The choice of the previous crop influences the mycotoxin content in barley and oats

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Problem

The most noxious, toxigenic cereal pathogens belong to the genus *Fusarium* and have been studied mainly in wheat and maize. Little is known about the occurrence of *Fusarium* species and the resulting contamination with mycotoxins in barley and oats.

Therefore, a *Fusarium* monitoring of barley (2013-2014) and oats (2013–2015) across Switzerland was done, whereby information about cropping factors were collected. Thus, we were able to identify the main occurring *Fusarium* species/mycotoxins and to reveal influencing cropping factors.

Occurrence

The dominating *Fusarium* species in barley (n=440) was *F. graminearum* (FG). However, due to the low infection rate, the contamination with deoxynivalenol (DON) and nivalenol was low, as revealed by LC-MS/MS. The maximum limit for unprocessed cereals (1.25 ppm) was exceeded in only seven samples of 2013 and in one sample of 2014.

For oats (n=327), *F. poae* (FP) was the most frequent species. Samples with a high occurrence of FP also showed a high contamination with the toxin nivalenol (r^2=0.51, p<0.001), whereby samples with a high incidence of *F. langsethiae* (2nd most occurring) had higher levels of the toxin T-2/HT-2 (r^2=0.78, p<0.001), which was the dominating mycotoxin in oats.

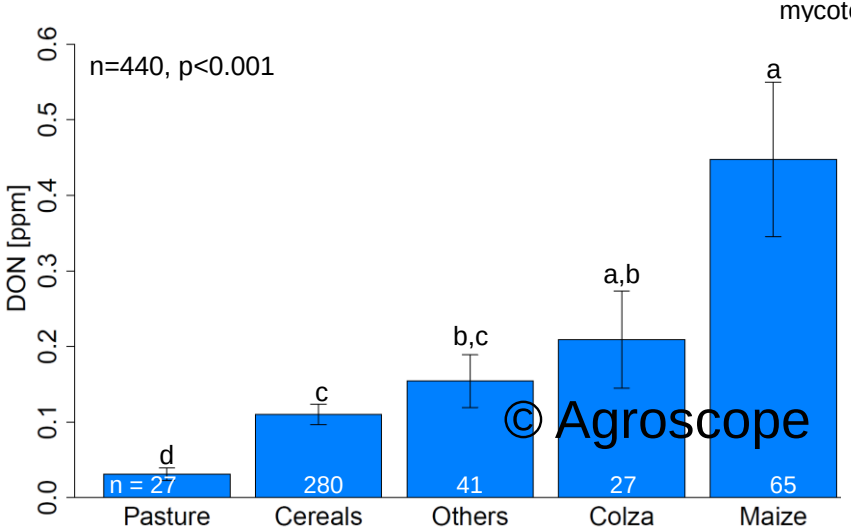

Fig. 1: Influence of the previous crop on the deoxynivalenol (DON) contamination in barley; error bars represent the standard error of mean; means with the same letters are not significantly different (Tukey-Test at α = 0.05).

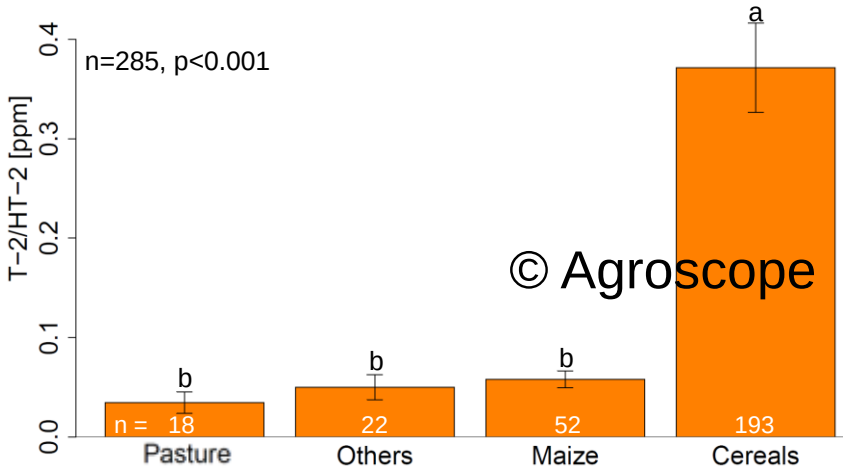

Fig. 2: Influence of the previous crop on the T-2/HT-2 contamination in oats; error bars represent the standard error of mean; means with the same letters are not significantly different (Tukey-Test at α = 0.05).

Cropping factors influencing the DON contamination of barley

The majority of barley samples contaminated with DON were detected in fields were maize was grown before barley (Fig.1). The contamination was even higher in fields where maize followed maize (n=21, p<0.001). The cultivation of winter varieties resulted in a significantly higher (n=440, p<0.001) contamination compared with spring varieties. In addition, higher DON contents were measured in samples with a high nitrogen fertilisation (>200 kg/ha).

Cropping Factors influencing the mycotoxin contamination of oats

The winter varieties showed a significantly (n=285, p<0.001) higher contamination with T-2/HT-2 and nivalenol compared with spring oat varieties. We also discovered that small grain cereals (e.g. wheat, barley) grown before oats resulted in a higher contamination with T-2/HT-2 (Fig.2). The proposed EU guideline limit for T-2/HT-2 of 1ppm for unprocessed oats was exceeded in only 16 samples during the three year observation phase.

Outlook

Ongoing epidemiological studies combined with results from the monitoring will be used to extend the existing forecasting system “FusaProg” towards barley and oats. A close collaboration with several partners along the cereal and nutrition sector was established to ensure the implementation of the results and to promote the cultivation of healthy and safe Swiss cereals.

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