

Feasibility of Detecting Pork Adulteration in Halal Meatballs Using near Infrared Spectroscopy (NIR)

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ABSTRACT

Halal food is widely accepted, with demand increasing yearly. However, due to advancements in food technology, pork adulteration, particularly in homogenous meat products, occurs frequently through attempts to gain monetary benefits. In this study, we used near infrared spectroscopy (NIR) to detect pork adulteration in meatballs. A long wavelength NIR (1000-2500 nm) was used to create a partial least square (PLS) regression model. The results showed that the model of beef meatballs had an R^2 -val of 0.88, a SECV of 3.45% and a bias of 0.14%, respectively. For chicken meatballs, the model had an R^2 -val of 0.83, a SECV of 4.18%, and a bias of 0.22%, respectively. Considering the strictness of Halal guidelines, the obtained prediction model had a high SECV (3.45% and 4.18% for beef and chicken meatballs) for the detection of pork adulteration in Halal foods. NIR acquisition of meatballs at 25°C and grilled products provided a good result, but frozen meatballs did not. However, considering several advantages of the technique – speed, reduction in required sample preparation and low cost – NIR proved to be a promising technique for screening pork adulteration in Halal meatballs.

Keywords: Near-infrared spectroscopy, Pork adulteration, Meatballs, Halal foods

INTRODUCTION

Islam is one of the world's largest religions. It has been estimated that, in 2009, there were 1.6 billion Muslims, about 23% of the world population (Pew Research Center, 2013). From the Muslim point of view, the decision to choose one food over another depends on its Halal status. Islamic dietary guidelines permit the consumption of Halal foods. According to these guidelines, Muslims cannot consume the following: pork or pork byproducts, animals that are dead prior to slaughter, animals not slaughtered properly or not slaughtered according to Islamic guidelines in the name of Allah, blood, and blood byproducts.

Halal food is widely accepted, with demand increasingly yearly. Most of the food products available on the market show a certificate of Halal label on the package to attract Muslim consumers. However, due to advancements in food technology, adulteration and fraud, via the addition of cheaper meats such as pork,