Single-kernel analysis of fumonisins and other fungal metabolites in maize from South African subsistence farmers.

Fumonisins are important Fusarium mycotoxins mainly found in maize and derived products. This study analysed maize from five subsistence farmers in the former Transkei region of South Africa. Farmers had sorted kernels into good and mouldy quality. A total of 400 kernels from 10 batches were analysed; of these 100 were visually characterised as uninfected and 300 as infected. Of the 400 kernels, 15% were contaminated with 1.84-1428 mg kg\(^{-1}\) fumonisins, and 4% (\(n = 15\)) had a fumonisin content above 100 mg kg\(^{-1}\). None of the visually uninfected maize had detectable amounts of fumonisins. The total fumonisin concentration was 0.28-1.1 mg kg\(^{-1}\) for good-quality batches and 0.03-6.2 mg kg\(^{-1}\) for mouldy-quality batches. The high fumonisin content in the batches was apparently caused by a small number (4%) of highly contaminated kernels, and removal of these reduced the average fumonisin content by 71%. Of the 400 kernels, 80 were screened for 186 microbial metabolites by liquid chromatography-tandem mass spectrometry, detecting 17 other fungal metabolites, including fusaric acid, equisetin, fusaproliferin, beauvericin, cyclosporins, agroclavine, chanoclavine, rugulosin and emodin. Fusaric acid in samples without fumonisins indicated the possibility of using non-toxinogenic Fusaria as biocontrol agents to reduce fumonisin exposure, as done for Aspergillus flavus. This is the first report of mycotoxin profiling in single naturally infected maize kernels.