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Wordwide occurrence of mycotoxins – results of a survey program

Ursula Hofstetter, Ines Rodrigues, Karin Griessler
Biomin Holding GmbH, Herzogenburg, Austria

From the cereal trade companies up to feedmillers and animal producers, all those involved in the long chain of food production are at risk of being impacted by the effects of some mycotoxins, secondary metabolites produced by filamentous fungi (molds) in the final stages of exponential growth phase (Jay, 2000). The majority of the known toxigenic species falls into three recognized genera: *Aspergillus*, *Penicillium* and *Fusarium.* Mycotoxin contamination often begins in the field and continues throughout harvest, transportation and storage.

This study was initiated and backed by BIOMIN to provide customers insights in the occurrence of mycotoxins in feed ingredients worldwide thereby enabling better feed management From January until December 2009, a total of 2727 samples were analyzed for the most important mycotoxins in terms of agriculture and animal production – aflatoxins (Afla), zearalenone (ZON), deoxynivalenol (DON), fumonisins (FUM) and ochratoxin A (OTA). Samples tested were ranging from cereals such as corn, wheat and barley to soybean meal, corn gluten meal, dried distillers grains with solubles (DDGS) and other fodder such as straw, silage and finished feed. Origin of the samples was Asia-Pacific region, Europe, Middle-East and Africa and North and South America. The majority of the analyses were performed at ROMER Labs Diagnostic (Austria), ROMER Labs Singapore, ROMER Labs (USA) and SAMITEC (Brazil). 75% of the samples were analyzed by High Performance Liquid Chromatography (HPLC), 25% by Enzyme Linked Immunosorbent Assay (ELISA) and less than 1% of the samples were submitted to thin-layer chromatography (TLC) method. Limits of detection of the main applied methods are shown in *Table 1*. *Table2* and *Table3* show the results from all survey samples and North America respectively.

Table 1 - Limits of detection of methods applied

	HPLC (ppb)			ELISA (ppb)		TLC (ppb)
Afla	0.5[1]	1[3,4]	4[2]	1[1]	4[3]	n.a.
ZON	10[1,4]	32[2]	100[3]	40[1,3]	-	n.a.
DON	50[1,2]	140[4]	-	250[1,3]	-	100/500*[3]
FUM	25[1]	50[4]	100[2,3]	250[1]	-	n.a.
OTA	1[1]	2[2,3,4]	-	2[1]	-	n.a.

* Depending if cereal grains or complex matrixes, such as corn silage
[1] ROMER Labs Diagnostic GmbH (Austria)
[2] ROMER Labs Singapore Pte Ltd
[3] ROMER Labs Inc (USA)
[4] SAMITEC (Brazil)
n.a. … no analysis performed

Table 2 – Overview of the survey

World-wide	Afla	ZON	DON	FUM	OTA
No. of tests	1735	2342	2432	1653	1060
Positive (%)	33%	35%	50%	56%	28%
Av. of positive (µg/kg)	82	221	831	2270	15
Max. (µg/kg)	6105	8952	29300	32510	1582
Com-modity	Corn	Barley	Barley	Corn gluten meal	Fin. feed
Origin	VN	US	US	MY	PK

Table 3- North America (USA and Canada)

North America	Afla	ZON	DON	FUM	OTA
No. of tests	102	148	163	85	37
Positive (%)	20%	34%	79%	65%	35%
Av. of positive (µg/kg)	48	538	1286	1744	4
Max. (µg/kg)	831	8952	29300	11381	12.6

The presence of mycotoxins is ubiquitous not only in terms of world regions, but also in terms of commodities. Animal producers are confronted with the fact that even low contamination levels mycotoxins have negative impacts on animal health and performance, enhanced by production stress animals are submitted to.

Reference: Jay, J. M. Modern Food Microbiology; 6th edition; Aspen Publication, MD, 2000.