

Characterization and differentiation of boiled pork from Tibetan, Sanmenxia and Duroc × (Landrace × Yorkshire) pigs by volatiles profiling and chemometrics analysis

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Background and objectives

According to a United States Department of Agriculture (USDA) report, global pork production is expected to rise to 113.0 million tons. China has the largest pork share in the global market, accounting for 48.7% (55.0 million tons) of total production in the whole world. Moreover, pork is popular with consumers due to its sensory attributes, such as tender texture, rich nutritional composition (Purriños, Franco, Carballo, & Lorenzo, 2012; Sivakumar 2016) and unique flavor. Flavour is one of the most important sensory attributes for consumers to judge the quality of and mainly associated with the generation of volatile compounds. Although a large number of volatile compounds associated with different processing technologies for specific types of pork have been fully analysed, information on volatile profiles in different varieties of processed pork products are still lacking.

The aim of this study was to characterize the volatile profile in boiled pork from Tibetan, Sanmenxia and Duroc × (Landrace × Yorkshire), and then to confirm the key odor-active compounds and potential flavour markers. Multivariate statistical methods for volatile compounds were used to explore the feasibility to differentiate boiled pork from Tibetan, Sanmenxia and Duroc × (Landrace × Yorkshire) pigs.

Materials and Methods

A total of 18 pigs from three breeds, including Tibetan pigs (TB1 = *Triceps Brachii* muscle of Tibetan pigs, TB2 = *Biceps Femoris* muscle of Tibetan pigs), Sanmenxia pigs (SMX1 = *Triceps Brachii* muscle of Sanmenxia pigs, SMX2 = *Biceps Femoris* muscle of Sanmenxia pigs) and Duroc × (Landrace × Yorkshire) (DLY1 = *Triceps Brachii* muscle of Duroc × (Landrace × Yorkshire), DLY2 = *Biceps Femoris* muscle of Duroc × (Landrace × Yorkshire)) were studied. All the pigs were reared under the same conditions and provided with the same feed. They were slaughtered following the same commercial procedures in the nearby abattoir. *Triceps brachii* and *Biceps femoris* muscles of all of the pigs were dissected from the carcasses.

- **GC-MS/O conditions:** The volatiles were separated on polar DB-wax and non-polar DB-5 capillary column (30 m × 0.32 mm i.d., 0.25 µm film thickness; J & W Scientific, Inc., Folsom, CA, USA). Ultra-high purity helium (≥99.999%) was used as the carrier gas and the constant flow rate was 1.2 ml/min. Temperature programme began with isothermal heating at 40° C for 3 min, then rising to 200° C at a rate of 5° C/min, followed by another increase to 230° C (DB-wax) and 250° C (DB-5) at 10° C/min. Final temperature was held for 3 min. The transfer line temperatures were maintained at 240° C (DB-wax) and 270° C (DB-5).
- **E-nose method:** Approximately 1.00 g of a boiled pork sample was added to a 10 ml glass vial. A filtered and dried air flow (99%, 300 ml/min) was used as a carrier gas for E-nose detection. The data acquisition period lasted for 60 s, and an additional 180 s was required for system rebalance. For each sample, the E-nose analysis was repeated three times for the same conditions.

Results and Discussion

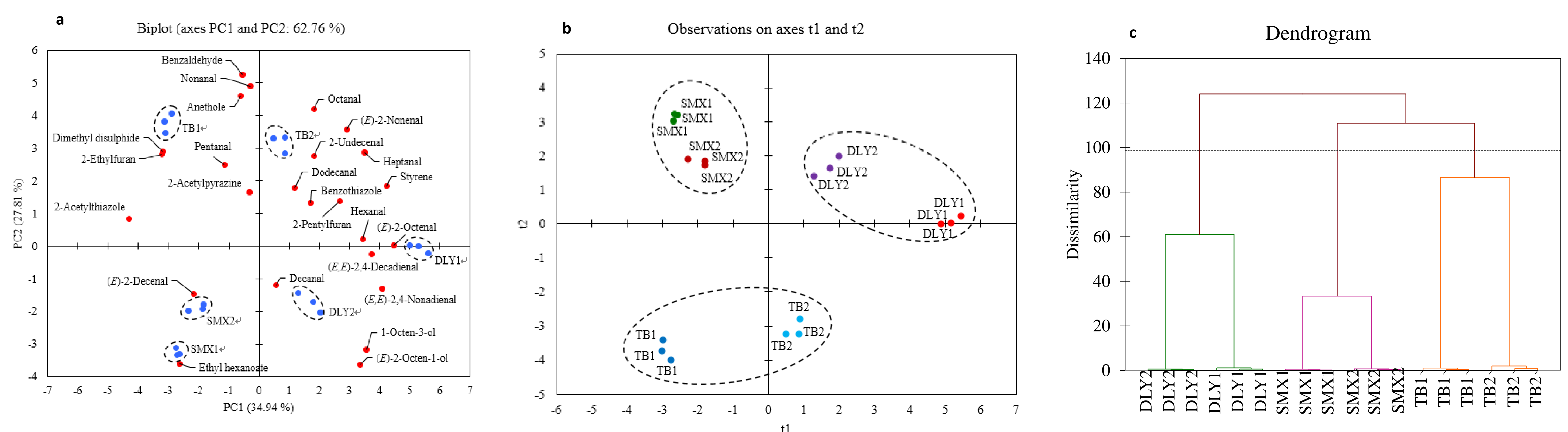


Fig 1. (a) PCA and (b) PLS-DA score plot from different boiled pork, (c) AHC results of the different boiled pork by GC-MS/O.

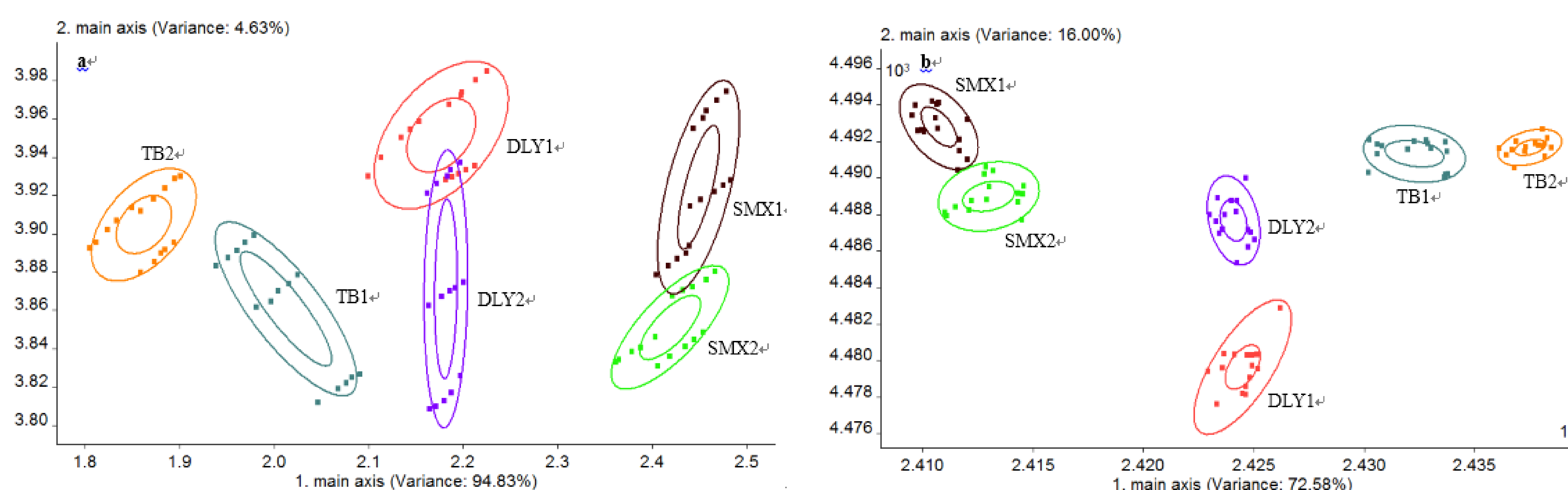


Fig 1. (a) PCA and (b) LDA plot of e-nose response from different boiled pork by E-nose.

The odour-active compounds were examined by principal component analysis (PCA), agglomerative hierarchical clustering (AHC) and partial least squares-discriminant analysis (PLS-DA). The results showed that boiled pork from the three pig breeds could be clearly distinguished.

Conclusion

Overall, it can be concluded that the characterization and differentiation of boiled pork from Tibetan, Sanmenxia and Duroc × (Landrace × Yorkshire) pigs by volatiles profiling and chemometrics analysis has the potential to be a feasible method to evaluate pork from different breeds.

References

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