Mycotoxin Matters podcast episode #25

**SPEAKERS**

Announcer, Nick Adams, Dr. Max Hawkins, Dr. Radka Borutova

**Announcer** 00:00

Welcome to the mycotoxin matters podcast from Alltech mycotoxin management. As mycotoxins present an ever-increasing threat to livestock production, join us as we discuss these impacts and potential solutions, sustainable farming and our vision for a Planet of Plenty.

**Nick Adams** 00:21

Hello, and welcome to our latest edition of the mycotoxin matters podcast, where we're going to take time in this edition to review the results of our latest harvest analysis projects that have been going on around the world. As we sit here in January of 2023, we now have all of the data compiled for the harvests that have taken place throughout various countries in the northern hemisphere towards at the end of last year, and we're joined by Dr. Max Hawkins and Dr. Radka Borutova, both of whom work for Alltech's mycotoxin management team and who bring with them many years of experience providing technical support back into the feed industry. So Max and Radka you're very welcome to the podcast today.

**Dr. Max Hawkins** 01:24

Thank you, Nick.

**Dr. Radka Borutova** 01:25

Thank you, Nick.

**Nick Adams** 01:27

So Radka, maybe you could start us off and just talk to us a little bit about what exactly have we done as part of these harvest analysis projects? What grains did we test and how were they tested?

**Dr. Radka Borutova** 01:44

Yes, Nick. Basically, what the harvest analysis is. or what the objective of the harvest analysis is to give, ask you the information or as precise information as possible to anybody who is going to purchase grain or is going to use grain forages for the animal feeding and would like to know what is the mycotoxin situation in those. And that's why we always, what we do, we analyze newly harvested grains. When we talk about small grains, we are collecting the samples at the beginning of July. It lasts until the end of September middle of October, when talk about large grains, that’s corn. This is collected, the samples are collected in September, and it lasts until end of November. The same for forages, the straw samples which were also analyzed this year and also previous year in Europe. These samples are collected just right after the harvest of small grain. When we talk about grains, and I talked about small grain then we analyze wheat, barley, triticale and oats in different parts of the world. So, in different regions. If you talk about large grain, then it's corn. And when we talk about silages these are different types of silages, but mainly corn and grass silage. And then we also analyzed straw in Denmark. The methods which were used for the analysis of grains and forages were various because all samples were analyzed in different labs around the world. These labs are using different analytical techniques. Most of the samples nevertheless were analyzed in 37+ labs in Ireland or in Kentucky. The other big proportion of samples were analyzed in Europe by SGS our partner they use LC-MS-MS, HPLC systems which is that chemistry, but also Eliza systems and the straw samples and forage samples were analyzed also in 37+ lab and just to add 37 + lab is analyzing every sample for 54 different mycotoxins but using UPLC MS-MS method. So that was a little bit in a nutshell, what we do. It's the core information is that all is newly harvested grains. It's not the samples which we will be collecting throughout the entire year. But we are focusing on newly harvest grains and forages.

**Nick Adams** 04:39

And Radka, maybe just a point of clarification, when we are collecting those samples, those samples are collected as very much a sort of generic survey, as opposed to maybe some other samples that would come into our labs where there's a specific issue on a farm where we're looking to try and diagnose something. These samples are a random collection of samples.

**Dr. Radka Borutova** 05:06

Exactly, exactly. Nobody knows what these samples are, because they are basically collected before they're used for feed manufacturing. So, they are not causing any problems in the animals, there is no indication the samples are somehow spoiled by molds or have some high mycotoxin loss is just no information. And these are random samples, which we collect ourselves or our customers are sending those samples in the labs.

**Nick Adams** 05:36

Excellent. Thanks, Radka. And so maybe Max, if we if we turn to yourself, there's clearly a lot of data and information that we can glean from the results of the harvest analysis projects. Maybe you could give us a really quick trip around the world and give us some of the sort of top line overview as to some of those insights that have been derived from the results that you've seen.

**Dr. Max Hawkins** 06:05

Yeah, Nick, you're correct with the amount of data that's collected. and even though we, we went through a lot of that data, really all of the data to date, but we're going to continue to go through that data and glean out as we move through the rest of the year. Being able to add that with samples that come in, coming out of storage to see what those trends are. Globally, there's a lot of difference, but yet a considerable amount of similarity as we move different regions, different continents around the globe. The biggest similarity that we see is the weather pattern, and the mycotoxins that's generated from that situation. Many parts of the globe this year experienced some drought conditions, maybe not across the whole continent, but certainly across portions of it. And that made a big difference as we get into those drought conditions, lesser water, lesser moisture available, we tend to see more Aspergillus mold and Aspergillus toxins. That's very evident North America, Europe, Latin America, and even to portions of Oceania. Those types of toxins, even though we still have to deal with them, they may not be as severe in impact as the trichothecenes where we tend to get from wetter weather and every continent experienced some portions of wet weather that generated fusarium molds and the fusarium mycotoxins. Multiple mycotoxins per sample, very consistent going around the globe. One thing I think that we noticed, with the drier weather we thought that aflatoxin might be somewhat of a more major problem. I think it is in portions of Europe. It hasn't been as severe problem as we thought it might be throughout the central and western United States and into western Canada, where the drought was fairly severe. But going around the globe, weather patterns are going to generate consistent mold and mycotoxin trends, no matter which continent you're on. And this year, the greatest amount of risk came from wetter areas that produce fusarium molds and multiple fusarium mycotoxins.

**Nick Adams** 08:42

Thanks, Max. Radka, then if we come back to yourself, and Max has sort of talked about some of those similarities and differences with the mycotoxin profiles that we've seen, which are largely dependent on the weather related to those different growing seasons in the different geographies. If you look at some of those key findings from the mycotoxin risk standpoint, what are some of the interpretations that you make on the harvest analyses that we've seen?

**Dr. Radka Borutova** 09:17

That's a very good question, Nick, because we get plenty of data from many different regions. And it's really difficult, I would say to summarize, but for me, the key findings are quite similar to what Max was going through. I would go just through the issues and then I would like to summarize like maybe the number one defining region, that would be maybe the best way to go through these. So for me, what I have seen, I am based in Europe, and this is something common to Europe and the US, hot and dry weather, as Max already mentioned, is responsible for highest levels of aflatoxins, aflatoxin b1. Again, small grain are very good quality when they look at Europe, look at Canada, and the most prevalent mycotoxins are emerging mycotoxins, but we have to realize that low risk doesn't mean no risk, because we still as Max already mentioned, it talks about multi mycotoxin contamination. Forages are contaminated with high levels of Penicillium mycotoxins. It's a high risk when we look at the risk level. And also, straw, because I'm from Europe, so we have the data from straw. It's a high-risk ingredient because of high levels of type b trichothecenes, but probably we'll talk about this a little bit later. If I have to summarize region by region, and I will have to choose one issue which is like the burning issue in that region. For me in Europe this year, it's definitely aflatoxins, aflatoxin b1. The issue for me produces that high risk and it's coming from corn. When we go to the US, then I think that's deoxynivalenol in the corn when we found very high levels of deoxynivalenol the average was 1700 ppb so corn could be also a highly risky ingredient when we talk about deoxynivalenol contamination in Canada. It's very important I'm again, I repeat, I'm from Europe, but we import a lot of grain from Canada, especially corn. So, corn we found high prevalence of deoxynivalenol, zearalenone, T-2 toxin, HT-2 toxin in corn. So, when we will find these in Ireland or in the UK, and its corn imported from Canada, that's probably the issue. If you go to other regions like India, that's the samples which we tested in India 80% of samples were positive for mold. So, they were moldy and there is a high prevalence of aflatoxin, deoxynivalenol and zearalenone and then when we go to more like peaceful region which would be Australia. Normally, Australia is a country with quite hot and dry weather. We don't have high prevalence of mycotoxins whatever type, but this year was different. There's high moisture, floods, loads of rain, low temperatures which favors fusarium mycotoxins which produce deoxynivalenol, or zearalenone, so definitely, the harvest in Australia is much, the quality of the harvest in terms of mycotoxin contamination is much worse than it was in 2021. And finally if you go to Asia. Asia is just getting a cocktail of different raw materials from all around the world. So, it's very important. Everybody who imports raw material in Asia for some parts of the world, to be aware which mycotoxins are an issue in that part of the world, we cannot compare really conditions in India with conditions in Canada or Europe, or Australia. So, it's very important to know the conditions and mycotoxin contamination profiles of different countries. So definitely some high risk for forages, high risk for straws, low risk for small grain, and definitely corn could be moderate to high risk, depending to what animal species are we going to feed that corn. So how I would like to put it in little bit into a nutshell but it's quite complicated because huge amount of data.

**Nick Adams** 13:43

Yeah, certainly Radka, trying to summarize all of that data across so many countries and different grains and forages is tough, but hopefully, that's giving people a bit of a top line on some of the key things to look out for in terms of some of those ingredients forages and geographic origins. You mentioned earlier that different analytical methods have been used as part of the analysis, and that those different methods test for different mycotoxin panels. So, when you look across the data from those different panels, is there anything that stands out that, you know, between the methods and between the different mycotoxins that have been evaluated?

**Dr. Radka Borutova** 14:35

This is an excellent question, Nick. Because as the raw materials were tested in different parts of the world in different labs, we are not just comparing 37+ analyses with the other wet chemistry, analyses and rapid test kits. They are tested for different amounts of mycotoxins. 37+ is testing for 54 mycotoxins when compared with the other wet chemistry methods like LC-MS-MS or HPLC, or lasers or rapid tests where we are getting results for four to six different mycotoxins. We also talk about the same methods and the difference or using the same method in different labs. Different labs have different limits of quantification. This is also where lower the limit of quantification, a higher probability I will find some, let's say lower levels of mycotoxins. A higher limit of quantification, higher probability, I will miss those mycotoxins so it's not only to compare the methods but it's also to compare the means of quantification among the labs. That's a little bit of an issue. And of course, we have to realize the more mycotoxins we can test for, probability we will find more mycotoxins is higher. If for example, I could test for 1000 mycotoxins out of 1000s. Then the picture I will get finally, is much more reliable, as if I can test for 10 mycotoxins out of 1000s of mycotoxins. This is automatically. So, every time we are testing for more mycotoxins, so like let's say in 37 + is 54 different mycotoxins the probability I can do more proper or better risk estimation is higher. So, I think we can estimate the mycotoxin risk better if we can look for more mycotoxins and if you're just testing for one or two, or three different mycotoxins. This is a little bit difficult, comparing different models comparing different limits of quantification. When reporting we have to be taking all of this into consideration. So, Radka then, as you've sort of laid out that some of those differences in terms of the methods, what mycotoxins have we seen when we use those methods like 37 + that are testing for more mycotoxins? What sort of mycotoxins do we see in those scenarios? That's partly what I already described when I answered the first question. But for example, in small grains we found high prevalence of emerging mycotoxins. 100% of samples, so all samples from Europe, for example, were positive for emerging mycotoxins. And if we wouldn't test for those mycotoxins, we wouldn't know they are there and they are causing the risk for the animals, possibly humans and so on. This is one group of mycotoxins, which we're all testing at 37+ lab, another group of mycotoxins could be Penicillium mycotoxins. We found out that in forages, there's very high prevalence of the Penicillium mycotoxins like penicilloic acid or mycophenolic acid, which if we wouldn't test for those mycotoxins in 37+ lab, we would never find out. We've probably found out that silage, silage, A, B or C is examples that contains some levels maybe of deoxynivalenol, sometimes this and that mycotoxin but the most important mycotoxins in forages or silages are the penicillium mycotoxins. It's high prevalence and very high levels and they are highly risky for ruminants. So, these are mycotoxins, which are not routinely tested. They are also not legislatively regulated. They are very often found there is very high prevalence in some raw materials, especially when we talk emerging mycotoxins, penicillium mycotoxins, the other Aspergillus mycotoxins, and many others, which we take into consideration when we are testing samples in the 37+ lab. That's the difference compared to the other wet chemistry analyses or rapid test kits, Eliza testing.

**Nick Adams** 19:19

Thanks, Radka. Maybe then, Max, we come to you for the final question around the concept of forages. I think we've talked a lot about the grain side of things and Radka has touched on the forage side a little bit based on the results that we've seen from the harvest analysis project. What insights might you give us on the silage and straw samples that have been analyzed?

**Dr. Max Hawkins** 19:49

Well, the forages certainly play a major portion. And as you get into the ruminants and the forage inclusions, they're at a pretty high inclusion rate, particularly on the dairy side. So, even moderate levels of risk when animals consume high amounts of that forage dry matter, that can be quite problematic if we look at it globally, or even compare, let's say, North America to Europe, where all the samples were analyzed with 37+, and you can make that comparison more accurately. All those 40 samples contain six and a half mycotoxins per sample, on average, with 100% of the samples containing multiple mycotoxins. The greatest risk kind of goes by which forage that you're feeding with. With corn silage, that risk is primarily coming from the Type B trichothecenes or the DON deoxynivalenol family of toxins and zearalenone. But yet, as we get into Europe, where we feed a much higher prevalence of grass silage, that greatest risk comes from Penicillium. So different parts of the world forages present different risks, but they can all be quite significant. If we look at it globally, 83% of all forage samples are moderate or high risk. So it bears watching we need producers need to test to know what those risk levels are going to be. When we look at straw which is, it is more prevalent use in Europe than it is in the US because of the additional requirement to bed with, but even in the US where we feed a lot of straw in certain dairy diets, the straw that came from Europe was averaging five and a half mycotoxins per sample. All samples contain multiple mycotoxins, and that risk is coming from a bigger variety. There's a DON family of toxins or the B trichothecenes, zearalenone certainly because typically, where we find higher levels of DON, we can also find higher or more significant levels of zearalenone. But also there was very concerning levels of citrinin and citrinin can be quite problematic to kidney function and a lot of things, particularly as the straw is used, particularly in maternal herds. This can be quite problematic over time, and over 60% of all the samples of straw were at moderate or high risk. So, it does present a problem. Even as you bed with straw animals are going to graze that straw, whether it be a pig or a cow, or a calf, they're still going to graze that bedding. So, there's the risk of adding additional mycotoxin on top of what's in the finished feeds and TMRs. So, forages do present a significant risk. And it really needs to be monitored and it really applies to all forms of forage and not just corn silage or grass, silage, or straw. But the haylages, all the other forages the pea silage, small grain silages they all can present similar risks.

**Nick Adams** 23:38

Well Max, Radka, many thanks for your insights today. And fundamentally, we have taken in the region of 3000 samples from different forages in grains across these different geographies, from this latest set of harvests as it were, and you've tried to give us some very top line stats and insights to take away. If people are interested in greater levels of detail. There are separate webinars that you can log on to and watch historically. And if you visit www.knowmycotoxins.com, that's kn o w mycotoxins.com. You can find links to those webinars. So, Max, Radka, once again, many thanks for your time and your insights today.

**Dr. Radka Borutova** 24:33

Thank you very much.

**Dr. Max Hawkins** 24:34

Thank you, Nick.

**Announcer** 24:34

We hope you enjoyed listening today and look forward to you joining us next time on the Mycotoxin Matters podcast. For more information on the topics discussed, please visit knowmycotoxins.com That's K N O W mycotoxins.com