

Fusarium mycotoxins in UK straw from the 2008 harvest – Implications for pigs on straw bedding

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Introduction Straw based production systems are common in the UK compared to other countries. The effects of mycotoxins in cereal feed on livestock performance are relatively well documented with pigs being particularly sensitive to mycotoxicosis. The European Commission has recently set guideline limits for fusarium mycotoxins in animal feedstuffs (Anon, 2006). Guidance limits for feedstuffs for young pigs is 900 ppb deoxynivalenol and 100 ppb zearalenone. A previous study in 2006 identified straw as a potential source of fusarium mycotoxins for livestock on straw bedding. The cereal harvest in 2008 was the wettest for many years in the UK. This resulted in severe losses in grain quality and the highest recorded levels of fusarium mycotoxins in UK wheat and barley grain samples. This project was conducted to evaluate the corresponding levels of fusarium mycotoxins in straw from the 2008 harvest.

Material and methods A total of 58 samples of wheat and barley straw were collected from pig farms across England and Scotland. All straw samples were from the 2008 harvest and collected in July 2009. Samples (ca. 500 g) were collected from several points in the interior of a cut bale. Each sample was dried to ca. 12% moisture content and milled in a hammer mill with a 1mm screen. Zearalenone (ZON) and deoxynivalenol (DON) were analysed using Ridascreen DON and Zearalenone ELISA test kits (R-Biopharm Rhone), which based on the modified extraction procedure had limits of quantification for DON and ZON of 75 and 7 parts per billion (ppb) respectively. Mycotoxin data were normalised using a log transformation and wheat and barley mycotoxin levels compared by unbalanced ANOVA using Genstat software (version 12).

Results The concentrations of fusarium mycotoxins in wheat and barley straw (Table 1) were higher than those found in corresponding wheat and barley grain samples from the same harvest (HGCA, 2009). The concentrations were also higher than those found in a previous study of wheat straw in 2005 (White *et al.* 2007), particularly for ZON. There was significantly ($P < 0.001$) higher DON and ZON in wheat compared to barley straw. High concentrations of fusarium mycotoxins, however, existed in both barley and wheat samples with both cereals having maximum DON and ZON concentrations of ca. 2000 and 4000 ppb respectively. Five barley samples (17%) exceeded the ZON guidance limit for piglet feed (100 ppb) and two samples (7%) exceeded the DON guidance limit for pig feed (900 ppb). Twelve wheat samples (44%) exceeded the ZON guidance limit for piglet feed (100 ppb) and 13 samples (48%) exceeded the DON guidance limit for pig feed (900 ppb).

Table 1 Mean DON and ZON concentrations from UK barley and wheat straw and grain from various studies

Year	Cereal	Product	DON (ppb)	ZON (ppb)	Reference
2005	Wheat	Straw	460	23	White <i>et al.</i> 2007
2008	Barley	Grain	32	36	HGCA 2009
2008	Wheat	Grain	584	121	HGCA 2009
2008	Barley	Straw	166	12	This study
2008	Wheat	Straw	983	499	This study

Conclusions UK cereal straw, in particular wheat straw, can contain high levels of fusarium mycotoxins. There are limited data on the rate of consumption of bedding straw, however one study calculated weaned pigs consumed about 1.6 kg per day. Based on the levels of fusarium mycotoxins found in straw, then this could be a significant proportion of the mycotoxin load consumed by pigs and contribute to sub-clinical (reduced weight gain) and clinical mycotoxicosis. There have been several cases of ZON mycotoxicosis reported within the pig industry since the 2008 harvest. Zearalenone mimics oestrogen resulting in hyperoestrogenism. Symptoms reported include swollen vulva in newborn piglets, reduced litter numbers and increased numbers of weak and/or deformed piglets at birth. Results from this study would indicate that mycotoxins within bedding straw could contribute to mycotoxicosis. Farmers using a straw bedding system should therefore consider straw as a component of the diet and as such it should be tested as part of any veterinary investigation of mycotoxicosis.

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References

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