Non-Destructive Rapid Detection and Differentiation of Aflatoxigenic *Aspergillus* species using Fourier-Transform Infrared Spectroscopy in Kenyan Milled Maize

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Abstract

Rapid testing and identification of foodborne pathogens is paramount in the field of microbiology where the concept of food safety directly correlates to overall well-being of the human populace. Household fungi in particular pose serious health concerns due to their ability to produce spores, whose microscopic nature allows them to be easily dispersed in immediate and far-off environments. The detection, screening and identification of these fungal specimens often adopts conventional approaches that are not only expensive, but also time consuming, labor-intensive and hardly yield specific results. Fourier-Transform Infrared Spectroscopy (FTIR) offers a novel approach of rapid fungal screening and identification that is both cost-effective and time-saving; proving to be highly valuable to food processors, importers and traders altogether. The rapid assessment nature of FTIR spectroscopy has been shown to be highly valuable to the food industry, coupled with the fact that samples are analyzed in a non-destructive manner that requires little or no prior preparation. The current study aimed at determining whether aflatoxins were present in milled maize samples sourced from the Rift-valley region of Kenya; and how recovered strains differed from already known aflatoxigenic strains. Samples (whole grain maize kernels) were collected from two administrative counties that are known for high maize production; Uasin Gishu and Elgeyo Marakwet. FTIR spectral analysis was performed using a PerkinElmer Spectrum Two Spectrometer on all 156 samples. Absorbance spectra were obtained within the range of 4000-500 cm-1, with a further resolution of 4 cm^{-1}. Single beam spectra of all the samples were obtained after running a background calibration measurement spectrum of air, which was subtracted at the end of each exercise. Spectra data preprocessing was done through baseline correction and Attenuated Total Reflectance (ATR), after which visualization of the differences in absorbance

between different corn samples was done by plotting the peaks using Origin Pro software. The results showed significant variation in terms of Aspergillus species identity, with strains collected from sampled regions differing from already known aflatoxin producers. Despite aflatoxin levels not being alarmingly high, the discovery of new strains could indicate novelty in terms of strain identity; an aspect that should be investigated further by undertaking longitudinal studies in similar or neighboring Rift Regions of Kenya.