



# Volatilome evaluation of modified atmosphere packaged chilled and super-chilled pork loins using electronic nose and HS-GC-IMS integration

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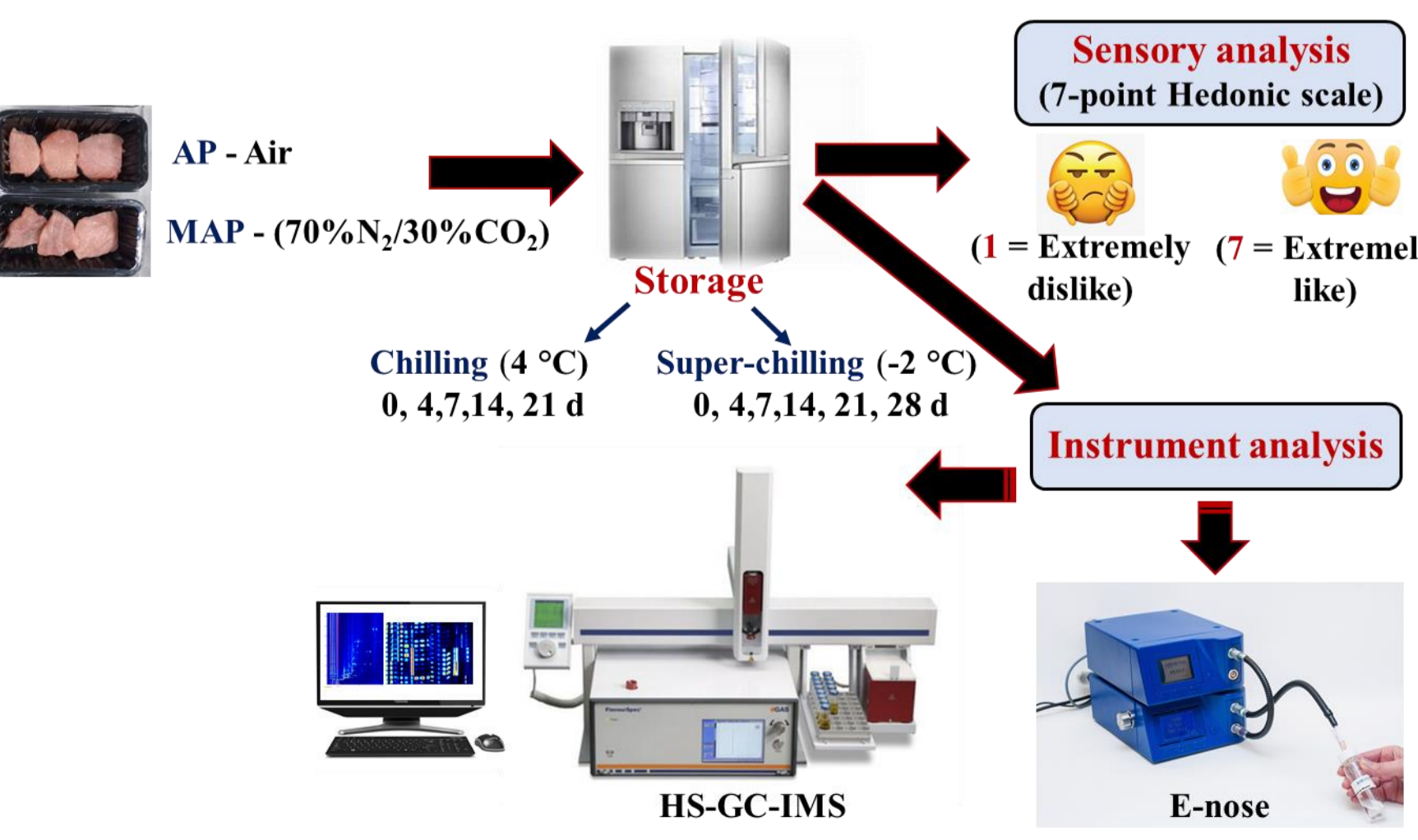
## INTRODUCTION

- The deterioration of sensorial attributes in meat is linked to microbial metabolic activity on nutrient substrates.
- This induces the production of unpleasant volatile substances such as ketones, aldehydes, alcohols, and volatile fatty acids [1].
- The advancement of rapid, sensitive, analytical devices such as electronic (E) nose and headspace-gas chromatography-ion mobility spectrometry (HS-GC-IMS) have been remarkable in compound characterization.

## AIM

- To evaluate the sensorial distinction and volatile profile in modified atmosphere packaged (MAP) and air packaged (AP) fresh pork loins at chilled (4 °C) and super-chilled (-2 °C) storage associated with spoilage.

## METHOD



## RESULTS

### Sensory analysis:

- ❖ MAP group obtained higher sensory values than AP group in both conditions. Marked variations ( $P < 0.05$ ) were observed from 7 d (4 °C) and 14 d (-2 °C) throughout storage.

### E-nose:

- ❖ The high E-nose principal component scores (PC1 and 2) at 4 °C and -2 °C conditions indicated the reflection of the overall volatile profiles.
- ❖ At 4 °C (Fig. 1A), the sensors (Table 1) were more clustered in MAP than AP group, signifying the higher similarity of compounds in the former than the latter.

- ❖ Consistently, both AP (0, 4, and 7 d) and MAP (0, 4, 7, and 14 d) groups shifted towards aromatic-derived responses (W3C, W1C, and W5C) at -2 °C storage (Fig. 1B).

- ❖ The groups were mostly sensitive to spoilage-induced sensors (W3S, W1W, W2W, W1S, and W6S) as storage progressed.

### HS-GC-IMS:

- ❖ HS-GC-IMS fingerprints provide an effective illustration to distinguish close relations (Fig. 2).
- ❖ The “red” and “yellow” areas signify the marked changes in AP and MAP groups, while “i, ii, iii” and “x, y, z” including “a, b” and “m, n” denote the compound concentrations in AP and MAP groups at 4 °C and -2 °C conditions.

Table 1: E-nose sensors and their corresponding compounds

Sensor name	Representative material species	Representative material
W1C	Aromatic compounds	Sensitive to aromatic constituents, benzene
W5S	Broad range	Sensitive to nitrogen oxides
W3C	Aromatic	Sensitive to aroma, ammonia
W6S	Hydrogen	Sensitive to hydrides
W5C	Arom-aliph	Sensitive to short-chain alkane aromatic component
W1S	Broad-methane	Sensitive to methyl
W1W	Sulphur-organic	Sensitive to sulfides
W2S	Broad-alcohol	Sensitive to alcohols, aldehydes and ketones
W2W	Sulph-chlor	Sensitive to organic sulfides
W3S	Methane-aliph	Sensitive to long-chain alkanes

Fig. 1: E-nose PC score plots of AP and MAP fresh pork loins at 4 °C (A) and -2 °C (B) storage conditions.

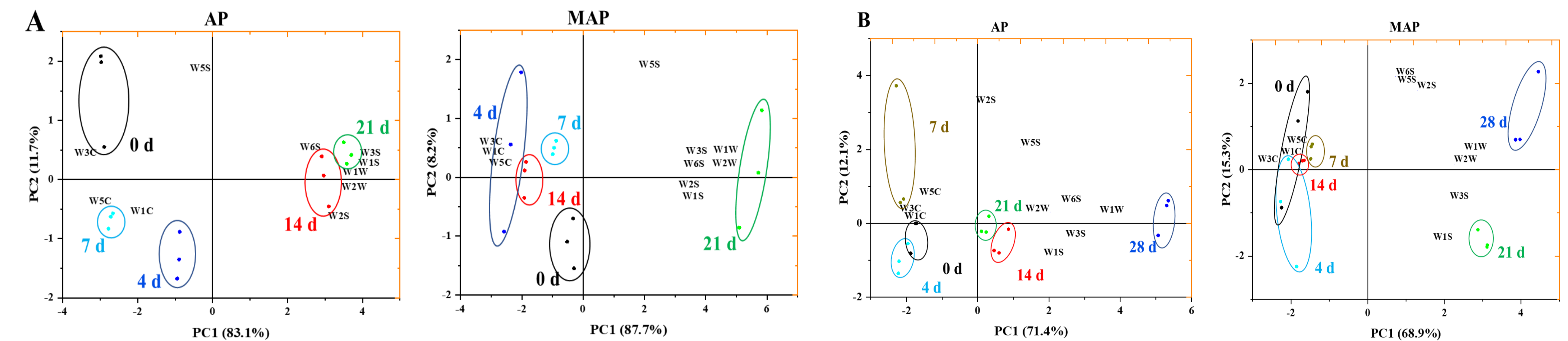
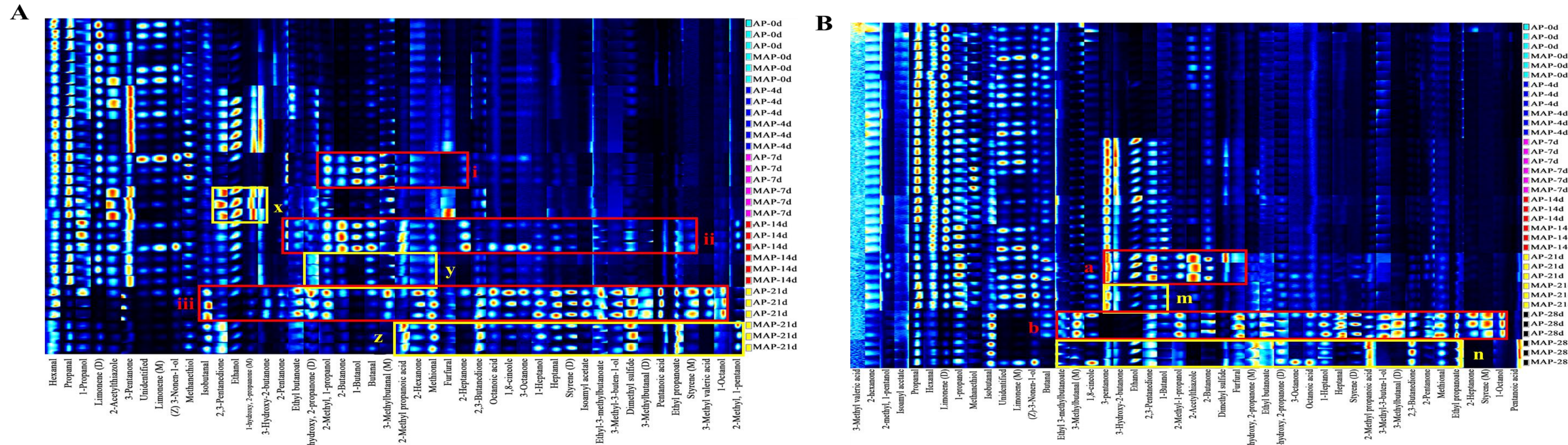


Fig. 2: HS-GC-IMS fingerprints AP and MAP fresh pork loins at 4 °C (A) and -2 °C (B) storage conditions



## CONCLUSION

- ❖ This study affirms the potential of 70%N<sub>2</sub>/30%CO<sub>2</sub> application to inhibit spoilage of meat and meat products during storage.
- ❖ A metabolomics study will help to elucidate the metabolic composition and pathways associated with spoilage processes in fresh pork.

## FUNDING

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## REFERENCE

1. Pellissery, A. J. et al. Spoilage bacteria and meat quality. In Meat Quality Analysis: Advanced Evaluation Methods, Techniques, and Technologies. 2019. Elsevier Inc. <https://doi.org/10.1016/B978-0-12-819233-7.00017-3>