QUALITATIVE AND QUANTITATIVE EVALUATION OF POWDERED MEAT USING A HANDHELD NIR FOOD SCANNER

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INTRODUCTION

Determination of the origin and composition of foods is getting more attention. Consumption of certain meats is favored, while that of others might be forbidden based on health, ethical, religious or other considerations, and these practices may differ around the world. The latest horse meat scandal of Europe has drawn the attention to cost effective, rapid, non-destructive testing methodologies that can detect food fraud. Furthermore, there is a need of knowing the amount of some constituents both in food industry and during assorting people's diet.

OBJECTIVE

Detecting the spectral differences of freeze-dried pork and rabbit meat, and predicting fat content by means of end-user type handheld near infrared (NIR) technology.

MATERIALS

- Homogenized freeze-dried pork neck, pork loin, rabbit thigh (n=90)
- Smartphone controlled Tellspec Enterprise Food Scanner, Tellspec Inc., TO, Canada
- NIR spectra : 900-1700 nm interval @ 2 nm

Pork neck 32.91±7.37%

Pork loin 8.67±2.69%

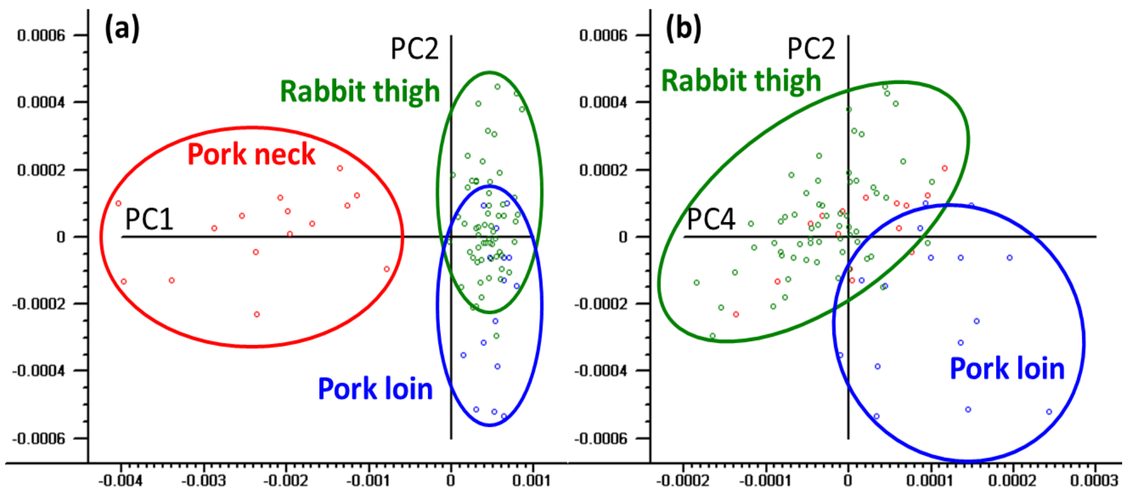
Rabbit thigh 8.24±2.50%

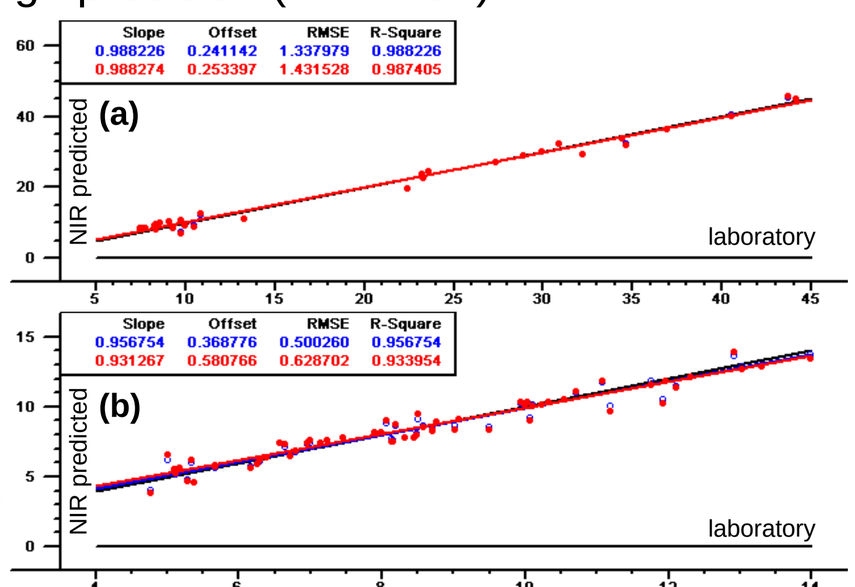
dry matter based intramuscular fat content, mean ± SD

RESULTS

Data pretreatments → Principal Component Analysis (PCA) → Multidimensional patterns → Spectral outliers

- In PCA describing the spectral variations of the freeze dried meat samples, pork neck was clearly separated from pork loin and rabbit thigh based on having significantly larger intramuscular fat content. Pork loin and rabbit thigh showed separation in the higher PCA dimensions, highlighting spectral regions relating to both protein and fat.
- Discriminant analysis (DA) was run using the first ten principal components. 97.8% correct classification was registered during cross-validation.
- Partial Least Squares Regression (PLSR) models predicted fat content with high precision ($R^2 > 0.93$).





Qualitative multivariate models: (a) Separation of the pork neck samples from pork loin and rabbit thigh along the 1st principal component in the non-supervised PCA. **(b)** Separation of pork loin from rabbit thigh in the plane described by the 2nd and 4th PCs in PCA. (c) Identification of the groups with the supervised DA.

Quantitative multivariate models: Results of the PLSR calibrations **(blue)** and cross-validations **(red)** for fat content in homo-genized freeze-dried **(a)** pork and **(b)** rabbit meat samples

CONCLUSIONS

Tellspec Enterprise Food Scanner can identify the spectral differences between freeze dried rabbit and pork meat. Identification is based not solely on differences in fat content. Using the Tellspec Food Scanner, fat content of freeze dried meats can be predicted rapidly and with high accuracy.

MINISTRY OF HUMAN CAPACITIES

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