

Field study to identify frequently used mycotoxin detoxifiers in Belgium

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Products on the European market*

*results of internet research conducted May 2013

Active MOS	Mycogen
Adfimax	Mycosal
Agrabond	Mycosorb
Agrabond	Mycotec
Fuzion	Mycozym
Agrabond Zea	Neofeed
AgriMOS	Neutox
Agrotox	Neutox
AlphaTox	Novasil plus
Ammomin	Nutricell
andSORB	polysorb
andSORB MOS	Ocra-tox
andTOTAL	Oligos
Animasanam	Plusbind
Antaferm H25	Plusbind bio
MOS	Prosid TB
Antaferm MT	Protease A-DS
Antaferm MT80	Resindox
Ascogen	Rheintox
Astro Ben 20	Safe
Astri-PeC	Safmannan
ATOX	Solis
Bentonites	Solis MOS
Betasacc	Sorbatox
bgMOS	Sorbatox
Biocell	Sorb-it
Biolex MB40	SPLF Elite
Bionit S	Starbind
Biosecure MP	Stop tox
362	T5X Bind
Calibrin A	T5X Premium
Calibrin Z	T5X SD
Captex	Tonilys
Captex Fusa	Toxinor
Captex T2	Toxiroak
Detoxa plus	Toxiroal Gold
Elitox	Toxisorb
Escent	Toxo-MX
Exal	Toxtrap
F1- Natural	Toxynil plus dry
Fibosel	Ultrabond
Fixar Bios	Ultrasorb
Fixar S	Ultrasorb
Fixar Viv	Unike plus
FloBond	UT aflatrol
Fra Bind	Vilocym z
Fra MaxiBind	Volclay
Freetox	XPIs Myco Bind
Globafeed ap	Zagribind
Globafix	Zeofarm
Grainsure E	Zeolex
Klinofeed	Zeolita natural
Klinosan	Nutrica
Klinosorb	Zeolite
Magnet	
Mareguard plus	
Mastersorb	
Mastersorb fm	
Mastersorb gold	
Mastersorb premium	
Mia Myco fit	
Mia Myco bond	
Microsafe max	
Milbond TX	
Min-a-zel plus	
MMi.S	
MT X+	
MT.x+	
Myco-Ad A-Z	
Tox Free	
CoBind AZ	
Mycoad ZT	
Mycobond	
Mycofix plus	

Introduction

Contamination of feed with mycotoxins is a difficult problem to resolve. Application of good agricultural practices or the disposal of heavy contaminated lots is not always sufficient to guarantee feed safety since effects can occur even with very low levels of contamination. Therefore, other solutions are explored and the most popular is mixing special additives in feed. The additives used for this purpose can be divided into two groups: binders and modifiers. Binders aim to prevent the uptake of toxic compounds by adsorbing the toxins, binders are often clay minerals or yeast derived products. Modifiers aim to alter the chemistry of the toxins to reduce their toxicity and are often of microbiological origin. They comprise whole cultures of bacteria or yeasts, as well as specifically extracted enzymes.

The procedure for registration is only a minor threshold to market these products as they are registered as technical additives, feedstuff or digestibility enhancer. Furthermore, these products gain popularity because they are relatively cheap compared with other options such as replacing the feed reserves. The increasing popularity attracts new entrants to this market and results in many new materials, combinations and rebranded products, contributing to the complexity of this industry. In addition, Belgian and European legislation does not require full transparency with regard to the content of the additives. Registers of the use and content of these products are not available, which makes it difficult to identify the most used compounds. However, identifying and characterizing these compounds is necessary to ensure quality and transparency in the food chain (EFSA, 2010).

In addition to the regulatory and economic hurdles, chemical ambiguities also contribute to the problem of identifying and characterizing mycotoxin binders and –modifiers. This is especially the case when clays are used as an ingredient, which is often the case in the available products. Literature on clays used as feed additive indeed suggests a large variability in the composition of the material, resulting in vague specification and misunderstandings, this results in difficulties in identification and comparing results with literature data. This study will identify and characterize the most relevant products used to prevent problems caused by mycotoxin contamination.

Materials and methods

Mycotoxin binders and modifiers on the European market were identified using internet and literature research, experts indicated the most popular products in Belgium. Cation exchange capacity was determined using the ammonium acetate (pH=7) displacement method, exchangeable cations were quantified using Inductively Coupled Plasma analysis. Mineral and moisture fraction was determined gravimetrically with the aid of a muffle furnace. XRD diffractograms were made of dry powder-, oriented- and glycolysed samples of the different products.

Results

Products available on the European market are listed in the table on the left. As the market situations changes constantly, the exclusiveness cannot be guaranteed. Chemical and physical properties of the most popular products on the Belgian market are presented in the table below.

sample ID	commercial name	XRD result	HCl	CEC (meq/100g)	pH	Ca (ppm)	K (ppm)	Mg (ppm)	Na (ppm)	MF (%)	RH (%)
13-1633	Z	Zeolite	+	172,91	8,33	6748,97	40026,70	208,60	5652,64	94,40	4,58
13-1634	S	Sepiolite, smectite	+	31,87	7,73	2937,91		2448,29	293,90	96,01	8,65
13-1635	C	Clinoptilolite	-	120,32	7,65	3365,45		301,53	2347,45	97,69	4,93
13-1636	Z	Zeolite	-	413,51	10,31		13848,05	14,38	83531,71	93,78	7,13
13-1637	L	Humic substance, quartz	-	185,88	4,19	2877,02		861,93	4406,99	15,77	10,64
13-1638	B	Mixed layer montmorilloniet, Quartz	-	51,00	7,70	3996,71	4173,13	940,39	5018,19	78,62	3,37
13-1639	B	Montmorillonite	++	82,91	9,76	5000,96		994,58	14662,98	97,14	10,06
13-1640	B	Montmorillonite	-	100,47	3,72	7710,53	710,11	752,32	185,54	95,94	13,32
13-1641	H	Sepiolite, Montmorillonite, Quartz (t), Dolomite (t), Albite (t)	+	39,33	8,24	3300,90	234,95	2554,22	138,44	96,30	5,36
13-1642	F	Montmorillonite, Sepiolite, Quartz (t), Calcite (t)	++	56,72	8,45	6755,45	218,16	1993,62	6174,33	96,93	9,08
13-1643	B	Montmorillonite, Quartz (t), Calcite (t), Feldspars (t)	++	64,14	9,31	7860,67	1179,16	1670,62	12489,22	98,27	11,87
13-1644	H	Humic substance, quartz	-	166,35	4,39	514,42	4486,25	232,29	4237,77	5,95	12,40
13-1645	H	Sepiolite, montmorillonite, calcite (t), Quartz (t)	+	22,06	7,10	7107,06		2312,04	1002,91	80,30	6,73
13-1646	S	Montmorillonite	-	109,37	5,59	8707,81	6708,32	472,89	969,43	92,77	7,23
13-1647	N	Calcite, Dolomite, organic material	++	12,61	5,68	14212,53	7455,43	1037,69	5979,68	38,88	5,07
13-1648	C	Thenardite, Montmorillonite, Quartz, organic material		7,80	4,10	918,19	10183,13	1744,38	30301,18	27,35	6,39
13-1649	G	Montmorillonite	-	71,76	8,04	3813,56		681,18	11368,87	90,16	9,84
13-1650	N	Clinoptilolite	-	176,64	7,42	6073,69	17486,22	496,33	1377,93	96,27	4,72
13-1651	T	Quartz, Mica, Montmorillonite, kaolin	-	59,73	7,90	7252,38	732,00	2240,45	63,08	95,38	7,95
13-1652	T	Mica, Kaolin, Quartz, Montmorillonite	+	59,59	7,93	5757,73	968,51	2184,41	129,94	97,02	9,01
13-1653	A	Multi layered Smectite	+	23,66	9,86	5321,73		4791,38	10973,20	97,47	7,54
13-1654	N	Mica, Calcite, Smectite	+	77,95	7,98	13577,18	701,85	1029,19	200,29	88,65	11,35
13-1655	T	Montmorillonite, Sepiolite, calcite (t)	++	46,51	7,88	9696,29	543,24	1184,16	12698,21	92,66	7,34
13-1656	N	Montmorillonite, Mica, Feldspars	-	7,01	6,18	3245,97		823,59	1117,61	94,79	5,21
13-1657	N	Calcite, Montmorillonite (t)	++	26,08	6,62	22360,42	4170,13	601,16	2665,14	97,05	2,95
13-1658	N	Multi layered montmorillonite, Quartz, Feldspars	-	27,87	7,73	3726,40	558,62	646,02	1125,50	98,02	1,98
13-1659	N	Montmorillonite	-	111,74	9,50	3486,06	525,57	1007,28	15973,57	86,75	13,25

Characteristics of the most relevant mycotoxin binders and –modifiers on the Belgian market. ‘HCl’ indicates presence of chalc, ‘CEC’ is the Cation Exchange Capacity, ‘pH’ indicates the degree of acidity, ‘Ca’, ‘K’, ‘Mg’ and ‘Na’ indicate the amount of exchangeable ions of resp. calcium, potassium, magnesium and sodium, ‘MF’ indicates the fraction of mineral content, ‘RH’ stands for Relative Humidity, ‘(t)’ indicate trace amounts of the compound.

Future outlook

Chemical and physical properties of the mycotoxin binders and modifiers will be linked to literature data on the efficacy and safety of these products in a review study. Factorial analysis will be used to identify the main properties indicative for binding or modifying mycotoxins as well as veterinary drugs.

References

[EFSA]European Food Safety Authority. 2010. Statement on the establishment of guidelines for the assessment of additives from the functional group ‘substances for reduction of the contamination of feed by mycotoxins’. EFSA J.8:1693

Acknowledgements

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