BIOMIN World Mycotoxin Survey 2017

Annual Report No. 14

Naturally ahead

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BIOMIN World Mycotoxin Survey 2017

World Overview

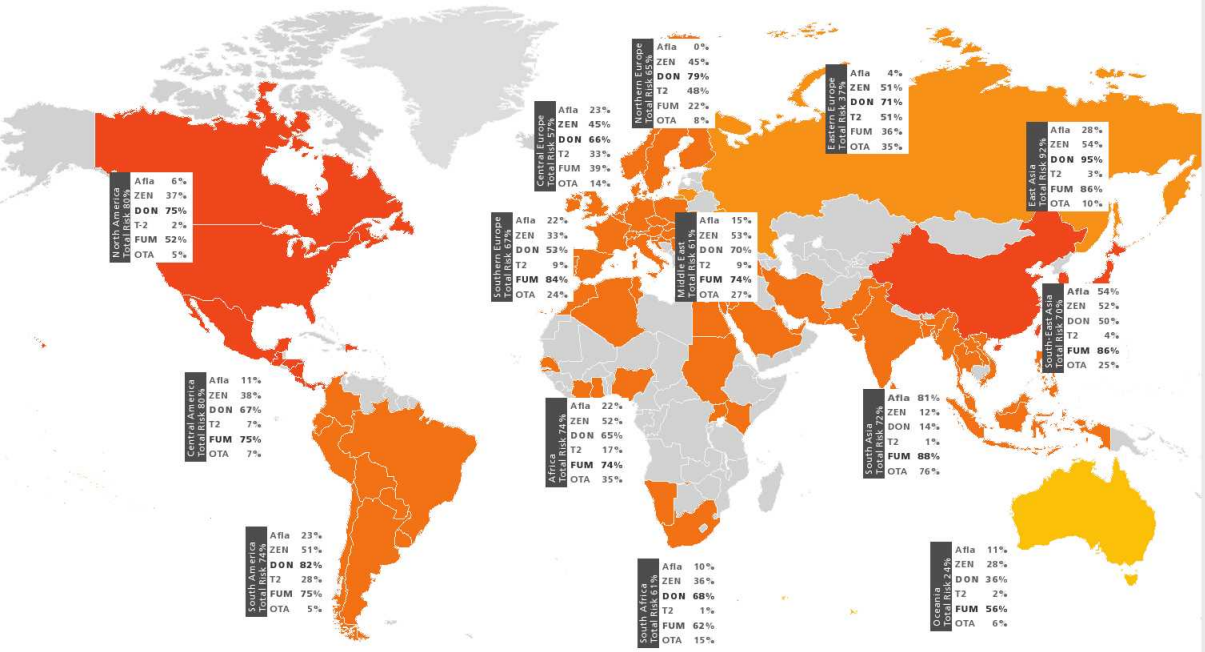


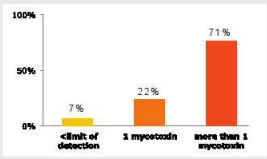
Figure 1. Global map of mycotoxin occurrence and risk in different regions.

Legend

- Moderate risk: 0-25% of samples above risk threshold
- High risk: 26-50% of samples above risk threshold
- Severe risk: 51-75% of samples above risk threshold
- Extreme risk: 76-100% of samples above risk threshold
- No samples tested

18 757	73 692	72
Samples	Analyses	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). A severe risk level indicates that >50% of samples may represent a risk to productivity or disease susceptibility.

Recommended risk threshold of major mycotoxins in ppb

Afla	ZEN	DON	T-2	FUM	OTA
2	50	150	50	500	10

ACKNOWLEDGEMENTS
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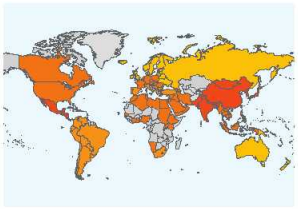
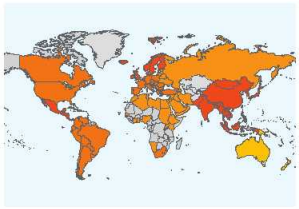
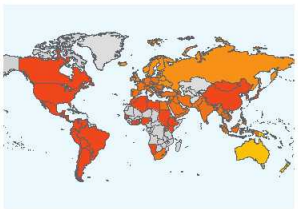
Mycotoxin trends



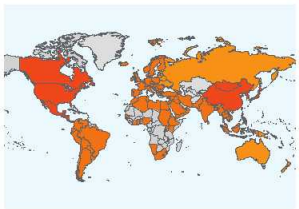
January – June 2016



July – December 2016



January – June 2017

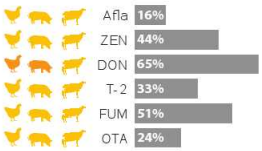


July – December 2017

A regional overview

Changes in risk for half year from 2016 to 2017 indicate the changes that happen with the main crop harvests (particularly in the Northern Hemisphere). Lower contamination present in European crops in the 2015 harvest affects the early 2016 results. Similarly, early 2017 results in the Northern Hemisphere show the relatively high risk in the 2016 harvest. In the second half of 2017, the risk level increased in the northern part of Europe (on average from 44% increasing to 70% of samples at a level above the risk threshold). Increases were also seen in North America (from 59% in the second half of 2016 to 77% in the second half of 2017), East Asia (88% to 92%), Oceania (24% to 26%), Middle East (from 47% to 69%) and Africa (from 48% to 73%).

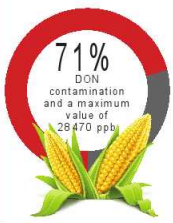
Europe



species risk assessment according to legend on page 2 and % positive samples

Mycotoxins in main commodities

	Total samples: 4 812	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	1045	1330	1351	1120	1075	1044
	% Contaminated samples	10%	61%	76%	39%	65%	39%
	Average of positives (ppb)	5	33	245	19	398	4
	Median of positives (ppb)	2	17	164	9	158	2
	Maximum (ppb)	54	856	7000	300	8725	70
Corn	Number of samples tested	497	712	776	492	592	482
	% Contaminated samples	22%	39%	71%	21%	73%	9%
	Average of positives (ppb)	12	151	889	102	1508	42
	Median of positives (ppb)	2	44	417	46	742	2
	Maximum (ppb)	468	6082	28470	978	15554	889
Cereals*	Number of samples tested	443	1463	1851	667	478	448
	% Contaminated samples	16%	29%	57%	41%	9%	11%
	Average of positives (ppb)	1	77	580	34	171	17
	Median of positives (ppb)	1	26	277	22	40	3
	Maximum (ppb)	4	2681	19510	361	3006	364



*Cereals: wheat, barley, oats, triticale, rye, sorghum, millet

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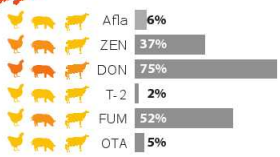
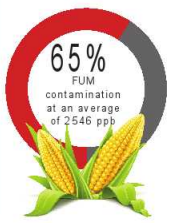
North America



species risk assessment according to legend on page 2 and % positive samples

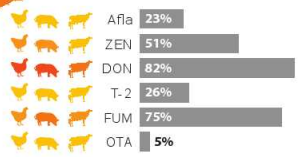
Mycotoxins in main commodities

	Total samples: 1 496	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	466	466	466	419	466	466
	% Contaminated samples	11%	42%	83%	4%	67%	7%
	Average of positives (ppb)	47	142	728	17	2378	5
	Median of positives (ppb)	41	84	493	15	689	3
	Maximum (ppb)	148	3320	4040	90	290517	13
Corn	Number of samples tested	426	426	426	398	426	426
	% Contaminated samples	5%	33%	74%	1%	65%	1%
	Average of positives (ppb)	26	250	897	67	2546	13
	Median of positives (ppb)	9	119	475	67	884	5
	Maximum (ppb)	139	4213	51374	115	64585	39
Cereals*	Number of samples tested	26	26	26	26	26	26
	% Contaminated samples	0%	15%	65%	4%	15%	4%
	Average of positives (ppb)	-	96	939	2	359	6
	Median of positives (ppb)	-	69	307	2	147	6
	Maximum (ppb)	0	227	6467	2	1041	6



*Cereals wheat, barley, oats & rghum

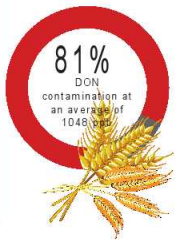
South & Central America



species risk assessment according to legend on page 2 and % positive samples

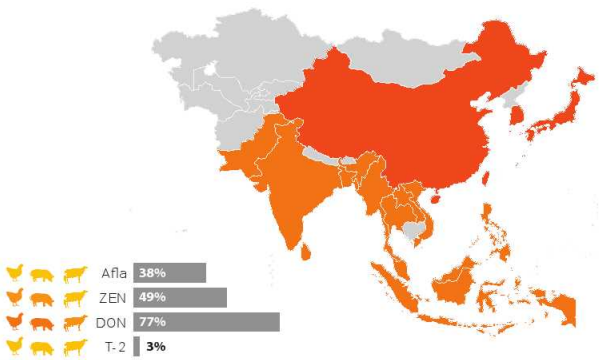
Mycotoxins in main commodities

	Total samples: 8 380	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	1785	1689	1639	394	1922	262
	% Contaminated samples	18%	35%	82%	4%	91%	3%
	Average of positives (ppb)	10	57	653	18	1896	3
	Median of positives (ppb)	4	36	600	3	1370	2
	Maximum (ppb)	1336	1239	4556	127	34860	5
Corn	Number of samples tested	3521	2855	1729	654	2520	176
	% Contaminated samples	18%	46%	80%	8%	90%	3%
	Average of positives (ppb)	11	164	756	50	3915	4
	Median of positives (ppb)	4	61	500	25	1655	1
	Maximum (ppb)	351	3553	8290	976	218883	14
Cereals*	Number of samples tested	238	74	74	53	92	29
	% Contaminated samples	20%	53%	81%	38%	20%	21%
	Average of positives (ppb)	5	106	1048	49	2460	3
	Median of positives (ppb)	5	68	645	54	274	3
	Maximum (ppb)	20	586	3272	79	33504	6



*Cereals wheat, & rghum, barley, oats rice

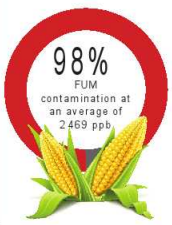
Asia



species risk assessment according to legend on page 2 and % positive samples

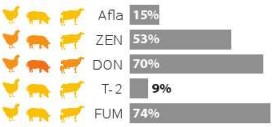
Mycotoxins in main commodities

	Total samples: 3 347	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	1054	1199	1259	613	926	621
	% Contaminated samples	39%	45%	79%	1%	87%	43%
	Average of positives (ppb)	77	106	489	25	798	6
	Median of positives (ppb)	8	57	369	19	495	3
	Maximum (ppb)	10918	7080	5824	85	46515	270
Corn	Number of samples tested	734	847	873	222	741	222
	% Contaminated samples	63%	62%	85%	1%	98%	7%
	Average of positives (ppb)	45	114	633	99	2469	6
	Median of positives (ppb)	1	42	480	99	1379	2
	Maximum (ppb)	762	2095	6120	163	169500	24
Cereals*	Number of samples tested	126	198	203	104	124	106
	% Contaminated samples	5%	40%	68%	1%	49%	7%
	Average of positives (ppb)	3	46	575	14	110	1
	Median of positives (ppb)	2	27	250	14	64	1
	Maximum (ppb)	11	845	4707	14	686	3



*Cereals wheat, barley, rye, oats rice, s rghum

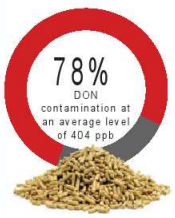
Middle East



species risk assessment according to legend on page 2 and % positive samples

Mycotoxins in main commodities

	Total samples: 224	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	77	90	92	92	92	73
	% Contaminated samples	8%	62%	78%	7%	97%	40%
	Average of positives (ppb)	1	55	404	15	390	2
	Median of positives (ppb)	1	41	263	14	247	1
	Maximum (ppb)	1	193	1658	21	1750	8
Corn	Number of samples tested	25	37	39	34	39	24
	% Contaminated samples	16%	46%	72%	21%	85%	4%
	Average of positives (ppb)	3	60	268	30	2489	1
	Median of positives (ppb)	2	27	222	29	1297	1
	Maximum (ppb)	9	331	1147	69	11658	1
Cereals*	Number of samples tested	24	27	27	27	27	20
	% Contaminated samples	0%	15%	37%	4%	22%	10%
	Average of positives (ppb)	-	38	468	3	339	1
	Median of positives (ppb)	-	32	184	3	79	1
	Maximum (ppb)	0	86	2840	3	956	1



*Cereals wheat, barley

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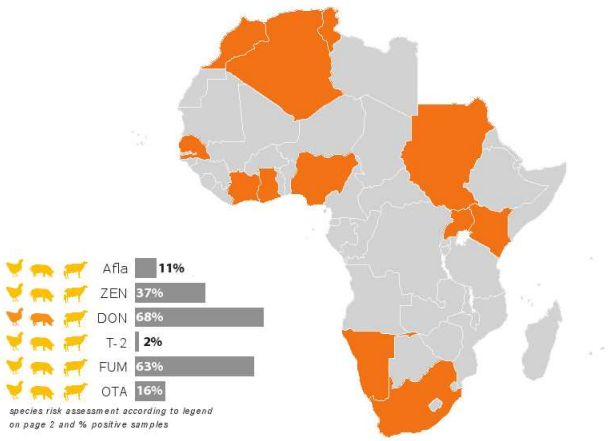
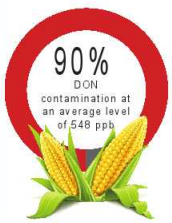
Africa



species risk assessment according to legend on page 2 and % positive samples

Mycotoxins in main commodities

	Total samples: 494	Afla	ZEN	DON	T-2	FUM	OTA
Finished feed	Number of samples tested	118	113	118	113	113	113
	% Contaminated samples	4%	50%	71%	4%	77%	8%
	Average of positives (ppb)	90	56	436	4	513	2
	Median of positives (ppb)	2	39	288	3	131	1
	Maximum (ppb)	232	221	9805	6	4727	6
Corn	Number of samples tested	163	186	188	161	161	161
	% Contaminated samples	11%	39%	90%	1%	80%	9%
	Average of positives (ppb)	2	118	548	54	1681	8
	Median of positives (ppb)	1	58	332	54	307	1
	Maximum (ppb)	14	1295	7518	80	16932	95
Cereals*	Number of samples tested	15	14	15	14	14	14
	% Contaminated samples	13%	14%	33%	7%	29%	7%
	Average of positives (ppb)	13	75	289	5	34	1
	Median of positives (ppb)	13	75	367	5	25	1
	Maximum (ppb)	26	108	494	5	77	1

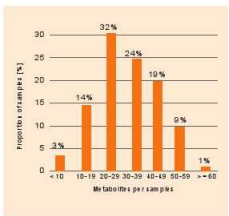


*Cereals wheat, sorghum, rice, barley **471 samples originated from South Africa

Multiple Mycotoxin Overview

Multiple mycotoxin occurrence

Spectrum 380® results 2017: the most comprehensive mycotoxin analysis available*



32 mycotoxins and metabolites per sample on average

9.7 out of **10** samples contaminated with *Fusarium* toxins

97% Contained **10** or more mycotoxins and metabolites

905 samples

In which raw materials are emerging mycotoxins most commonly found?

Wheat:
Aurofusarin 78%

Maize:
Moniliformin 91%
Beauvericin 84%
Culmorin 67%

Barley:
Infectopyron 95%
Tryptophol 93%

Mycotoxins & metabolites

		Average	Maximum	Rank
cyclo(L-Pro-L-Val)	86%	1104	18467	1
cyclo(L-Pro-L-Tyr)	85%	568	10668	2
Moniliformin	78%	171	2900	3
Tryptophol	76%	318	16800	4
Beauvericin	76%	26	509	5
Aurofusarin	76%	349	8664	6
Culmorin	72%	286	5500	7
Brevianamid F	69%	69	1469	8
Aspergiaucide	66%	114	6188	9
Deoxynivalenol	64%	387	5646	10
Zearalenone	64%	46	2748	11
Enniatin B1	64%	52	698	12
Asperphenamate	63%	43	1658	13
Equisetin	63%	38	2015	14
15-Hydroxyculmorin	61%	325	9319	15
Flavoglaucin	59%	133	14736	16
Enniatin B	57%	56	1056	17
Neoechinulin A	55%	79	2415	18
Fumonisin B1	55%	942	28990	19
Emodin	54%	32	1240	20
Rugulosovin	53%	67	1006	21
Fumonisin B2	52%	321	8144	22
Enniatin A1	51%	23	369	23
3-Nitropropionic acid	51%	29	1794	24
Infectopyron	48%	958	61298	25
Bikaverin	46%	42	712	26
DON-3-glucoside	45%	52	1134	27

Positive Samples [%] for metabolites present in more than 40% of samples (orange bars indicate regulated or guideline mycotoxins)
Cut off for all metabolites 1 ppb (except for aflatoxins 0.5 ppb)

*Spectrum 380® is developed and conducted by the world's leading independent mycotoxin research lab at the Department of Agrobiotechnology (IFA-Tulln) at the University of Natural Resources and Life Sciences Vienna and offered through cooperation with BIOMIN.

Mycofix®

MYCOTOXIN RISK MANAGEMENT

Abs lute Protection

Powered by science to actively defend against multiple mycotoxins*

With 3 combined strategies

Mycofix® NOW EU AUTHORIZED FOR POULTRY

- ADSORPTION
- BIOTRANSFORMATION
- BIOPROTECTION

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* Authorized by EU Regulations No 1115/2014, 1060/2013, 1016/2013, 2017/913 and 2017/930 for the reduction of contamination with fumonisins, aflatoxins and trichothecenes.

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