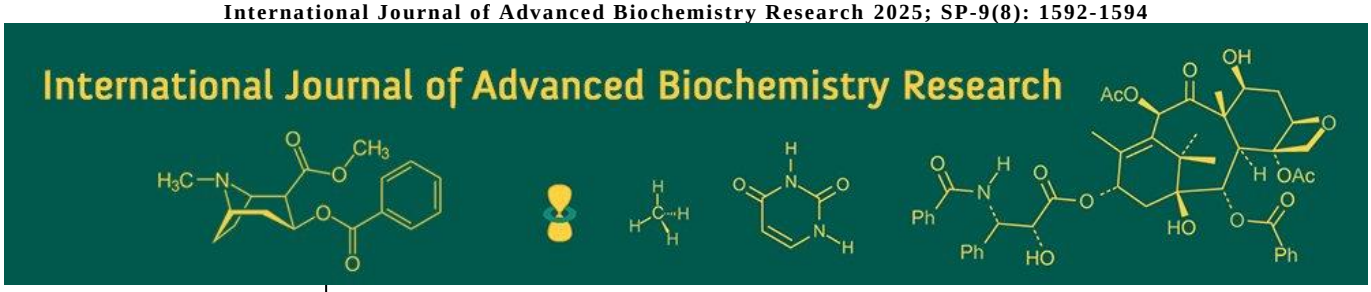

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Evaluation of functional properties of poultry meat: extract release volume, swelling capacity, and water holding capacity

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Abstract
Properties of poultry meat, including Extract Release Volume (ERV), Swelling Capacity, and Water Holding Capacity (WHC), are critical indicators of meat quality. These properties influence the texture, juiciness, and processing characteristics of poultry products, which directly impact consumer acceptance and industrial applications. This study evaluates these parameters through standardized laboratory methods. ERV is determined by centrifugation to measure the amount of released fluid, while swelling capacity assesses the ability of meat proteins to absorb water. WHC is analyzed by applying external pressure to measure retained moisture. The results of these analyses provide valuable insights into poultry meat's quality, aiding in optimizing meat processing, storage, and overall product improvement. Understanding these functional properties is essential for ensuring high-quality poultry meat and enhancing its commercial value.

Keywords: Poultry meat, extract release volume, swelling capacity, water holding capacity

Introduction
The functional properties of poultry meat, including Extract Release Volume (ERV), Swelling Capacity, and Water Holding Capacity (WHC), play a significant role in meat quality assessment. These properties influence texture, juiciness, and overall consumer acceptability. Significance and Importance of the Determination and Analysis of Extract Release Volume (ERV), Swelling Capacity, and Water Holding Capacity (WHC). The determination and analysis of Extract Release Volume (ERV), Swelling Capacity, and Water Holding Capacity (WHC) play a crucial role in assessing the quality, functionality, and processing characteristics of poultry meat. These properties are essential in ensuring product integrity, consumer satisfaction, and efficient meat processing.

Significance in Meat Quality Assessment: Texture and Juiciness: WHC and swelling capacity directly impact meat tenderness and juiciness, which are critical factors influencing consumer preference. Freshness and Moisture Retention: ERV helps in evaluating the ability of meat to retain moisture, preventing excessive drip loss during storage.

Indicator of Protein Functionality: The ability of meat proteins to bind and retain water influences overall quality, including cooking yield and texture.

Importance in Meat Processing and Storage
Minimizing Weight Loss: Meat with higher WHC retains more water, reducing weight loss during processing and storage, thereby improving yield and profitability. Optimizing Meat Processing Techniques: Understanding ERV, swelling capacity, and WHC helps manufacturers choose the right processing methods (e.g., marination, curing) to enhance product quality. Prevention of Defects: Low WHC can lead to undesirable conditions like pale, soft, exudative (PSE) meat or dark, firm, dry (DFD) meat, affecting market acceptance.
3. Relevance to Food Safety and Industry Standards Compliance with Quality Standards: Regulatory agencies (e.g., FSSAI, USDA, ISO) consider WHC and related parameters as

benchmarks for meat quality control. Consumer Health and Satisfaction: Proper evaluation ensures the meat maintains nutritional value, safety, and sensory attributes, making it more appealing to consumers. Impact on Processed Meat Products: These properties influence sausages, nuggets, and other poultry-based processed foods, ensuring consistency in quality and texture.

The evaluation of ERV, swelling capacity, and WHC is essential for meat science, industry quality control, and consumer satisfaction. By analysing these functional properties, producers can improve meat quality, enhance storage stability, and ensure compliance with safety regulations, ultimately leading to a more efficient and profitable poultry industry.

The assessment of ERV, Swelling Capacity, and Water Holding Capacity (WHC) provides valuable insights into the functional properties of poultry meat. Higher WHC and swelling capacity indicate better meat quality, whereas ERV acts as an indicator of moisture retention during processing. These analytical methods are vital for meat science research and quality assurance in the poultry industry. By examining ERV, Swelling Capacity, and WHC, one can effectively evaluate the quality of poultry meat. An increase in WHC and swelling capacity reflects improved meat quality, while ERV offers a measure of moisture retention. These approaches are crucial for the advancement of meat science research and the maintenance of quality standards.

Materials and procedures

This research aims to conduct a comprehensive evaluation of the characteristics of poultry meat procured from a local vendor Anand, which was selected for sampling and subsequently stored under refrigerated conditions at a temperature of 4 °C. Each sample underwent triplicate analysis to ensure accuracy and reproducibility, and the average values of the measurements were recorded and reported of the following properties.

1. Extract release volume

This technique relies on the quantity of aqueous extract produced by the homogenate of meat when it is permitted to flow through filter paper for a specified duration. High-quality meat, characterized by favorable organoleptic and microbial properties, yields a substantial volume of extract, while lower-quality meat produces a smaller volume or none at all.

Requirements: Beaker, distilled water, Cellulose based qualitative filter paper, pestle and mortal, graduated cylinder.

Procedure

To evaluate the extract release volume, begin by taking a 25 g portion of meat and placing it into 100 mL of distilled water. Using a pestle and mortar, gently macerate the sample until thoroughly homogenized. Next, fold a cellulose-based qualitative filter paper three times to form eight distinct sections, and carefully filter the homogenate so it seeps between these folds. Allow the extract to collect in a 100 mL graduated cylinder positioned beneath the filter for 15 minutes, ensuring that gravity facilitates a gradual and complete collection of the filtrate. Finally, record the total volume of the extract released in the cylinder. This measured volume serves as the basis for interpreting the degree of solubilization or extract release, offering insight into the meat's cellular integrity and water-soluble component release potential.

Observation: The extract release volume is obtained is 24 ml

Interpretation

ERV (ml) Meat quality

> 25 mL Good quality

> 20 mL Incipient spoilage

< 20 mL Spoiled meat

2. Swelling capacity

This assessment evaluates the freshness of meat. The swelling capacity of meat rises during spoilage as a result of protein degradation and the absorption of increased amounts of water within the protein matrix. A technique for measuring the water binding capacity of muscle proteins, characterized by low water holding forces, is referred to as meat swelling.

Requirements: distilled water, centrifuge, blender, graduated cylinder

Procedure

To assess the meat swelling capacity, take 25 g of the meat sample and immerse it in 100 mL of distilled water, then blend the mixture for 2 minutes to ensure a thorough homogenization. Next, transfer 35 mL of this homogenate into a centrifuge tube and centrifuge it at 2000 rpm for 15 minutes. After centrifugation, carefully measure the volume of the clear supernatant—this value is recorded as "S." The percentage of meat swelling can then be calculated using this measured supernatant volume, which reflects how much of the sample's components have been leached into the water matrix. This quantification provides insight into the meat's capacity to absorb or bind water under processing conditions, a key quality indicator in food science.

Calculation:

S = (35-s-7) X 100

Where, S =% of Swelling

s = Supernatant volume in ml

Observation meat swelling capacity of given sample 28.57%

3. Water Holding Capacity (WHC)

The capacity of water retention is characterized as the capability of meat to maintain its inherent moisture when exposed to external pressures, including cutting, heating, grinding, or pressing.

Requirement: Fresh poultry meat sample, Whatman No. 1 filter paper, Glass slides, 500 g weight, Weighing balance

Procedure

To determine the water-holding capacity (WHC) of poultry meat using a simple filter-paper press method, begin by accurately weighing a 5 g sample of poultry and placing it carefully between two layers of filter paper. Next, apply a standardized weight of 500 g directly on top of the sample and maintain this pressure for 5 minutes; this static load encourages water to be squeezed out of the meat and absorbed by the filter paper. After the time has elapsed,

remove the weight and re-weigh the meat sample. The difference between the initial and final weights corresponds to the amount of water lost during the pressing. Finally, express the WHC as a percentage of the initial weight of the sample, calculating it by dividing the weight of water lost by the original 5 g and multiplying by 100. This percentage quantifies how much water the meat released under pressure, offering a straightforward measure of its water-holding capacity.

Calculation:
% WHC = (C-F)/2 *100

Where,
Weight of Whatman filter papers (2 Nos) = A
Weight of filter papers after drying = B
Weight of the meat sample 500 mg = C
Weight of the meat flake = D
Amount of protein attached to the filter paper = B-A = E
Actual weight of meat flake after pressure treatment = E + D = F

Observation: WHC of given poultry meat sample is 0.5%

Conclusion
The determination and analysis of Extract Release Volume (ERV), Swelling Capacity, and Water Holding Capacity (WHC) provide valuable insights into the functional properties of poultry meat, which are crucial for assessing its quality and suitability for processing. A higher WHC and swelling capacity indicate superior meat quality, as they contribute to better texture, juiciness, and overall consumer acceptance. Additionally, ERV plays a significant role in evaluating moisture retention, which is essential for maintaining product integrity during storage and processing. These parameters are not only fundamental in meat science research but also serve as critical quality control measures in the poultry industry, ensuring that meat products meet the required standards for commercial and consumer use.

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