Title Optimising sorting and washing of home-grown maize to reduce fumonisin contamination under laboratory-controlled conditions

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Abstract

Subsistence farming communities with low socio-economic status reliant on a mono cereal maize diet are exposed to fumonisin levels that exceed the provisional maximum tolerable daily intake of 2 μg kg^{-1} body weight day^{-1} recommended by the Joint FAO/WHO Expert Committee on Food Additives. In the rural Centane magisterial district, Eastern Cape Province, South Africa, it is customary during food preparation to sort visibly infected maize kernels from good maize kernels and to wash the good kernels prior to cooking. However, this customary practice seems not to sufficiently reduce the fumonisin levels. This is the first study to optimise the reduction of fumonisin mycotoxins in home-grown maize based on customary methods of a rural population under laboratory-controlled conditions. Maize obtained from subsistence farmers was analysed for the major naturally occurring fumonisins (FB_1, FB_2 and FB_3) by fluorescence HPLC. Large variations were observed in the unsorted and the experimental maize batches attributable to the non-homogeneous distribution of fumonisin contamination in maize kernels. Optimised hand-sorting of maize kernels by removing the visibly infected/damaged kernels (fumonisins, 53.7 ± 15.0 mg kg^{-1}, 2.5% by weight) reduced the mean fumonisins from 2.32 ± 1.16 mg kg^{-1} to 0.68 ± 0.42 mg kg^{-1}. Hand washing of the sorted good maize kernels for a period of 10 min at 25 °C resulted in optimal reduction with no additional improvement for wash periods up to 15 h. The laboratory optimised sorting reduced the fumonisins by 71 ± 18% and an additional 13 ± 12% with the 10 min wash. Based on these results and on local practices and practicalities the protocol that would be recommended to subsistence farmers consists of the removal of the infected/damaged kernels from the maize followed by a 10 min ambient temperature water wash.