Effect of inaccurate storage on *Fusarium* mycotoxins in maize

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Introduction

Maize is the world's leading grain crop and it is one of the most comune cultivated plants in Hungary. *Fusarium* infection, known as Fusarium ear rot, is a global agricultural problem for crop quality and yield. Some *Fusarium* species produce mycotoxins which can feed on food and contaminate it. This can lead to an increase risk for animals and human health. Major *Fusarium* mycotoxins that can occur in maize and maize-based products are deoxynivalenol (DON), zearalenon (ZEA) and fumonisin (FUM). Their biosynthesis can be impressed by numerous factors counting humidity, temperature, oxygen level, mechanical cereal damage and the presence of mould spores. (Sforza et al. 2006). It should also be considered that fusarium-causing species have different aggressiveness and mycotoxin-producing ability. For example*, F. garminearum* and *F. culmorum* produce DON and ZEA, *F. moniliforme* and *F. proliferatum* produce FUM (Kismányoki 2013).

Materials and methods

Field experiments were conducted in 2017 at 5 sites using the maize variety ES Flato. The difference between each sites was soil type and forecrop. After harvesting, the amount of mycotoxin was measured from each sites as our first measurement time. All samples were stored in BigBag bags to create more humid circumstance and sampled at 3 different times. The three mycotoxins DON, ZEA and FUM was measured with Rosa FAST5 DON/ZEA/FUM Quantitativ test in feed and grain by Charm Sciences, which is a rapid one step assay. For inquiry DON distilled water, ZEA and FUM 70% methanol is added to the ground sample, the next step is shaking vigorously and allow to settle. Supernatant and Diluted Buffer was mixed. After that the diluted extracts from samples are applied to the test strip, incubated for 5 minutes, and read in the Rosa-M Reader.

Results and discussion

The DON toxin was not found in the tested maize. There are lots of reasons for this, for example *F. graminearum* and *F. culmorum*, which are responsible for the production of DON toxin could not be found on the maize, or the storage did not cause stress that triggered the mycotoxin production of *Fusarium spp*. The ZEA occurred only in two samples, at the first measurement time the NG-8 (16 ppb) and NG-15 (107 ppb).

Table1: Maximum allowed and maximum recommended levels of Fusarium mycotoxins in maize intended for use as food and feed component in EU (EC 2006)

Myco-toxin	Max level for food (ppb)	Max level for feed (ppb)
DON	1750	8000
ZEA	350	2000
FUM	4000	60.000

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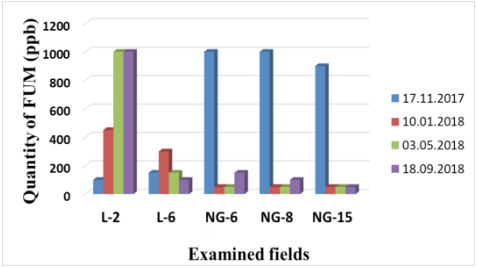

Figure1: Concentrations of FUM mycotoxin in maize harvested in 2017 on 5 different fields

The presence of fumonisin can be found in all samples, as shown on Figure 1. There is only steady increase in the L2 area, 100 ppb at the first measurement, and 1000 ppb in May and September 2018. All in all, the lowest values were measured on the L-6 plot, the highest was 300 ppb. In the next 3 plots (NG-6, NG-8, NG-15), the values measured after harvest were the highest. Since the decrease in fumonisin at a higher temperature begins at 100-120 °C (Dupuy et al., 1993), the higher values suggest that a number of infection nodes were sampled during sampling. Within an item mycotoxins are typically unevenly distributed, so we have to take a sample from multiple locations for representative results. None of the values did not exceed the maximum allowed and maximum recommended levels of *Fusarium* mycotoxins in unprocessed maize (Table 1).

Conclusion

This experiment studied the issue of *Fusarium* mycotoxin contamination of maize in 4 different sampling times from same storage. Only FUM was occured all samples, but not transcend the maximum allowed level even inaccurate storing method were used (high moisture level). The measured mycotoxin level was changing by time. Even the rising of it was predicted, it could be detected only in one case. In others a very high initial level could be found but it should be the result of some mistake in sampling or the handling of the samples.

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