CHROMATOGRAPHY

Think about **food**
Care about **safety**

Vol. 6

Mycotoxins

MACHEREY-NAGEL
www.mn-net.com

ADIS INTERNATIONAL

MN Since 1911

Focus on mycotoxins

The global production and trading of food and feed products makes monitoring and control difficult.

Only analysis of food and raw materials for the production of food can ensure safe and edible food. Food safety is an essential part of our quality of life.

MN shows examples for food analysis that will help you with your work and make our food safer!

Vol. 6: **Mycotoxins in food infested with mold**

Mycotoxins are secondary metabolites of fungi / molds. In contrast to environmental contaminants (pesticides, PCBs, PAHs, etc.) mycotoxins are inevitable. More than 300 mycotoxins are chemically characterized [Food and Agriculture Organization of the United Nations (FAO) – http://www.fao.org/docrep/005/y1390e/y1390e0b.htm]. The following mycotoxins can be considered as the most common mycotoxins in feed and food:

Aflatoxins (aflatoxin B_1, B_2, G_1 and G_2, aflatoxin M_1), ochratoxin A (OTA), trichothecenes (Deoxynivalenol – DON, nivalenol, T-2 toxin, HT-2 toxin), patulin, ergot alkaloids, zearalenone – ZEA, fumonisins B_1 and B_2)

The presence of mycotoxins in food and feed may affect the health of humans and animals. Many adverse health effects are suspected, such as causing of cancer and mutations and excess estrogens, gastrointestinal and kidney disorders [Food and Agriculture Organization of the United Nations (FAO) – http://www.fao.org/wairdocs/x5008e/x5008e01.htm].

Toxicological properties of selected mycotoxins

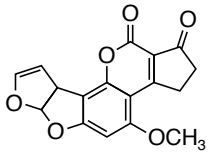
Mycotoxin	Possible effects
Aflatoxins	Liver diseases (hepatotoxic, hepatocarcinogenic); carcinogenic and teratogenic effects; hemorrhages (intestinal tract, kidneys); reduced growth rate; diminution of performance; immune suppression
Ochratoxins	Nephrotoxic; carcinogenic; mild liver damage; enteritis; teratogenic effects; poor feed conversion; reduced growth rate; immune suppression
Fumonisins	Pulmonary edema; equine leukoencephalomalacia; nephro- and hepatotoxic; immune suppression
Trichothecenes	Digestive disorders (vomiting, diarrhea, feed refusal); reduced weight gain; hemorrhages (stomach, heart, intestine, lung, bladder, kidney); edema; oral lesions; dermatitis; blood disorders; infertility; degeneration of bone marrow; slow growth; immune suppression
Zearalenone	Estrogenic effects; edema of vulva; prolapse of vagina; enlargement of uterus; atrophy of testicles; atrophy of ovaries; enlargement of mammary glands; infertility; abortion
Ergot alkaloids	Nervous or gangrenous syndromes; Digestive disorders (vomiting, diarrhea, feed refusal); reduced weight gain; convulsion; abortion
Citrinin	Nephrotoxic; teratogenic; hepatotoxic
Patulin	Mutagenic; genotoxic; neurotoxic; immune suppression

Richard, J. L. (2007). Some major mycotoxins and their mycotoxicoses – an overview. International Journal of Food Microbiology, 119 (1–2), 3–10

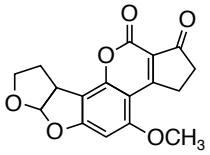
Compounds of interest

Chemical structures of selected mycotoxins

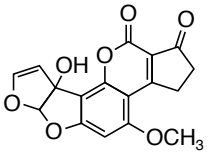
Aflatoxin B_1



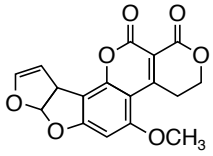
Aflatoxin B_2



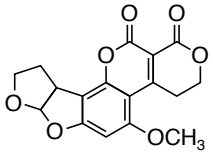
Aflatoxin M_1



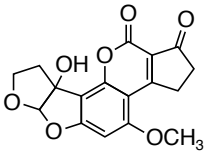
Aflatoxin G_1



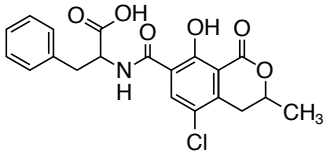
Aflatoxin G_2



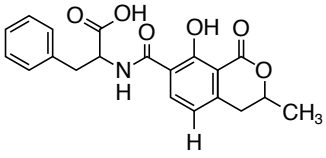
Aflatoxin M_2



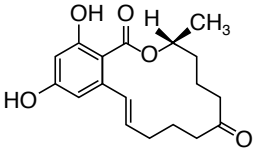
Ochratoxin A



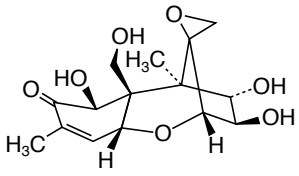
Ochratoxin B



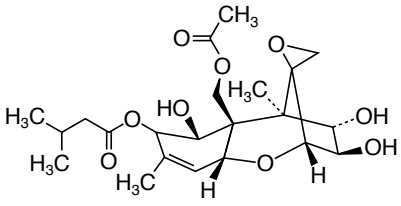
Zearalenone



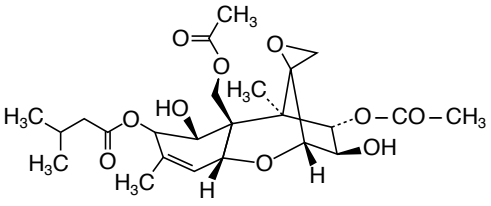
Nivalenol



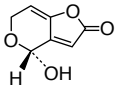
HT-2-Toxin



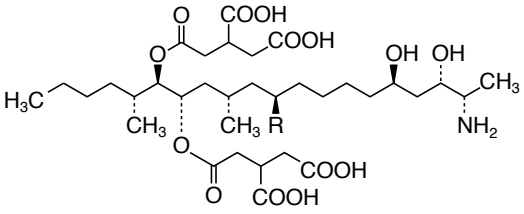
T-2-Toxin



Patulin



Fumonisins B$_1$: R = OH B$_2$: R = H



Typical samples, preparation

T-2 toxin and HT-2 toxin from oat products in accordance with § 64 LFGB

(German Regulation for Food Analysis)

Sample pretreatment

25 ± 0.1 g of a ground homogenized sample (particle size < 1 mm) are weighed into an Erlenmeyer flask or centrifuge tube. 100 mL acetonitrile – water (84:16, v/v) is added. The sample is mixed in a laboratory mixer (1 h, RT). After extraction 10 mL of solution is filtered through a folded filter or centrifuged (2500 g, RT).

Solid phase extraction

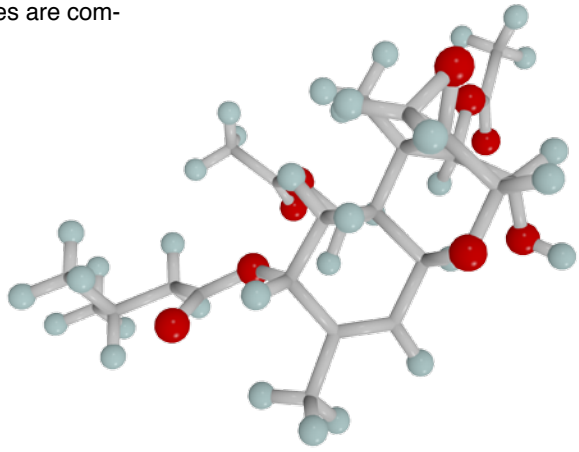
MN Appl. No. 305560

Column type:
CHROMABOND® Carbon/Alox/Celite®, 6 mL, 500 mg
REF 730584 (on request)
No conditioning or equilibration of the SPE column is necessary.

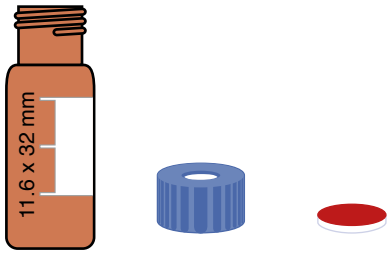
Sample aspiration:
5 mL of prepared sample is passed through the column by slight vacuum (1–2 drops/s) into a silanized glass vial.

Washing:
2 x 5 mL acetonitrile – water (84:16, v/v); these eluates are passed into the same silanized vial, i.e., all eluates are combined.

CHROMABOND® vacuum manifold for 12 columns
REF 730150



Transfer into a sample vial, e.g., 1.5 mL screw neck vials N 9, amber, flat bottom, label and scale, wide opening, REF 702284 (silanized version REF 702079) and ready assembled screw closures N 9, blue, center hole with septum silicone / PTFE, REF 702287.1



It is recommended to filter the prepared sample through disposable filters **CHROMAFIL® Xtra PVDF-45/25**
REF 729219

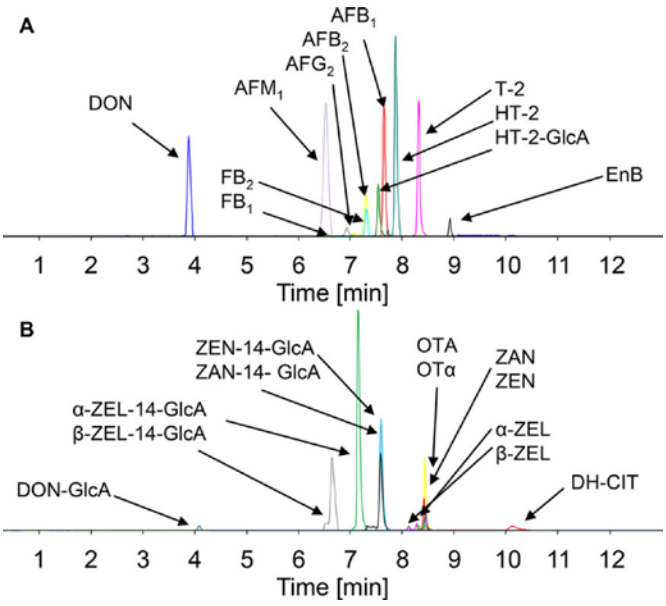
For other applications see *www.mn-net.com/apps*

Subsequent analysis: HPLC

Mycotoxin exposure in Germany

MN Appl. No. 127240

Column: EC 150/2 NUCLEODUR® C_{18} Pyramid, 3 µm
REF 760261.20



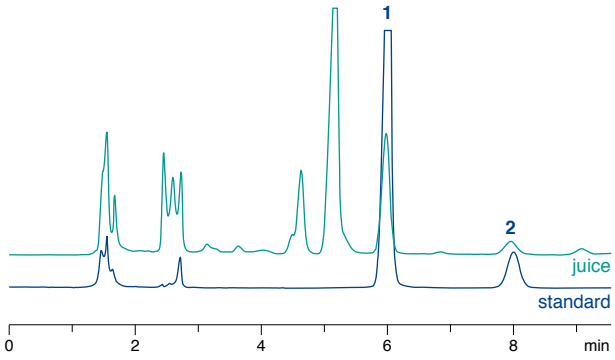
Peaks

DON	Deoxynivalenol
DON-GlcA	Deoxynivalenol-3-glucuronide / Deoxynivalenol-15-glucuronide
T-2	T-2 toxin
HT-2	HT-2 toxin
HT-2-GlcA	HT-2-toxin-4-glucuronide
FB1	Fumonisin B_1
FB2	Fumonisin B_2
AFB1	Aflatoxin B_1
AFB2	Aflatoxin B_2
AFG2	Aflatoxin G_2
AFM1	Aflatoxin M_1
ZAN	Zearalanone
ZEN	Zearalenone
α-ZEL	α-Zearalenol
β-ZEL	β-Zearalenol
ZEN-14-GlcA	Zearalenone-14-O-glucuronide
ZAN-14-GlcA	Zearalanone-14-O-glucuronide
α-ZE*L*-14-GlcA	α-Zearalenol-14-O-glucuronide
β-ZE*L*-14-GlcA	β-Zearalenol-14-O-glucuronide
OTA	Ochratoxin A
OTα	Ochratoxin alpha
EnB	Enniatin B
DH-CIT	Dihydrocitrinone

Patulin and hydroxymethylfurfural from apple juice

MN Appl. No. 121800

Column: EC 250/4 NUCLEODUR® C_{18} Gravity, 5 µm
REF 760101.40



Peaks
1. Hydroxymethylfurfural
2. Patulin

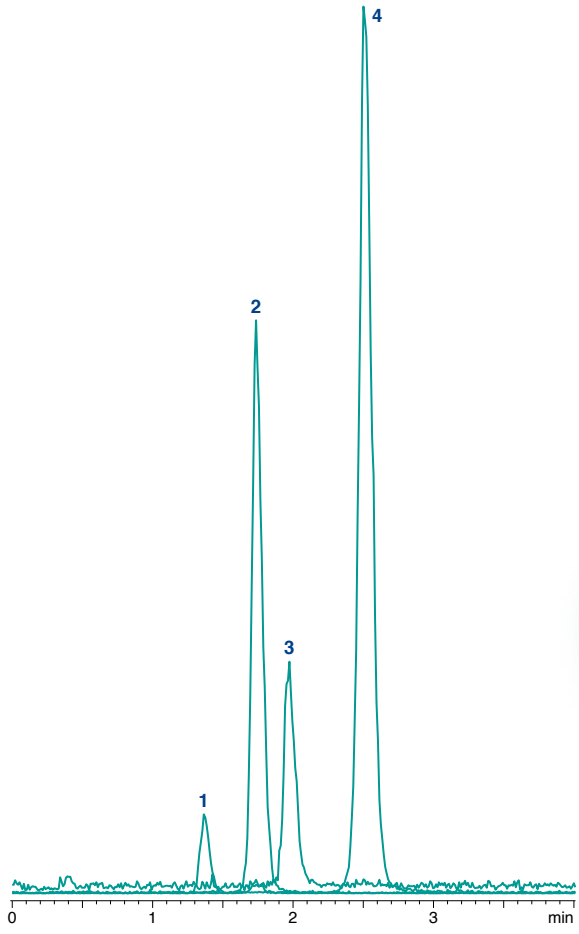
Detailed conditions are available online at *www.mn-net.com/apps*

Subsequent analysis: HPLC

Fast separation of aflatoxins

MN Appl. No. 125600

Column: EC 50/2 NUCLEOSHELL® PFP, 2.7 µm
REF 763532.20



Peaks:
1. Aflatoxin G_2
2. Aflatoxin G_1
3. Aflatoxin B_2
4. Aflatoxin B_1

MN suggests using guard columns to protect your main column
and significantly increase column life.

The **Column Protection System** (REF 718966)
is suitable for all analytical HPLC columns
with 1/16” fittings!

Detailed conditions are available online at *www.mn-net.com/apps*

Product information

Ordering information

Step	Product	Pack of	REF
SPE	CHROMABOND® Carbon/Alox/Celite®, 6 mL, 500 mg (on request)	30	730584
	CHROMABOND® vacuum manifold for 12 columns	1	730150
Filtration	Disposable filters CHROMAFIL® Xtra PVDF-45/25	100	729219
Vials and caps	1.5 mL screw neck vials N 9, amber, label and scale	100	702284
	Vials N 9 as before, silanized version	100	702079
	Ready assembled screw closures N 9, blue, center hole with septum Silicone white / PTFE red	100	702287.1
HPLC 1			
Column	EC 150/2 NUCLEODUR® C_{18} Pyramid, 3 µm	1	760261.20
Guard column	EC 4/2 NUCLEODUR® C_{18} Pyramid, 3 µm	3	761916.20
Guard column holder	Column Protection System	1	718966
HPLC 2			
Column	EC 250/4 NUCLEODUR® C_{18} Gravity, 5 µm	1	760101.40
Guard column	EC 4/3 NUCLEODUR® C_{18} Gravity, 5 µm	3	761903.30
Guard column holder	Column Protection System	1	718966
HPLC 3			
Column	EC 50/2 NUCLEOSHELL® PFP, 2.7 µm	1	763532.20
Guard column	EC 4/2 NUCLEOSHELL® PFP, 2.7 µm	3	763538.20
Guard column holder	Column Protection System	1	718966

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www.adis-international.ro

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