



Sampling for heterogeneously distributed aflatoxins in maize lots from large shipments

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Background

The presence of aflatoxin B₁ (AFB₁) in maize based feed has caused elevated levels of aflatoxin M₁ (AFM₁) in milk in Western Europe, including in the Netherlands in 2013. The AFB₁ levels, up to 250 µg/kg, were not detected during routine controls. Recently, EU legislation on sampling procedures of aflatoxins in large shipments has been adjusted (Regulation (EU) No 691/2013).



Objective

The aim of this research was to study the inhomogeneity of aflatoxins in maize lots for underpinning of laboratory sampling procedures.



Methods

The study consisted of two components:

Literature review to study homogeneity of aflatoxins in the maize production chain

The literature review focused on obtaining insight into the formation of aflatoxins in the different stages of the chain, and the variation in aflatoxin concentrations in maize lots, as reported from previous studies.

Sampling and analyses of a large shipment of maize contaminated with aflatoxins

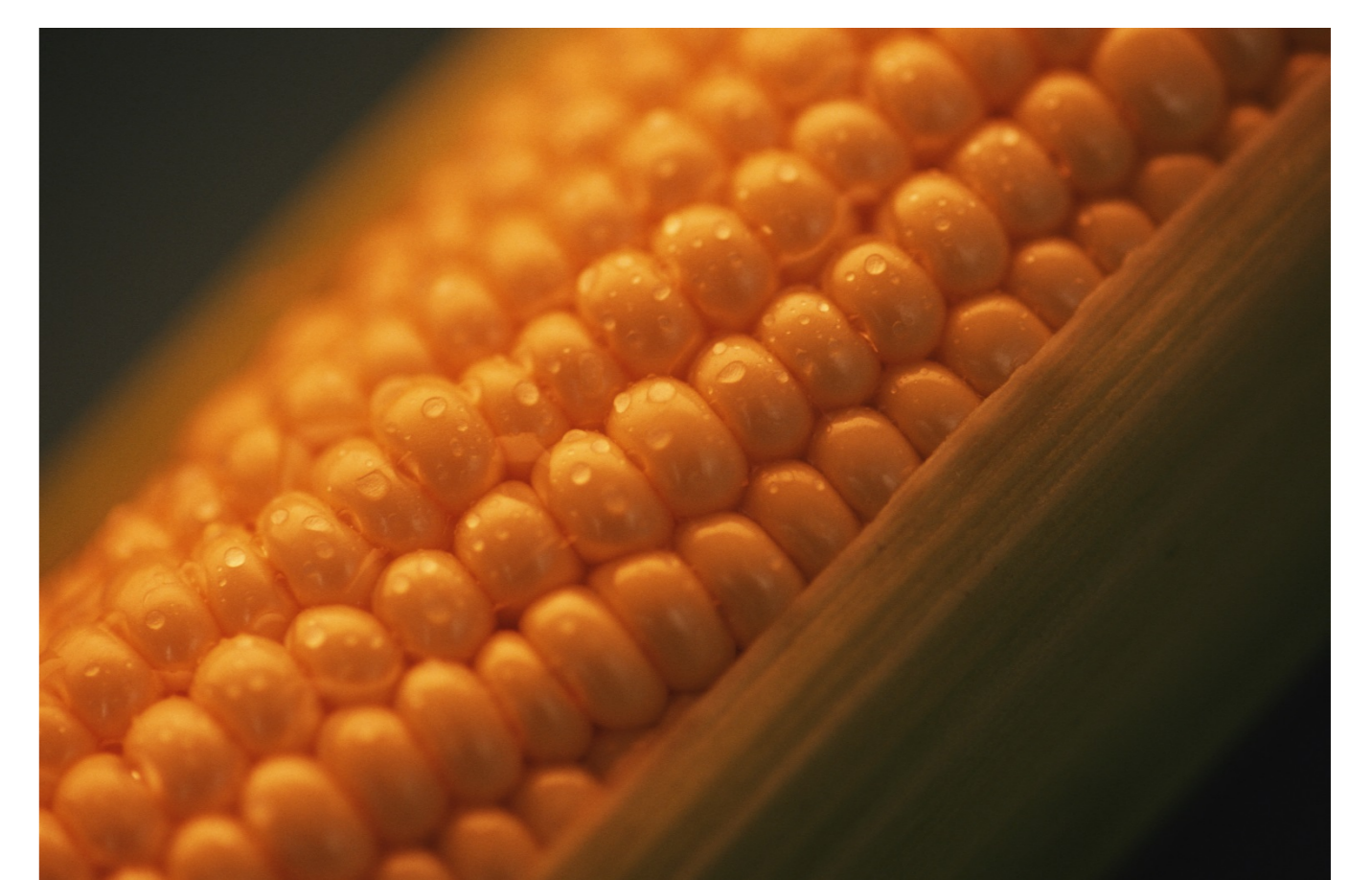
The large maize shipment was sampled to obtain insight into the inhomogeneity of aflatoxin contamination of the load. In total, 70 out of 140 different subsamples were collected and analysed individually for aflatoxin concentration. The obtained insight into the concentration and variation within the lot was compared with the literature results. The remaining 70 samples were used for fungal determination and a growth experiment.

Results

- The inoculation with *Aspergillii* starts at the field where maize kernels damaged due to drought and insects are most contaminated. Inadequate storage conditions during shipment can increase the heterogeneity within a lot.
- Aflatoxin concentrations in maize kernels varied among the 70 subsamples of the shipment. AFB₁ concentrations varied between 6 to 168 µg/kg, with an average AFB₁ concentration of 51 µg/kg.
- The large variation in concentrations was in agreement with the results from literature (see Table 1).
- Sample storage at four different temperature regimes did not lead to enhanced aflatoxin concentration in maize.

Origin	Type of aflatoxin	Range (µg/kg)	Reference
Balkan	B1	6.2-168	De Rijk <i>et al.</i> (2014)
Serbia	B1+B2+G1+G2	1-86.1	Kos <i>et al.</i> (2013)
Pakistan	B1	0-30.9	Shah <i>et al.</i> (2010)
Brazil	B1	6-1600	Machinski Jr <i>et al.</i> (2001)

Table 1. Overview of the variations of aflatoxin concentrations in maize kernels, derived from scientific literature.



Conclusions

- Both literature review and sample analysis show a large heterogeneous aflatoxin distribution per maize lot.
- The inhomogeneity starts at the field and can be increased by storage conditions during shipment.
- Neither sample inhomogeneity nor fungal growth during storage were the cause of non-detection during routine controls.

References

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Acknowledgements

The authors acknowledge the Dutch Ministry of Economic Affairs (EZ) for financial support of this study.

