Dry vs vacuum aging in Italian autochthonous adult sheep meat: oxidative, colorimetric and volatobolomic profile

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Objectives: The total worldwide population of small ruminants has exceeded 2 billion heads. Moreover, these animals are reared in a wide variety of husbandry systems. Sheep are widely recognized as a good source of valuable, high-quality meat, rich in many vi- tamins, minerals, and essential PUFAs. Nevertheless, meat of adult animals is frequently underrated as a culinary product because of stereotypes associated with it (Junkuszew et al., 2020). Survival of a breed is linked to its ability to meet current and future mar- ket demand and biodiversity protection is of great importance, not only from a genetic point of view, but also for productive op- tions. In Southern Italy, autochthonous breeds are reared for milk and lamb production, but at the end of their productive career themselves could be a great resource of meat. The aim of this work is to evaluate two different aging effects on Italian autochthonous sheep meat oxidative status, colorimetric and volatile compounds' profile

Materials and Methods: twenty-four Gentile di Puglia ewes, aged 7 years old, were involved in the trial. All animals were not preg- nant and were fed with ad libitum alfalfa hay (188 g/kg crude protein DM, 322 g/kg crude fibre DM) and a commercial pelleted concentrated mixture (barley, corn and faba beans; 20.3% crude protein DM, 10.8% crude fibre DM, 2.7% crude fat DM and 7.2% ash DM). All animals were slaughtered at a European Community approved abattoir (1/2005EC) (1099/2009EC). After 24 hours, *rectus femoris* muscle of both legs was sampled. The two samples obtained by each head have been randomly assigned to vacuum or dry aging treatment, both lasting 35 days. Vacuum aging was done storing samples after vacuum packaging at 4°C, dry aging was done in an aging room set with 2°C and 62% of humidity. After 35 days, TBARS, hydroperoxides (HY) and protein carbonyls (PC) concentration were analyzed. Besides, FRAP and ABTS analysis were carried out. Moreover, colorimetric analysis was per- formed according to the Hunter-Lab method. Finally, samples were grill cooked and Volatile Organic Compounds (VOC) profile was performed by solid-phase microextraction (SPME) and gas chromatography-mass spectrometry (GC-MS). Data were analyzed using a two-way ANOVA, where aging method, aging time and their binary interaction were set as independent variables and the single animal as random effect. Significance was set at $P < 0.05$.

Results and Discussion: The TBARS increased in both aging methods during time, with higher values in dry aged sheep meat after 35 days ($P < 0.01$), starting from 0.21 and 0.23 mg/MDA kg of meat (respectively in vacuum and dry) and reaching values of 0.35 and 0.71. Also hydroperoxides increased during aging, reaching higher values in dry aged meat compared to vacuum aged meat (1.25 vs. 0.84 mmol/g of meat). Yellowness values decreased during aging, with higher values in vacuum aged meat (1.28) compared to dry aged meat (0.51; $P < 0.01$) after 35 days. Aldehydes are the most produced volatile compounds, with hexanal as the most abundant in both aging methods studied. However, it showed increasing values during aging, reporting higher values in dry aged meat (121.22 mg/kg) compared to vacuum aged meat (81.22 mg/kg). Myoglobin concentration and its redox status represent the main factors that affect color variation during aging (Mancini and Hunt, 2005) and b*, particularly, is linked to meat oxidative stability, both to myoglobin stability and lipid oxidation processes. The higher b* values observed in vacuum meat suggests that the lower oxygen availability could slow down meat oxidation processes. In fact, as well as yellowness decreased during aging, with lower values in dry aged meat, TBARS and hydroperoxides increased more in dry meat, reporting higher oxidation processes on them after 35 days. Mechanisms of lipid oxidation in foodstuff are still an area of controversy and remain as a subject of active re- search, although several researchers have highlighted that lipid oxidation should be considered as multiple interrelated pathways ablea to affect the odour of cooked meat from different species (Estevez et al., 2011)and the complexity of the issue becomes evident. In the present study, most volatiles detected in cooked sheep meat samples derived from the thermal degradation of lipids, and the greater oxidation processes of dry aged meat could have affected the greater production of these volatile compounds, as particularly hexanal.

References:

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Key words: Sheep meat, Dry aging, Vacuum aging, Oxidative profile, Volatile compounds