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Analysis of Mycotoxins in Various Cattle Forages and Food Matrices with the TSQ Quantum Discovery MAX

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Mycotoxins are toxic metabolites produced by certain species of fungi that can infect and colonize on various agricultural crops in the field and during storage. Mycotoxins pose a potential threat to human and animal health through the ingestion of contaminated food products and can have both chronic and acute effects on human and animal health.

This application note describes an LC–MS/MS method for the determination of mycotoxins in various cattle forages. Using this method, it is possible to simultaneously measure the following 12 mycotoxins within 12 minutes: Nivalenol (NIV), Deoxynivalenol (DON), Aflatoxin G1, Aflatoxin G2, Aflatoxin B1, Aflatoxin B2, Fumonisin B1, Fumonisin B2, Diacetoxyscripenol (DAS), T2-Toxine, Ochratoxin A, and Zearalenon (ZEN).

Experimental Conditions

Sample Preparation

The samples analyzed were various extracts of cattle forages and food products. To begin, 25 g of ground sample was dissolved in 100 mL of acetonitrile:water (80:20 v/v). The extract was then mixed for two hours. Afterwards, the extracts were filtered and diluted four times with water. The resulting solution was acetonitrile:water 20:80 v/v.

HPLC

HPLC analysis was performed using the Surveyor HPLC System (Thermo Scientific, San Jose, CA). Each 20 μ L sample was injected directly onto a Hypersil GOLD™ 100 \times 2.1 mm, 5 μ m analytical column (Thermo Scientific, Bellefonte, PA). A gradient LC method used mobile phases A (0.1% formic acid in water) and B (0.1% formic acid in acetonitrile) at a flow rate of 0.3 mL/min.

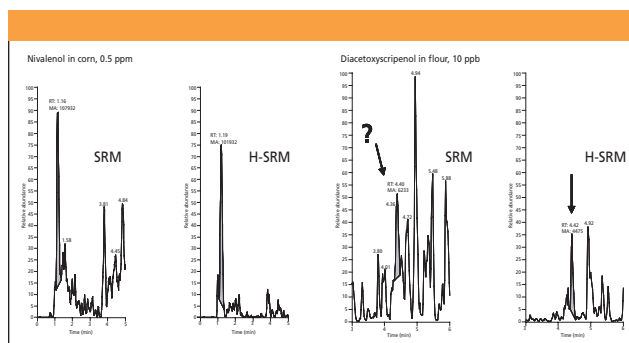


Figure 1: Comparison of SRM and H-SRM data for two samples.

Mass Spectrometry

MS analysis was carried out on a TSQ Quantum Discovery MAX™ triple stage quadrupole mass spectrometer with a heated electrospray ionization (H-ESI) probe in positive ionization mode (Thermo Scientific, San Jose, CA).

Results and Discussion

The TSQ Quantum Discovery MAX offers the unique capability of highly-selective reaction monitoring (H-SRM). Setting the resolution of Q1 at 0.1 FWHM helps to decrease the background noise and eliminate isobaric interferences. This improves the signal-to-noise ratio and results in a lower limit of quantification. Figure 1 compares SRM and H-SRM data for two samples.

The mycotoxin levels found in the various matrices were in the expected range. For example, in a QC-sample used as an internal control, Aflatoxin B1 was expected on a level of 5 ppb (in extract). This level for Aflatoxin B1 is subjected to EU legislation as the low limit of quantification.

Conclusion

LC–MS/MS is a major technique for all kinds of environmental safety and food control laboratories. The TSQ Quantum Discovery MAX is the workhorse of the Quantum series for round-the-clock productivity. Matrix effects are always an issue with LC–MS/MS methods. However, this application note shows that the TSQ Quantum Discovery MAX can help overcome these effects with its unique features of H-SRM and H-ESI. The results presented here were obtained without extensive preparation. A wide range of matrices were analyzed and excellent results were obtained.

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Table 1: H-SRM transitions

Compound	Parent	Daughter (Quan)	Daughter (Qual)	Rt	Conc Range (ppb)
Aflatoxin B1	313	241	285	4.8	0.1-100
Aflatoxin B2	315	259	287	4.5	0.1-100
Aflatoxin G1	329	243	283	5.0	0.1-100
Aflatoxin G2	331	245	275	4.8	0.1-100
Fumonisin B1	722	334	352	4.4	0.1-1000
Fumonisin B2	706	336	318	4.8	0.1-1000
Ochratoxin	404	239	221	5.6	0.1-1000
Zearalenon	319	187	185	5.7	0.1-100
Deoxynivalenol	297	249	231	1.2	0.1-100
Diacetoxyscripenol	367	307	289	4.4	0.1-100