Newsletter

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> EDITORIAL

Mycotoxins cause problems all around the world. Hardly any country can exclude the presence of these "silent killers" in their feeds. This is on the one hand due to the extraordinary adaptability of the mycotoxin producing fungi itself and on the other hand due to the transport of feedstuffs over thousands of miles. Our customers, who are generally aware of problems caused by mycotoxins and who are importing goods from far distanced countries, are very often interested in the contamination of their imported materials. As a response to this repeated request this newsletter is published.

In general it is very difficult to receive representative data since international laboratories are often not willing to forward their results. Moreover an international database, is not available yet although to our knowledge the European Union is working on its completion. Therefore this newsletter is based on data kindly provided by independent laboratories in Argentina, Austria, Brazil, Singapore and the USA. However, readers should always be aware that the collected data are only able to give an impression of the general contamination in a specific country/region in the year 2003. Increased contamination frequently results from transport, improper storage and insect damage - only to mention a few. Thus, data shown in this report can never be understood as a certificate for feed samples obtained from the respective area! Actual contamination of feeds can only be assessed by accurate feed analyses of well-sampled feeds!

Verena Starkl

Mycofix® Plus product line

Most of the data available are derived from South America and the USA, which are also the biggest grain exporting countries. Argentina provided us with detailed data of Aflatoxin, T-2 toxin and Zearalenone contamination of around 1000 feed samples (figure 1). Brazilian data mainly show Aflatoxin and Fumonisin contamination. Feed samples in Singapore and in the USA were analysed on nearly all agriculturally important mycotoxins. The lab in Austria analysed mainly deoxynivalenol (also referred to as vomitoxin) and zearalenon contamination of feed samples from Central European countries.

Occurrence of Mycotoxins Worldwide

Due to globalization and intercontinental transport of feeds, feedstuffs all over the world can be contaminated with any mycotoxin.

However, although all data were provided by specialized laboratories, figures should be observed keeping in mind that due to improper sampling false positive and false negative results are still possible (see Newsletter Vol. 2, No. 10). Furthermore, even if sampling was done correctly, analytical results sometimes do not show the real contamination. The reason for this are so called masked mycotoxins. Especially zearalenone is well-known to possess the capability to "hide".

This phenomenon was reported to us several times: Symptoms of hyperestrogenism are obvious, feed is carefully sampled and analyzed by a certified laboratory, but the results do not show any zearalenone contamination! Due to microbial activity in the feed mycotoxins can be bound to feed components. These bound mycotoxins cannot be detected by means of conventional analysis. During digestion of the feed, enzymes present in the intestinal tract of animals break these bonds and zearalenone and its toxic effects are released into the body of the animal.

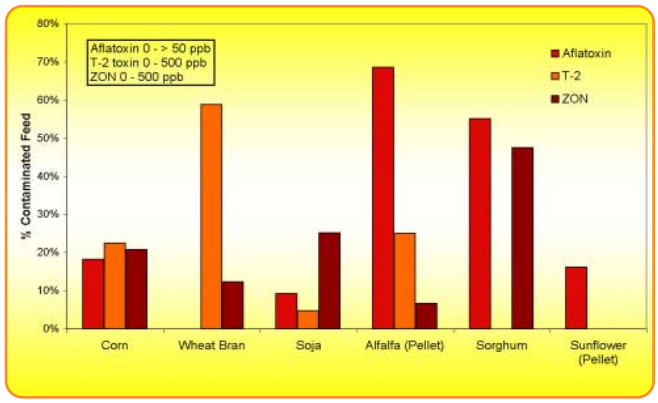

Figure 1 *Mycotoxin contamination of feedstuffs in Argentina 2003 (Biofarma, Departamento Control de Calidad, Argentina).*

On the other hand it should also be kept in mind that frequently only materials suspected for contamination are sent to laboratories. This also influences the overall contamination data.

Geographical distribution of mycotoxins

The formation of mycotoxins is considered to be a global problem. However in certain geographical areas of the world, some mycotoxins are produced more readily than others (figure 2). In colder, more temperate, regions such as Canada and the Northern USA and most European countries, aflatoxins are not considered as being the major problem except in imported feedstuffs grown in warmer southern climates. In these regions deoxynivalenol (DON), zearalenone (ZON), ochratoxin A (OTA), and T-2 toxin are the most prevalent mycotoxins.

Figure 2 *Mycotoxin contamination worldwide.*

In Europe, the differences in climatic conditions among the northern, middle and southern parts, favour the development of different fungal species. In the corn growing areas of Southern and Middle Europe (Sweden, Austria, Hungary) mainly fusariotoxins (deoxynivalenol, zearalenone, T-2 toxin) cause illness and poor performance of livestock whereas ochratoxin A is of greater concern in the northern part of Europe (Denmark, Poland). 88% of the analysed Austrian corn samples were contaminated with DON (<250ppb – 2100ppb)! Tropical and subtropical countries on the other side are mainly susceptible to aflatoxins and fumonisins. However, during the colder winter season in countries such as Brazil, Peru, Venezuela and Argentina, high moisture conditions may result in other mycotoxins such as zearalenone, deoxynivalenol, T-2 toxin, ochratoxin, etc. (figure 3). Soybeanmeal samples from Argentina, Brazil, India and the USA did not show any aflatoxin and fumonisin contamination but showed rather high percentage of zearalenone contaminated samples (50.0% Argentina, 28.6% Brazil, 37.5% India, 25.0% USA). Samples were contaminated up to 200ppb.

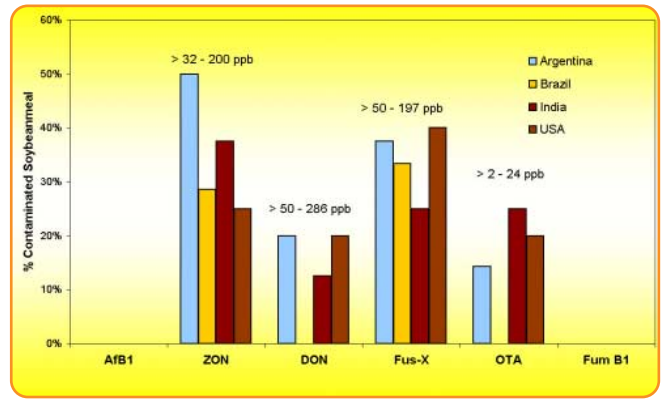

Figure 3 *Mycotoxin contamination of soybeanmeal in Argentina, Brazil, India and USA 2003 (Romer Labs Singapore).*

Aflatoxin – affects not only peanuts!

Large populations of *Aspergillus flavus* and thus aflatoxin contamination occurs each year in the southern United States, but serious outbreaks are associated with above-average temperature and below-average rainfalls (US corn belt). A high incidence of aflatoxin has been reported also in Latin America, southern China, Southeast Asia, Africa and also some parts of Australia. The occurrence of aflatoxin is not only dependent on the geographical region but also on the season, as Brazilian data show. Aflatoxin contamination in Brazilian corn samples is therefore highest in the Brazilian winter 10.2% positive samples, compared to spring 6.8%, summer 0% and autumn 5.7%. It is also important to recognize that not only peanuts are affected by aflatoxins but also all kinds of other foods and feeds (see figure 4). Highest contamination were detected in corn (51.9%, <15ppb), mixed feeds (46.2%, 30ppb) and peanuts (45.3%, < 110ppb) but also soya (15.3%), wheat (11.2%), sorghum (18.0%) and rice (9.2%) were aflatoxin-charged.

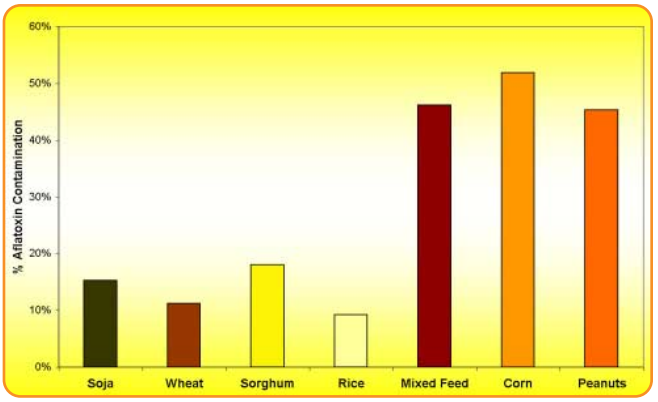

Figure 4 *Aflatoxin contamination of various feedstuffs in Brazil 2003 (www.lamic.ufsm.br) .*

Ochratoxin – not only prevalent in cold climates!

Ochratoxin A is produced by *Penicillium verrucosum* in temperate or cold climates and a number of species of Aspergillus in warmer and tropical parts of the world [1]. It is confirmed that contamination occurs both pre- and postharvest, although postharvest contamination is considered as being the major factor of contamination. OTA has been reported as naturally occurring in almost all cereals including corn, barley, wheat, sorghum, rye, oats and rice. Barley, oats, wheat and corn grown in Denmark and other Scandinavian countries as well as in Balkan countries, Canada and India are particularly susceptible to high levels of OTA contamination [2, 3]. Figure 3 shows that 25% of soybeanmeal samples in India were contaminated with OTA within a range of <2–24ppb. Danish scientists stated that a wet season during harvest makes it impossible to be OTA free. According to Pittet (1998) analyzed Danish wheat (32% positive), rye (42%) and oats (44%) samples were contaminated with OTA up to 121ppb. In Canadian wheat levels up to 27000ppb OTA were detected [3]!

Trichothecenes *(Deoxynivalenol, T-2 toxin, DAS,…)* – a huge family!

Trichothecenes are mainly produced by a wide range of *Fusarium* moulds.
Recent epidemics in North America have been attributed to increases in conservation tillage practices and to cropping systems in which corn and wheat are rotated or in which wheat is planted every year. Wheat scab affects China, European barley and wheat growing regions, Russia, Argentina and Uruguay. Red ear rot of corn has been reported from all corn growing areas around the world, but is especially prevalent in temperate climates when relatively cool temperatures and wet weather coincide with silk emergence. Outbreaks of red ear rot are reported in years with wetter summers. Northern Italy, eastern Europe, former Soviet Union, China, central and southern Africa are mostly affected of the this disease.
DON and T-2 producing *Fusarium* strains are found in Northern and Southern America (figure 1) and in Europe as well as in Asia. Significant high concentrations are very often found in wheat, barley, corn and oats. Figure 5 shows very high DON contamination of corn in China (92% positive samples), Taiwan (100%) and the USA (66.7%). Contamination levels between <50 and 1265ppb was detected!

Zearalenone – the masked mycotoxin…

Zearalenone, is an estrogenic mycotoxin produced by numerous species of Fusarium which frequently colonize cereal crops worldwide. Zearalenone is mainly considered as being produced on the field but especially high concentrations might also result from improper storage. Most surveys indicate that zearalenone occurs primarily in corn, as well as in certain other grains. 49% of all analyzed Austrian corn samples were contaminated between <50 and 250ppb with this oestrogen-mimicking mycotoxin! Argentinean feedstuffs were even contaminated up to 500ppb (figure 1)! Please compare also the respective data shown in figure 3 and figure 5.

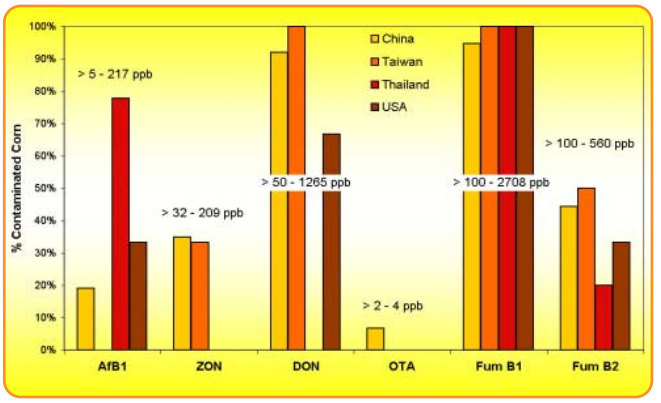

Figure 5 *Mycotoxin contamination of corn in China, Taiwan, Thailand and USA 2003 (Romer Labs Singapore).*

Fumonisin – contaminant of corn

Fumonisin is produced by some species of *Fusarium* and mainly infects corn crops. It appears that fumonisins can be found almost anywhere in corn growing areas - possibly with the exception of North Eastern Europe and Canada which seem to escape the problem. Recently, problems with high fumonisin contamination were reported from North and South American countries as well as African and Asian countries. Brazilian data show 53% fumonisin contamination of corn and 58% contamination of feedstuffs. In figure 5 the high amount of fumonisin contaminated corn samples is obvious. 100% of the corn samples from Taiwan, Thailand, USA and 95% of the Chinese corn were contaminated with up to 2708ppb fumonisin!

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26. Mycotoxin Workshop
Munich, Germany, May 1 - 3, 2004

XI International IUPAC Symposium on Mycotoxins and Phycotoxins
Maryland, USA, May 17 – 21, 2004

VIV Poultry Istanbul 2004
Istanbul, Turkey, June 10 –13, 2004

VII International Conference on Mycotoxins and Pathogenic Moulds
Bydgoszcz, Poland, June 16 –18, 2004

18th Int. Pig Veterinary Society Congress
Hamburg, Germany, June 28 - July 1, 2004

Fifth International Conference on Bioaerosols, Fungi, Bacteria, Mycotoxins and Human Health
Saratoga Springs, NY, USA, Sept. 10 - 12, 2004

> Literature

[1] Pittet A. (1998) Natural occurrence of mycotoxins in foods and feeds- an updated review. Revue Méd. Vet., 149, 6, 479-492

[2] Council for Agricultural Science and Technology. (2003) Mycotoxins: Risks in Plant, Animal and Human Systems. Report No. 139. Council for Agricultural Science and Technology, Ames, Iowa.

[3] Van Egmond H.P. and Speijers G.J. A. (1994) Survey of data on the incidence and levels of ochratoxin A in food and animal feed worldwide. Journal of Natural Toxins, Vol.3, No. 2.

> Impressum

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