



UNIVERSITY OF LIFE SCIENCES
"KING MIHAI I" FROM Timisoara
**Multidisciplinary Conference on
Sustainable Development**
30-31 May 2024



Stability of Poultry Meat During Refrigerated Storage, Based on the Packaging Used

**Ioana BOLOHAN, Roxana LAZAR, Bianca Maria MADESCU, Roxana Mihaela BOLOHAN (COCIORVA),
Madalina Alexandra DAVIDESCU, Paul Corneliu BOISTEANU**

"Ion Ionescu de la Brad" University of Life Sciences, 3 Mihail Sadoveanu Alley, 700490, Iasi, Romania

Abstract: This study proposes a comprehensive investigation into identifying the spoilage threshold of refrigerated meat, focusing on skinless boneless chicken breast, packaged in two distinct methods: polyethylene bags with clips (Cryovac system) and trays wrapped in stretch film (Skin type). The analyses were initiated starting from the 7th day of storage, following the manufacturer's recommendations, and included parameters such as pH, easily hydrolyzable nitrogen, hydrogen sulfide, and formic aldehyde. Every day, we rigorously followed a protocol to examine five product units for each packaging method. The results indicate that, for 7 days, the freshness of the meat was maintained under both packaging conditions; however, subsequently, it was compromised. Nevertheless, it is noted that the chicken breast packaged in polyethylene bags with clips exhibited significantly longer freshness retention compared to the chicken breast packaged in trays with stretch film. These findings make significant contributions to understanding the process of refrigerated meat spoilage and can guide the development of improved packaging and storage strategies in the food industry.

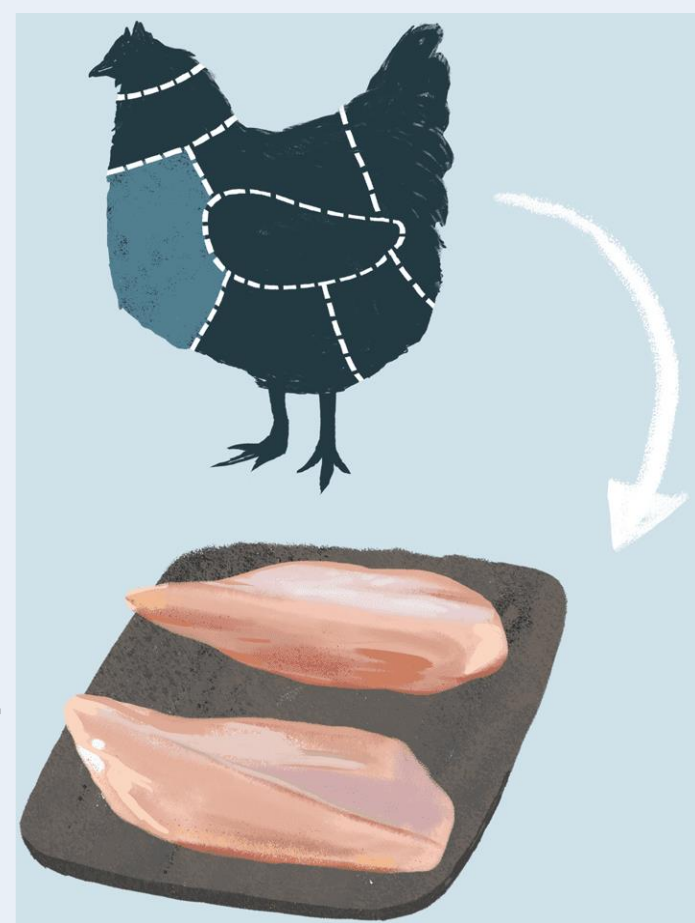
Introduction

Providing a healthy diet is a priority for any state, with significant cultural, social, and economic implications. Animal husbandry plays a crucial role in supplying high-quality food products in increasing quantities to meet the needs of a continuously growing population. Meat is an essential source of protein with a high biological value, making it indispensable for a balanced diet.

The poultry sector stands out due to its rapid expansion in the meat industry, thanks to the superior qualities of poultry meat. It is rich in protein, low in calories, contains all essential amino acids, and is easy to chew and digest, making it suitable for all ages.

Refrigeration plays an essential role in maintaining the freshness of the meat, preserving the initial characteristics influenced by the birds' genetics, nutrition, and growth conditions.

Packaging technologies have evolved significantly in recent decades, contributing to the protection and extension of food storage. This study investigates the influence of packaging on the stability of poultry meat during refrigeration, comparing boneless and skinless chicken breasts packaged in polyethylene bags with clips and in trays with stretch film to determine the most effective preservation method.



Materials and methods

The research was organized into two experiments, differentiated by the packaging method applied, on which specific determinations were carried out (determination of pH value, identification of easily hydrolyzable nitrogen, identification of hydrogen sulfide, and identification of formic aldehyde).

Specifically, Experiment 1 (E1) focused on the packaging method of boneless, skinless chicken breast in polyethylene bags with clips (Cryovac system), while Experiment 2 (E2) focused on packaging boneless, skinless chicken breast on trays with stretch film (skin type). Each of the two experiments aimed to assess the stability of boneless, skinless chicken breast during refrigerated storage.

The chicken breast was sourced from the same producer and transported under appropriate conditions (in a refrigerated container) to the laboratories where specific analyses were conducted. In both packaging methods, the producer recommends storing the products at temperatures between 0 and 4 °C for a maximum of 7 days (this period represents the shelf life).

We conducted the analyses starting from the 7th day of storage, which corresponds to the manufacturer's recommended shelf life, and examined 5 product units for each packaging method. We repeated these analyses daily until the 11th day of storage, adhering to the same working protocol.



Results and discussions

The pH dynamics

The study reveals significant variations in the pH of boneless and skinless chicken breasts, depending on the packaging method.

After 7 days of storage, the average pH for the polyethylene bag with clip packaging was 5.82, while for the stretch film packaging, it was 6.65.

On the last day, both packaging methods recorded significant increases in pH, reaching 7.03 and 7.28, respectively (Figure 1).

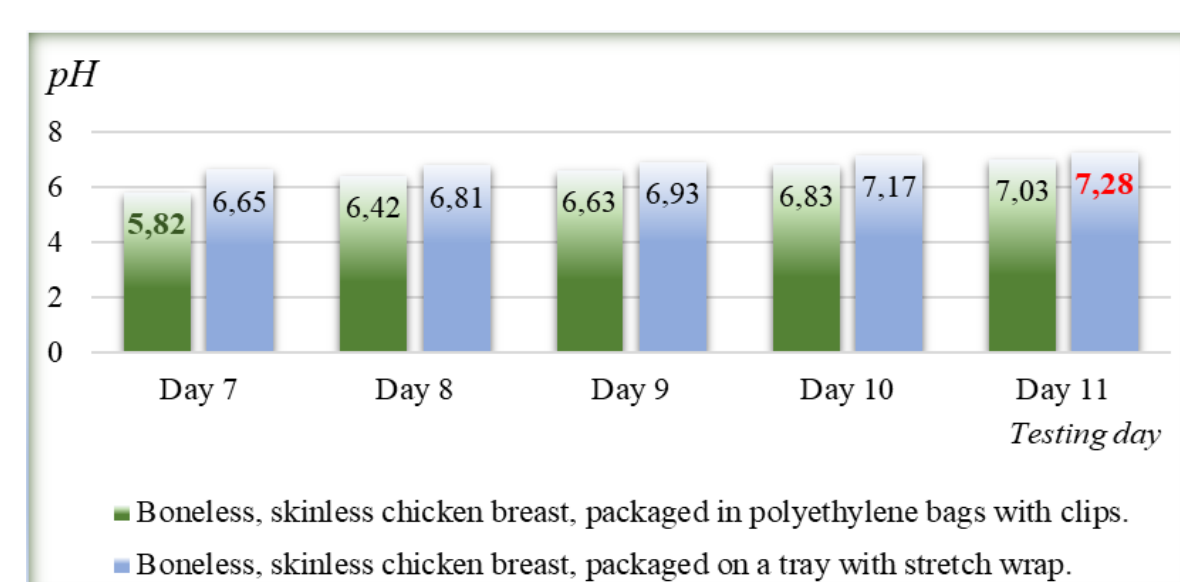


Figure 1. pH value dynamics for boneless, skinless chicken breast

The dynamics of easily hydrolyzable nitrogen

The data highlight a significant increase in the content of easily hydrolyzable nitrogen in boneless and skinless chicken breast, depending on the packaging method: in polyethylene bags with clips or in trays with stretch film, during refrigerated storage.

For chicken breast packaged in polyethylene bags with clips, the content of easily

hydrolyzable nitrogen increased from 17.21 to 26.85 mg NH₃/100 g product on the 11th day (Figure 2).

In the case of chicken breast packaged in trays with stretch film, the content of easily hydrolyzable nitrogen increased from 21.20 to 26.00 mg NH₃/100 g product on the 10th day. These findings highlight the impact of the packaging method on the evolution of the product's chemical composition, influencing its quality assessment.

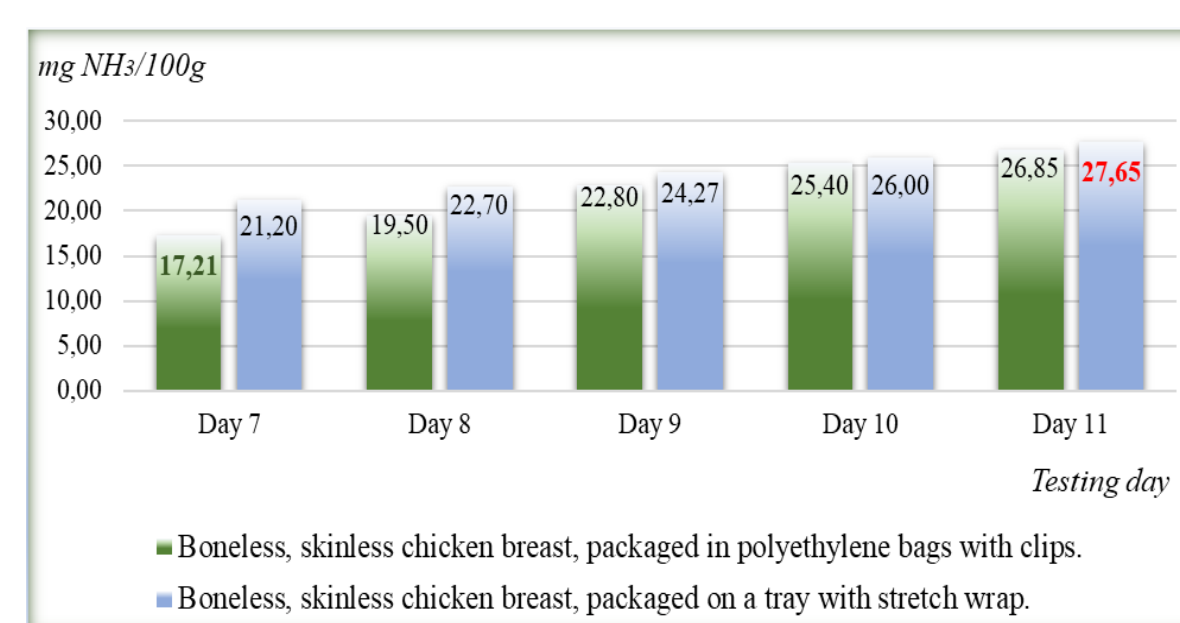


Figure 2. Dynamics of easily hydrolyzable nitrogen for boneless, skinless chicken breast (mg NH₃/100g)

Identification of hydrogen sulfide presence

For the chicken breast packaged in polyethylene bags with clips (Cryovac system), freshness was maintained for 8 days of refrigerated storage. Starting on the 9th day, signs of spoilage were observed, and on the 11th day, the hydrogen sulfide identification reaction was strongly positive (Table 1).

In the case of chicken breast packaged in trays with stretch film, freshness was maintained for 7 days of storage, but starting on the 8th day, signs of spoilage appeared, and on the 11th day, the hydrogen sulfide identification reaction was strongly positive (Table 1).

These findings emphasize the importance of using the hydrogen sulfide identification method as a sensitive indicator of ongoing spoilage processes, with significant implications for assessing the quality and durability of food products depending on packaging and storage conditions.

Table 1. Identification of hydrogen sulfide presence for boneless, skinless chicken breast

Testing day	E ₁	E ₂
Day 7	-	-
Day 8	-	±
Day 9	±	±
Day 10	±	±
Day 11	+	+

E1: boneless, skinless chicken breast packaged in polyethylene bags with clips; E2: boneless, skinless chicken breast packaged in trays with stretch film; "-" = negative reaction; "±" = weakly positive reaction; "+" = positive reaction.

Identification of aldehydes presence

For the chicken breast packaged in polyethylene bags with clips (Cryovac system), freshness was maintained for the first 7 days of refrigerated storage, according to the manufacturer's recommendations. On the 8th and 9th days, slight signs of spoilage were observed, manifested by weakly positive reactions with a pale pink coloration.

On the 11th day, obvious signs of spoilage became pronounced, highlighted by a red-violet coloration (Table 2).

In the case of chicken breast packaged in trays with stretch film, freshness was maintained for the first 7 days of refrigerated storage, according to the manufacturer's recommendations

In the last two days of storage, namely the 10th and 11th days, strong signs of spoilage were noted, manifested by a red-violet coloration (Table 2).

These findings underscore the importance of analyzing fats in assessing the product's spoilage status and reveal a potential indicator of product quality over successive storage periods. Proper management of storage conditions is essential for maintaining product integrity.

Table 2. Identification of the presence of aldehydes for boneless, skinless chicken breast

Testing day	E ₁	E ₂
Day 7	-	-
Day 8	±	±
Day 9	±	±
Day 10	+	+
Day 11	+	+

E1: boneless, skinless chicken breast, packaged in polyethylene bags with clips; E2: boneless, skinless chicken breast, packaged in tray with stretch film; "-" = negative reaction; "±" = weak positive reaction; "+" = positive reaction.

Conclusions

The increasing demand from consumers and the continuous expansion of the meat market have stimulated producers to research and implement new packaging solutions.

In a comparative context of the two packaging methods, we observe that the polyethylene bag with clips provides superior resistance to meat deterioration processes compared to stretch film. However, after approximately seven days of storage, both methods have shown signs of alteration.

These conclusions emphasize the critical role of packaging in maintaining the integrity and freshness of poultry meat, as well as the need for improved packaging and storage strategies in the food industry. We anticipate that these results will inform future research and enhance food industry practices.