

MODIFIED ATMOSPHERE PACKAGING FOR POULTRY MEAT: IMPACT ON MICROBIOTA AND ODOUR CHARACTERISTICS

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Specific packaging conditions such as a modified atmosphere can have a tremendous effect in delaying the proliferation of food spoilage microorganisms and, consequently, increasing the shelf life of products and reducing food waste.

To evaluate the impact of different packaging atmospheres on the microbial load and microbiota of poultry meat, chicken breasts packed in high oxygen-containing packages (55-70% O₂, 20-30% CO₂) and in high carbon dioxide-containing packages (0% O₂, 50-55% CO₂, 45-50% N₂) were collected from the producer (day 0) and stored at 4 °C. At specific time points, total viable counts (TVC) were enumerated in Plate Count Agar and DNA extraction was performed using Qiagen DNeasy PowerLyzer Powersoil kit. Microbial community analysis was performed using EMP 16S Illumina Amplicon Protocol V.2. Olfactory sensory evaluation of the samples was also conducted by a group of semi-trained panellists.

The TVC in chicken breasts at the beginning of the storage (day 0) were similar for both atmospheres (around 3.7 log CFU/g). After 15 days of storage, the TVC were also comparable in breasts from both packaging atmospheres (approximately 8.0 log CFU/g), having increased at a maximum rate of 0.6 ± 0.1 log CFU/g day⁻¹ (high O₂ packages) and 0.5 ± 0.04 log CFU/g day⁻¹ (high CO₂ packages).

Throughout storage at 4 °C, the gas composition of high CO₂ packages was stable, with fluctuations of around +5% in CO₂ content between the beginning and the end of the storage period. In turn, the high O₂ packages revealed a decrease in O₂ content and an increase in CO₂ (both around 15%), thus indicating the presence and proliferation of oxygen-consuming spoilage microorganisms in this type of atmosphere. However, this effect must be analysed together with the gas transfer through the package.

As revealed by the microbial community analysis, there was a clear change in the microbial composition resulting from the different packaging conditions. A considerable decrease in the relative abundance of *Brochothrix* and an increase of *Lactobacillales* (mainly *Carnobacterium divergens*), *Lactococcus* spp. and *Lactobacillus* spp. was observed with high CO₂ packaging. The relative amount of *Yersiniaceae* (often *Serratia proteamaculans*) was relatively similar for both high O₂ and high CO₂ packages.

The presence of distinct microbial communities triggered by the different packaging atmospheres appears to have a considerable impact on the olfactory characteristics of the chicken breasts, as revealed by the results of the semi-trained panel. The overall odour intensity of chicken breasts packed under high O₂ atmosphere was somewhat similar from day 0 up to day 7 of storage, and after 11 and 15 days, the semi-trained panellists indicated higher overall odour intensity, and the presence of aromas related to product degradation. This was also observed for chicken breasts packed under high CO₂ atmosphere, but only after 19 days of storage, and the overall odour intensity was fairly similar from day 0 up to day 12. These results suggest an improved perception of chicken freshness for a longer period, which may be a valuable outcome for extending the shelf life of this product.

Keywords: MAP, gas composition, microbial load, microbiota, shelf life

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