifico<sup>1</sup> · Johannes Faas<sup>2</sup> · Timothy Jenkins<sup>2</sup> · Veronika Nagl<sup>2</sup> · Michael Sulyok<sup>3</sup> · Roman Labuda<sup>4,5</sup> · Qendrim Zebeli<sup>1,6</sup>

Received: 20 September 2021 / Revised: 18 February 2022 / Accepted: 8 March 2022 / Published online: 26 March 2022

- first assessment of the **fungal diversity in mouldy silage in Austria**
- highlights the potentially **substantial contribution of silages to co-contamination** with **complex mycotoxin mixtures in cattle diets**
- **no correlation between mould counts and corresponding metabolites** was detected







**Fig. 3** Occurrences and concentration of grouped mycotoxins, other fungal and unspecific metabolites detected in mouldy spots of grass (green) and maize silages (yellow)\* Significantly different ( $p$ -value < 0.05)

**Sampling of mouldy spots of grass and maize silages intended for feeding dairy cows**

Article

# Mycotoxin Occurrence in Maize Silage—A Neglected Risk for Bovine Gut Health?

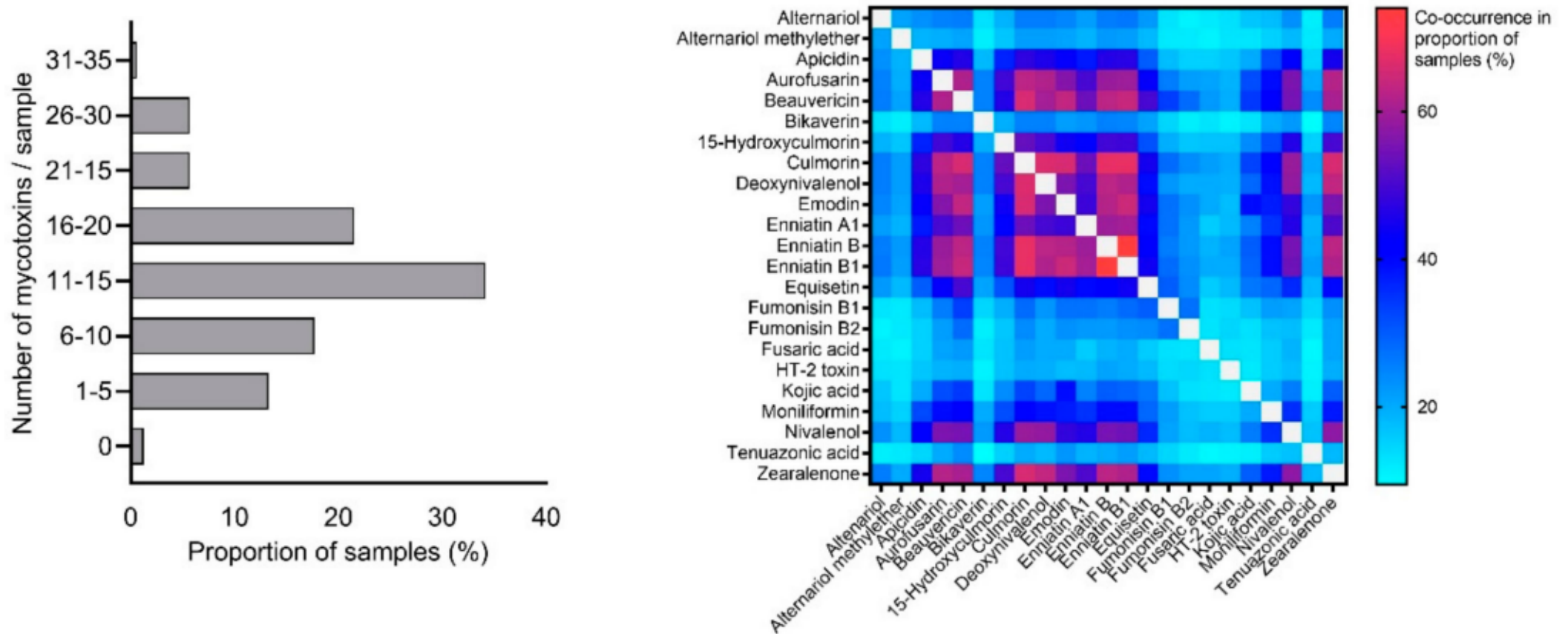
Nicole Reisinger <sup>1</sup>, Sonja Schürer-Waldheim <sup>1</sup>, Elisabeth Mayer <sup>1</sup>, Sandra Debevere <sup>2,3</sup>,  
Gunther Antonissen <sup>2,4</sup>, Michael Sulyok <sup>5</sup> and Veronika Nagl <sup>1,\*</sup>

**158 maize silage samples** were collected from European dairy cattle farms



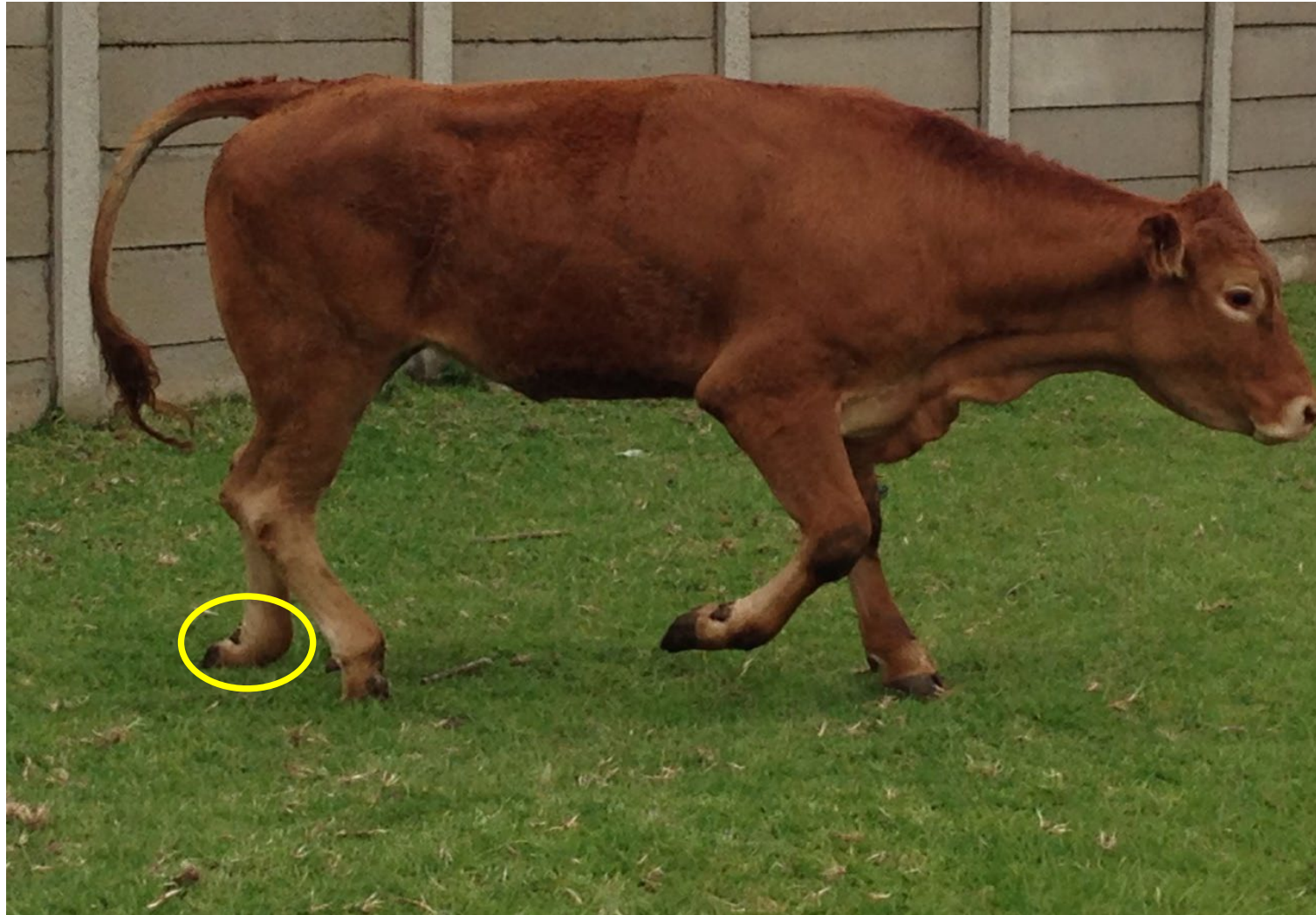
Number of maize silage samples per country of origin.

- Presence of **emerging mycotoxins** (e.g., emodin, **culmorin**, enniatin B1, enniatin B, and beauvericin) in >70% of samples
- Among the **regulated mycotoxins**, DON and ZEA were most frequently detected (68%)



**Figure 1.** Mycotoxin co-occurrence in maize silage samples collected at European dairy cattle farms. Left: Number of mycotoxins detected per sample. Right: Prevalence of different mycotoxin combinations (only mycotoxins with individual prevalence of  $\geq 20\%$  were used for calculations).

# Multi-Toxin-Case Study: Semi-automated production of sprouted barley in Pretoria as feed for cattle



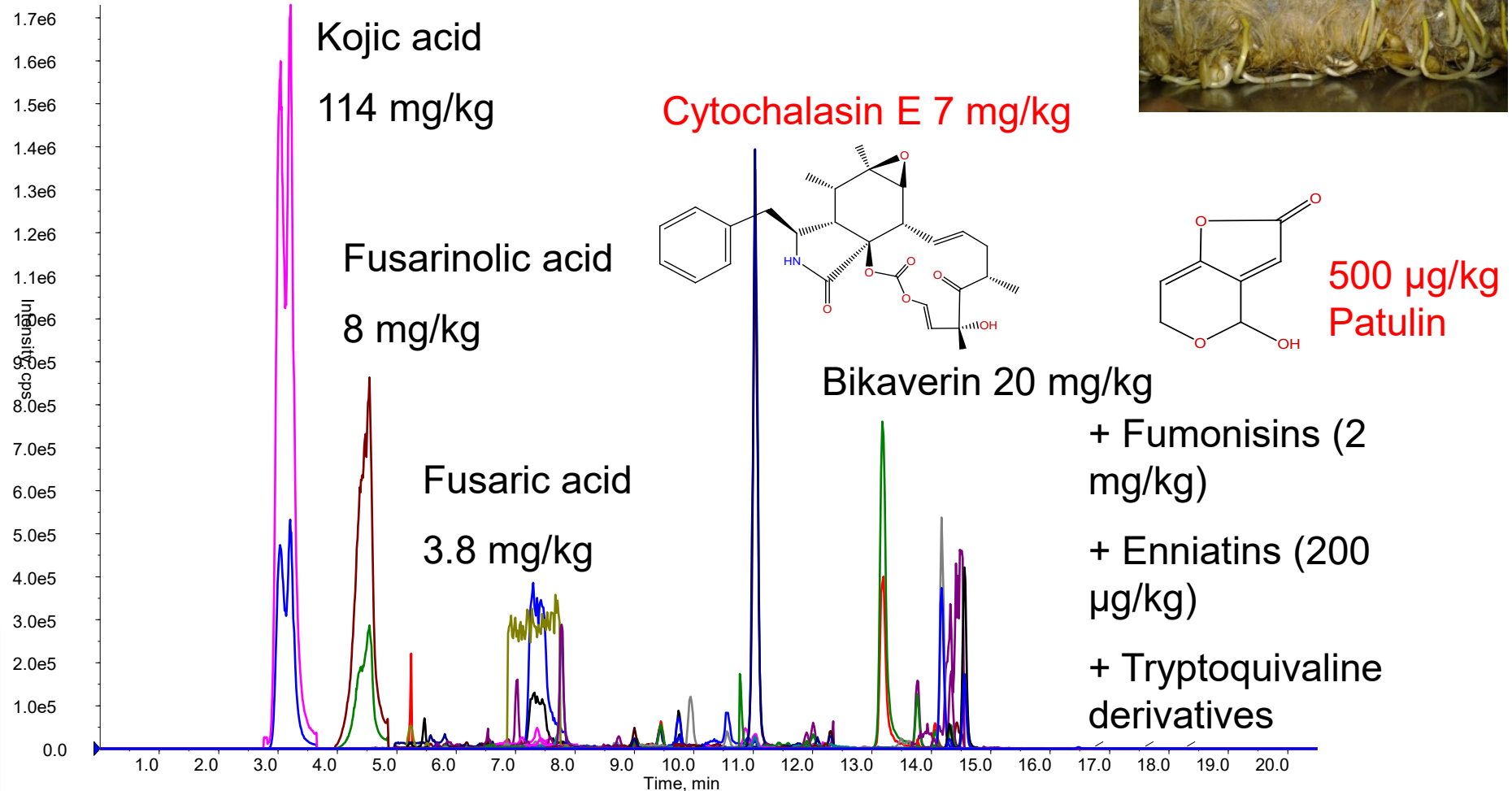
Diagnosis: **Tremor**

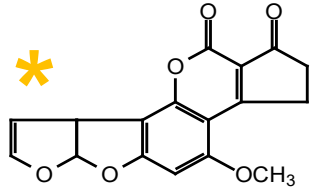
# Case study: Semi-automated production of sprouted barley in Pretoria



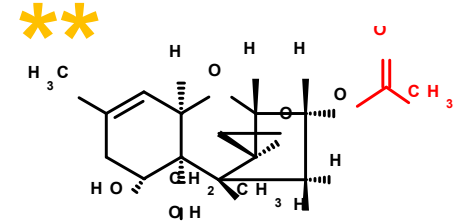
# Case study: Sprouted barley in Pretoria as feed

LC-MS/MS (+/-) analysis of barley seed grass





# Emerging Mycotoxins & plant toxins



More frequent and new/**unexpected**\* occurrence data

Advanced LC-MS methods

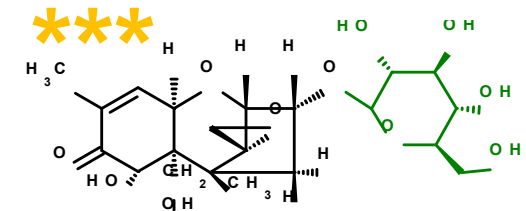
Climate change

Plant breeding

New findings\*\* (e.g. masked toxins\*\*\*)



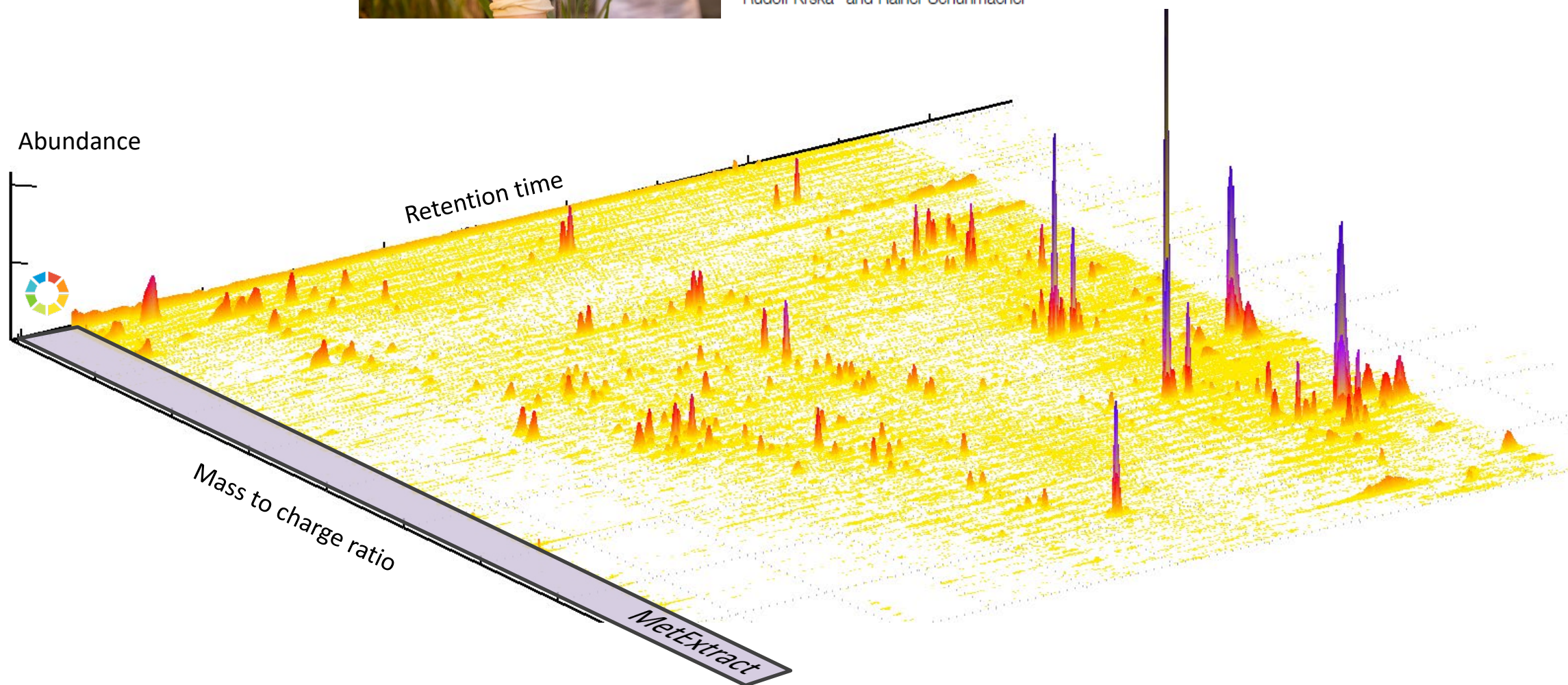
Fusaproliferin, Beauvericin, Enniatins, Moniliformin, 3-AcDON, NX-2\*\*, Ergot alkaloids, Alternaria,.. ?



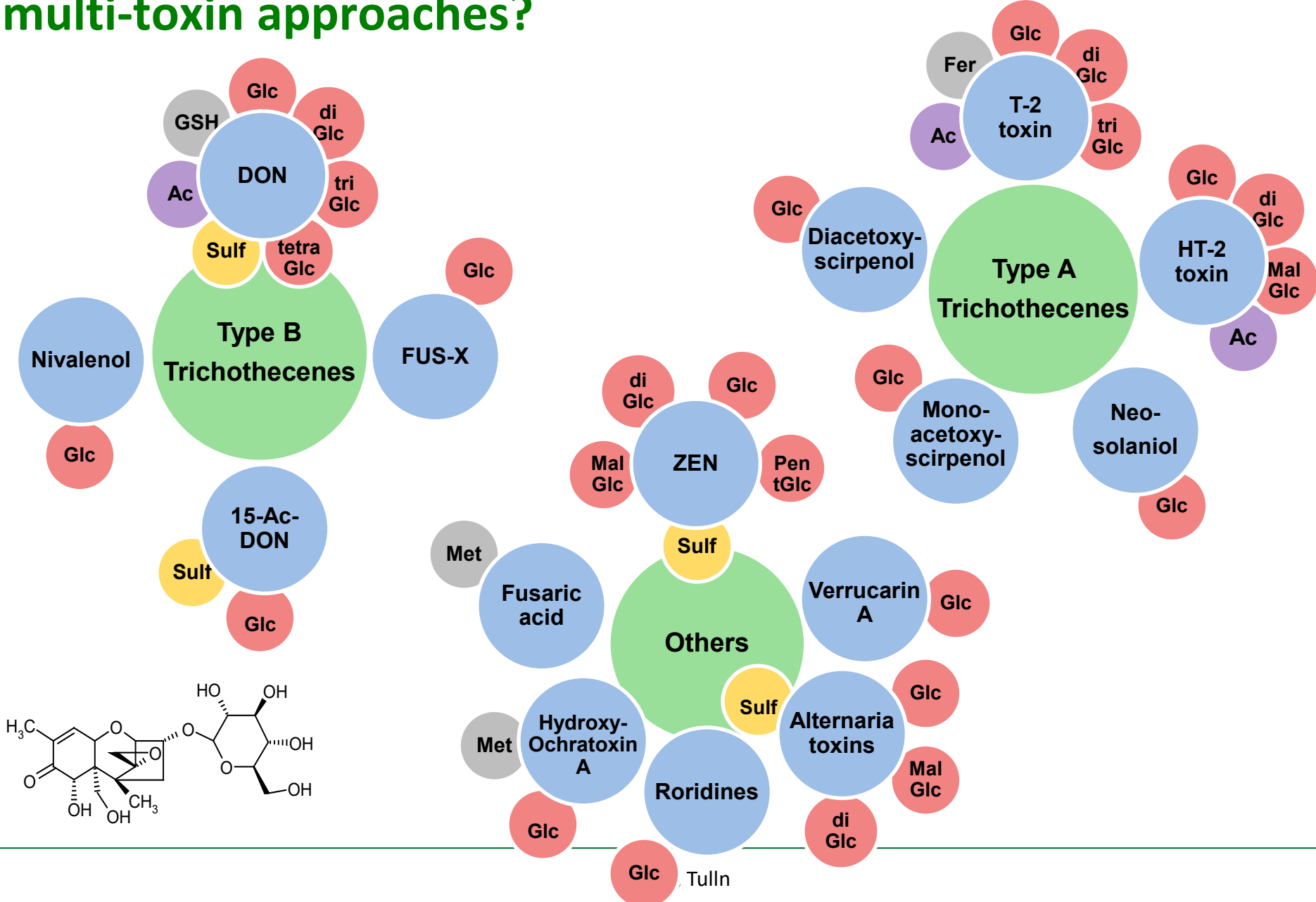


**MetExtract: a new software tool for the automated comprehensive extraction of metabolite-derived LC/MS signals in metabolomics research**

Christoph Bueschl<sup>1,2</sup>, Bernhard Kluger<sup>1</sup>, Franz Berthiller<sup>1</sup>, Gerald Lirk<sup>2</sup>, Stephan Winkler<sup>2</sup>, Rudolf Krska<sup>1</sup> and Rainer Schuhmacher<sup>1,\*</sup>



# What can only be seen by LC-MS based multi-toxin approaches?





FoodSafeR is funded by the European Union Horizon Europe Programme (HE/2021 2027) under grant agreement n° 101060698.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 678012.



**Safe food in a world of changing climate:  
The doctoral training programme to develop novel control,  
mitigation and risk assessment methods for biotoxins**



**FUNDING**

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**FFoQSI – Austrian Competence Centre for  
Feed and Food Quality, Safety & Innovation**

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PHOTONICS PUBLIC PRIVATE PARTNERSHIP



***Protecting the Food Chain***

**AgriSearch Mycotoxin Seminar**

14<sup>th</sup> April 2026

## Contaminated Irish pork recall: 'very high levels' of toxic substance

"Very high levels" of a toxic substance led to the recall of Ireland's pork products, the country's Europe Minister has disclosed.



The recall of contaminated pork could cripple Ireland's 400 pig farmers Photo: Claire Lim

By **Chris Irvine**

12:53PM GMT 07 Dec 2008

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IN FOOD AND DRINK NEWS

**Impact: €180 million in losses, international trade restrictions, and consumer confidence erosion.**

# Industry Food Assurance Group (IFAG)



**Chaired by Professor Pat Wall  
(Former EFSA Chair)**



## **Institute for Global Food Security**

**Formerly Institute of Agri-food and Land Use @ QUB**

**Director: Professor Chris Elliott**

**Professor of Food Safety**



# Testing Priorities based on Risk Score (Severity x Frequency of Risk)

| Commodity              | Hazard   | Frequency (2021-2023 RASFF Data) | Severity score (1-14) | Risk Score | Primary    | Secondary          | Tertiary              | Other                    |
|------------------------|--|----------------------------------|-----------------------|------------|------------|--------------------|-----------------------|--------------------------|
|                        |  |                                  |                       |            |            |                    |                       |                          |
| Barley                 | Illegal Pesticides                                   | 5                                | 9                     | 45         |            |                    |                       |                          |
|                        | Salmonella   | 4                                | 12                    | 48         | Salmonella | Illegal Pesticides | Dioxins/PCBs          | NA                       |
|                        | Dioxins/PCBs   | 1                                | 14                    | 14         |            |                    |                       |                          |
| MAIZE/CORN & PRODUCTS  | Mycotoxins   | 18                               | 8                     | 144        |            |                    |                       |                          |
|                        | Salmonella   | 2                                | 12                    | 24         |            |                    |                       |                          |
|                        | Dioxins/PCBs   | 1                                | 14                    | 14         |            |                    |                       |                          |
|                        | Illegal Veterinary drugs                             | 1                                | 11                    | 11         | Mycotoxins | Salmonella         | Dioxins/PCBs          | Illegal Veterinary Drugs |
|                        | Illegal Pesticides                                   | 4                                | 9                     | 36         |            |                    |                       |                          |
|                        | Others: (foreign body (1))                           | 1                                | 5                     | 5          |            |                    |                       |                          |
| CORN BYPRODUCTS        | Dioxins/PCBs   | 1                                | 14                    | 14         |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 1                                | 9                     | 9          | Dioxins    | Salmonella         | Illegal Pesticides    | Other                    |
|                        | Salmonella   | 3                                | 12                    | 36         |            |                    |                       |                          |
|                        | Other  | 1                                | 5                     | 5          |            |                    |                       |                          |
| SORGHUM                | Others: (high content of ragweed (15))               | 17                               | 5                     | 85         | Others     | Illegal Pesticide  | Mycotoxins            | NA                       |
|                        | Mycotoxins   | 1                                | 8                     | 8          |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 1                                | 9                     | 9          |            |                    |                       |                          |
| FEED WHEAT & PRODUCTS  | Mycotoxins   | 3                                | 8                     | 24         |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 2                                | 9                     | 18         | Mycotoxins | Illegal Pesticides | Salmonella            | Others                   |
|                        | Others: (2-chloroethanol (1))                        | 1                                | 5                     | 5          |            |                    |                       |                          |
|                        | Salmonella   | 3                                | 12                    | 36         |            |                    |                       |                          |
| WHEAT BYPRODUCTS       | Others: (2-chloroethanol (1) & border refection (1)) | 2                                | 5                     | 10         | Mycotoxins | Illegal Pesticides | Salmonella            | Others                   |
|                        | Mycotoxins   | 35                               | 8                     | 280        |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 4                                | 9                     | 36         |            |                    |                       |                          |
|                        | Salmonella   | 2                                | 12                    | 24         |            |                    |                       |                          |
|                        | Salmonella   | 53                               | 12                    | 636        |            |                    |                       |                          |
| SOYA PRODUCTS          | Others: (high content of ragweed (5))                | 5                                | 5                     | 25         | Salmonella | Others             | Illegal Pesticides    | Mycotoxins               |
|                        | Illegal Pesticides                                   | 2                                | 9                     | 18         |            |                    |                       |                          |
|                        | Mycotoxins   | 1                                | 8                     | 8          |            |                    |                       |                          |
| RAPE PRODUCTS          | Salmonella   | 50                               | 12                    | 600        |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 1                                | 9                     | 9          | Salmonella | Others             | Illegal Pesticides    | NA                       |
|                        | Other (Phosphane/phosphine (2) & PAH 4/BaP (1))      | 3                                | 5                     | 15         |            |                    |                       |                          |
| SUNFLOWER PRODUCTS     | Salmonella   | 23                               | 12                    | 276        |            |                    |                       |                          |
|                        | Mycotoxins   | 21                               | 8                     | 168        | Salmonella | Illegal Pesticides | Mycotoxins            | Others                   |
|                        | Mineral Oil  | 2                                | 5                     | 10         |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 20                               | 9                     | 180        |            |                    |                       |                          |
|                        | Legal Pesticides                                     | 4                                | 2                     | 8          |            |                    |                       |                          |
|                        | Others   | 24                               | 5                     | 120        |            |                    |                       |                          |
| OILS AND FATS          | Others   | 68                               | 5                     | 340        |            |                    |                       |                          |
|                        | Dioxins/PCBs   | 6                                | 14                    | 84         |            |                    |                       |                          |
|                        | Mineral Oil  | 18                               | 5                     | 90         | Others     | Mineral Oil        | Dioxins/PCBs          | Illegal Pesticide        |
|                        | Illegal Pesticides                                   | 7                                | 9                     | 63         |            |                    |                       |                          |
|                        | Mycotoxins   | 1                                | 8                     | 8          |            |                    |                       |                          |
|                        | Salmonella   | 1                                | 12                    | 12         |            |                    |                       |                          |
|                        | Enterobacteriaceae                                   | 1                                | 6                     | 6          |            |                    |                       |                          |
| MOLASSES               | Mycotoxins   | 2                                | 8                     | 16         | Mycotoxins | NA                 | NA                    | NA                       |
|                        | Salmonella   | 15                               | 12                    | 180        |            |                    |                       |                          |
| FEED PREMIXES          | Legal Veterinary drugs                               | 1                                | 1                     | 1          |            |                    |                       |                          |
|                        | Illegal Veterinary drugs                             | 1                                | 11                    | 11         |            |                    |                       |                          |
|                        | Mycotoxins   | 25                               | 8                     | 200        | Mycotoxins | Salmonella         | Dioxins/PCBs & Others | Heavy Metals             |
|                        | Dioxins/PCBs   | 10                               | 14                    | 140        |            |                    |                       |                          |
|                        | Heavy metals   | 14                               | 7                     | 98         |            |                    |                       |                          |
|                        | Illegal Pesticides                                   | 3                                | 9                     | 27         |            |                    |                       |                          |
|                        | GMO  | 4                                | 3                     | 12         |            |                    |                       |                          |
|                        | PAPs   | 3                                | 10                    | 30         |            |                    |                       |                          |
|                        | Others   | 28                               | 5                     | 140        |            |                    |                       |                          |
|                        | Salmonella   | 20                               | 12                    | 240        |            |                    |                       |                          |
|                        | PAPs   | 2                                | 10                    | 20         | Salmonella | PAPs               | Enterobacteriaceae    | NA                       |
| Foods of animal origin | Enterobacteriaceae                                   | 1                                | 6                     | 6          |            |                    |                       |                          |

Pesticides  
Mycotoxins  
Dioxins/PCBs  
Heavy Metals

# **The Food Fortress contaminant testing network for compound feeds**

**Operating as a collaborative network  
owned and directed by its members**

*76 feed compounders & 7 importers  
(Approx 8 million tonnes)*

*Recognised by industry – Pilgrim's Europe, FQAS Beef & Lamb*

*Working with Regulators – DAERA & FSA agreements and earned  
recognition*



## Risk Factors Associated with Mycotoxins

| Situation                          | Risk   | Potential Mycotoxin   |
|------------------------------------|--|---|
| Late planting                      | Heat stress at silking<br>Late Harvest<br>High moisture at harvest | Aflatoxins, Fumonisin<br>Trichothecenes, Zearalenone<br>Aflatoxins, Ochratoxins, Others |
| Short period of planting           | Short harvest period and over mature crops                         | Trichothecenes, Zearalenone   |
| Foliar disease, insect damage      | Secondary mould infection  | All   |
| Hot, dry weather                   | Plant stress   | Aflatoxins, Fumonisin   |
| Wet weather, moderate temperatures | Plant stress   | Trichothecenes, Zearalenone   |
| High fuel costs                    | Inadequate drying  | Aflatoxins, Ochratoxins, Others   |

# Combined Testing Programs

1 July 2024 – 30 June 2025

- 596 Mycotoxins
  - Aflatoxin B1, Fumonisin, Deoxynivalenol, T2 & HT-2 toxin, Ochratoxin & Zearalenone
    - 30+ Mycotoxin test
  - 283 Heavy Metals
    - Arsenic, Cadmium, Lead & Mercury
      - 246 Dioxins
        - Dioxins & Furans, Dioxin like PCBs
      - 249 Pesticides
        - Screening 300 active ingredients

# Importer Results

|                      | Aflatoxin B1<br>µg/kg | Fum B1+B2<br>µg/kg | Deoxynivalenol<br>µg/kg | HT-2 toxin<br>µg/kg | T-2 toxin<br>µg/kg | Ochratoxin A<br>µg/kg | Zearalenone µg/kg |
|----------------------|-----------------------|--------------------|-------------------------|---------------------|--------------------|-----------------------|-------------------|
| FEED BARLEY          | 0.1                   | NA                 | 10                      | 10                  | 10                 | 0.4                   | 10                |
| DISTILLERS<br>GRAINS | 5.9                   | 6100               | 40                      | 10                  | 10                 | 0.4                   | 11                |
| RAPEMEAL             | 0.1                   | NA                 | 10                      | 10                  | 10                 | 0.4                   | 10                |
| FEED WHEAT           | 0.1                   | NA                 | 36                      | 10                  | 10                 | 0.4                   | 10                |
| RYE                  | 0.1                   | NA                 | 18                      | 10                  | 10                 | 0.4                   | 10                |
| A/O MAIZE            | 0.1                   | 504                | 670                     | 10                  | 10                 | 0.4                   | 24                |
| SOYA HULLS           | 0.1                   | NA                 | 10                      | NA                  | NA                 | 0.4                   | 32                |
| RAPEMEAL             | NA                    | NA                 | NA                      | NA                  | NA                 | NA                    | NA                |
| SOYABEAN MEAL        | 0.1                   | NA                 | 10                      | 10                  | 10                 | 0.4                   | 10                |
| SUNFLOWER<br>PELLETS | 0.7                   | NA                 | 10                      | 10                  | 10                 | 0.4                   | 10                |

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|                      | Green Light  | Amber Light                                   | Red Light   |
|----------------------|--|---|---|
| Material             | Test results indicate no issues at normal inclusion levels | Management required. Refer to guidance notes. | Breach of EU legal limit for raw material – don't use |
| Maize                |  |   |   |
| Wheat                |  |   |   |
| Barley               |  |   |   |
| Maize Gluten         |  |   |   |
| Distillers D. Grains |  |   |   |
| Pollard              |  |   |   |
| Soya Bean Meal       |  |   |   |
| Soya Hulls           |  |   |   |
| Sugar Beet Pulp      |  |   |   |
| Palm Kernel          |  |   |   |
| Rapeseed Ext         |  |   |   |

## IMPORTER RESULTS

Reported as Traffic Lights

Based on results submitted by -

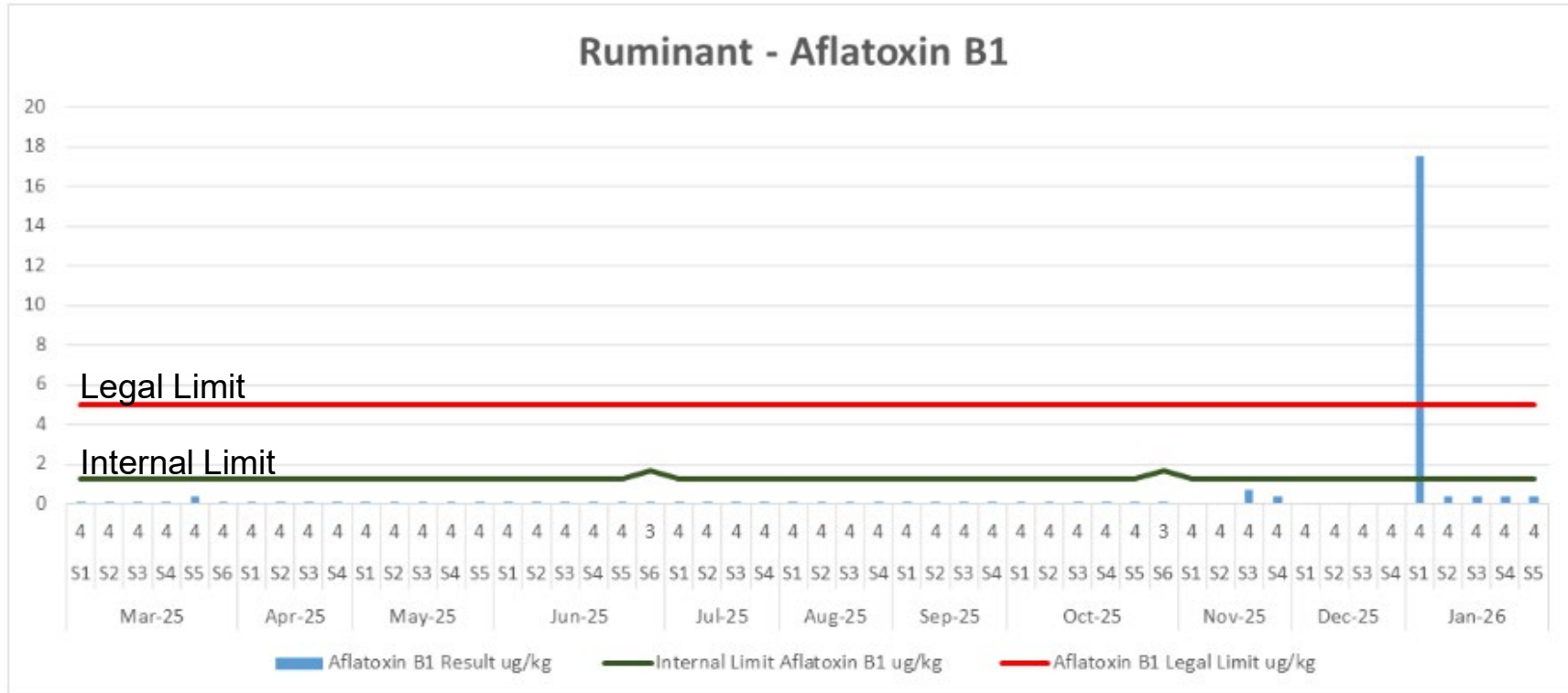
- ADM/Arkady
- Barnett-Hall
- Cefetra
- Comex McKinnon
- McCaughey, Russell & Baird
- Precision Liquids
- United Molasses

# Composite Samples



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# PERMITTED MYCOTOXIN LEVELS

|                                     | Raw Material Grains             | Pig Compound | Poultry Compound | Ruminant Compound     |
|-------------------------------------|---------------------------------|--------------|------------------|-----------------------|
| <b>Aflatoxin</b><br>Legal limit     | 20 ug/kg                        | 5 - 20 ug/kg | 5 - 20 ug/kg     | 5 - 20 ug/kg          |
| <b>Deoxynivalenol</b><br>(guidance) | 8,000 ug/kg<br>12,000 maize bps | 900 ug/kg    | 5,000 ug/kg      | 5,000 ug/kg           |
| <b>Fumonisin</b><br>(guidance)      | 60,000 ug/kg                    | 5,000 ug/kg  | 20,000 ug/kg     | 20,000 - 50,000 ug/kg |
| <b>H2 &amp; HT2</b><br>(guidance)   | 100 - 1,000 ug/kg<br>In cereals | 250 ug/kg    | 250 ug/kg        | 250 ug/kg             |
| <b>Ochratoxin</b><br>(guidance)     | 250 ug/kg                       | 50 ug/kg     | 100 ug/kg        | 250 ug/kg             |
| <b>Zearalenone</b><br>(guidance)    | 3,000 ug/kg                     | 250 ug/kg    | 2,000 ug/kg      | 500 ug/kg             |

# ***Managing Mycotoxins***

- **Measure & mitigate**
- **Reducing inclusion rates in rations**
- **Use only in tolerant species**
- **Treatment - eg mycotoxin binders**





# AgriSearch

Driving Excellence & Innovation