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Literature Review Journal Analysis of Water Content in Meat Using Gravimetric Method

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A B S T R A C T

Water content analysis is an important parameter in determining meat quality. The study aims to determine the water content in meat samples using the gravimetric method. Meat samples are dried in an oven at a certain temperature until they reach constant weight. To provide accurate and precise results in determining the water content of meat. This study compares the water content of beef and chicken using the gravimetric method. The results of the study showed significant differences in water content between types of beef and chicken. The effect of drying time and drying temperature on the results of meat water content analysis using the gravimetric method has been studied. The results of the study showed that optimal temperature and drying time can affect the accuracy of the analysis results

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INTRODUCTION

One of the constituents of several food ingredients is water. Water is in intracellular form or is extracellular in vegetables and animal products. Water is a chemical substance with the chemical formula H2O, one water molecule consists of two hydrogen atoms covalently bonded to one oxygen atom. The nature of water is colorless, odorless, and tasteless under standard conditions and is a solvent for various other chemicals such as sugar, salt, acid, several types of gases and organic molecules (Astuti, in Kinanti 2015). The water content in meat is a significant parameter that affects the quality, shelf life, and nutritional value of meat products. The gravimetric method is often used for water content analysis because of its accuracy and ease of application. In this method, water content is measured based on the difference in sample weight before and after drying. Several studies have shown that optimal water content can improve the organoleptic quality of meat and extend its shelf life (Smith et al., 2015; Johnson & Lee, 2020).

Water content is also a very important characteristic of food ingredients, because water can affect the appearance of the texture and taste of food ingredients. The water content in food ingredients also determines the freshness and durability of the food ingredients. High water content causes microorganisms such as bacteria, mold, and yeast to grow so that changes occur in the food ingredients. Analysis of water content in food is important for both fresh and processed foods. Water content can be determined in various ways. Determination of the water content of a material can be determined in several ways, namely drying (thermogravimetry), distillation (thermovolumetry), chemical methods, physical methods, and special methods such as Nuclear Magnetic Resonance. In line with population growth in Indonesia, the need for meat continues to increase every year, thus the need for animal protein also increases. Beef consumed is expected to have decent quality (Liur, et al., 2022).

Meat quality is the level of good or bad meat, both chemically and physically. The physical quality of meat is seen from the value of water holding capacity (WHC), color and pH, while chemical is seen from the value of protein content, fat content and water content of broiler chicken meat (Pratama et al., 2015). Color, cooking loss, tenderness, and fiber texture before and after cutting are some of the factors that affect meat quality. Water content is also a very important characteristic of food ingredients, because water can affect the appearance of texture and taste of food ingredients. The water content in food ingredients also determines the freshness and durability of the food ingredients. High water content causes microorganisms such as bacteria, mold, and yeast to grow so that changes occur in the food ingredients. Analysis of water content in food is important for both fresh and processed foods. Water content can be determined in various ways. Determination of the water content of a material can be determined in several ways, namely drying (thermogravimetry), distillation (thermovolumetry), chemical methods, physical methods, and special methods such as Nuclear Magnetic Resonance. Meat quality is the level of good or bad meat, both physically and chemically. The physical quality of meat is seen from the value of water holding capacity (WHC), color and pH,

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Beef contains high protein, iron, zinc, selenium, riboflavin, vitamin B6, vitamin B12, niacin, phosphorus, and essential amino acids needed by humans. The level of beef consumption per capital in Indonesia in 2016 was 0.417 kg. Increasing public consumption needs to be followed by ensuring the hygiene and quality of beef in circulation. One factor that affects the quality of beef is the water content of the meat. The normal water content of meat is 65-80%. If it is more than that, the meat will be more watery, rot quickly, and have high cooking loss. Anticipating this, a test tool is needed to estimate the water content of meat accurately and efficiently. This study aims to obtain a formula for estimating water content based on the water footprint of meat given a pressure of 2 kg (Fakhri Husain, 2019).

Chicken meat is a food ingredient with a balanced nutritional content and is needed by the body. Meat quality is a combination and variation of meat properties so that meat products can be eaten. Meat quality can be reflected in nutritional, physical and sensory properties (Hidayah, 2019). Nutrition in meat can be seen from the water, protein, and fat content.

LITERATURE REVIEW

The gravimetric method has been a standard in food science and meat analysis for many years. Early works on moisture determination in meat focused on improving the precision of drying techniques, such as the use of ovens, desiccators, and vacuum drying systems. Over time, refinements in drying protocols, such as the optimization of temperature and time, have been introduced to ensure that all water, including bound and free water, is adequately removed without altering the meat's composition.

METHODOLOGY

In writing this article, the method used is a journal review method or literature review from various existing library sources. By carefully analyzing and evaluating journals or scientific articles published from 2014-2024. Then summarized and entered into the table data that has been created. The source of this article review with the topic: Analysis of water content in meat using the gravimetric method.

RESULT AND DISCUSSION

Sample weight measurement data based on research by (Sustanto et al., 2019), the initial weight of the meat sample before drying was an average of 5 grams. After drying at 105 • C for 24 hours, the average final weight of the sample was around 1.5 grams. This weight reduction indicates the amount of water that evaporates during the drying process. (Rahmawati et al., 2020) found that the water content in meat using the gravimetric method was around 70%, consistent with the literature which states that the water content of meat is in the range of 60-75%.

Haryanto et al. (2018) stated that the gravimetric method is quite accurate for samples with high water content. In this study, drying at a temperature of 105°C for 24 hours ensured the evaporation of water until constant weight was achieved, although some volatile compounds other than water could also evaporate at that temperature. The results of the 70% water content in this meat sample are in line with the results of other studies, such as those expressed by (Santoso and Permana, 2021), which reported that the water content of meat was in the range of 60-75%. This supports the validity of the gravimetric method in analyzing water content in meat.

Table 1. Journal Review Results Table

No	Article Title	Chemical Compounds	Result	Author
1	Analysis of Water Content and Physical Quality of Beef .	Glikogen	The results of the study showed the highest water content of 76.04% and the lowest of 74.83%. This value is still considered normal.	Liur et al., 2022.
2	Analysis of Water and Protein Content in Sausage Products at PT.Jakarana Tama Bogor	Aliphatic Hydrocarbons, Aldehydes, Alcohols, Ketones, Esters, Carboxylic Acids, Aromatic Hydrocarbons, and Oxygenated Heterocyclic Compounds.	The results of the analysis of water content in chicken sausage products averaged 51.24%, in beef sausages an average of 54.93%, in grilled chicken sausages an average of 50.23% and in grilled beef sausages 50.03%, the results of the analysis of protein content in chicken sausage	Herliyana, Salmahaminati, dan Bambang aji Wismono (2021)

			products 9.91% in beef sausages 9.15%, so that these values have met the established quality standards.	
3	Water Content and Total Microbes in Beef at the Bandar Lampung Slaughterhouse (TPH)	amino acids	The results showed variations in water content and microbial counts depending on the age of the cow and the slaughter conditions. Younger beef tends to have higher water content.	Deni Hernando et al., (2015)
4	Analysis of Nutritional Content and Acceptability of Mackerel Fish Nuggets	Amilosa, amilopektin	The results of the analysis of the water content in mackerel nuggets have 58.35%	Syifa Meida. 2024 Oplki.
5	Analysis of Water Content of Mackerel Fish Surimi	Nacl	From the results of the study, the water content of mackerel surimi before being frozen was 67.48% and after being frozen for seven days was 71.9%.	Antika et al., 2018

CONCLUSIONS AND RECOMMENDATION

Based on the results of our journal literature review, the gravimetric method is effective in determining the water content in meat. Through the process of drying the sample at a certain temperature, this method can measure the decrease in mass caused by water evaporation, so that the percentage of water content in the meat is obtained. The results of the analysis show that the water content in meat varies depending on the type and condition of the meat being tested. This method has proven to be simple and accurate for water content analysis, although it takes a long time and precise equipment to achieve consistent results.

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