Results from the 2017 survey into mycotoxins in Spanish maize

Mycotoxins are a structurally diverse group of mostly small molecular weight compounds, produced mainly by the secondary metabolism of some filamentous fungi, or moulds, which under suitable temperature and humidity conditions, may develop on various foods and feeds, causing serious risks for human and animal health.

by Radka Borutova,
Business development manager,
Nutriad International.
www.nutriad.com

Currently, more than 300 mycotoxins are known and scientific attention is mainly focused on those that have proven to be carcinogenic and/or toxic. Human exposure to mycotoxins may result from consumption of plant-derived foods that are contaminated with toxins, the carry-over of mycotoxins and their metabolites in animal products such as meat and eggs or exposure to air and dust containing toxins.

The 2017 Nutriad Mycotoxin Survey included 121 maize samples from across Spain. All samples were collected almost immediately after the harvest from farms or animal feed production sites. Sample providers were advised to follow the principles of good sampling. Analytical personnel and/or laboratory staff were not involved in the sampling and did not influence any part of this procedure.

More than 480 analyses were conducted to test for the occurrence of the four mycotoxins most frequently found in agricultural commodities intended for animal production. The survey provided an insight into the incidences of aflatoxin B1 (AfB1), zearalenone (ZEN), deoxynivalenol (DON) and fumonisins (FUM) (sum of fumonisin B1 and fumonisin B2).

All four mycotoxins were analysed by Enzyme-Linked Immuno-Sorbent Assay (ELISA). For the purpose of data analysis, non-detection levels were based on the limits of quantification (LOQ) of the test method for each mycotoxin: AfB1 <1 µg/kg; ZEN <5 µg/kg; DON <74 µg/kg and FUM <222 µg/kg.

Results

The results showed that almost 47% and 44% of the maize samples were contaminated with FUM and DON, respectively. Only 5.8% of the samples contained AfB1 and this low incidence of contamination was unexpected.

The average concentrations of all recovered mycotoxins were medium (>LOQ but below EU recommendation levels). The highest concentration of DON detected in one of the samples reached 3090 µg/kg.

Unexpectedly, 53% of the samples contained ZEN, a mycotoxin than can affect the fertility performance of all animal species. This incidence is much higher in comparison to the previous year when only 8% of samples were positive for ZEN.

Several samples were concurrently contaminated with 2-4 mycotoxins which may lead to synergistic interactions among them.

The unexpected results of this survey were the very high average concentration

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	Aflatoxin B1	Deoxynivalenol	Zearalenone	Fumonisins
Number of tests	121	121	121	121
% of positive	5.8	43.8	53	46.3
Average of positive (g/kg)	30.2	516	31.7	1209
Maximum (g/kg)	115.4	3090	253	4800

Table 1. Mycotoxin contamination of maize in Spain 2017.

Maize harvested in Europe 2017 (Olga Averkieva, Nutriad International).

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of AfB1 which reached 30 μg/kg and the maximum concentration of AfB1 which reached 115 μg/kg. Such high average and maximum concentrations of aflatoxin B1 in maize collected in Spain will be a definite concern in the Spanish market.

Consequently, there may be a high level of the metabolite aflatoxin M1 in the milk of dairy cows, which could also be a concern. Both average and maximum aflatoxin B1 concentrations exceeded the maximum EU permitted concentration of aflatoxin B1 (20 μg/kg) in feed materials (Commission Regulation (EU) No 574/2011).

The correlation between DON and ZEN that looked high at the beginning, was not confirmed by the correlation analysis (R2=0.1518).

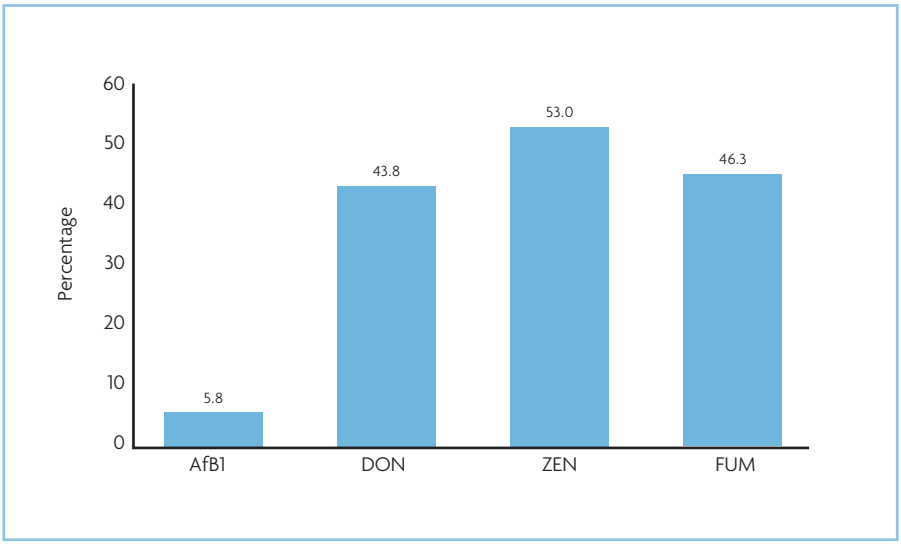

Fig. 1. Percentage of positive samples (›LOQ).

Conclusion

The Nutriad 2017 Mycotoxin Survey concluded that the year's harvest of maize in Spain was of medium quality (›LOQ but below EU recommendation levels) in terms of mycotoxin contamination (DON, ZEN, FUM). The exceptions were the very high average and the maximum concentrations of aflatoxin B1 which clearly exceeded the concentration of aflatoxin B1 permitted in the EU in feed materials.

Due to the unexpected very high average and maximum concentrations of aflatoxin B1, the 2017 maize crop in Spain should not be considered safe for inclusion into finished feed rations for dairy milk producers and a degree of vigilance is prudent. Vigilance is always advisable as cereals in animal feeds originate from many sources. Some continental European cereals and South American soya harvested in 2017 have been shown to be contaminated with medium to high concentrations of mycotoxins. The last possible line of defence is the detoxification of mycotoxins in vivo. The addition of proven mycotoxin deactivators to animal feeds is a very common method to prevent mycotoxicosis and is an effective strategy to keep the mycotoxin risk low under any and all conditions. ■

References are available from the author on request