

The effect of the storage method on the quality of game meat

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Introduction: Game meat, compared to other animal species, is characterized by high quality, exceptional taste, and unique dietary and health-promoting properties. Improper storage of meat may result in increased oxidation of proteins and lipids. Conditions in Poland allow for an increase in the share of game meat in the meat industry as these animals are not exposed to stress which is associated with industrial breeding. Greater consumer awareness of the advantages of eating game meat compared to farmed species, as well as obtaining new information on quality issues, including oxidative and microbiological changes and safety, could contribute to an increase in the consumption of game meat in Poland.

The aim of the study was a qualitative evaluation of selected muscles of European roe deer (*Capreolus capreolus*) and European wild boar (*Sus scrofa scrofa*) and monitoring oxidative changes occurring during storage of vacuum-packed meat (VAC), in a modified atmosphere (MAP), and in a dry-aging cabinet (DRY-AGED).

Materials and methods: The subjects of this study were the longissimus dorsi muscle, biceps femoris muscle, and vastus lateralis muscle from 5 carcasses of roe deer and wild boar. The muscles were stored at 5 ± 1 °C vacuum-packed and in a modified atmosphere (80% O₂/20% CO₂), and also in a meat seasoning cabinet at 2°C with 80% humidity for 21 days. Samples were analyzed on the 1st, 7th, and 21st days of storage, for each variant. The analyzes included the physicochemical and oxidative properties of meat: proximate composition (protein, water, fat, and ash content), colour (CIE L*, a*, b*), pH, water activity, cooking and storage losses, Warner-Bratzler shear force test, and protein and lipid oxidation. Assays for the determination of protein oxidation included derivatization of the carbonyl group with 2,4-dinitrophenyl hydrazine (DNPH). Lipid oxidation was evaluated using a thiobarbituric acid (TBA) assay reacting with lipid peroxidation and the product malondialdehyde (MDA).

Results: The storage method affected meat characteristics such as oxidative processes, colour, storage loss, cooking loss, pH, tenderness, and water activity. The results showed a significant effect of storage on the oxidation of proteins and lipids. No significant differences in protein oxidation were detected on the 7th day of analysis. Regarding m. longissimus dorsi of wild boar, The carbonyls content was 0.87 ± 0.08 for MAP, 1.17 ± 0.22 for DRY-AGED meat and 1.06 ± 0.26 [nmol/mg protein] for VAC. TBARS values on the 7th day of analysis were highest for modified atmosphere packaged meat with 1.77 ± 0.12 [mgMDA/kg]. No significant differences were observed for VAC and DRY-AGED samples (0.55 ± 0.08 , 0.59 ± 0.14 [mgMDA/kg]). Protein carbonylation and TBARS values for MAP were higher for wild boar than roe deer. On the 21st day, a significant effect of the method on TBARS and carbonylation was noted. Carbonyls content (from the 7th day of analysis) in MAP increased by 278.16%, in VAC by 2.83%, in DRY-AGED meat by 43.59%. Increased lipid oxidation occurred in MAP (247.46%), 78.18% increase for DRY-AGED meat. The level of lipid oxidation products decreased by 43.37% for vacuum-packed samples. A correlation was observed between stored muscle and the rate of oxidative changes. There is no significant difference in protein carbonylation and TBARS values for wild boar and deer. A correlation was observed between oxidation and deterioration of meat tenderness.

Conclusions: Oxidative processes lead to the deterioration of meat's functional properties, as well as negatively affect its nutritional value. The use of appropriate packaging, storage, or preservation technologies can affect the effective control of oxidative processes of game meat. The results indicate that dry-aging is the best method for wild boar and vacuum-packaging or dry-aging can be selected for roe deer meat.

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