What do pig producers need to know from harvest 2021?

Harvest 2021 across the key grain-growing regions of the Northern Hemisphere suffered under the weather conditions that prevailed during both the growing season and the actual harvest itself. Europe experienced a combination of drought in southern regions, while further north, flooding dominated.

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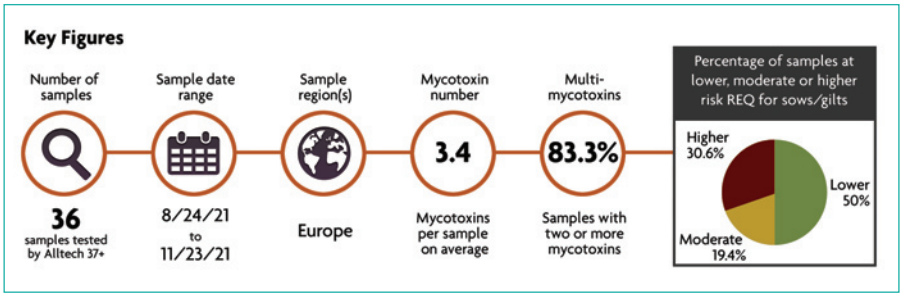

Fig. 1. An overview of straw samples analysed from Denmark.

In the US, drought was a constant issue throughout June, July and August, and it was felt from the upper midwest to as far as parts east of the Mississippi River, covering large amounts of corn-growing country. These effects were compounded by late-season rains that delayed harvest in some regions.

A similar picture surfaced across Canada, with large parts of the country being hampered by severe drought throughout the main growing season. Overall, these weather conditions manifested in a greater threat of mycotoxins from 2021 harvested grains compared to the previous year.

Pig producers across these regions and further afield should be aware of this when purchasing grains and establishing annual nutrition plans.

Annual harvest analyses programmes

Each year, Alltech carries out comprehensive mycotoxin testing programmes across Europe, the US and Canada that help uncover the mycotoxin threat in newly harvested crops. This year, Alltech collaborated for the first time with SGS, a world leader in mycotoxin testing services.

Working together with SGS in Europe on the collection and analysis of corn samples has allowed us to expand the number of samples that we analyse and deliver a larger geographical representation of the crop quality throughout the continent.

Some key themes emerged in Europe this year, including elevated levels of aflatoxins in Central and Southern European corn samples. This can likely be attributed to drought in the region adversely impacting crop quality. A number of the samples (4.2%) tested exceeded EU regulatory levels for the mycotoxin, posing a direct risk to livestock.

In the US, over 70% of 2021 harvested corn samples represented a moderate to higher mycotoxin risk to pigs when Alltech's Risk Equivalent Quantity (REQ) metric was applied to the results. Canadian grain samples showed some notable higher levels of DON and ZEA.

Mycotoxins of most interest to swine producers in 2021 harvested crops

The mycotoxins of most interest to swine producers in 2021 harvested crops include the following:

● Type B-trichothecenes

The results of small grain contamination revealed that 88% and 85% of all barley and wheat samples collected in Europe and Canada, respectively, contained type B-trichothecenes.

Canadian and US corn also contained high levels of type B-trichothecenes (the maximum concentration found in Canada was 1,409ppb, and in the US, it was 1,245ppb). Trichothecenes are toxins produced by several fungal species, such as Fusarium, Trichothecium, Cephalosporium and Trichoderma. These toxins contaminate foods and feeds, in particular cereals.

Type B-trichothecenes include mycotoxins like deoxynivalenol (DON), nivalenol (NIV), 3-Acetyl deoxynivalenol (3-AcDON) and 15-Acetyl deoxynivalenol (15-AcDON).

Susceptibility to trichothecenes varies between mycotoxin type, mycotoxin concentration, animal species/breed and management systems.

Swine are considered sensitive to DON. Clinical signs of type B-trichothecene toxicity in swine include reduced feed intake, lower weight gains, intestinal haemorrhaging, diarrhoea, increased intestinal pathogen occurrence, reproductive failure and even mortality.

● Fumonisins

The European and US results show that 47% and 60% of corn samples, respectively, were contaminated with fumonisins, which are toxins primarily produced by Fusarium moniliforme, Fusarium proliferatum, Fusarium nygamai and Alternaria alternata f. sp. Lycopersici.

The highest concentration of fumonisins has been found in corn samples from the US (31,630ppb). Fumonisins contaminate mostly corn and corn-based human foods and animal feeds and are the most recently characterised mycotoxins.

So far, 12 fumonisins of related groups A, B, C and P have been identified.

Exposure of swine to feeds contaminated with fumonisins can lead to porcine pulmonary edema (PPE) and hydrothorax, while the nervous system, liver and kidneys are also known to be negatively impacted.

● Emerging mycotoxins

The third-largest group of mycotoxins identified in this year's testing programmes are emerging mycotoxins. The highest concentration of emerging mycotoxins was found in a European barley sample (2,617ppb).

Emerging mycotoxins are defined as 'mycotoxins, which are neither routinely determined, nor legislatively regulated,' however, the evidence of their incidence increases year on year. This group of mycotoxins can be produced by a wide range of fungi, including Aspergillus sp., Penicillium sp., Alternaria sp. and Fusarium sp. Currently, in vivo data about the toxicity of emerging mycotoxins in swine are rare, but it is known that beauvericin and enniatins may impact the immune system and bioavailability of pharmaceuticals. Alternariol negatively impact reproductive functions. Tenuazonic acid in chicken can cause inappetence, liver damage, diarrhoea, vomiting, haemorrhages, muscle tremor and convulsion. Phomopsin A and tenuazonic acid are genotoxic, carcinogenic and embryotoxic. Due to missing in vivo evidence about the toxicity of this group, most of the emerging mycotoxins are not a concern for human health (EFSA, 2014).

Zearalenones

Zearalenone is often seen as the mycotoxin that can lead to the greatest challenges in pig production and mainly causes oestrogenic effects in pigs. In pregnant sows, zearalenone has been found to increase the occurrence of abortions and stillbirths.

Zearalenone-contaminated feed can also induce swelling and reddening of the vulva and lead to false heats and false pregnancy. This mycotoxin was much more prominent in US corn samples (28% of samples) compared to less than 5% of contaminated corn, wheat or barley samples in Europe.

Straw: a notable mycotoxin threat

For the first time, we have analysed a representative quantity of straw samples, which were collected throughout Denmark. All barley and wheat straw samples collected in Denmark contained type B-trichothecenes – the average concentration was 2,252ppb, and the maximum concentration was 10,914ppb of DON. As can be seen in Fig. 1, 50% of straw samples analysed present a higher risk of mycotoxins when used in breeding pig production. This flags a potential issue for pig producers in the shift toward more welfare-friendly systems, as producers need to be cautious of mycotoxin exposure risk in straw bedding.

Low risk does not mean no risk

Small grain samples (wheat, barley) show a universal lower mycotoxin risk across Europe and Canada, only presenting around half of the mycotoxin levels contained in corn.

However, pig producers should recognise that 'low risk' does not mean 'no risk,' as research shows that prolonged exposure to mycotoxins can harm livestock, even at low levels. Producers still need to develop a plan to combat the issue.

When assessed individually, the average levels of mycotoxins identified are below the EU recommendation for each mycotoxin.

However, the risk level for productive species based on the Alltech REQ varies from moderate to high when considering the multiple mycotoxin challenge. Although the average REQ for breeding sows and young piglets coming from small grains (wheat and barley) is low, pig producers should be aware that moderate to high-risk pockets exist.

When feeding small grains, at an average REQ of 27 (ppb-AfB1 equivalent) for grow-finish pigs, mycotoxins may impact average daily gain and feed conversion rate (FCR). The estimated average daily gain loss could be up to 16.8g/day, and the potential increase in FCR could be up to 3.36%.

Sustainability suffers under a mycotoxin challenge

A mycotoxin challenge leads to more than just risks to animal health and production profits. By combining mycotoxin contamination data with the impacts on animal health and performance, we are learning more about how mycotoxins also contribute to the overall carbon footprint of an agricultural operation – the greater the scale of the challenge, the greater the impact.

With the services of Alltech E-CO_2, we have uncovered the environmental threat posed by mycotoxins in European feed ingredients, enabling us to understand better how we may be able to manage a challenge that is becoming more and more relevant to European producers (Table 1).

Avoiding the risk of storage mycotoxins

Even if a feedstuff is not directly contaminated at the time of harvesting, the quality of harvested grains and forages can deteriorate significantly during storage, meaning the feed the animals consume some months later may present a mycotoxin risk if the right conditions for mycotoxins to proliferate are present.

This post-harvest mycotoxin risk can come from the exacerbation of mycotoxins that were already present pre-harvest or the development of Penicillium toxins, such as ochratoxin and citrinin, which are more commonly found to develop during the storage of feedstuffs.

There are several key management practices that producers can undertake to limit the potential risk of mycotoxin contamination in stored grains and forages, helping to reduce the negative threat to animal productivity and farm profitability.

These include regular monitoring of grain temperatures, avoiding moisture build-up, sufficient aeration, effective insect control, cleaning of stores and silos between different batches of grain and the use of a routine mycotoxin testing programme.

Recognising a mycotoxin challenge on-farm

There are several key warning signs that pig producers can use to help identify a potential mycotoxin issue in a herd.

By spotting any issues early, steps can be taken to mitigate the impact of mycotoxins on a herd's natural immunity and, subsequently, production profitability.

These warning signs include visible moulds in feedstuffs, reduced feed intake, reduced performance, reproduction challenges or inconsistent faeces.

Mycotoxin management requires a holistic approach, and the only accurate way to understand the true risk in the feeds that animals are consuming is to use a routine mycotoxin testing programme when purchasing feed ingredients and establishing nutrition plans. ■

References are available from the author on request

Table 1. CO_2 emissions of finished pigs fed diets that contain small grains and corn harvested this year in Europe for a baseline farm finishing 18,783 pigs across 179 days.

	Wheat/barley diet (moderate risk)		Corn diet (higher risk)	
	Difference from baseline	Difference (%)	Difference from baseline	Difference (%)
Finished pig, emissions per kg LW (kg CO_2e)	0.05	1.5	0.086	2.63

The difference in intensity per kg emissions (kg CO_2e/kg/LW) between the baseline and a diet containing mycotoxins is equivalent to:		
Flights around the world	58	100
Cars off the road for a year	32	56