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Candida milleri detected by Electronic Nose in tomato sauce

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Abstract

The tomato sauce is a product of great importance for its massive production in Italy. Microbial contamination is a constant concern for the industries, causing severe economic losses, posing risks to consumers' health and contributing to an enormous wasting of food. This work shows how the use of the Electronic Nose (EN) EOS 507C can be effective compare to the current procedures in the food production. EN composed of an array of thin film sensors, 6 Metal Oxide (MOX). All the samples were analyzed in parallel with classical chemical technique, like GC-MS with SPME.

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Keywords:

1. Introduction

Electronic Nose EOS 507 C (EN), was identified in the past few years as valuable candidates for food quality control due to their simplicity of use, low cost, rapidity, stability and good correlation with sensory human panels. Microbial management is a crucial task in food processing industry[1]–[3]. Microorganisms that contaminate the raw material can persist in the treated product, creating problems for the health of the consumer. Microbial contamination can clearly affect processed tomato, thus responsible both organoleptic adulterations and potential

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health risks for humans. Pioneering techniques for a rapid and reliable diagnose of spoilage, such as electronic nose technology, are highly requested in order to guarantee food safety and to improve production. For this reason it is very significant to do an accurate and fast control of individual batches produced before the selling. The availability of fast, reliable and simple to use monitoring tools for food products is consequently a target both for safeguard of customer's wellbeing and production improvement[4].

2. Materials and Methods

For this work has been used tomato sauce production of Consorzio Casalasco del Pomodoro Soc. Coop.Arl. This matrix has been contaminated with a known concentration of *Candida milleri* YAB 15, yeast in charge of major fermentation of tomato and high losses to product. Tomato sauce was inoculated with 10 µl of cells suspension in 100 ml of simple and, incubated at 28° C for 21 and 25 hours.
Subsequently was aliquot in 10 ml vials and incubate for another 3 hours before the measurement. All the samples, contaminated and uncontaminated were analyzed by the EOS507C; the analysis were repeated to confirm the accuracy of the responses observed. The EOS507C is an innovative device because is equipped with a system for the adjustment air humidity to a fixed Dew Point (DP) value, calculated to optimize the instrument regulation capability based on the measured reference baseline air humidity.

3. Results and Discussions

The results obtained using the electronic nose are very positive. In Figure 1 it is possible to see the distinctions between tomato sauce contaminated and uncontaminated samples. Headspace analysis done with SPME techniques was performed in parallel to EN analyses[5]–[7]. The development of *C.milleri* (Figure 2) leads to the creation of several organic volatile compounds (VOCs). This alteration of the original organic volatile profile in the contaminated samples was demonstrated since 22h after inoculation and supports the EN's results (Figure 3).

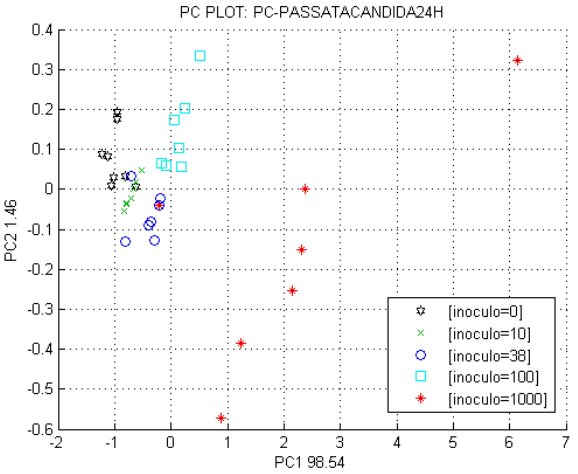

Fig. 1: PCA score plot of EN sensors responses to tomato soup samples contaminated by *Candida milleri* labeling the patterns against the inoculated CFU per 100 ml (different inocula 0-10-38-100-1000 CFU) of product. It's clear the difference between contaminates and not-contaminated samples. The yellow line is a indicator between the two different samples (contaminated and uncontaminated).

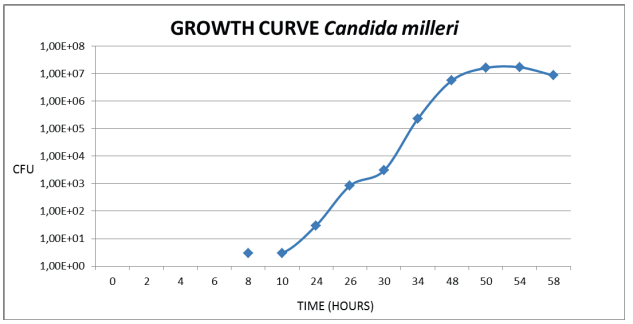

Fig. 2 Growth curve of *Candida milleri.*

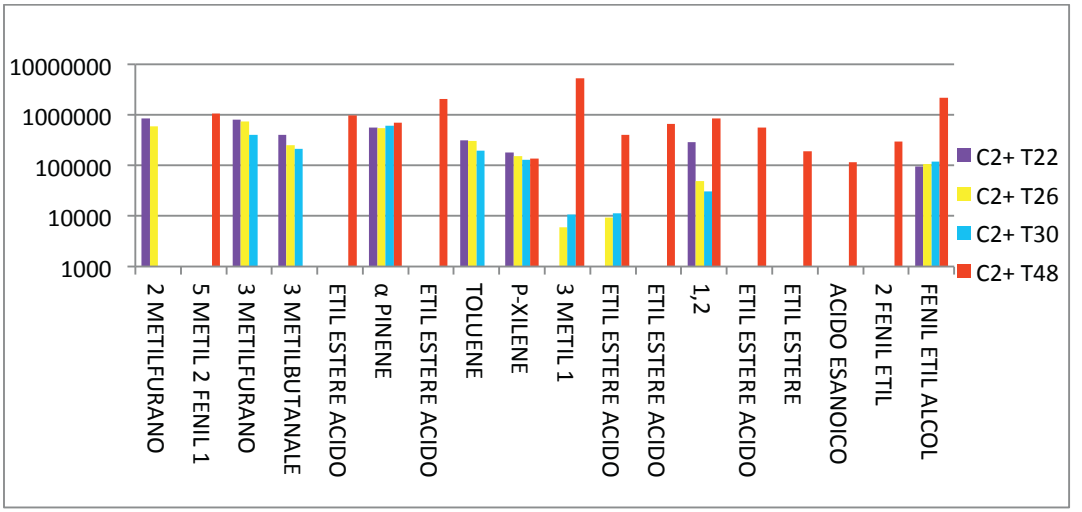

Fig. 3 The volatile profile of tomato sauce contaminated with *Candida milleri*, after 22-26-30-48 hours.

4. Conclusions

This work attest that the electronic nose is an excellent candidate to acquire early the presence of possible microbial contamination.
The results obtained are congruent to the initial expectations. The electronic nose is a good device to detect the spoilage, taking advantage from the high sensitivity of MOX sensors.
In our opinion it can be applied directly on the food chain, with the aim to obtain the removing or reduction of the possible contamination for selling product.

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