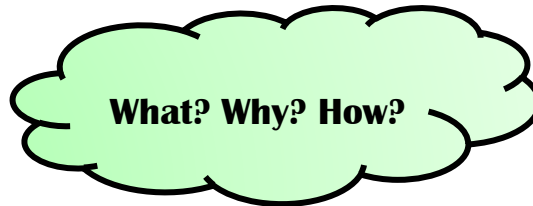


**TOXFIN™ Dry***Maja Sakkers, Taylor Tonkin, KSSA*

Toxfin™ is a unique, non-digestible, broad spectrum mycotoxin binder that contains active absorbents which bind to mycotoxins. The product comes in powder form and can be mixed into the contaminated feed. Toxfin is non-digestible which ensures that the product is stable and active in the entire gastro-intestinal tract. Toxfin is pH stable so that it can be effective in all areas of the digestive tract.

How does TOXFIN™ work?

TOXFIN™ contains active absorbents in the form of specialised minerals, these include activated sepiolite and bentonite (hydrated magnesium silicate). These clays are activated via chemical and physical processes, to enhance specific binding and functional characteristics, giving strong mycotoxin binding capabilities. The mycotoxins bind to the active ingredients via ionic binding, which is similar to magnets, which are attracted to their opposite charges (positive and negative charges pull together and remain “stuck” together). Both the activated clays and mycotoxins contain an array of charges, allowing for ionic bond formation between them. The Kemin research team has done extensive testing, to ensure specific activation processes are optimised and the selection of compounds used give the highest possible binding capacity and safety of our Toxfin™ products.

Do the activated clays affect the animal and feed absorption?

No, Toxfin™ is a non-digestible product. This means that even though the animal ingests/ consumes the product in the feed, the Toxfin™ will not be digested/ absorbed within the digestive process and has no effect on the absorption of feed within the animal. As the product passes through the digestive system it will attract and bind mycotoxins, however the product is not absorbed or digested, therefore passing safely out of the animal. The product is designed in this way to ensure that the mycotoxins can bind to the product and be excreted as waste materials.

Where do mycotoxins come from?

Mycotoxins are toxic compounds produced by moulds. It is believed they are produced as a defense strategy by moulds, to ensure survival of the moulds during difficult conditions. Moulds are ubiquitous, meaning they are present almost everywhere. Thus, mycotoxins can potentially be produced anywhere. Moulds require nutrients, moisture and oxygen to grow and spread, making crops and plants frequent carriers of moulds and mould spores (as well as soil). Most cereals and plant based ingredients are thus potentially contaminated during growth on the field. As these are often major components of animal feeds, contamination may occur from these sources.

What are the risks of feeding mycotoxin contaminated feed to animals?

Unfortunately mycotoxins are toxic and harmful compounds for both animals and humans. Many animals, especially young animals and high performing animals such as lactating animals are especially susceptible to their harmful effects. Most mycotoxins affect the liver and immune systems, making animals more vulnerable to infections and may even result in mortalities. Mostly financial losses are incurred when mycotoxins are present in feed, due to decreased health and loss in productivity of animals. Additionally, some mycotoxins can be

transferred into animal products, such as milk and meat, which can then enter the human food chain. Some mycotoxins are also carcinogenic and thus the consumption of contaminated food products can cause harm.

Does the use of the product affect end products; such as eggs, milk or meat?

No, the product is non-digestible and harmless to any animal products. The product will pass through the digestive tract and absorb mycotoxins, but has no effect on the animal itself or the products produced by animals. In fact, there is often a reduction in mycotoxin contamination in final products from animals consuming a mycotoxin binder, due to a lowered mycotoxin load within the animal. Mycotoxins can however carry over into animal by-products such as milk, eggs and meat, thus prevention of this is important.

Is the product effective in different pH ranges of the digestive tract of the animal?

Toxfin™ has been developed using a model that mimics the normal digestive process (low pH and then a more neutral pH) to ensure binding through the digestive tract. Both in vitro and in vivo testing have been done on the product, to ensure correct functionality, safety and efficacy throughout the digestive system.

Is there any risk from inhalation of the product?

Toxfin™ is a very fine powder, to ensure high surface binding area and efficacy and sometimes a little inhalation of the fine particles does occur when handling the product. The product is not harmful and is classified as non-toxic, non-irritant and non-sensitising, indicating no adverse effects to humans working with the product. If required, some fresh air is recommended to help clear the nose and respiratory tract after inhalation.

Can Toxfin™ be used in breeder feeds?

Yes, Toxfin™ has been developed to be safe and effective in all feed types, including breeder feed and can safely be used in any type of breeder feed and for any growth or reproductive phase.

What about binding of DON, why is this so problematic to bind using binders?

In structure DON is a very compact and globular mycotoxin structure, with high water solubility. There are multiple charges in a small space and thus binding to this mycotoxin is extremely difficult, due to the number and types of charges, which create quite a repellent structure overall. Most mycotoxin binders work on ionic binding, so overall charge, structure and also types and number of charges play a key role in binding efficacy.

What alternatives are there, when DON is present?

If DON is a concern and at low to moderate levels (for broilers between 150 ppb and 1000 ppb), then 300 g/t of ButiPEARL™ (an encapsulated slow release butyric acid) can also be combined with the Toxfin, to specifically support the digestive tract and villi regeneration, due to the cytotoxic effects of DON. Butyric acids provides the major energy source to the intestinal cells and helps improve gut health. The ButiPEARL™ is generally used at the discretion of the customer/ vet/ nutritionist, based on farm conditions and what is being seen in the birds at the time. The ButiPEARL is generally used throughout the cycle, when used, to ensure continued support of the villi and tight junctions. The combination of ButiPEARL™ and Toxfin™ ensure a holistic and cost effective approach to mycotoxin risk management.

We store our maize for up to 6 months in our silos. Can our mycotoxin levels keep increasing over time?

Unfortunately yes, they can increase over time. Notably Aflatoxins and Ochratoxins are the most likely to increase. These two mycotoxins are classified as storage mycotoxins and are well documented to increase during storage and over time, especially in favourable conditions. Other mycotoxins can also show slight changes in levels over time.

What can we do to decrease our mycotoxin levels or at least prevent an increase in levels over time?

Good storage management is critical, especially pest and rodent control, as often damaged grains are more likely to mould and increase in mycotoxin levels. Ventilation and temperature control are also important to reduce mould growth. Moisture levels and keeping them below 12% does also reduce but not eliminate the risk of increasing mycotoxins levels. Treatment of grain before storage with a mould inhibitor has been shown to be highly successful in reducing mycotoxin levels over time as well as preserving the nutrient quality of the grain for longer, resulting in improved bird performance.

I do not have the ability to test mycotoxins or get results quickly enough before the raw materials are consumed. What are the general recommended dosages for broilers, as a preventative measure?

Generally we recommend using 1.5 kg/t of Toxfin for pre-starter and starter rations and then 1kg/t from grower until slaughter. The higher dosage for starter phases is aimed at ensuring less toxins are able to enter the body, allowing for the digestive tract and liver development, which is occurring rapidly during the first week of life, and then later these organs support muscle and then feather growth. Damage to the digestive tract and liver during this critical phase (week 1, after hatching) can have longer term effects, so this is considered the most important phase to focus on, to give the birds the best possible start.

What is the recommended dose of Toxfin?

The recommended dosage depend on the species of animal, the life stage of the animal and the level of mycotoxins present in the raw materials or feed. Generally between 1 and 3 kg of Toxin™/ tonne of feed is used and only high mycotoxin levels will require a higher dosage than 3 kg/ tonne of feed. The table below indicates some general dosage ranges for each species. The Kemin Team can also assist with technical advice and recommendations based on your specific levels and conditions.

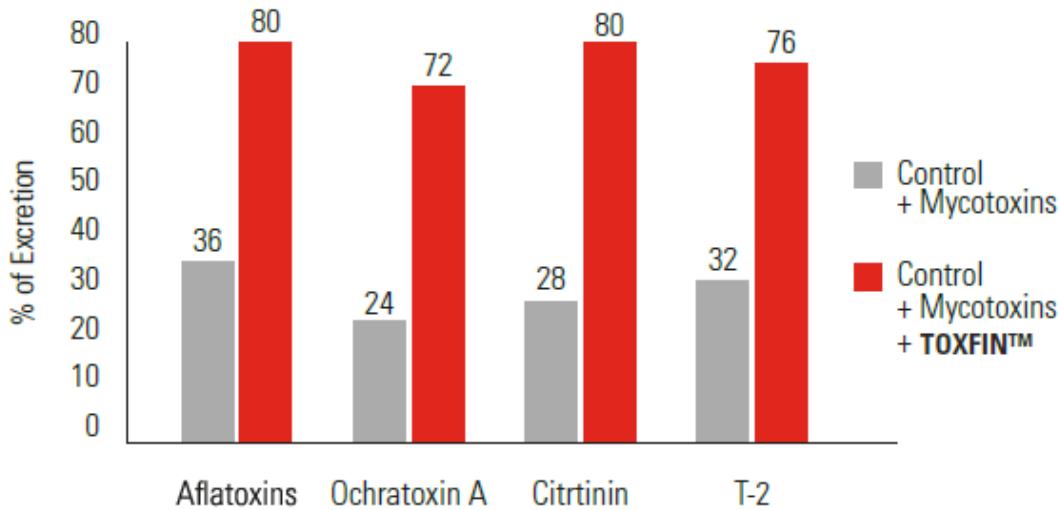
Table 1: Toxfin™ Dry general dosage recommendations (varies based on species, ages, risk as well as mycotoxin levels and type of mycotoxins present)

Feed type	Dose (kg/ tonne)
Poultry	1 – 5
Swine	2 – 5
Dairy/ Cattle	20 - 100 grams per head per day
Horses	2 – 5

Have any *in vivo* tests been done on Toxin?

Yes, *in vivo* testing has been done in broiler birds with results summarised in the graph below.

Graph 1: Toxin™ Dry *in vivo* excretion study results in broiler birds.



Are there any other benefits to adding Toxin™, other than for mycotoxin binding?

Although Toxin™ was developed specifically as a mycotoxin binder, there are some additional potential effects and benefits of the product. The use of the product can help to decrease ammonia production (faecal ammonia), which can cause burnt hocks in poultry, as well as potentially assisting in reducing wet litter and diarrhoea. Clays have also been shown to provide some benefits during pelleting, improving pellet quality, electrical consumption and throughputs in many cases.

Are there any peer reviewed publications for Toxin™?

Yes, we currently have 4 peer reviewed journal articles for Toxin™ Dry, as well as a peer reviewed publication on prevention of mycotoxins in maize during storage, using a Kemin mould inhibitor product Myco CURB®.

References

Kemin Internal Documents: BB-07-00036, SD-20-23111 & TL-20-18559

Brake, J., Hagler, W.M., Jones, F.T., 1989. Effect of Feeding Diets Containing Corn Treated with a Commercial Mold Inhibitor (Myco CURB®) on Broiler-Breeder Performance. J. of Poultry Science, 69, p 37 – 44.