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羊肉纯度电子舌快速检测方法

Fast discriminating of purity on minced mutton using electronic tongue

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中文摘要:

为实现掺假羊肉的快速、客观评价，利用电子舌对混入不同比例鸡肉的掺假羊肉糜进行检测及定性和定量分析。3种浸提溶液分别浸提，样品量均对电子舌传感器的响应影响极显著；以数据点重复性和聚类效果为依据，采用主成分分析方法确定了电子舌检测羊肉糜样品的较佳条件为0.1 mol/L KCl溶液浸提15 g肉糜样品。在此较佳条件下，对混入不同比例鸡肉的掺假羊肉进行检测，结果表明：采用主成分分析和典则判别分析，前2个主成分累积贡献率均超过80%，电子舌均能很好地区分混入不同比例鸡肉的羊肉糜样品；采用多元线性回归分析和偏最小二乘回归分析建立的定量预测模型能有效预测混入的鸡肉比例（R2>0.99，RMSE<3%）。试验表明：电子舌在羊肉掺入鸡肉的鉴别中具有可行性，研究结果可为羊肉掺假鉴别提供参考。

英文摘要:

Abstract: Cheaper animal protein, such as Chicken as an example, has been fraudulently used as a substitute for more expensive animal proteins, like mutton and beef. The adulteration of mutton has attracted increasing attention. It requires reliable methods for the authentication of mutton adulteration. An electronic tongue with chemically modified field-effect-transistor sensors was employed to analysis the adulteration of chicken in minced mutton. The effects of sample weight on the sensor responses of electronic tongue were studied at three different extraction solutions. Analysis of variance found that the sample weight affected the responses of the sensor significantly. With the help of Principle component analysis (PCA), the optimum experimental parameters were acquired: 15 g sample extracted by 100 mL KCl solution.The adulterated mutton was made by mixing mutton with chicken at levels of 0, 20%, 40%, 60%, 80%, and 100% by weight, respectively. With the optimum experimental parameters, 168 samples of adulterated mutton were detected, and the signals were analyzed by pattern recognition techniques to build models for classification of adulterated mutton with different content of chicken, and prediction of the content of chicken in minced mutton. With PCA, the adulterated mutton samples were grouped according to their content of chicken with good classification results, except that samples containing 80% and 100% chicken partially overlapped with each other. Better classification results were found when canonical discriminant analysis (CDA) was employed, as samples containing 80% and 100% chicken were clearly grouped and separated. Multiple linear regression (MLR) and Partial least square analysis (PLS) were employed to build the predictive model for the content of chicken adulterated into minced mutton. Both models could predict the adulteration with a high determination coefficient as high as 0.9925 and 0.9923, respectively. MLR was more effective for the prediction of chicken content. The E-nose proved to be a useful authentication method for meat adulteration detection for its efficiency and high accuracy.

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