



Development and application of analytical methods for the determination of mycotoxins in organic and conventional wheat

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Abstract

The aim of this study was to develop a multicomponent analytical method for the determination of deoxynivalenol (DON), ochratoxin A (OTA) and zearalenone (ZEN), nivalenol (NIV), 3-acetyl-DON (3-acDON), 15-acetyl-DON (15-acDON), zearalenol (ZOL) and citrinin (CIT) in wheat. It also aimed to survey the presence and amounts of DON, OTA and ZEN in Belgian conventionally and organically produced wheat grain and in wholemeal wheat flours. After solvent extraction, an anion-exchange column (SAX) was used to fix the acidic mycotoxins (OTA, CIT), whilst the neutral mycotoxins flowing through the SAX column were further purified by filtration on a MycoSep cartridge. OTA and CIT were then analysed by high-performance liquid chromatography (HPLC) using an isocratic flow and fluorescence detection, while the neutral mycotoxins were separated by a linear gradient and detected by double-mode (ultraviolet light fluorescence) detection. The average DON, ZEN and OTA recovery rates from spiked blank wheat flour were 92, 83 and 73% (RSD_R = 12, 10 and 9%), respectively. Moreover, this method offered the respective detection limits of 50, 1.5 and 0.05 µg kg⁻¹ and good agreement with reference methods and inter-laboratory comparison exercises. Organic and conventional wheat samples harvested in 2002 and 2003 in Belgium were analysed for DON, OTA and ZEN, while wholemeal wheat flour samples were taken from Belgian retail shops and analysed for OTA and DON. Conventional wheat tended to be more frequently contaminated with DON and ZEN than organic samples, the difference being more significant for ZEN in samples harvested in 2002. The mean OTA, DON and ZEA concentrations were 0.067, 675 and 75 µg kg⁻¹ in conventional samples against 0.063, 285 and 19 µg kg⁻¹ in organically produced wheat in 2002, respectively. Wheat samples collected in 2003 were less affected by DON and ZEN than the 2002 harvest. Organic wholemeal wheat flours were more frequently contaminated by OTA than conventional samples ($p < 0.10$). The opposite pattern was shown for DON, organic samples being more frequently contaminated than conventional flours ($p < 0.10$).