OPTICAL CHARACTERIZATION AND RAMAN SPECTROSCOPY OF AFLATOXIN B1 AND AFLATOXIN-CONTAMINATED MAIZE

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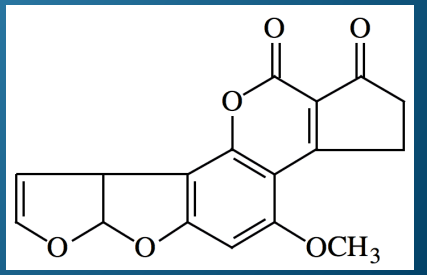
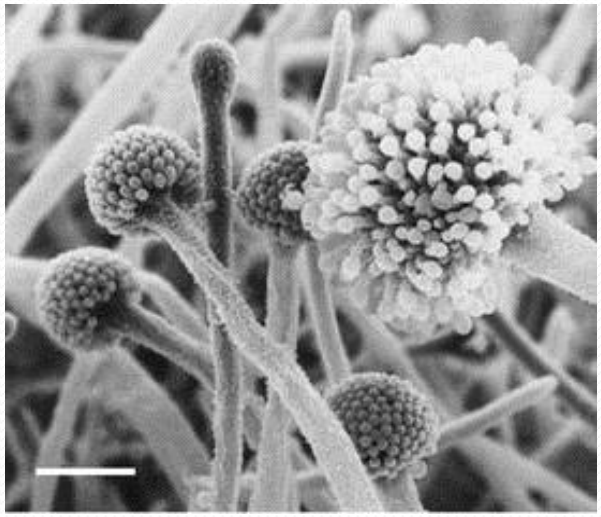
Funded by ISP



What are aflatoxins

Maize infected by *Aspergillus fungi*

Aspergillus fungi Produces; AFB1,AFB2,AFG 1 and AFG2



Conventional methods

HPLC, TLC, LC, ELISA and RIA which are expensive, time consuming

Justification and objectives

Loss of both human and animal lives

Develop a fast and reliable method of aflatoxin detection and quantification

Losses to farmers and –ve economic impacts

Optical methods

- Fluorescence
- IR spectroscopy

Disadvantages

Overlapping, only used in small samples, measures to certain limits

Raman Spectroscopy

Does not need sample preparation

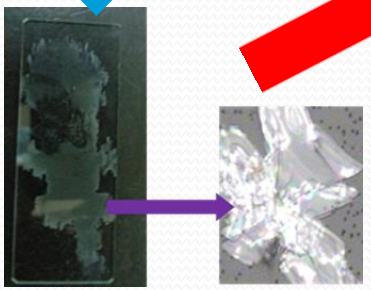
Insensitive to water

Finger printing

Materials and methods

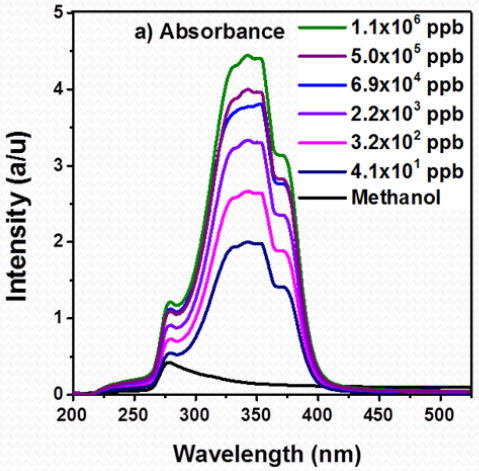
Absorbance and fluorescence

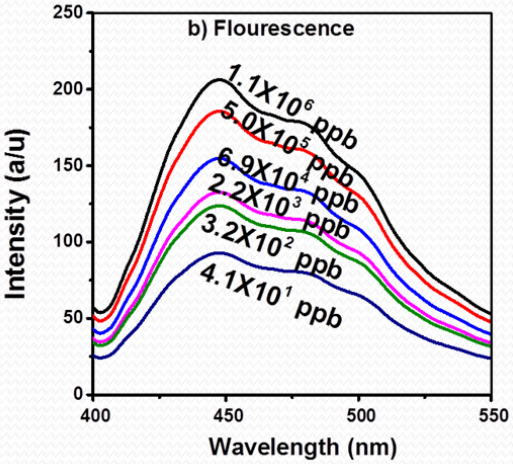
Raman spectroscopy

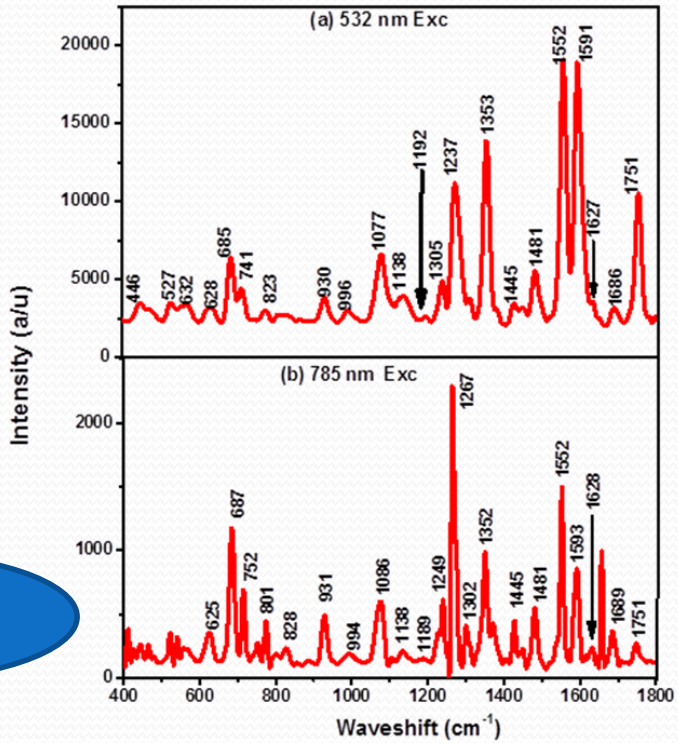


ELISA process

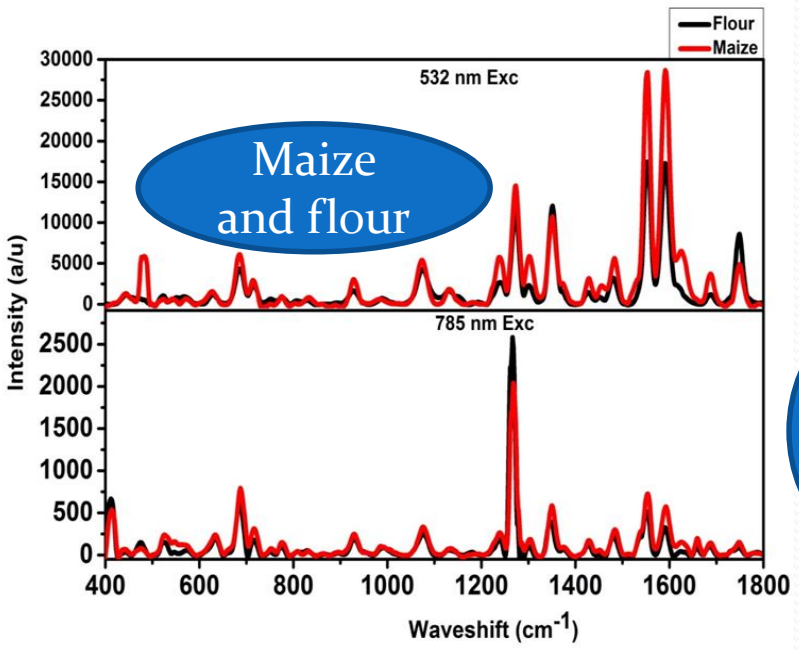
Characteristic AFB1 spectra





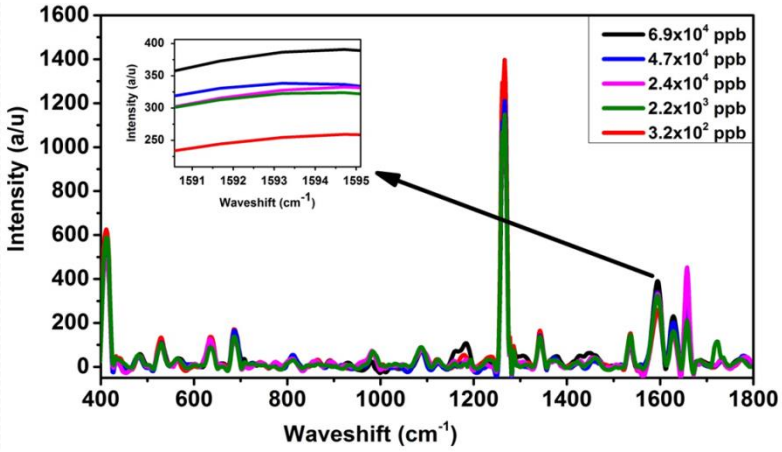


AFB1 on glass-slide

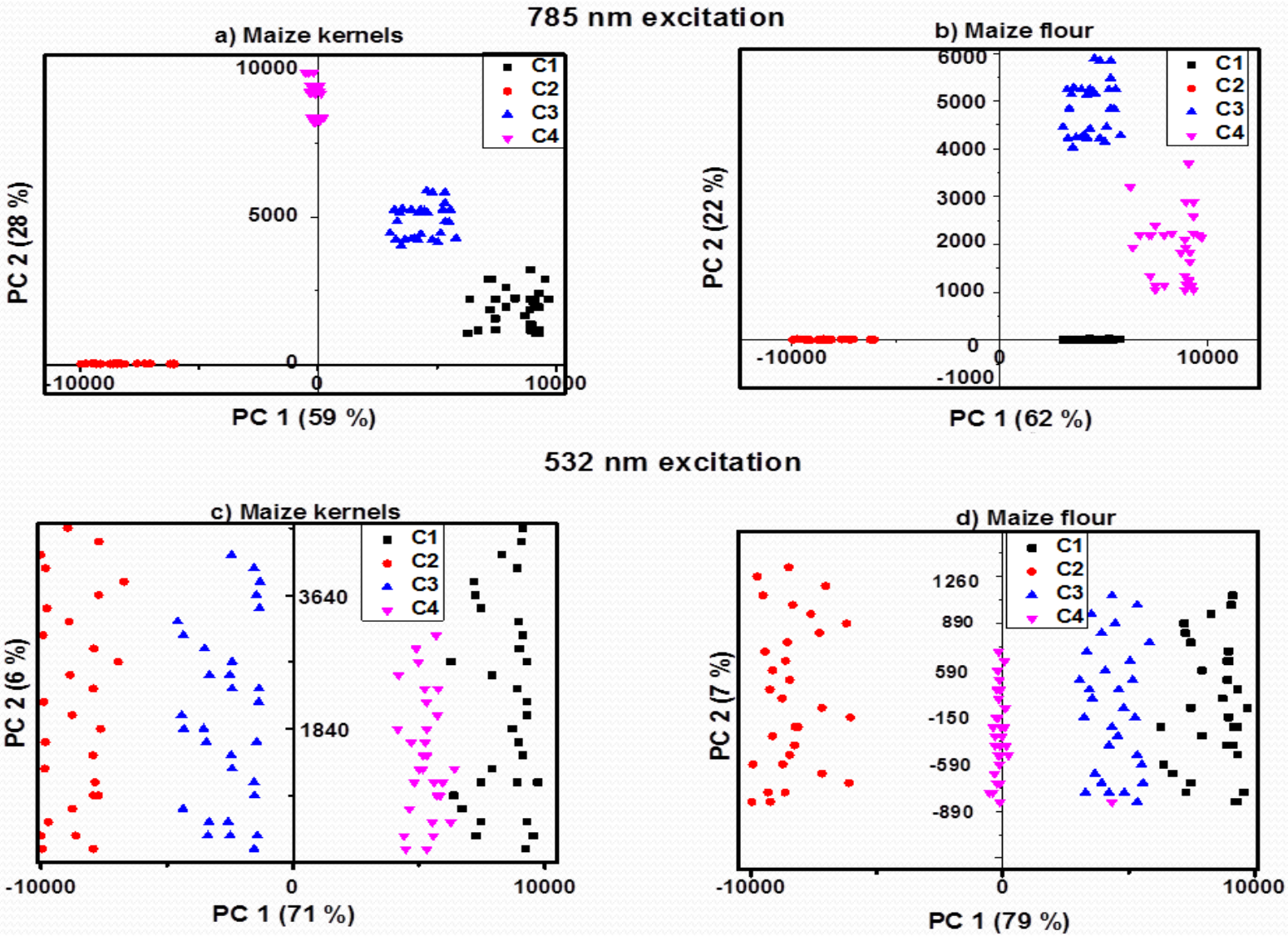


Maize and flour

Several Conc. of AFB1 in kernels

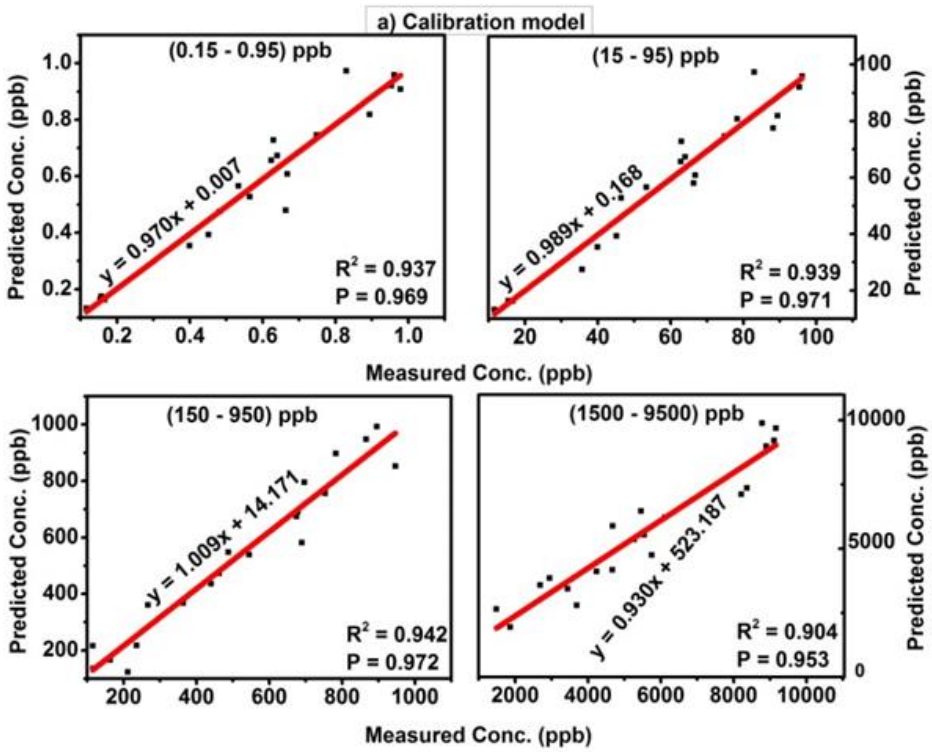


Principal Component Analysis

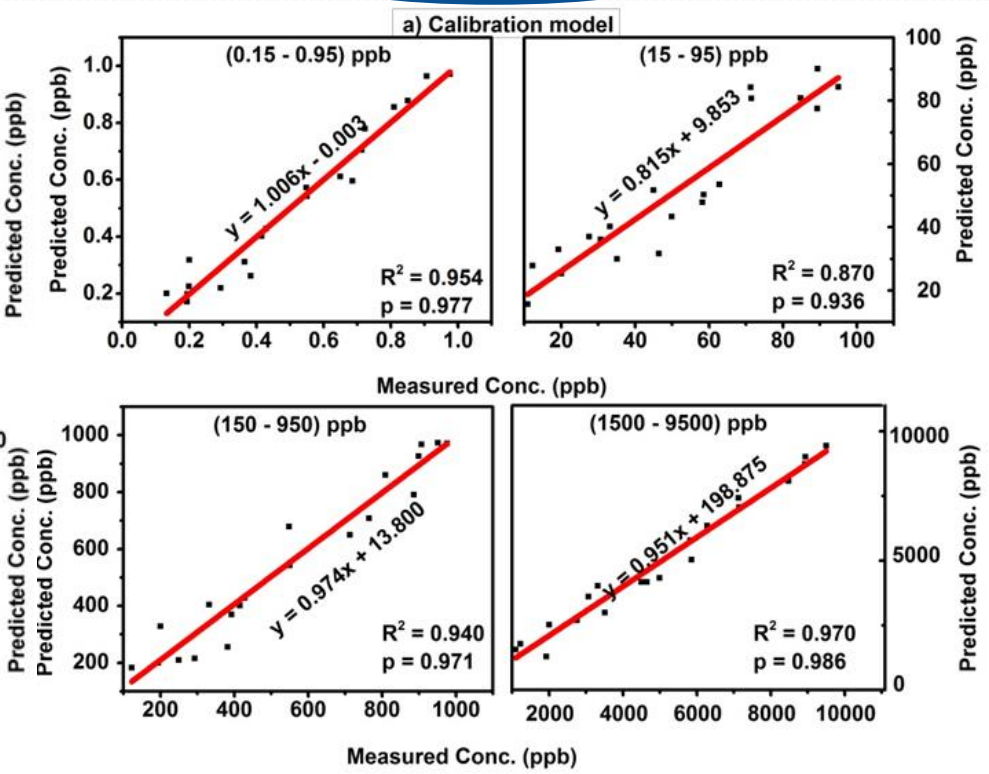


Chemometrics models

PLSR



MLR



Average values of R^2 for kernels and flour were 0.972; 0.931 and 0.768; 0.744 for 785 and 532 excitation respectively

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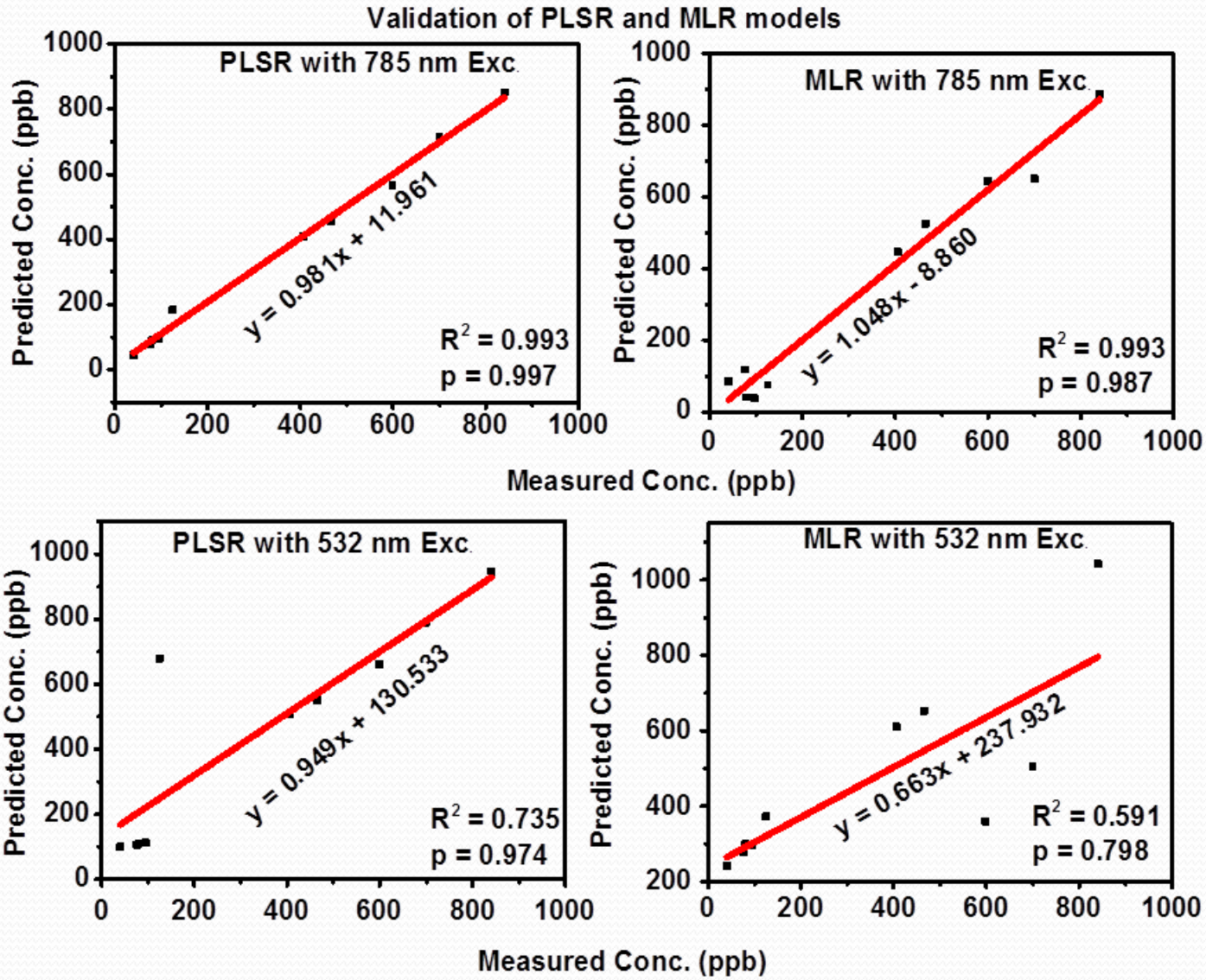
Validation of PLSR and MLR models



Conclusions and recommendations

Absorption and fluorescence was found at 340 nm and 440 nm respectively

>22 AFB1 peaks were found with both lasers with the main peaks at ~ 1552 and 1992 nm

υ(C-C), ring deformation and υ(C-C-C) assigned to the main peaks were responsible for PCA patterns hence detection of AFB1

Nairobi open market maize was quantified at 12 -800 ppb. The model is best with kernels and 785 nm laser than flour samples and lower excitation. PLSR is better than MLR

There was no statistical difference btn ELISA and Raman measurement with both R^2 and $p > 0.9$

We propose the use of pellets and simulates for better detection limits in the upcoming research