The Effect of Storage Time on Fat Content, Ash Content, and Organoleptic of Mutton Soup Meat

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Abstract. The research was conducted to analyze the effects of storage time on fat content, ash content, and organoleptic mutton soup meat. The design used a Randomized Complete Block Design (RCD) with three treatments and five replications. The treatments consisted of T0 = 0-week storage, T1 = 1-week storage, and T2 = 2-week storage. Variables of this research were fat content, ash content, and organoleptic, such as color, aroma, and taste scores. The average fat content on each treatment was 0.91-1.52%; ash content was 1.08-1.75% and organoleptic such a color 3.5-1.95%; aroma 3.7-2.0% and taste 3.3-1.25%. The research showed that storage time had a significant effect (P<0,05) on the ash content of mutton soup meat, while storage time had a highly significant effect (P<0,01) on fat content and organoleptic. This research concluded that storage at different times affected mutton soup meat on fat content, ash content, and organoleptic.

1 Introduction

Sheep is one of the slaughtered animals that plays an essential role in meeting the protein needs of the community, especially in Indonesia. Lamb production in Indonesia reached 54.650.53 tons in 2022 [1]. Lamb meat contains several main components that are good for humans, such as 17.1% protein and 14.8% fat with characteristics of pink color, much fat in the muscles which are white and have a distinctive smell [2]. Lamb meat is generally processed into products such as bone soup, satay, curry, and rica-rica [3]

Diversification of processed products allows meat to be consumed over a longer time. Soup is one of the diversifications of lamb meat by boiling the remaining meat attached to the bone for 3 – 4 hours [4]. During boiling, several components, such as amino acids, fatty acids, and peptides, create a savory aroma and taste in mutton soup [5]. The use of seasonings in food ingredients can add flavour and increase the shelf life of food products [6].

Mutton meat processed into soup still has a high moisture content, which can cause the shelf life of mutton soup meat to be limited. Meat has a moisture content of 68-80% [7]. During storage, moisture content in meat correlates with ash content and fat content. The higher the moisture content, the lower the ash and fat content [8]. However, the storage of food products is generally related to temperature during shelf life. The lower the storage temperature, the longer the shelf life [9].

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The quality of processed food ingredients will also decrease if stored longer [10]. It decreases the quality of processed food ingredients that can occur in the form of physical damage. One of the effects of long shelf life on the organoleptic properties of mutton is to cause the color of mutton to brown [11]. Based on the background, it is important to research the effect of storage time on mutton soup has never been done, so it is necessary to conduct further research on the effect of storage time on fat content, ash content, and organoleptic mutton soup.

2 Materials and Methods

The research began from September 2023 to October 2023 at PT KTHR (Kelompok Tani Hutan Rakyat) at Jamuran Hamlet, RT 05 RW 02, Sukodadi Village, Wagir District, Malang Regency as a place to make mutton soup and at Saraswanti Indo Genetech Laboratory Surabaya as a place to analyze fat content, ash content, and organoleptic of mutton soup. The ingredients include mutton meat, oil, water, garlic, onion, shallot, ginger, pepper, lemongrass, cardamom, and star anise.

The research method was an experiment and counted with Randomized Complete Block Design (RCD) consisting of three treatments, T0, T1, and T2 (storage time 0-week, 1-week, and 2-week) and five replications. Variables consisted of fat content, ash content, and organoleptic. Mutton soup production method [12], Fat content used a soxhlet by SNI 01-2891-1992 [13], Ash content used an oven by SNI 01-2891-1992 [13], and organoleptic testing with scoring test method used is based on a scale of 1-4 with color (1-4, light brown – dark brown), aroma (1-4, fragrant – very rancid), taste (1-4, very savory – not savory) and it consists of 2 trained panelists [14].

3 Results and discussion

The results of the research on mutton soup meat are shown in Table 1 below:

Table 1. The results of mutton soup meat with different storage time

Treatment	Fat Content (%) ± SD	Ash Content (%) ± SD	Organoleptic (%) ± SD		
			Color	Aroma	Taste
T0	0.91 ± 0.01^{a}	1.08 ± 0.06^{a}	3.5 ± 0.35^{c}	3.7 ± 0.20^{c}	3.3 ± 2.65^{c}
T1	1.16 ± 0.02^{b}	1.66 ± 0.67^{b}	2.9 ± 0.20^{b}	2.7 ± 0.26^{b}	2.65 ± 0.19^{b}
T2	1.52 ± 1.14^{c}	1.75 ± 0.20^{b}	1.95 ± 0.10^{a}	2.0 ± 0.23^{a}	1.25 ± 0.38^{a}

3.1 Fat Content

Fat content is the total fat contained in a food. According to SNI 01-2891-1992, fat content testing is based on extracting free fat with a non-polar solvent. The test is carried out by direct extraction method with Soxhlet. The result showed that storage times had a highly significant effect ($P<0,01$) on the fat content of mutton soup meat. Research obtained the fat content of processed beef products such as empal gentong 3.73% and rawon 1.43%, which these results indicated that mutton soup meat is still within the limits of the fat content of processed meat products [15]. The result of the research on mutton soup meat, which was stored at -18°C, was thought to have decreased moisture content during storage. The fat content is correlated with moisture content. The higher the fat, the lower the moisture content [16]. It can be

expected that before analyzing the fat content, water will come out in the meat. Thus, meat that undergoes freeze-thawing can decrease moisture content due to water loss [17].

The highest fat content found in the T2 treatment was 1,52%, while the lowest fat content found in the T0 treatment was 0.91%. Mutton soup meat did not decrease in fat content, presumably due to adding spices to mutton soup meat, which can increase shelf life. It is comparable to the research that spices such as ginger, garlic [18], and shallots can also limit lipid oxidation during 14 days of frozen storage in meat samples, in addition to being antioxidants. Thus, the difference in the value of fat content in the result of research is also likely due to differences in the type of meat during the cooking process. It is supported by the fact that fat in meat can be influenced by age, condition, feed, and carcass [16]. It added that differences in fat content in rawon can be caused by differences in raw material, seasonings, and cooking processes [19].

3.2 Ash Content

Ash content is a measure of inorganic residue left after drying at 500-800°C. According to SNI 01-2891-1992, the principle of ash content analyzes the process of igniting organic substances, which are broken down into water and CO2, but inorganic materials are not. The result showed that storage times had a significant effect (P<0,05) on the ash content of mutton soup meat. Research obtained the ash content of rawon 1.43% and empal gentong 1.87%, which shows that mutton soup meat is still within the limit of ash content of processed meat products [15]. The data in Table 1 shows that the ash content increases with the length of storage time. It stated that the high and low ash content can be influenced by the length of time and storage temperature [20].

The highest average ash content was obtained after two weeks of storage (T2), which was 1.75%. Research shows that processed beef stored frozen experienced an increase in ash content for 15 days from 1.09% to 1.16% [21]. The ash content of meat indicates that the meat contains minerals. In frozen storage (-18°C) for two weeks, there is an increase in calcium in chicken meat boiled with bones because calcium in the bones is transferred to the meat [22]. In addition to bones, mutton meat also contains the mineral calcium (Ca).

In general, meat has a chemical composition of 70% water, 20% protein, 9% fat, and 1% ash [23]. The average value of ash content is in the range 1.08-1.75%. The addition of spices to mutton soup meat ingredients is thought to cause an increase in ash content. Mineral content in garlic can affect the ash content. Some mineral contents in garlis include Zn, Mg, and Fe [24]. It is in line with research that processing sie reuboh, rendang, and kalio with the addition of spices can increase the ash content of meat by 1% compared to fresh meat [25].

3.3 Organoleptic

According to SNI 01-23345-2006, organoleptic testing uses the human senses as the primary tool in assessing the quality of a product. Organoleptic tests on food products are color, aroma, and taste. Color is one of the indicators in determining the physical quality of food ingredients. Color can be a visual factor in food products. If food is considered nutritious and tasty but has the wrong color, it will affect the perception of customers [26]. Based on Table 1, the result showed that storage times had a highly significant effect (P<0,01) on the color score of mutton soup meat. The average value of color score of mutton soup meat is in the range of 3.5-1.95%. The Maillard reaction can cause the browning that occurs in meat. The Maillard reaction can be formed due to chemical reactions between free amino acids and reducing groups, causing brown pigments in meat [27].

The aroma in food products is one of the determinants of product quality towards panelist acceptance. Panelists can tell whether a food product is tasty by smelling the aroma from a

distance [26]. The data in Table 1 shows that storage times had a highly significant effect (P<0,01) on the aroma score of mutton soup meat. Some factors that can affect the aroma of soup are the Maillard reaction, lipid oxidation, and vitamin degradation [5]. In addition, it stated that in food products, the longer the storage, the less the acceptance of panelists will decrease on sensory scores such as appearance, aroma, and taste [28].

Taste is one of the panelist's acceptances during organoleptic testing. The taste of food products can be influenced by several factors, such as cooking time, chemical compounds, consistency, and temperature [29]. Based on Table 1, the data showed that storage times had a highly significant effect (P<0,01) on the taste score of mutton soup meat. The highest average test score was obtained by 0-week storage time (T0), which was 3.3%. The taste of food ingredients can be influenced by the addition of spices during the cooking of processed meat products [26]. The taste of mutton soup can be influenced by temperature, time, NaCl content, and the meat used [5].

4 Conclusion

The storage time consisted of 0-week, 1-week, and 2-week of mutton soup meat has effect on ash content and highly significant effect on ash content and organoleptic such a color, aroma and taste of mutton soup meat. The average fat content results in each treatment are 0.91-1.52%; ash content 1.08-1.75%; color 3.5-1.95%; aroma 3.7-2.0%; and taste 3.3-1.25%. Thus, the storage at different times affects mutton soup meat on fat content, ash content, and organoleptic.

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