VOLATILE COMPOUNDS PROFILE IN AGED BEEF USING LIPIDIC SOURCES COATINGS

Renata T. Nassu[1*], Vanessa C. Francisco[1] Jonatã H. R. Souza[2] and Sérgio B. Pflanzer[2]

[1]Embrapa Pecuária Sudeste. São Carlos – São Paulo, Brazil. Rod. Washington Luiz, Km 234 - Fazenda Canchim - Zip code: 13560-970

[2]Department of Food Technology, School of Food Engineering, University of Campinas - Unicamp, Campinas – São Paulo, Brazil

*Corresponding author email: renata.nassu@embrapa.br

I. INTRODUCTION

Volatile compounds are responsible for the formation of meat aroma and flavor, and are affected by processing, storage and cooking [1]. The proteolysis and lipid oxidation reactions that occur during the meat aging process are responsible for the formation of flavor precursors [2]. New meat aging techniques have been used in the meat market, such as “butter aging”, in which the meat is aged with a butter coating in order to reduce losses during the dry aging process [3]. Due to the lack of studies on the influence of using lipid source coatings on the flavor of aged meat, the aim of this study was to evaluate the effect of the technique of coating meat with different lipid sources during the aging process on the formation of volatile compounds.

II. MATERIALS AND METHODS

In this experiment, four treatments were carried out: fresh beef (without aging), vacuum (wet aging), lard (aging with refined pork lard coating) and butter (aging with unsalted milk butter coating. Three samples from each treatment were analyzed in duplicate. The samples were cooked in an electric oven until an internal temperature of 75°C, then after cooling they were ground in food processor. In a glass flask with a capacity of 60 mL, 1 g of the ground sample was weighed and the extraction of volatile compounds was performed by the technique of microextraction in solid phase (SPME) using a carboxen/polydimethylsiloxane (CAR/PDMS) fiber as stationary phase. Gas chromatography coupled to mass spectrometry (GC-MS) was used to separate and identify volatile compounds in the samples, using a DB-5 MS column (5% phenyl, 95% dimethylpolysiloxane) 60 m x 0.25 mm internal diameter and 1 µm stationary phase thickness (J&W Scientific®, Santa Clara, CA, USA). The oven temperature started at 40 °C, increasing 4 °C min^{-1} to 180 °C, 10 °C min^{-1} to 280 °C, remaining at this temperature for 5.3 min. Helium (He) was used as carrier gas. The compounds were identified through their spectra compared with the NIST library database. A qualitative analysis and a Principal Component Analysis (PCA) was applied for analyzing the obtained data.

III. RESULTS AND DISCUSSION

A total of 148 volatile compounds were identified among the beef samples, the main classes being: alcohols (n=17), aldehydes (n=22), ketones (n=24), esters (n=26) and hydrocarbons (n= 25). In samples without aging (fresh) 123 compounds were identified, 107 in wet-aged samples, 118 in butter-coated samples and 99 in lard-coated samples. In the butter-coated samples five compounds were observed only in this treatment: methyl propionate (banana-like fruity aroma), 2-methylpropyl 2-hydroxypropanoate (buttery flavor and aroma), ethyl octanoate (taste notes and waxy aroma with creamy milky nuance), methylpyrazine (popcorn flavor) and 2-heptanol (bitter, pungent taste), leading to a more characteristic profile when butter coating is used. In samples coated with lard, no differentiated compounds were found, meaning that this type of coating had no differentiation effect on volatile compounds on meat. To show the variations between each treatment based on individual volatile compounds, a principal component analysis was performed (Figure 1). The first principal component (PC1) described 73.98% and the second principal component (PC2) described 21.67%, with a total variation of 95.66%. The fresh and wet-aged

samples were close together, located in the lower quadrant close to compounds with odoriferous importance such as hexanal, 2-pentanone and nonanal. In the upper quadrant butter- and lard-aged samples are close to compounds such as 1-hexanol and ethyl butanoate. The coated samples showed a similar behavior in the formation of volatile compounds, but differently from the fresh and wet-aged samples as can be seen in Figure 1. Fresh and vacuum-packed samples showed proximity to lipid oxidation products as aldehydes (hexanal, 2-heptenal, nonanal), esters (butanoic acid, methyl ester) and ketones (2- and 3-pentanone), although these compounds were not characteristic from only these samples.

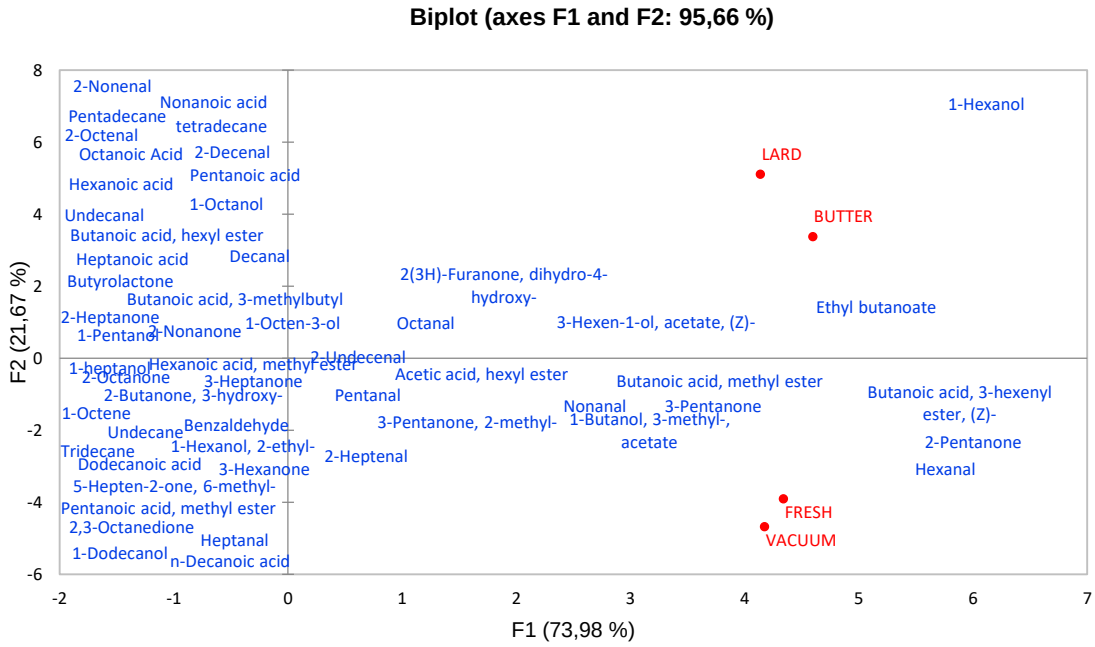

Figure 1. Principal Component Analysis (PCA) of volatile compounds present in raw beef (FRESH), wet aged meat (VACUUM), lard-coated aged beef (LARD) and butter-coated aged beef (BUTTER)

IV. CONCLUSION

The aging technique affected the qualitative profile of volatile compounds in the samples coated with lipid sources, differentiating them from the samples without coating.

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REFERENCES

1. Calkins, C.R., Hodgen, J.M. (2007). A fresh look at meat flavor. Meat Science, 77(1), 63–80.
2. Koutsidis, G., Elmore, J. S., Oruna-Concha, M. J., Campo, M. M., Wood, J. D., & Mottram, D. S. (2008b). Water-soluble precursors of beef flavour. Part II: Effect of post-mortem conditioning. Meat Science, *79*(2), 270–277.
3. Souza, J.H.R., Grimaldi, R., Ribeiro, A. P. B., & Pflanzer, S. B. (2022). Utilização de manteiga de leite como recobrimento no processo de maturação de carne bovina. In: I Simpósio Online Sulamericano de Tecnologia, Engenharia e Ciência de Alimentos (pp. 1–6), 2-6 may 2022, Diamantina(MG), Brazil, 2022.