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# Rapid Detection of Fumonisin B1 in Maize Kernels (*Zea mays*) Using a Semi-portable Near-infrared Spectrometer

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**Abstract**

Maize and maize based-products are the main commodity affected by fumonisins, a group of mycotoxins produced by the Fusarium genus. Although its presence can be found worldwide, it is commonly found in warm or warm tropical areas. It has been proven that fumonisin B1 (FB1) causes, among other adverse effects, nephrotoxicity and cytotoxicity in mammals and has been classified as a group 2B carcinogen. Because of the danger it represents to humans and livestock, there is an increasing demand to develop techniques that allow the fast detection of mycotoxins. Therefore, the feasibility of a rapid method using a semi-portable near-infrared spectrometer to detect FB1 in maize kernels was evaluated. For this, a submersion method was applied to perform control contaminations with standard solutions at different concentrations of FB1 (0, 1, 5, and 10 mg $kg^{-1}$) on the kernels. The samples were analysed milled and whole with a near-infrared spectrometer (NIRS) in the wavelength range of 900–2,500 nm. PCA results showed good separation between the different concentrations used in both milled and whole kernels. A calibration model was developed by a partial least square regression (PLSR) for each matrix type. Milled samples allowed the fitting of a better prediction model ($R^2 = 0.74$ and RMSECV = 1.30) than whole kernels ($R^2 = 0.63$ and RMSECV 1.56). Although improvements are needed to obtain a more robust model, initial results are promising. This methodology does not require extraction of mycotoxin, like traditional wet chemical analysis, allowing to perform *in situ* analysis, an advantage for the farmer. Therefore, the application of the developed method can help to carry out rapid analysis to ensure mycotoxin monitoring along the production chain, avoiding contaminated materials from entering the food chain.

**Keywords:** Cereals, food safety, mycotoxins, optical method

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