Mycotoxin Report

Biomin®

Survey Report 2014

Your personal Mycotoxin Risk Management tool

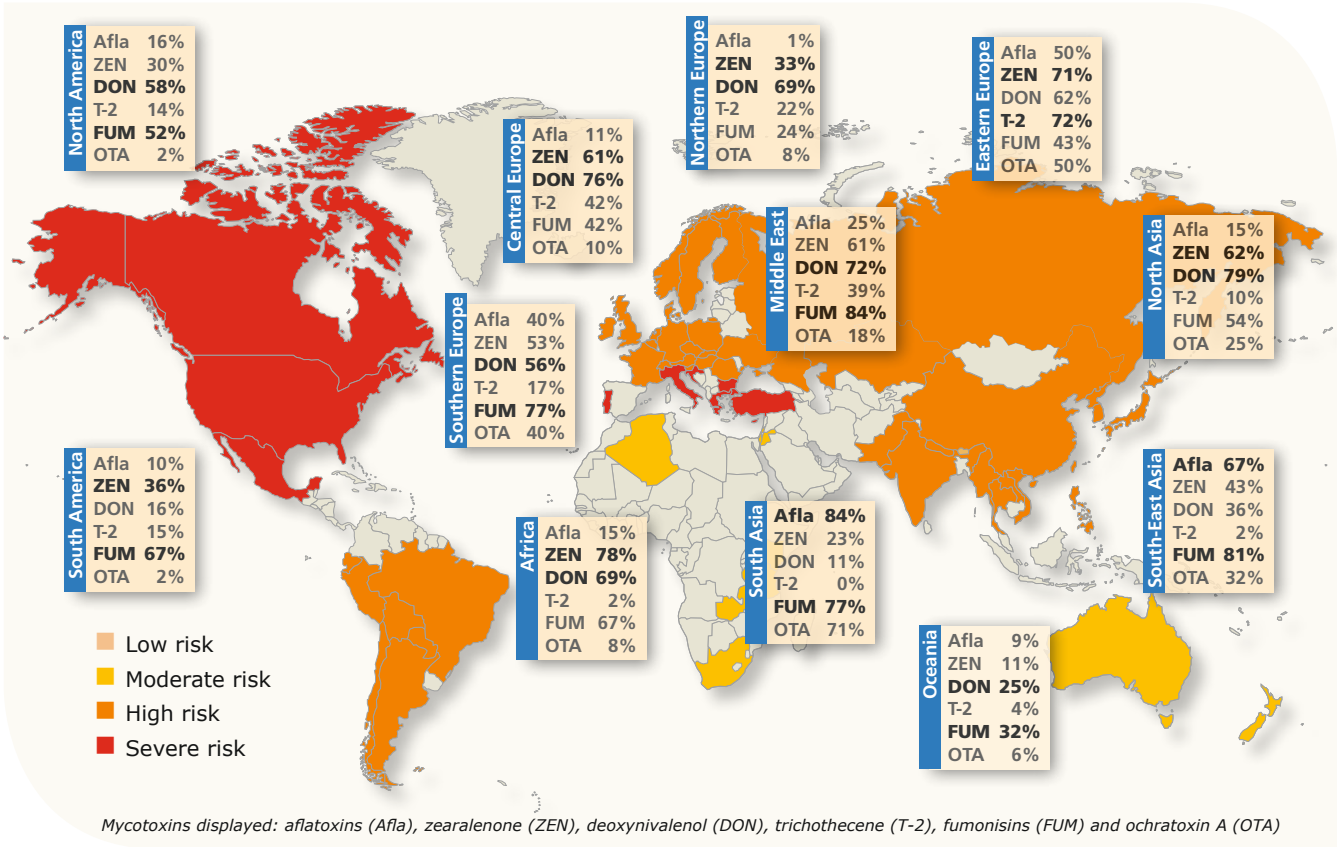
Mycotoxin Survey 2014

The latest BIOMIN Mycotoxin Survey covers 6,844 agricultural commodity samples from 64 countries, based on thousands of analyses conducted to identify the presence and potential risk posed to livestock animal production by mycotoxins worldwide.

Mycotoxins are fungal metabolites toxic to animals and humans produced by common molds found in almost all types of grains. The survey results provide an insight on the incidence of aflatoxins (Afla), zearalenone (ZEN), deoxynivalenol (DON), T-2 toxin (T-2), fumonisins (FUM) and ochratoxin A (OTA) in the primary components used for feed which include corn (maize), wheat, barley, rice, soybean meal, corn gluten meal, dried distillers grains (DDGS) and silage, among others.

Main findings

Livestock production in **North America** and **South Europe** face the **highest threat** from mycotoxin contamination. Livestock in Africa face the least threat, on average, although specific instances of contamination can still occur. A typical agricultural commodity sample intended for animal feedstuff contains **30 different metabolites**. Globally, **deoxynivalenol poses the most frequent threat to livestock** —with a prevalence of 66 % and average contamination level of 1,394 parts per billion— though levels of fumonisins and zearalenone also present a cause for concern.



Mycotoxins displayed: aflatoxins (Afla), zearalenone (ZEN), deoxynivalenol (DON), trichothecene (T-2), fumonisins (FUM) and ochratoxin A (OTA)

Figure 1. *Threat of mycotoxin-related risks to livestock for the six most common mycotoxins based upon threshold levels per mycotoxin according to most sensitive species.* ***Low risk*** *indicates that average levels of single mycotoxin presence for a given zone do not exceed minimum risk thresholds for livestock. The average level does not preclude specific, severe instances of mycotoxin contamination in farm or fields locally, nor does it account for the negative impacts of multiple mycotoxin presence.* ***Moderate risk*** *indicates the presence of one to two major mycotoxins at levels known to cause harm in animals.* ***High risk*** *indicates the presence of three to four major mycotoxins at levels known to cause harm in animals.* ***Severe risk*** *indicates the presence of five or more major mycotoxin at levels known to cause harm in animals.*

Tracking presence vs. threats to livestock

Mycotoxin testing and analysis methods have advanced considerably since the inaugural 2004 BIOMIN Mycotoxin Survey. State-of-the-art techniques such as LC-MS/MS now permit simultaneous detection of minute quantities of over 380 mycotoxins or metabolites in one go. Because of the powerful sensitivity of these tools, it is no longer sufficient to talk about the mere presence of mycotoxins; concentration levels must be considered. As a result, the latest results feature a **mycotoxin risk map** based upon both the presence of mycotoxins and their potential harm to livestock based upon concentration levels associated with known health risks. The objective is to raise awareness of the dangers of mycotoxins found in agricultural commodities intended for animal feed, focusing on areas of greatest risk to animal health and economic loss.

Reading the map

Figure 1 provides the mycotoxin occurrence data for each region as a percentage of all samples tested. A region's overall risk level is determined by the number of single mycotoxins with average contamination levels (measured in parts per billion, ppb) in excess of the maximum risk threshold levels for livestock. Because it relies upon single mycotoxin occurrence, this methodology understates the threat posed by mycotoxins to animals given their known synergistic effects (the presence of multiple mycotoxins compounds the potential harm) and subclinical effects (even low levels of mycotoxin contamination can impair animal health and performance).

Global mycotoxin trends

As in 2013, deoxynivalenol and fumonisins are once again the main threat and are found in over half of all samples tested worldwide. Deoxynivalenol poses the most frequent threat to livestock with a prevalence of 66 % and average contamination level of 1,394 parts per billion. A full 82 % of samples containing DON exceed risk thresholds for livestock. Levels of fumonisins (56 % of samples, 1,594 ppb on average) and zearalenone (53 % of samples, 221 ppb on average) also present a cause for concern. Half of FUM and ZEN occurrence exceeds risk threshold levels (48 % and 54 %, respectively). Aflatoxins were detected in 22 % of samples at 64 ppb on average, of which 74 % of positive samples exceed risk threshold levels. Positive occurrence was 24 % for T-2 toxin (T-2) at an average of 59 ppb, exceeding risk threshold levels in one fourth of positive cases. Ochratoxin A (OTA) was found in 20 % of cases at 6 ppb on average, exceeding risk threshold levels one-tenth of the time. *Figure 2* displays the occurrence of positive samples and occurrence above risk threshold levels for each mycotoxin as a percent of all samples tested worldwide.

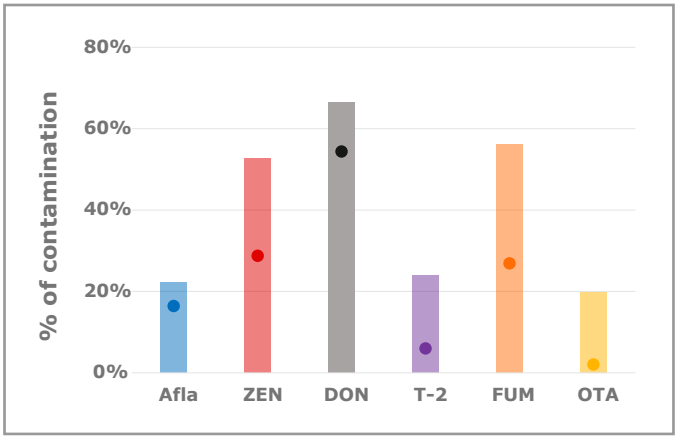


Figure 2. *Worldwide prevalence of major mycotoxins. Bars represent the % of contaminated samples. Dots display the occurrence of mycotoxins above risk threshold levels*

Year on year trends

Compared to the previous year, the number of samples positive for aflatoxins decreased from 30 % in 2013 to 22% in 2014, though the average concentration nearly doubled from 33 ppb to 64 ppb. The frequency of the other five mycotoxins rose compared to 2013, while the average concentration of zearalenone and deoxynivalenol nearly doubled, to 221 ppb and 1,394 ppb, respectively.

Co-occurrence brought to light

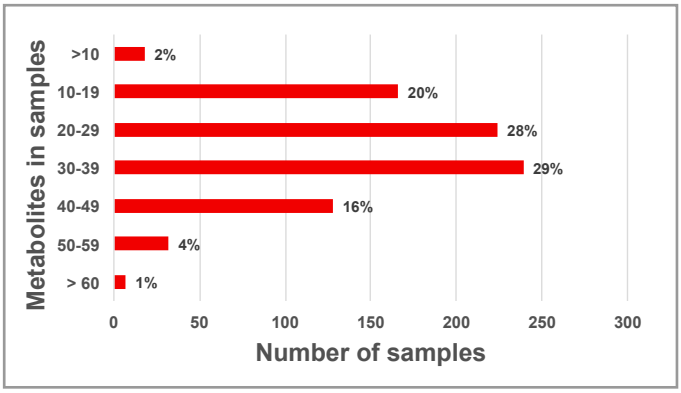


Figure 3. *Co-occurrence of mycotoxins worldwide (excluding Asia)*

Until recently, it was common to test samples for each mycotoxin individually. In 2011, a new research tool made it possible to detect and analyze more than 380 mycotoxins simultaneously in a sample. The latest annual survey results leverage the Spectrum 380® LC-MS/MS analysis —available commercially for the first time in 2014— which was conducted by a leading independent mycotoxin research lab. Worldwide, samples tested with the multi-mycotoxin technique contained 30 metabolites on average mycotoxins, based on data for all regions except Asia. Of 814 samples tested, all contained multiple metabolites ranging from a low of 4 metabolites to a high of 75 metabolites. *Figure 3* displays the distribution of samples grouped by number of metabolites present.

Mycotoxin	Afla	ZEN	DON	T-2	FUM	OTA
Recommended risk threshold (ppb)	2	50	150	50	500	10

Regional results

Figure 4 provides a more detailed view of mycotoxins occurrence by geographic zone, highlighting the specific threats posed by mycotoxins that can vary from one region to another. Overall, North America and Europe face the most severe threat of mycotoxin-related risks to livestock, each registering average concentrations for five major mycotoxins above risk threshold levels. Deoxynivalenol is the number one threat in all regions except for South America, where fumonisins constitute the most frequent health risk to livestock. Despite its high prevalence in Asia, Europe and Africa, Ochratoxin A poses a relatively low risk in these regions compared to other mycotoxins. *Table 1* provides further information on the number of samples tested, average contamination levels and maximum contamination values.

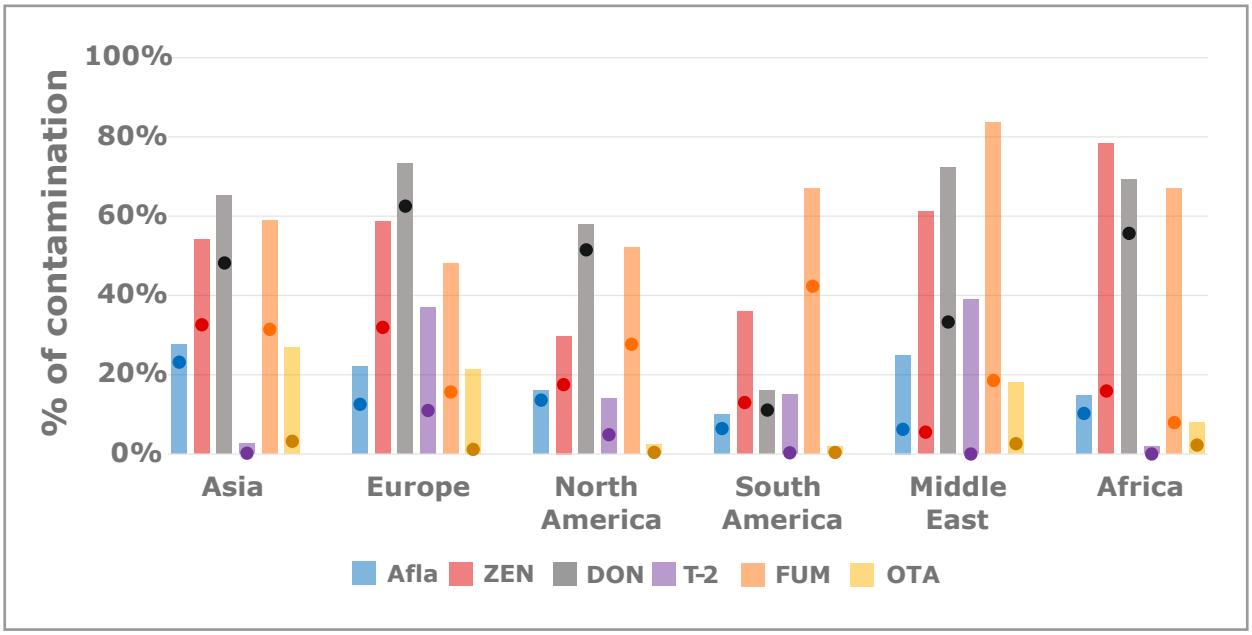


Figure 4. *Prevalence of major mycotoxins by region. Bars represent the % of contaminated samples. Dots display the occurrence of mycotoxins above risk threshold levels*

Table 1 *– Detailed results of mycotoxin occurrence by region*

		Afla	ZEN	DON	T-2	FUM	OTA
Europe	Number of samples tested	1036	2620	3373	1322	1199	1021
	Average of positives (ppb)	8	272	1864	66	1019	3
	Maximum (ppb)	481	16495	29600	1300	56948	76
Asia	Number of samples tested	1751	1767	1762	436	1651	1686
	Average of positives (ppb)	104	167	512	18	1399	7
	Maximum (ppb)	5155	6215	8901	61	130246	854
North America	Number of samples tested	603	566	623	510	556	460
	Average of positives (ppb)	29	282	1231	60	3353	6
	Maximum (ppb)	980	13700	24792	285	154000	22
South America	Number of samples tested	483	407	342	314	470	251
	Average of positives (ppb)	40	107	866	9	1932	3
	Maximum (ppb)	1352	3779	7590	361	52438	11
Middle East	Number of samples tested	48	54	54	44	43	38
	Average of positives (ppb)	2	19	194	12	541	13
	Maximum (ppb)	8	148	641	37	2927	67
Africa	Number of samples tested	88	88	88	88	88	88
	Average of positives (ppb)	7	39	599	2	249	13
	Maximum (ppb)	23	452	9176	2	2781	57

Feedstuffs

Finished feed and corn (maize) are the commodities most affected by mycotoxins, with the average contamination levels of Afla, ZEN, DON, T-2 and FUM all above risk threshold levels (*Figure 5*). Deoxynivalenol constitutes the most frequent threat to finished feed, corn, wheat and silage. Although the prevalence of several mycotoxins in wheat were not notably high, the average concentrations of Afla, ZEN, DON and T-2 in wheat samples all exceeded risk threshold levels (*Table 2*).

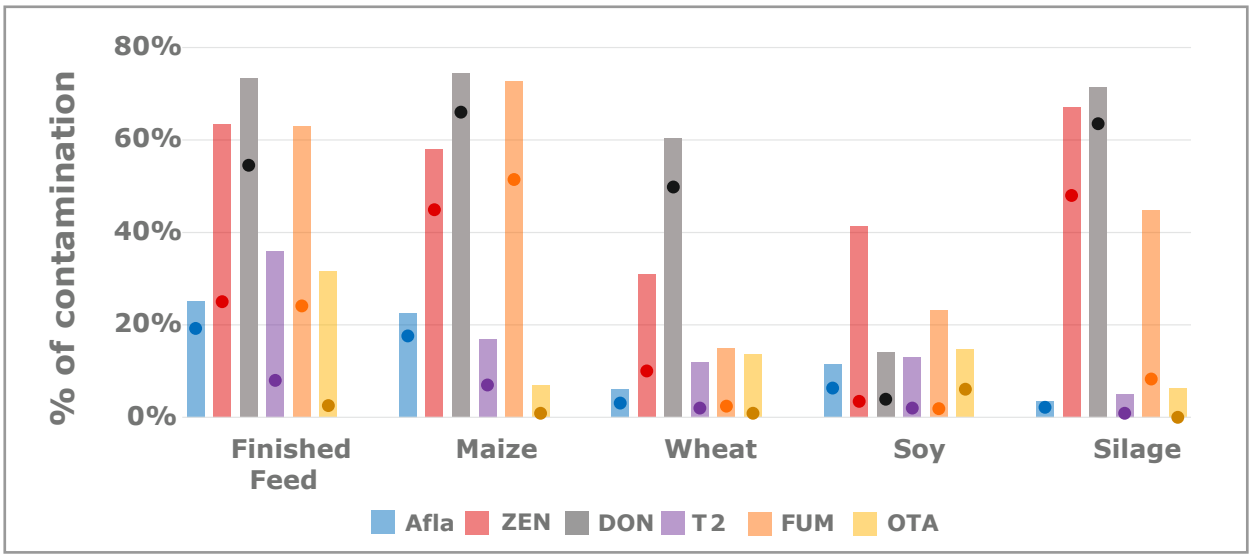


Figure 5. *Mycotoxin occurrence per agricultural commodity*

Table 2 *– Detailed results of mycotoxin occurrence by commodity*

		Afla	ZEN	DON	T-2	FUM	OTA
Finished Feed	Number of samples tested	1592	1872	1983	931	1676	1459
	Average of positives (ppb)	32	87	484	57	926	6
	Maximum (ppb)	484	6215	17920	1300	25041	854
Maize	Number of samples tested	1169	1793	2123	830	1071	1012
	Average of positives (ppb)	45	411	2443	83	2914	4
	Maximum (ppb)	1352	16495	29600	852	154000	52
Wheat	Number of samples tested	227	408	592	164	208	228
	Average of positives (ppb)	10	83	860	86	433	3
	Maximum (ppb)	87	2115	28864	1300	4333	18
Soy	Number of samples tested	158	174	178	142	160	164
	Average of positives (ppb)	3	19	204	18	123	19
	Maximum (ppb)	11	288	1166	108	977	141
Silage	Number of samples tested	139	225	277	112	145	127
	Average of positives (ppb)	6	290	2521	43	319	2
	Maximum (ppb)	15	3055	13920	174	3939	5

> DISCLAIMER: BIOMIN GmbH and the authors had no influence on the sampling process of the investigated samples. Therefore, the contamination levels found in the samples do not necessarily reflect the actual contamination level of these regions/ commodities. However, the samples provide more insight into the range and levels of mycotoxins which can be found in diverse commodities of various regions.

> ABOUT BIOMIN

BIOMIN is a world-leading company focusing on livestock health and nutrition. Leveraging on the latest technologies and extensive R&D, BIOMIN offers sustainable quality products which include solutions for mycotoxin risk management and gut performance which address dietary requirements for livestock.

> Impressum:

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