

Abstract

The potential of the electronic nose (E-nose) and the mass spectrometer-based E-nose (MSE-nose) to monitor changes in apple fruit volatiles during shelf life was studied. These techniques were compared with a traditional technique to measure volatiles, gas chromatography combined with mass spectrometry (GC/MS). Apples were stored for 8 months at three different storage conditions and the volatile profile changes were followed subsequently over a period of 15 days. Analysis of the score plot of the principal components analysis for the E-nose measurements showed no storage history effect and only very little shelf life effect. In contrast, the MSE-nose and GC/MS score plots clearly indicated the presence of both shelf life and storage history trend. Moreover, the volatile profile changes during shelf life depended on the storage history. The loading plots of the PCA of the GC/MS data revealed which volatiles are important to differentiate between storage conditions and which ones are important during ripening on the shelf.

Partial least square (PLS) models based on the three data sets to relate firmness and days of shelf life with the volatile production of apples were built based on the three data sets. It was found that the models based on the E-nose data had worse prediction performance than those based on the MSE-nose data. Both for firmness (0.95) and days of shelf life (0.98) a high cross-validation correlation was observed between measured and predicted values. The standard error of prediction (S.E.P.) of firmness and shelf life were $2.38 \times 10^6 \text{ Hz}^2 \text{ g}^{2/3}$ and 1.02 days, respectively. Models based on the GC/MS data showed comparable results.