Comparative analysis of fusariotoxins occurrence in wheat, barley and corn grain.

LAURAIN Julia¹, MARENGUE Eric², NACER KHODJA Elise¹
¹OLMIX SA – ZA du haut du bois - 56580 Bréhan, France, animalcare.ts@olmix.com
²Laboecea, Laboratoire public territorial, France

INTRODUCTION

Feed raw materials show different fusariotoxins occurrence depending on the type of culture, as shown by SCOOP survey in 2003. The aim of this study is to identify the occurrence of 10 different fusariotoxins in the 3 main cereals used by the feed industry: wheat, barley and corn grain.

MATERIAL AND METHOD

This study uses the Laboecea database composed of chromatography analysis results run with LC MS/MS from 2013 to 2015 (civil year). 24 fusariotoxins are analyzed for each sample. The percentage of positive samples (> LOQ) and the median level of contamination (ppb) per mycotoxin are the two main criteria used. In order to avoid any geographical interaction, samples from one restricted area only (France) are considered: wheat (n=274), barley (n= 104) and corn grain (n= 336).

RESULTS AND DISCUSSION

- Data shows that corn grain is more poly-contaminated than wheat and barley. On average, 7 fusariotoxins are found above detection limits for corn grain, 2 for wheat and 3 for barley. 72% of the corn samples are contaminated with more than 5 mycotoxins whereas 89% and 72% of wheat and barley samples are contaminated with less than 5 mycotoxins.
- Deoxynivalenol (DON) is the most frequent fusariotoxin (>90% of positive samples) in all cereals, but its median level of contamination is far higher for corn grain (740 ppb) than for wheat (215 ppb) and for barley (75 ppb). These data are in accordance with the conclusion of the large survey run by SCOOP in 2003.
- The levels of 15-O-acetyl DON, zearalenone (ZEA) and fumonisins (FB₁ and FB₂) are also significantly higher for corn grain (153, 135 and 345 ppb respectively) than for wheat (15, 25 and 50 ppb respectively) and barley (20, 25 and 30 ppb respectively).
- Focusing only on straw cereals, wheat shows higher median contamination in DON, T-2 toxin and fumonisins (215, 35 and 50 ppb respectively) than barley (75, 10 and 30 ppb respectively), whereas barley is more often contaminated (% of positive samples) in DON acetyl forms (40.4% in 15-O-acteyl and 17.3% in 3-O-acetyl DON) than wheat (5.8% in 15-O-acteyl and 16.4% in 3-O-acetyl DON). This is in accordance with Rishi et al. (2008) findings showing that all barley isolates had the 15-O-acetyl DON chemotype whereas only 62% of wheat isolates had it.
- The different cropping parameters (time of harvest, use of fungicide…) of corn could explain the important differences in fusariotoxins occurrence compared to straw cereals. Fusarium strains have different developments between wheat and barley and thus may explain the variable fusariotoxins occurrence.

CONCLUSION

This study confirms that corn grain present a higher risk in all fusariotoxins comparing to straw cereals. The fusariotoxins contamination of straw cereals is more complex as the occurrence and the level of median contamination are variable between barley and wheat. DON always remains the major mycotoxin but high contamination of 15-O-acteyl DON, as observed on barley, can also have an important impact on animals because of its higher toxicity. This study confirms the importance of running fusariotoxins profile analysis in order to better evaluate the toxicity of feed materials for animals.