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Multi-Mycotoxin Occurrence in Feed: The case of one dairy farm located in Portugal

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Mycotoxins presence can affect dairy farming with regards to feed contamination and the risks posed not only to productivity but also due to the ability to reach the human diet through the consumption of animal by-products such as milk.

A study aimed to characterize the multi-mycotoxin occurrence in the feed of one dairy farm located in Portugal. To accomplish this, 8 samples from cattle feed was analyzed comprised of the total mixed rations available to the lactating cows and maternity (2), corn flour (1), expanded soybean and minerals (1), grasses (1), cane molasses (liquid) (1), corn sealing (1) and brewers grain (1). Additionally, the litter available in the maternity area was also sampled (1) and it was comprised by straws.

Mycotoxins analyzed were nivalenol (NIV), deoxynivalenol (DON), zearalenon (ZEN), 3-acetyldeoxynivalenol (3-AcDON), monoacetoxyscirpenol (MAS), diacetoxyscirpenol (DAS), aflatoxin B₁, B₂, G₁, G₂ (AFB₁, AFB₂, AFG₁, AFG₂), fumonisin B₁, B₂, B₃ (FB₁, FB₂, FB₃), T-2 toxin, HT-2 toxin and ochratoxin A (OTA). Mycotoxins detection was carried out using high performance liquid chromatograph (HPLC) Nexera (Shimadzu, Tokyo, Japan) with a mass detector API 4000 (Sciex, Foster City, CA, USA).

All the samples presented at least contamination by one mycotoxin. Corn flour was the raw material with higher number of mycotoxins detected (13), including AFB₁ that was detected in only this sample (<0.18 ng/g). In this sample FB₁ presented the higher contamination (873 ng/g). The mixed ration available to the lactating cows was the next sample with higher number of mycotoxins (7). ZEN was detected in all the samples (0.6 – 155 ng/g) with the higher value obtained in the litter sample. DON was reported in 8 of 9 samples (<3 - 197 ng/g) with the higher value obtained in the corn flour. OTA was detected in 5 samples with values ranging from <0.4 to 4.53 ng/g. T-2 toxin and HT-2 toxin were detected in 4 samples and NIV, FB₁ and FB₂ were present in 3 samples. FB₃ was detected in two samples. 3-AcDON, MAS and DAS were only reported once.

Current data obtained in this study gives clear evidence of feed contamination by ZEN and DON with the corn flour being the most contaminated raw material. Although only aflatoxins (aflatoxin M₁) and OTA are regulated in milk and derived products, the obtained results show a complex picture since it can implicate the presence of multi mycotoxins in the milk. Such contamination constitutes a large potential of associated health effects due to the synergistic and/or additive toxicities of these toxins, which are not still fully understood scientifically. Therefore, there is a need for further studies to provide more data related with feed and milk contamination with multi mycotoxins and not only the regulated ones. Further studies should also tackle the mixture effect and possible health effects associated. Farmers should keep developing various strategies to control and minimize the risk of contamination by mycotoxins.

Keywords: Dairy farms; Feed contamination; Mycotoxins; Mixtures