AT-09

Ver 1.3

Mycotoxin Control

Feed Chain Alliance
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DOCUMENT HISTORY

Version and date of approval	Reason for revision	Revision scope	Ultimate application date
0.0 03/07/2008	Simplification of structure	Entire document	01/01/2009
1.0 09/08/2012	Approval of version 2 of the self checking guide 'Animal Feed G-001'	Entire document	09/11/2012
1.1 12/08/2013	Incorporation of indicative values for the sum of T-2 and HT-2	Points 1 and 4	12/11/2013
	Update of references	Points 2, 4 and 5	
1.2 17/01/2014	Addition of an action threshold for T-2 and HT-2 toxins in compound feed for cats.	Point 4	17/01/2014
1.3 21/10/2016	New lay-out	Entire document	21/10/2016

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1. Introduction

Mycotoxins are toxic substances which may be produced by specific molds. Molds likely to produce mycotoxins are *Aspergillus*, *Penicillium* and *Fusarium*.
Mycotoxins may occur during plant growth, or during storage. Animal tissues may become infected with mycotoxins, when animals are fed with mold contaminated feed.
Good Agricultural Practices such as crop rotation, making use of less sensitive varieties, or a conscious use of effective fungicides, could prevent mold producing mycotoxins.

In this particular document, it is mainly a question of mycotoxins occurring mostly commonly in animal feed, namely:

- Aflatoxin B1;
- Rye ergot;
- Deoxynivalenol (DON);
- Zearalenone (ZEA);
- Ochratoxin A (OTA);
- Fumonisin B1 + B2;
- T-2 and HT-2.

The list of undesirable substances also classifies rye ergot *(Claviceps purpurea)* of which the sclerotia contains mycotoxins, in the section dedicated to mycotoxins.

There are Legal standards as regards the presence of Aflatoxin B1 and rye ergot in animal feed. As for the other mycotoxins, there exists a European recommendation. This information can be found in document 'AT-03: Table of standards, action thresholds and notification limits'.

2. Aflatoxin B1

When cattle consume feed materials, contaminated with aflatoxin B1, they may become a source of aflatoxin M1 via milk and dairy products.

The following feed materials are sensitive to aflatoxin B1 contamination:

- Groundnut (peanut) expeller and groundnut (peanut), extracted;
- Copra expeller and copra, extracted;
- Palm nut;
- Palm kernel expeller and palm kernel, extracted;
- Cottonseed expeller and cottonseed, extracted;
- Babassu;
- Maize, products and by-products of maize;
- Kapok seed expeller;
- Safflower meal, extracted;
- Rice by-products.

The legal standards for Aflatoxin B1 are included in the following table.

Animal feed	Rejection limit (mg/kg)
Feed materials	0.02
Complete feed for cattle, sheep and goats, with the exception of: - dairy cattle - calves, lambs and kids	0.02 0.005 0.01
Complete feed for pigs and poultry (except young animals)	0.02
Other complete feed	0.01
Complementary feed for cattle, sheep and goats (with the exception of complementary feed for dairy cattle, calves, lambs and kids)	0.02
Complementary feed for pigs and poultry (except young animals)	0.02
Other complementary feed	0.005

The analysis as regards the level of Aflatoxin B1, must be performed according to the method described in Regulation (EC) No. 152/2009 laying down the methods of sampling and analysis for the official control of feed.

3. Rye ergot

The legal standards for rye ergot (*Claviceps purpurea*) can be found in the following table.

Animal feed	Rejection limit (mg/kg)
Feed materials	1000
Compound feed containing unground cereals	1000

Ergot alkaloids

A European Recommendation[1] (2012/154/EU) dd. 15/03/2012, addressed to Member States of the European Union, recommend that these Member States should at least analyze the following ergot alkaloids:

- ergocristine/ergocristinine;
- ergotamine/ergotaminine;
- ergocryptine/ergocryptinine;
- ergometrine/ergometrinine;
- ergosine/ergosinine;
- ergocornine/ergocorninine.

In order to have a better understanding of the relationship between the content of sclerotia and concentrations of various ergot alkaloids, Member States should if possible, simultaneously determine the content of sclerotia in the sample .

4. Other mycotoxins

[1] *Commission Recommendation No. 2012/154/EU of 15 March 2012 on the monitoring of the presence of ergot alkaloids in feed and food (Official Journal of the European Union – L 77 – 16/03/2012 – access to online text).*

Besides Aflatoxin B1 and rye ergot, the following mycotoxins may also be encountered in animal feed:

- Deoxynivalenol (DON);
- Zearalenone (ZEA);
- Ochratoxin A (OTA);
- Fumonisin B1 + B2;
- T-2 and HT-2.

For DON, ZEA, OTA and fumonisin B1 + B2 there exists a European Commission Recommendation[2] of August 17, 2006 (publication: 23/08/06). The Recommendation is included in the following table, as well as in document 'AT-03: Table of standards, action thresholds and notification limits'.

Mycotoxins	Animal feed	Action thresholds in mg/kg (ppm) animal feed reduced to a moisture content of 12 %
DON (deoxynivalenol)	**Feed materials:**	
	- Cereals and cereal products, with the exception of maize by-products	8
	- Maize by-products	12
	Complementary and complete feed, with the exception of:	5
	- Complete and complementary feed for pigs	0.9
	- Complete and complementary feed for calves (< 4 months), lambs and kids	2
Zearalenone	**Feed materials:**	
	- Cereals and cereal products, with the exception of maize by-products	2
	- Maize by-products	3
	Complementary and complete feed:	
	- Complementary and complete feed for piglets and gilts (young sows)	0.1
	- Complementary and complete feed for sows and fattening pigs	0.25
	- Complementary and complete feed for calves, dairy cattle, sheep (including lamb) and goats (including kids)	0.5
Ochratoxin A	**Feed materials:**	
	- Cereals and cereal products	0.25
	Complementary and complete feed:	
	- Complementary and complete feed for pigs	0.05
	- Complementary and complete feed for poultry	0.1
	-	
Fumonisin (mg FB1+FB2 / kg)	**Feed materials**	
	- Maize and maize products	60
	Complementary and complete feed for:	
	- Pigs, horses, rabbits and pet animals	5
	- Fish	10
	- Poultry, calves (< 4 months), lambs and kids	20

[2] *Commission Recommendation No. 2006/576/ EC of 17 August 2006 on the presence of deoxynivalenol, zearalenone, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding (Official Journal of the European Union – L 229 – 23/08/2006 – access to online text) + Commission Recommendation No. 2013/637/EU of 4 November 2013 amending Recommendation 2006/576/EC as regards T-2 and HT-2 toxin in compound feed for cats (Official Journal of the European Union – L 294 – 6/11/2013 – access to online text).*

Mycotoxins	Animal feed	Action thresholds in mg/kg (ppm) animal feed reduced to a moisture content of 12 %
	- Adult ruminants (> 4 months) and mink	50
T-2 + HT-2 toxin	**Compound feed for cats**	0,05

There is also another European Recommendation in place regarding the presence of toxins T-2 and HT-2 in cereals and cereal products[3].

The purpose of this document is to initiate a succession of (myco) toxins T-2 and HT-2 in cereals, cereal products and in certain feed and food.
The commission believes that Member States, with the active participation of traders in feed and food, must put in place a monitoring in order to detect the presence of toxins T-2 and HT-2 in cereals and cereal products (rice and rice products are not affected by this Recommendation).

This document includes an annex with guidelines for the sum of T-2 + HT-2 in cereals and cereal products.

Animal feed	Indicative values for the sum of T-2 et HT-2 (µg/kg) [4]
Non-processed cereals[5]:	
- Barley and maize	200
- Oats (not peeled)	1000
- Wheat, rye and other cereals	100
Cereal products intended for animal feed and compound feed [6]	
- Milling products of oats (husk)	2000
- other cereal based products	500
- Compound feed, with the exception of cat feed[7]	250

It is important to note that, here it relates to «Indicative values» and not «Standard values». In case of exceeding these indicative values, and certainly in case of repeated detection, the factors, leading to the presence of T-2 et HT-2, should be investigated. These indicative values are not security levels for animal feed.

For those mycotoxins, not included in the tables (above), or for which there are no rejections limits or indicative values, the companies may determine their own rejection limits based on the destination of the feed, which they place on the market.

5. Prevention and reduction of *Fusarium* toxins

[3] *Commission Recommendation No. 2013/165/UE of 27 March 2013 on the presence of T-2 and HT-2 toxin in cereals and cereal products (Official Journal of the European Union L 91 – 03/04/2013 – access to online text).*
[4] *Guiding values for the sum of T-2 and HT-2 (µg/kg) from/ above which a research should be performed, especially in case of repeated detection.*
[5] *Unprocessed cereals are cereals that have not been subjected to any physical or heat treatment other than drying, cleaning and sorting.*
[6] *The guiding values for cereals and cereal products intended for animal feed and compound feed relate to feed with a moisture content of 12 %.*
[7] *Due to lack of available data, and because at low doses serious health problems had occurred, no NOAEL or LOAEL could be established. Therefore the recommendation 2013/165/EU does not apply to cat feed, for which more stringent measures have been established by recommendation No 2013/637/EU(cf. point 4 - table of action thresholds).*

Here below you will find a number of measures to be taken in order to prevent *Fusarium* toxins. This non-exhaustive list is based on the European Commission Recommendation[8] of August 17, 2006 (publication: 29/08/06):

- Field crop rotation is a very effective way to reduce the risk of contamination. It is particularly effective in reducing contamination for winter cereals;
- Choose varieties that are adapted to soil and climatic conditions, and to agronomic practices commonly used. This will reduce plant stress, making the crop less sensitive to fungal infection;
- Avoid overcrowding of plants by maintaining the recommended row and intra-plant spacing;
- Avoid lodged cereals during harvest;
- Whenever possible, harvest cereals at the appropriate moisture content;
- Before harvest time, make sure that all equipment and facilities to be used for harvesting and storage of crops, are functional;
- Avoid, in as much as possible, mechanical damage to the cereals, and also avoid contact with soil during harvesting;
- Dry at harvest or immediately afterwards, until the required moisture level is reached. Cereals should be dried in such a manner that moisture levels are lower than those required to support mould growth during storage;
- Aerate wet grain to avoid overheating prior to drying;
- Cereals with different moisture contents, are best stored separately;
- For bagged commodities, ensure that bags are clean and dry;
- Check moisture content and temperature of the stored grain at regular intervals during the storage period;
- Transport containers should be clean and dry. As necessary, transport containers should be cleaned and disinfected before use;
- Shipments of cereals should be protected from additional moisture, by using covered or airtight containers or tarpaulins;

Avoid temperature fluctuations and any actions that may cause condensation to form during transport and storage, which could lead to local moisture build-up with subsequent fungal growth.

[8] *Commission Recommendation No. 2006/583/EC of 17 August 2006 on the prevention and reduction of Fusarium toxins in cereals and cereal products (Official Journal of the European Union – L 234 – 29/08/2006 – access to text online).*