MYCOTOXIN MANAGEMENT

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MANAGING MYCOTOXINS IN FEED AFTER HARVEST PART 1

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The summer of 2012 presented the grain and livestock industry with a mycotoxin challenge on a scale not seen for many years. Severe heat and drought covered nearly 90% of north America. European producers faced the same challenge in the south, while the north and west experienced extreme wet conditions.

The global trade of grains further exacerbated the mycotoxin challenge, leading to unforeseen toxin interactions and growing concern about the impact of toxins in one region on the quality of feed in another. The conditions reduced yields, grain and forage quality, and served as a precursor for mould growth and mycotoxin production.

The predominant concern for mould growth in the US, the world's largest exporter of grains, was Aspergillus flavus, as it thrives in hot dry weather. This mould and the aflatoxin B1 it produces is a major concern, particularly to dairy farmers, due to its regulation and potential transfer to milk.

Early field scouting confirmed that Aspergillus was present in higher than normal numbers. However, these fields tended to be regionalised. In the areas where aflatoxin is concentrated, it is a serious concern and a considerable amount of milk has been condemned.

Fusarium verticillioides was found in nearly 100% of the fields over the entire cornbelt area. Fumonisin B1 ,B2 and B3, produced by this mould, can have a negative effect on all classes of livestock. It affects ruminant immune status and productivity.

Alltech conducted a harvest analysis throughout the corn growing area of the US. These samples were analysed using LC-MSMS technology. Alltech's 37+ Program identifies 37 mycotoxins, including 'masked' toxins. The percent detection for different mycotoxins are shown in Table 1. Fumonisin was found in nearly 100% of the samples, followed by Penicilliums and the DON Group. It is important to note that over 95% of samples contained more than two mycotoxins.

This presents a compound effect as they can act additively or synergistically and so often have a greater impact on livestock production than may be expected.

Origin	Aflatoxins[1]	Ochratoxins[2]	DON group[3]	T-2 type[4]	Fumonisins[5]	Penicilium mycotoxins[6]	Ergot toxins[7]	Sterigmatocystin	Zearalenone group[8]	Alternariol
IA	0	20	20	20	100	20	0	0	0	0
NC	67	33	33	0	100	33	0	0	33	0
OH	0	50	0	0	100	50	0	0	0	0
PA	10	10	75	45	90	55	10	10	25	0
SD	0	25	13	13	100	63	0	13	0	13
WI	33	33	33	0	100	67	0	0	33	0

[1]Aflatoxins = Aflatoxin B1 + B2 + G1 + G2; [2]Ochratoxins = Ochratoxin A+B; [3]DON group; Deoxynivalenol (DON) + 15-acetyl DON + 3-acetyl DON + Fusarenon X + Nivalenol + DON 3-Glucoside; [4]T-2 group = T-2 + HT-2 + Diacetoxyscirpenol (DAS) + Neosolaniol; [5]Fumonisins = Fumonisin B1 + B2 + B3; [6]Ergot toxins = 2-bromo-alpha-ergocryptine + Ergocomine + Ergometrine/ergonovine + Ergotamine + Lysergol + Methylergonovine; [7]Penicilium mycotoxins = Gliotoxin + Patulin + Penicillic acid + Roquefortine C + Mycophenolic acid + Verruculogen + Wortmannin; [8]Zearalenone group = Zearalenone + α Zearalanol + β Zearalanol+Zearalanone

Table 1. Percent detection of various mycotoxin groups in harvest US corn samples 2012.

The average levels of mycotoxins were also assessed. Many of these levels are at practical limit and require a control programme. However, as they are combined with other ingredients, these levels could pose a more serious threat to livestock production.

Storage

The effects of storage have already been seen in the 2012 crop. Much of the crop was at a more mature stage when harvested and the forage did not compact well. This makes it more susceptible to mould growth and mycotoxin production.

The grain, even though dried sufficiently to <15% moisture, has been subjected to temperature and humidity swings.

There are many instances where mould growth has flourished and continued in storage. This presents an even greater danger for livestock as it is brought out of storage this winter and spring.

Management

Often producers try to find other sources to replace or limit the use of contaminated feedstuffs. However, this year's broad spectrum challenge makes it difficult, if not impossible.

It is also important to realise that most corn and corn silage samples from across the US were contaminated with multiple mycotoxins, and not just aflatoxin. In fact Fusarium is of greatest concern and requires a different approach to maintain livestock health and efficiency of production.

Adsorbents are widely used to manage mycotoxins. These are feed additives that are non-nutritive and are comprised of long polymeric molecules.

They are non-digestible and maintain their characteristics as they pass through the digestive system and are excreted. While in the digestive tract they attract and bind small molecules such as mycotoxins. This prevents the toxins from passing into the blood system and into the system and organs of the livestock.

These adsorbents are classified as inorganic or organic.

Inorganics are made of silica and referred to as clays. Organics are carbon based and are equivalent to plant fibres. Diaz et al. (Mycopathologia 157:223, 2004) has shown polymeric glucomannan adsorbent extracted from yeast cell wall, known as GMA, to be effective in preventing the transfer of aflatoxin into the milk.

GMA has also been shown to be effective in limiting the negative effects of combinations of Fusarium mycotoxins.

Broad spectrum mycotoxin adsorbents are an effective tool to lessen the effect of contaminated feedstuffs on livestock production. They represent the most effective way to utilise the crop you are feeding this year.

Producers need to be sure of the efficacy, traceability and consistency of the mycotoxin binder they choose.

- Has it been tested in-vivo?
- Does it bind essential nutrients (often the case with clay based products)?
- Has its efficacy been demonstrated in independent research?

Protect your herd and your profits! ■

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