**Abstract**

Mycotoxins, produced by moulds, are a large group of compounds with diversified chemical structure. They are mainly found in plant products (cereals, spices, coffee), but can also be present in animal products (meat, milk, cheese) and building materials. To protect human and animal health from the most common mycotoxins, the European Union (EU) has issued regulations on their presence in food and feed. Despite decades of research on the secondary metabolites of moulds, they contaminate food and feed, which remains a global problem. According to reports by the Food and Agriculture Organisation of the United Nations, mycotoxins are estimated to be present in around 25% of the world's crops each year, causing huge losses in agriculture and the food and feed industries. The economic impact is felt throughout the agricultural production chain, including plant and livestock producers, the grain industry and consumers. Reports of inadequate safety of food products and fodder have been recurring for many years. Therefore, the research topic undertaken to assess levels of metabolite contamination and the relationship between them serves to ensure safe and healthy food and fodder products. Raw materials and products are usually contaminated with multiple mycotoxins and assessing the occurrence (co-occurrence) of multiple analytes in the material under study is currently a major challenge for scientists worldwide due to the higher toxicity compared to single compounds.

During the work on PhD thesis, analytical procedures were developed using chromatographic techniques with fluorescence and mass spectrometry detection. These procedures meet the performance criteria for analytical methods set by the EU. The study has shown that both plant raw materials and animal feed are significantly contaminated with mycotoxins, although the proportion of samples with exceeded EU maximum levels is relatively low. The most prevalent mycotoxins were deoxynivalenol (DON) and zearalenone (ZEN), which were present in more than 95% of the samples, and the most contaminated matrices were maize and compound feed. The performance of more than 8,000 determinations in samples of plant raw materials and feeds showed the widespread co-occurrence of mycotoxins, with more than 95% of samples containing at least 2 analytes, and 5 toxins were detected in 75% samples. Statistically significant correlations between mycotoxin concentrations for DON and ZEN and for T-2 and HT-2 toxins were confirmed. In addition, weak correlations were found for mycotoxins produced by different mould species (ochratoxin A (OTA) and DON as well as OTA and ZEN). The analyzes of acorns revealed high concentrations of mycophenolic acid (14.6 mg/kg) as well as patulin (50 μg/kg). Of particular concern for the safety of acorns may be
their contamination with patulin, which is closely monitored because of its toxic properties. Of the mycotoxins determined in beer samples, OTA, DON and HT-2 toxin were the most frequently detected. The consumer exposure assessment carried out showed that the daily intake of OTA with beer ranges from 0.8% to 7.5% of the tolerable daily intake (TDI). For DON, the calculated exposure ranged from 4.1% to 21% TDI depending on the scenario, while for the HT-2 toxin, from 5% to 9.7% TDI. The results suggest that beer, due to its high water content, low proportion of malt extract and relatively low mycotoxin content, is not a major source of mycotoxin intake for humans. Higher levels of mycotoxins were found in craft beers, suggesting that these should be tested more frequently to protect the health of 'beer lovers'. Analyzes of green coffee and dietary supplements containing its extract found frequent contamination of samples with OTA and the moulds that produce it, but no citrinin. OTA concentrations were higher in processed products than in raw coffee beans, suggesting that contamination may have occurred during the production process. The results of the study justify the implementation of appropriate mycological control measures, especially for the production of food supplements, in which the highest concentration of OTA was 31.4 μg/kg (a value more than 6 times higher than the maximum level for coffee), and which are generally considered healthy and safe. Studies on human biological samples (serum) showed no statistically significant differences in OTA concentrations in healthy individuals and dialysis patients, even when comparing the results of the control group and the different age groups. The average OTA concentrations in patients with chronic

renal failure and healthy volunteers were comparable to those observed in other European countries (with the exception of Balkan countries where endemic Balkan nephropathy occurs).