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Colour-encoded lateral flow immunoassay for the simultaneous detection of aflatoxin B1 and type-B fumonisins in a single Test line

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Abstract

A multiplex Lateral Flow Immunoassay was developed based on the use of a single Test line and multicolour gold nanoparticles (GNPs) as signal reporters. Red and blue GNPs were linked to antibodies directed towards two different analytes and included in a typical lateral flow immunoassay configuration, in which the Test line was formed by the mixture of two antigens. As a result of the immunoreactions occurring at the Test zone, diverse combinations of red and blue GNPs labels were captured. Therefore, the Test line assumed different colours depending on which - and how much - analyte is present in the sample. The multiplexing capability of the 'colour-encoded assay' is illustrated by the simultaneous detection of aflatoxin B1 (AFB1) and type-B fumonisins (FMs) in wheat and food products that made with wheat. Reproducible detection of AFB1 and FMs contamination in raw and processed food was achieved with visual cut-off levels at 1 ng mL^{-1} and 50 ng mL^{-1} , respectively. The contaminant was identified based on the colour of the label according with a specific colour code. Furthermore, strips images were acquired by means of a common smartphone and analysed through RGB data analysis providing semi-quantitative detection of the two mycotoxins.

Graphical abstract

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