Synergy reduces fungal contamination

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The importance of fungi in animal pathology has been known for years and it has been studied many times. It has been proved in all cases that prevention is the best way to control the problem.

Prevention is basic to optimise control in order to completely eliminate the negative effects of the fungal contamination on the physiology of the animal.

In certain countries raw materials and feeds may be regularly contaminated with fungi occurring as plant pathogens or developed during storage. One of the major adverse effects induced by mould contamination in farm animals is due to the production of mycotoxins by certain species of these fungi.

Nonetheless, other complications can be associated with mould development.

The microbiological status of grains and ingredients determine the nutrient content of the feed after manufacture and, more importantly, the nutrient content of feed delivered to the animal.

Mould growth in field crops or stored grain reduces starch, protein and lipid content and change and decrease the amino acid content with a consequent increase in fibre, and an overall reduction in digestible energy. Moreover, palatability is often adversely affected. All of these factors will negatively affect animal performance.

Effects of mould growth on grains can be summarised in these four points:

- Mould growth changes vitamin content.
- Mould growth reduces energy content.
- Mould growth reduces starch content.
- Mould growth may result in mycotoxin development.

Factors like late and wet harvests are common causes of an excessive mould growth.

During storage, cereals (maize, wheat, sorghum, oats, millet) and complete feeds must be protected from moisture. In conclusion, livestock that consumes these cereals in their feed must have an efficient system to avoid the fungal growth and to avoid the presence of mycotoxins in the diet. It is necessary to be alert to detect fungal contaminations, their multiplication in feed and the clinical symptomatology of the disease, the mycosis.

Moulds associated with feeds include various species of Aspergillus, Penicillium and

Fusarium. The occurrence of these fungi is of particular concern due to their potential to produce harmful mycotoxins, like aflatoxins, zearalenone or ochratoxin A respectively.

Fungal contamination of cereal grains, oilseed meals and forages continues to represent a major animal health risk throughout the world and particularly in humid and hot climates. Inhalation of fungal spores or consumption of mycelia may cause conditions collectively known as mycoses.

Other important risks related with fungal development will be from the ability of particular species and strains of fungi to produce harmful compounds known as mycotoxins.

The use of fungicides and preservatives represents potential methods for reducing the prevalence of fungi. Nevertheless, to reduce the harmful effect of mycotoxins present in the raw material and feeds implies the use of other kind of active ingredients.

In this case the adsorption, the chemical detoxification, is required to avoid negative impact of the mycotoxins in the livestock.

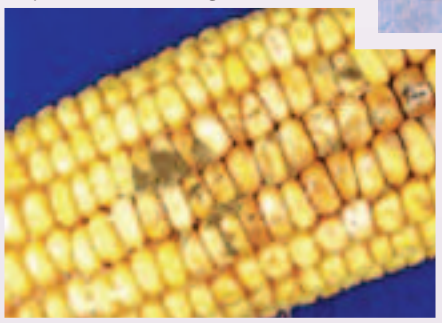
However, it is clear the relationship between mould growth and the presence of mycotoxins. It makes relevant the use of other more complete products to avoid fungal and mycotoxin contamination at the same time in order to more efficiently reduce the deleterious impact of both.

A formulation which combines the activity of the organic acids with the most potent fungicide action their salts and efficient clays created to prevent and treat the mould contamination and eliminate the content of some mycotoxins like aflatoxins, in cereals, raw materials and formulated feeds would be the solution.

Effects on animal health

There are many consistent reports about contamination of feeds with fungi and their spores. In hot climates, Aspergillus is the predominant species in raw materials and feeds, nevertheless it can be distributed worldwide as it is very resistant to climatic conditions and is able to grow in extreme situations.

Other species include Penicillium spp, Fusarium spp and Alternaria spp, which are also important contaminants of cereal grains.



Fungal contamination is undesirable because of the important pathologies induced in livestock. Systemic mycoses are usually related with fungal contamination in production and aspergillosis, induced by different Aspergillus species, is considered the most usual disease. In poultry, aspergillosis is also a very common disease, related to stress, poor disinfection and the administra-

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tion, as in other cases, of mouldy feeds or bedding.

Aspergillosis in poultry, which induces respiratory problems observing nodular formations in the aerial coats, economically is one of the most important diseases.

Mycotoxin intoxication

Aspergillus spp. readily proliferate under warm and humid conditions and predominate in plant products emanating from the warm regions. Aflatoxins are extremely toxic, mutagenic and carcinogenic metabolites produced by Aspergillus.

The growth curve for fungal organism includes a lag phase, an exponential phase where the growth rate is continuously increasing and a stationary phase where the number of mould remains constant. In this period mycotoxigenic moulds starts synthesising mycotoxins as secondary metabolites.

Mycotoxins arise from the secondary metabolism of fungi in response to a wide range of genetic and environmental factors.

Mycotoxin contamination of cereals frequently occurs in the field following infection of plants with specific pathogenic fungi.

In addition, contamination may occur during processing and storage of harvested products and feed whenever environmental conditions are appropriate for spoilage fungi. Moisture content and ambient temperature are key factors affecting fungal colonisation of, and mycotoxin production in, concentrates and compound feeds.

Extensive recommendations and also specific legislation exists for the control of mycotoxins.

Fungal contamination of feeds is a regular occurrence on a worldwide scale and detrimental effects have been observed in all classes of farm animals due to the production of mycotoxins by certain species and strains of moulds.

Aspergillus spp. dominates all other fungi in respect of mycotoxin production in cereals and some oilseeds.

For example, it has been observed that three species are responsible for virtually all mycotoxin production by this genus – Aspergillus flavus, A. parasiticus and A. ochraceus, and among them A. flavus, and A. parasiticus are responsible for the synthesis of aflatoxins.

Poultry are one of the most sensitive animals to aflatoxin contamination. In poultry aflatoxicosis induce mainly hepatotoxicosis and immunosuppression.

The effects observed include:

- Aflatoxin intoxication.
- Reduced performance.

– Reduction in growth and feed conversion.
– Decrease in egg production, egg quality and hatchability.

- Immunosuppression.

– Vaccination failure.
– Increased sensitivity to secondary infections.

- Reduced reproductive efficiency.
- Respiratory and digestive disorders.
- Death.

The exact figures for world economic losses resulting from aflatoxin contamination are very difficult to obtain. Apart from the obvious losses of food and feed, there are losses caused by lower productivity.

Sometimes aflatoxin occurs at concentrations high enough to cause major losses in health and in performance of animals.

However, a more likely scenario is to find aflatoxins at lower levels interacting with other stressors to cause subclinical losses in performance, increasing the incidence of disease. To the poultry farmer these subclinical losses are of greater economic importance than losses from acute effects. In these cases the disease impact can be enormous.

Fungal effects on animals

Pre-harvest control has involved using agronomic practices which minimise mould and mycotoxin accumulation in the field. In this situation the use of fungicides that resolve the problem of mould contamination has shown little efficiency in controlling pre-harvest aflatoxin contamination in raw materials. The best strategies to control mycotoxin presence are done post harvest.

The control of aflatoxins is done by adsorbent material such as clays which, when

added to the contaminated diets, contribute to reducing the effects of aflatoxins in livestock.

However, the application of adsorbent materials does not reduce mould contamination post harvest.

Controlling mould growth and mycotoxin production is very important to the feed manufacturer and poultry farmer.

The use of chemical ingredients, such as mould inhibitors and mycotoxin adsorbents against the presence of moulds and aflatoxins, respectively, are two well established practices in the livestock sector. In every case the product is focused on treating mould contamination or mycotoxin effect separately.

New formulation

Recently, a new generation of feed premixtures has been formulated. These combine both mould inhibitor and mycotoxin binder activity, to fight against global effects induced by fungal contamination.

Association of different ingredients ensures the sanitary quality of feed – organic acids in its free form ensure the higher and faster effectiveness as a mould inhibitor.

Salts of organic acids permit a long lasting action and maintains the microbiological quality of the feeds and raw materials for several weeks. The presence of the free form of mould inhibitor begins to decrease quickly after its inclusion as a result of chemical binding, mould activity, or both.

So, it is important to ensure an effective preservative action including the additive in its salt form which enables a prolonged release of the active ingredient in the time.

Aluminosilicates complement the activity of the feed premixture. They ensure the desired effect against aflatoxin contamination.

A high active surface and a significant cation exchange capability (CEC) are the main characteristics of this active ingredient which ensures the adsorption of aflatoxin molecules present in the feed, but without showing any negative interaction with vitamins, antibiotics, pigments or coccidiostats potentially present in the ration.

Micronised powder formulation makes its dispersion through the feed easier. High dispersion capability influences both the effectiveness of the mould inhibitor and the mycotoxin binder and enhances its benefits.

A dispersion as homogeneous as possible in the feed is a requisite for the proper activity of the mould inhibitor. Particle size of the product is important to ensure that the greater number of particles contact with the feed or feed ingredient.

In general, the smaller the size of product particles the greater the effectiveness, so product is homogeneously distributed and is able to penetrate into feed particles easily inhibiting mould. The use of pelleting technology in the feed industry does not affect the stability of the mycotoxin adsorbent.

On the other hand, the heat that the feed undergoes during pelleting enhances the effectiveness of organic acids. Generally, the higher the temperature, the more effective the mould inhibition during pelleting.

After pelleting, it is also important to control mould contamination and mycotoxin development.

If during storage conditions are not suitable enough to restrict recontamination after thermal processing, mould development in pelleted feeds is faster than in non-pelleted ones.

Processing feed conditions make feed more readily digestible by animals and also more easily digested by moulds.

However, the use of products that include different ingredients and which act synergistically, can improve the efficiency of the feed additive and acti against the fungal effects on animal feeds.

This kind of product favours the handling of the raw materials and feed, decreases the economical impact derived from application of feed additives and increases the efficiency of controlling feed contamination.

The final goal of this type of product is to maximise the quality of the food and the health status of the animals, acting in a global form against fungal contamination.

We must not forget that fungi, as much as the synthesised mycotoxins, are responsible for enormous economic losses in animal production. ■