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Online monitoring three dominant spoilage bacteria growth on pork using a four porphyrins composed colorimetric sensor array chip coupled with multivariate analysis

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Abstract

An online monitoring method based on colorimetric sensor array chip was developed for monitoring the three dominant spoilage bacteria (*Enterobacter cloacae* P5, *Brochothrix thermosphacta* S5 and *Pseudomonas koreensis* PS1) on pork. The colorimetric sensor array chip was made by printing four porphyrins materials on a reverse phase silica gel plate. The pork meats samples were monitored one day (24hours) under 20oC by the chip. Every 8 hour, the total viable bacterial count (TVC) of each pork sample was measured. A color change profile for each sample was obtained by differentiating the images of the sensor array before and after exposure to the odor of pork meat sample. Firstly, the digital data representing color change profiles were correlated with TVC by using partial least-square (PLS). The predication models were obtained with r = 0.815, 0.835, 0.752 for *Clostridia*, *Brochothrix thermosphacta* and *Pseudomonas*, respectively. Secondly, the color change profiles for the pork samples were used to distinguish the three dominant spoilage bacterial on pork by principal component analysis (PCA) and *K*-nearest neighbour analysis (KNN). The discrimination rates of KNN model were 0.700, 0.875, 0.897 at 8h, 16h, 24h in prediction set, respectively. This research suggests that the method is useful for monitoring bacteria growth and identifying the three dominant spoilage bacteria of pork and perhaps other meats containing high protein.