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Mycotoxins contamination of maize in the season of 2014 and 2015 in the Czech Republic

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Statement of the Problem: Maize is a relatively simple crop in the phytopathology point of view. Only a few pathogenic organisms cause symptoms during vegetation given the soil and climatic conditions of the Czech Republic. The appearance of corn smut is common every year, rust symptoms appear more frequently and primarily ears could be infected by fungi from the genus *Fusarium*. Discussions of diseases always include their economic consequences. *Fusarium* infection can be classified as most important from the economic perspective, not only damage plant tissue, but also decreased corn quality due to mycotoxins production.

Methodology & Theoretical Orientation: Discussions of the onset and course of a disease always include three basic factors which combine to affect the resulting pathology. These factors are: host, pathogen and environmental conditions. Weather condition of excess precipitation at relatively high temperatures in June and August 2014 caused humidity in the most of maize-growing regions in the Czech Republic and other European countries. The increased humidity resulted in a massive outbreak of infection by *Fusarium* fungi and huge content of mycotoxins in grain which exceeded the average amount. Damage from borers was very low in 2014 on the other hand.

Results: Mean deoxynivalenol (DON) content ranged at the level of 10,700 µg/kg whereas the maximum amount reached 28,750 µg/kg. The content of this toxin even increased in the later maize harvest. In harvested green matter, DON content ranged on average around 1.4 ppm. This value was around 2 ppm at milky maturity and 10 ppm at full maturity.

Conclusion & Significance: The European commission constantly monitors the maximum limits in food and fodder. The EFSA proposed derogation for maize grain from the 2014 harvest, but this has not yet occurred. Commodities with mycotoxins content determined above the limit should be excluded from further processing. Eliminating mycotoxins after their detection in a commodity is practically impossible, as mycotoxins resist chemical, physical and thermal deactivation.

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Development of analytical method for aflatoxins and their reduction in soybean-based model systems

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Statement of the Problem: The effects of chemical, physical and cooking treatments on the reduction of aflatoxin B1 (AFB1), B2, G1, and G2 in soybean matrix were investigated.

Methodology & Theoretical Orientation: Two analytical HPLC-FLD methods, trifluoroacetic acid and Kobra cell derivatization methods were compared; latter was selected based on high linearity and sensitivity. To decrease the level of AFs during the soaking process, the contaminated soybeans were submerged in organic acid solutions.

Results: The reduction rates of AFB1 in 1.0 N citric acid, lactic acid, succinic acid and tartaric acid for 18 h were 94.1, 92.7, 62.0, and 95.1%, respectively. In the case of pH and autoclave treatment, the level of AFB1 was significantly decreased during autoclaving process at pH 7.4, 9.0, and 11.1, compared with the non-autoclaved samples ($p < 0.05$). In the case of physical treatment, the heating process at 100 and 150°C for 90 min significantly decreased the level of AFB1 by 41.9% and 81.2%, respectively ($p < 0.05$). The reduction rate of AFB1 after cooking was 97.9% for soybean milk and 33.6% for steamed soybeans.

Conclusion & Significance: This research contains useful information about AF degradation in soybeans. As a future study, the reduction of AFs in various soybean-based food models such as soybean paste and soy sauce should be investigated.

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