Determination of Olfactory Quality of Nuts with the Airsense System

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Sensory quality is a great concern for nut producers. Gas chromatography based instruments have been successfully applied to differentiate good hazelnuts from rotten ones for at-line testing. In this application, the Airsense.net was chosen due to its speed for online measurement of nuts quality. The objective of the study was to detect rotten / rancid hazelnuts in between good ones.

Materials & Methods

Samples & Analytical Conditions

10 hazelnuts of a same quality (rotten or good) were filled into a 100 ml vial (Figure 1). The headspace was generated by heating the sample at 50°C for 20 minutes.

The headspace was then analyzed in scan mode with the sample pressure being set to 25 mbars. Hg (medium energy) ionization mode was used.

First, the ions specific to good and bad nuts were identified by performing scans from 40 to 123. In a second step, these ions were monitored in SIM mode allowing for higher sensitivity and faster measurement speed. Vials containing 1, 2, 3 or 10 of 10 rotten nuts were analyzed with this latter method.

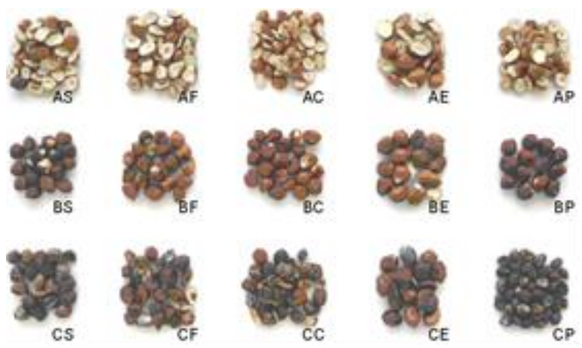

Fig. 1: Hazelnut samples analyzed with the Airsense system

Equipment

The analysis was conducted using an Airsense multi component analyzer (Fig. 2).

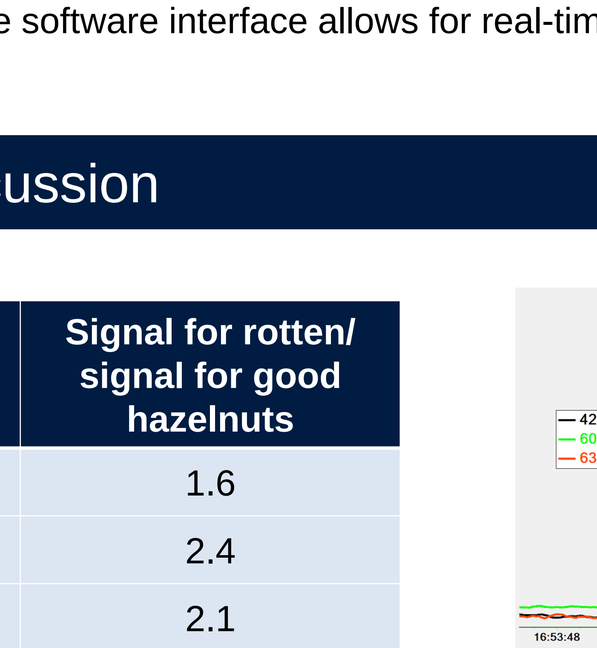

Fig. 2: Airsense analyzer and schematics of working principle

Low energy (10 - 14 eV) and highly efficient ionization allows for low level detection of volatiles with minimal fragmentation. After ionization the analyte ions are separated using a quadrupole mass filter and an electron multiplier.
The software interface allows for real-time readouts of the signals.

Results & Discussion

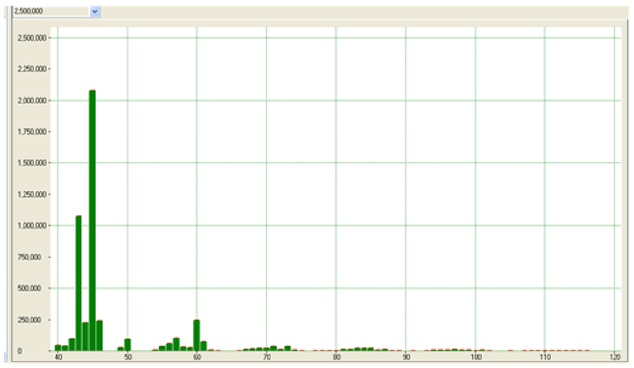

Figure 3: Spectrum of a rotten hazelnuts sample

Mass (amu)	Signal in good nuts (cps)	Signal in rotten nuts (cps)	Signal for rotten/ signal for good hazelnuts
42	62 360	98 940	1.6
60	104 740	249 240	2.4
63	2 940	6 200	2.1

Table 1: Masses characteristic of rotten nuts and their quantity compared to the one in good nuts

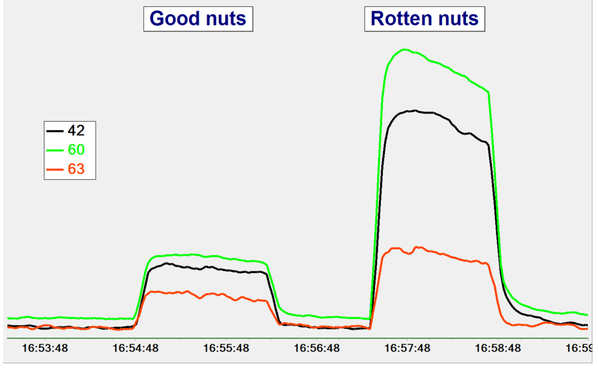

Figure 4: Online signals of masses 42, 60 and 63 obtained for 10 good/rotten hazelnuts

Upon recording and comparing the spectra of the 2 qualities of hazelnuts (Fig. 3), it could be determined that masses 42, 60 and 63 were important for the discrimination. They are present with a higher intensity in rotten hazelnuts (Table 1).

These masses were monitored in SIM mode for a sample containing 10 good nuts and another one containing 10 rotten ones (Fig. 4).
Based on the results above, the limit of detection can be estimated being between 1-3 nuts out of 10. Running mixtures confirm the performance at 3 bad ones, but while the results are promising, it still has to be proven for lower LOD.

CONCLUSION

In this study the feasibility of instantly discriminating rotten hazelnuts from good hazelnuts could be demonstrated with the Airsense system.
The next step will be to optimize the detection parameters, to reach 1 out 10 limit and evaluate the sampling process for an online detection system.