PRESS RELEASE

ADISSEO Brazil 2019: Survey of mycotoxins in maize

Author: Radka Borutova; Global Scientific &Technical manager at Adisseo, France

The term "mycotoxins" defines secondary fungal metabolites that cause biochemical, physiologic, and/or pathologic changes in other species, which include vertebrates, other animal groups, plants, and microbes. Mycotoxins have low molecular weight molecules (Mw <700) and are toxic in low concentrations (Haschek & Voss, 2013). Even though hundreds of compounds have been isolated and chemically characterized as mycotoxins, only approximately 50 have been studied in detail (CAST, 2003).

The 2019 Adisseo mycotoxin survey included maize samples from across Brazil. Number of analyzed samples is defined as "n". The survey provided insight into the incidence of aflatoxin B1 (AfB1); n=959, zearalenone (ZEN); n=281, deoxynivalenol (DON); n=305, T-2 toxin; n=210, HT-2 toxin; n=196, fumonisin B1 (FB1); n=325, fumonisin B2 (FB2); n=324 and ochratoxin A (OTA); n=181. The maize samples were collected directly from farms or animal feed production sites. Sample providers were advised to follow the principles of good sampling (Richard, 2000). Analytical personnel and laboratory staff were not involved and therefore did not influence the sampling process at any stage. All 8 mycotoxins were analyzed by liquid chromatography tandem mass spectrometry (LC MS/MS) in LAMIC, Brazil. 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 <20 µg/kg; DON <200 µg/kg; FB1 <125 µg/kg; FB2 <125 µg/kg; OTA <2,5 µg/kg; T-2 toxin <100 µg/kg and HT-2 toxin <100 µg/kg.

Results

The average concentrations of the recovered mycotoxins were medium to high. The results showed that 93.8% of the maize samples were contaminated with FB1 (Table 1 and Figure 2). The maximum concentration of FB1 recovered in one of the samples was 10 224 µg/kg, which is a very high concentration especially if the contaminated feed is fed to swine or horses. The average concentration of FB1 in the positive samples was 1085.3 µg/kg, which is lower than the average concentration from 2018 (Figure 1). The results also showed that 75.3% of the samples were contaminated with FB2 and the maximum concentration recovered was 3086 µg/kg. Only 3.3 % of samples contained DON.

As expected, none of the samples were contaminated with OTA and none of the samples contained T-2 toxin and HT-2 toxin. The LOQ levels used in this survey for T-2 toxin and HT-2 toxin are very high (100 µg/kg) which is likely why none of the samples showed contamination with these two mycotoxins. Typical LOQ for T-2 toxin and HT-2 toxin in European accredited laboratories is <10 µg/kg.

As expected, 12% of the samples were contaminated with AfB1, a typical Aspergillus mycotoxin. The maximum concentration of AfB1 recovered was 251 µg/kg which is very high, and in accordance with Brazilian legislation, should not be fed to animals. The maximum concentration of ZEN recovered was 1399 µg/kg which is also a concern as such concentration levels can cause detrimental health effects in all animal species. Figure 1 shows comparison between average concentration of positive samples in µg/kg (AB1 and FB1) in 2018 and 2019. While the results for aflatoxin B1 show similar trend, the results of fumonisin B1 show that the average concentration of positive samples was significantly lower in 2019 than in 2018.

Table 1 – Mycotoxin contamination of maize in Brazil

		% of positive samples	Average of positive samples [µg/kg]	Maximum of positive samples [µg/kg]
Mycotoxin		Maize		
	n			
AfB_1	959	12.0	14.5	251
DON	305	3.3	348.4	1018
ZEN	281	10.3	246.1	1399
FB_1	325	93.8	1085.3	10224
FB_2	324	75.3	416.9	3086
T-2 toxin	210	0	<LOQ	<LOQ
HT-2 toxin	196	0	<LOQ	<LOD
OTA	181	0	<LOQ	<LOD

AfB1=Aflatoxin B1; ZEN=zearalenone; DON=deoxynivalenol; =FB1=fumonisin B1; FB2=fumonisin B2; OTA=ochratoxin A, LOQ=Limit of Quantification; n=number of analysed samples

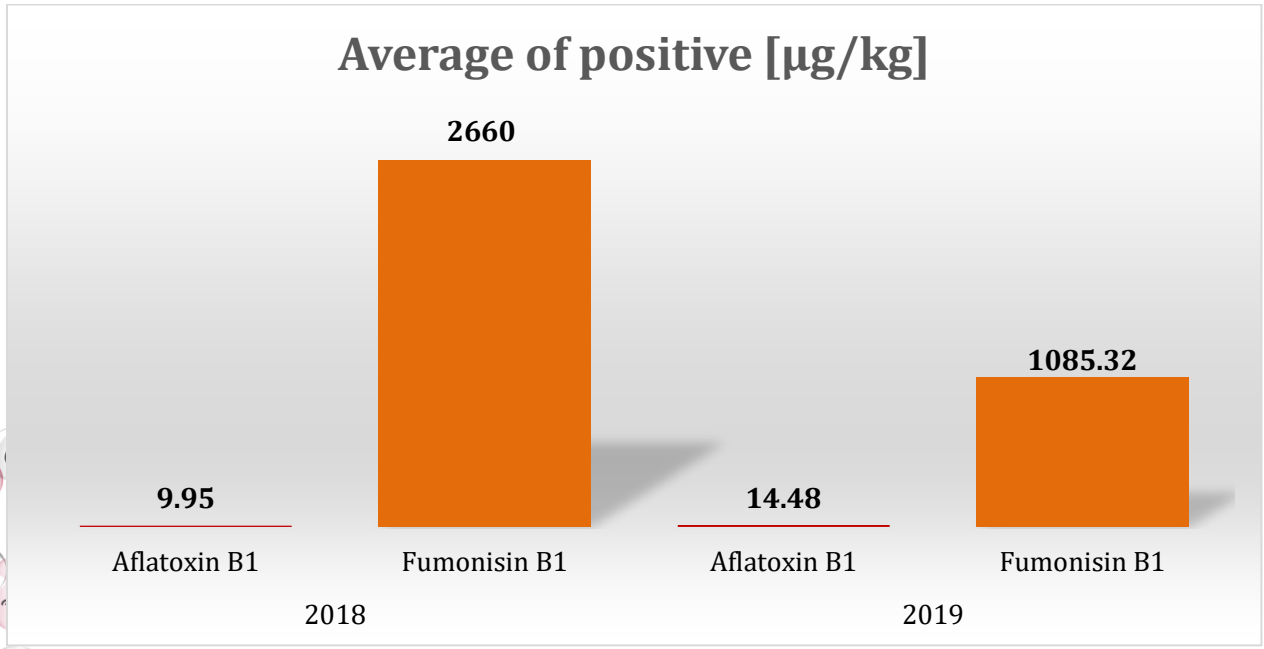

Figure 1 – Comparison between average concentration of positive samples µg/kg (aflatoxin B1 and fumonisin B1) in 2018 and 2019

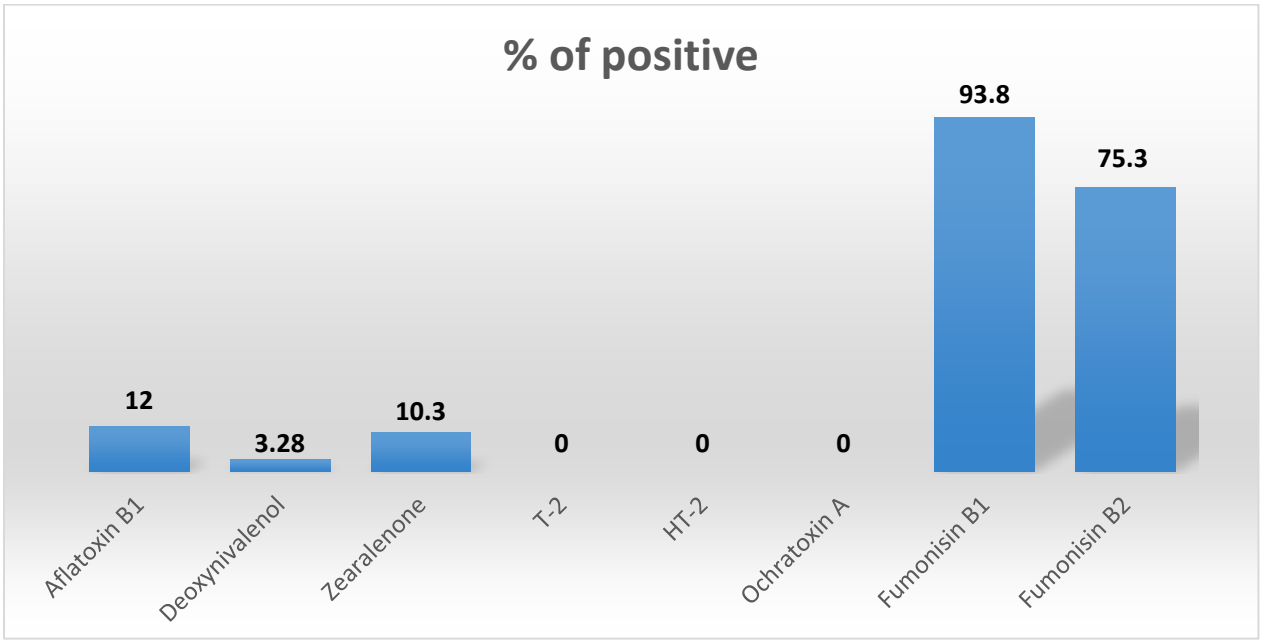

Figure 2 – Percentage of positive samples from maize, Brazil 2019

Conclusion

The Adisseo 2019 mycotoxin survey concluded that the year's maize harvest in Brazil was of medium (>LOQ but below MERCOSUR regulatory level) to low (>MERCOSUR regulatory level) quality in terms of mycotoxin contamination. Based on the results of the survey, the 2019 maize crop in Brazil should not automatically be considered safe for inclusion in finished feed rations for all animal species and a degree of vigilance is prudent. Special attention should be paid to the high average concentration of FB1, which was found in over 50% of the samples, as well as to the maximum concentration recovered which reached 10 224 µg/kg.

The aflatoxin regulations in food are often set for the sum of the aflatoxins B1, B2, G1 and G2. The limit for AfB1 in any raw material to be utilized directly or as ingredient for rations aimed for animal consumption is 50 µg/kg (FAO, 2004). In this survey, the AfB1 regulatory limit was exceeded in 6 of the analysed samples. The major Latin American agricultural crops (maize, wheat, coffee, cotton, soybeans, barley,

sunflower, groundnuts and tree nuts and cocoa) are highly susceptible to fungal contamination and mycotoxin production (Pineiro, 2004). Nineteen countries accounting for 91% of the population of the region are known to have specific mycotoxin regulations. Harmonized regulations for aflatoxins exist in MERCOSUR, a trading block consisting of Brazil, Argentina, Paraguay and Uruguay. Other countries have indicated that they follow the MERCOSUR regulations as well.

Vigilance is always advisable as cereals in animal feeds originate from many sources. Some cereals harvested in the United States in 2019 have been shown to be contaminated with medium to high concentrations of mycotoxins.

The last possible line of defence is detoxification of mycotoxins in vivo. The addition of proven mycotoxin deactivators to animal feeds is a very common method of preventing mycotoxicosis and is an effective strategy to keep mycotoxin risk low under any and all conditions.

Adisseo is one of the world's leading experts in feed additives. The group has 10 research centres and production sites based in Europe, USA and China to design, produce and market nutritional solutions for sustainable animal feed. With more than 2,200 employees, Adisseo serves around 3,900 customers in over 110 different countries through its global distribution network. Adisseo is one of the main subsidiaries of China National BlueStar, a leader in the Chinese chemical industry with nearly 21,500 employees and a turnover of 9,3 billion USD. Adisseo is listed on the Shanghai Stock Exchange. Find out more at http://adisseo.com/

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ADISSEO France S.A.S | Immeuble Antony Parc II |
10, place du Général de Gaulle | 92160 Antony | France
Tél.: +33 (0)1 46 74 70 00 | Fax: +33 (0)1 40 96 96 96 | www.adisseo.com | feedsolutions.adisseo.com