Formosa Journal of Science and Technology (FJST)
Vol.2, No.7, 2023: 1855-1874

Quality of Broiler Chicken Meat Given Bean Sprouts Waste in Rations During Storage

Ni Ketut Sri Rukmini[1*], Ni Ketut Mardewi[2], and I Gusti Ayu Dewi Seri Fortune[3]
Animal Husbandry Study Program, Faculty of Agriculture, Warmadewa University
Corresponding Author: Ni Ketut Sri Rukmini srirukmini9999@gmail.com

ARTICLE INFO

Keywords: Broiler Chicken, Meat Characteristics, Fermented Bean Sprouts Waste, storage

Received : 05, May
Revised : 10, June
Accepted: 15, July

ABSTRACT

The purpose of this study was to determine the quality of broiler chicken meat which was given rations containing fermented bean sprout waste flour during storage. This study used a completely randomized design (CRD) with 2 factors, namely factor 1 which consisted of P0 (control ration without the addition of fermented bean sprout waste flour), P1 (ration containing 3% fermented bean sprout waste flour), P2 (ration containing 6% fermented bean sprout waste flour, and P3 (ration containing 9% fermented bean sprout waste flour) Factor 2 consisted of 4 levels, namely storage day 0, day 4, 8 and 12. The results showed that administration Fermented bean sprout waste showed no significant effect (P>0.05) on broiler meat quality, while storage time had a very significant effect (P<0.0. 01) on the moisture content of broiler chicken meat and the significant effect (P<0.05) on pH and cooking loss of broiler chicken meat. The interaction of fermented bean sprout waste and storage time showed no significant effect (P>0.05) on the quality of broiler chicken meat. The storage time for broiler meat at 8˚C with good quality is 8 days.

DOI prefix: https://doi.org/10.55927/fjst.v2i7.4640
ISSN-E: 2964-6804
https://journal.formosapublisher.org/index.php/fjst

INTRODUCTION

Broilers, also known as commercial chickens with meat, are superior breeds resulting from crossing several chickens that have high productivity, especially in producing chicken meat. Broiler is one source of contributing to the needs of animal protein for the community. The specialty of broiler chickens is that they have the ability to produce meat with a relatively short rearing time.

Some of the obstacles that are often faced by breeders in raising broiler chickens is one of them is the cost of feed. Feed costs as much as 60-70% of the total production costs(Daghir, 2009). To reduce high feed costs, innovative efforts are needed in utilizing alternative feed ingredients that are cheap and easy to obtain and have good nutritional content(Sari et al., 2014). One way that can be done is to utilize waste that can still be used as animal feed, such as market waste.

Of the several types of market waste, one of the market wastes that can be used as animal feed is bean sprout waste. Bean sprout waste comes from the remaining processing of bean sprout production which can be used as broiler feed ingredients. Bean sprout waste has several weaknesses, namely crude fiber such as high hemagglutimin, which is 49.44%, which is a compound that is toxic when given to livestock.(Puspitasary et al., 2018)

This is in opinion(Sari et al., 2014)stated that high crude fiber needs to be limited in its use in rations, because poultry have limitations in digesting crude fiber. One way to overcome this problem, by increasing the nutritional value of the ration, by reducing the high crude fiber and increasing the digestibility, is by carrying out fermentation.(A. Lestari, 2019). Fermentation is a processing of bean sprout skin waste with the help of enzymes from a microorganism, in the fermentation process a complex compound reaction occurs which is converted into a simpler compound. Fermentation aims to increase nutrient content, reduce anti-nutrients, increase livestock digestibility and increase the storage time of the bean sprout skin product. In addition, fermentation is expected to increase the efficiency of using feed ingredients, so that the growth and percentage of broiler chicken carcasses will increase(Surung, 2008).

In Indonesia, the quality standard for chicken carcasses is regulated in SNI 3924:2009. This standard specifies the classification, quality requirements, carcass cuts, packaging, labeling and storage of purebred chicken carcasses and meat. In developed countries, consumers are very concerned about the quality and characteristics of the meat to be consumed, so that meat with good quality and characteristics will have a higher selling value.

Broiler chicken meat is easily damaged due to contamination of germs originating from feathers, skin, digestive tract of chickens and the slaughter process until it is ready for consumption. Germ contamination can cause changes in the quality of chicken meat, both physical quality, chemical quality, and microbiological quality(Sangadji et al., 2019). The number of germs in chicken meat will increase along with the length of storage. Under cold storage conditions and covered, chemical reactions occur in cells and muscle tissue which affect their physical properties such as water holding capacity, cooking

loss, pH and changes in texture, aroma and color of broiler chicken meat. The length of storage of chicken meat in the refrigerator for up to six days shows a decrease in pH up to 5.70, an increase in the percentage of cooking loss of 34.48%, a change in color to reddish white, the aroma tends to rot and has a soft texture(Sangadji et al., 2019).

From the description above, it is necessary to conduct research on the quality of broiler chicken meat fed bean sprout waste in rations during storage.

LITERATURE REVIEW

Broiler Chicken

Broiler chickens are livestock products that have economic characteristics, fast growth as a producer of meat, harvested in a fast time because of their fast growth, generally harvested at the age of 5-6 weeks(Kartsudjana, 2006). Broiler chickens in the economic classification have characteristics with the characteristics of tender meat, large body size, wide chest shape, dense and filled, efficient in rations and very fast body weight gain.

Broiler chicken is one of the largest contributors of animal protein from livestock and is a superior commodity. Broiler chickens have been known by the people of Indonesia for their various advantages so that in their maintenance, many new breeders and seasonal breeders have sprung up in various parts of Indonesia.(Kartsudjana, 2006). Broiler chickens have the ability to produce meat with a relatively short rearing time. The rapid development of broiler chickens or broiler chickens is also an effort to balance people's need for chicken meat.

Chicken meat

Meat is defined as all animal tissues and all products resulting from the processing of these tissues are suitable for consumption and do not cause health problems for those who eat them.(Soeparno, 2011). Fresh meat contains enzymes that can break down/break down several nutritional components (protein, fat) which eventually cause meat spoilage. Meat is easily damaged because of its high nutritional and water content and contains lots of vitamins and minerals. Appearance, texture, suppleness, tenderness, smell and taste are important elements in meat that can affect the quality assessment of the initial and final consumers. Furthermore, the objective properties of meat such as water holding capacity, cooking loss, pH and meat color are needed to provide an assessment of meat products.

Chicken meat has a good taste and aroma, soft texture, and relatively affordable price, so it is liked by many people(Jaelani et al., 2014). Healthy chicken meat has the following characteristics: (1). the color of the flesh is bright white-yellow (not dark, not pale, not bluish), (2) the skin color of the chicken is white-yellow, bright, shiny and clean, (3). When touched, the meat feels moist and not sticky (not dry), (4). Specific smell of meat (no pungent smell, no fishy smell, no rotten smell), (5). The consistency of the chest and thigh muscles is supple or elastic (not mushy), (6). The inside of the carcass and muscle fibers is slightly pale white, (7). The veins on the neck and wings are empty(DG of

Manpower, 2012). Unsafe meat will endanger the health of consumers, some of the criteria for unsafe meat are as follows: (1). Sick animals (2). animals in treatment, especially giving antibiotics (3). Abnormal flesh color and (4). rotten flesh.

Waste Sprouts

Mung bean sprout waste is a by-product of making mung bean sprouts. It consists of mung bean skin and bean sprout fragments which are the leftover production of mung bean sprouts(Christiana, 2012). In making mung bean sprouts, 1 kg of mung beans produces 5 kg of bean sprouts, of which 100 to 200 grams is bean sprout skin.(Yulianto, 2010). According to [3], the chemical composition of green bean sprout waste consists of 36.70% dry matter, 7.35% ash, 13.60% crude protein, 1.17% crude fat, 49.44% crude fiber and 28.44% BETN. %. In 100% dry matter, bean sprout waste contains 2.40% ash, 0.52% fat, 21.95% protein and 57.06% crude fiber. Efforts to reduce the crude fiber content in bean sprout waste can be done by the fermentation process. Fermented feed ingredients have a better digestibility value because the complex components will be broken down into simple components so that they are easily digested by livestock(Hajrah et al., 2022)

Fermentation

Fermentation is a process of overhauling the coarse structure physically, chemically and biologically, so that materials from complex structures become simpler. The fermentation process increases the digestibility of livestock to become more efficient(Bidura, 2017). Fermentation is the process of breaking down carbohydrates and amino acids in an aerobic manner, ie without the need for oxygen. Each fermentation process uses the metabolic activity of a particular microbe or a mixture of several microbes.

Biological treatment (fermentation) aims to increase the nutritional value of the digestibility of the material with the help of living things, for example by growing fungi, bacteria or by adding enzymes that aim to degrade lignohemicellulose, which is a component of crude fiber which primarily interferes with digestion.(Leasa & Matdoan, 2015). According to(Hidayat et al., 2006)To obtain an optimum fermentation system, the fermentation must meet the following requirements, free from contaminants, the culture volume is relatively constant (no leaks and evaporation), dissolved oxygen levels must meet environmental standards and conditions such as: temperature and pH must be controlled.

Characteristics of Broiler Chicken Meat

According to SNI 3924:2009 concerning Quality of Chicken Carcass and Meat, it is stated that broiler carcass is the part of the broiler after being cut, plucked from the feathers, removed the innards and abdominal fat, the head and neck and both legs have been cut off. The method of cutting can be differentiated into whole carcass, halves, quarters, body parts (chicken parts or cut put), and debond, namely broiler carcass without bones or skin. Meanwhile, based on how to handle it, it is divided into fresh carcass and frozen carcass.

Fresh carcass is a carcass that is immediately cooled after processing so that the temperature of the meat is between 4 and 5 °C, while frozen carcass is a carcass that has undergone a fast or slow freezing process with a storage temperature between -12°C to -18°C.

The composition of chicken meat consists of 73.7% water, 20.6% protein, 4.7% fat and 1% ash. The mineral content of chicken meat is 4% consisting of sodium, potassium, magnesium, calcium, iron, sulfur phosphate, chloride and iodine.(Anggorodi, 1995).

The quality of chicken meat is influenced by several factors, both when the animal is still alive and after being slaughtered. While the animal is alive, the determining factor for meat quality is the method of maintenance, including feeding, maintenance management, and health care, whereas after the animal is slaughtered, the quality of the meat is affected by bleeding when the animal is slaughtered and microbial contamination.(Murtidjo, 2003).

Meat (fresh) contains enzymes that can break down several nutritional components (protein, fat) which eventually cause meat to spoil so that meat is categorized as perishable food. Meat is easily damaged because of its high nutritional and water content. Meat quality is the term used to describe the overall characteristics of meat including physical, chemical, morphological, microbial and nutritional. Appearance of texture, suppleness, tenderness, odor and sourness are important elements in meat that can affect consumer ratings. While the objective properties of meat such as water holding capacity, cooking losses, pH, shelf life are needed for additional assessment of meat quality.

Chicken Meat Storage

Broiler chicken meat is a highly nutritious food ingredient, has a delicious taste and aroma, soft texture and relatively cheap price, so it is liked by many people. However, broiler meat is not without its drawbacks, especially its perishability. Broiler chicken meat is easily damaged due to contamination of germs originating from feathers, skin, digestive tract of chickens and the slaughter process until it is ready for consumption. Germ contamination can cause changes in the quality of chicken meat, both physical quality, chemical quality, and microbiological quality(Jaelani et al., 2014). The number of germs in chicken meat will increase along with the length of storage. Under cold storage conditions and covered, chemical reactions occur in cells and muscle tissue which affect their physical properties such as water holding capacity, cooking loss, pH and changes in texture, aroma and color of broiler chicken meat.

Most of the damage is caused by poor handling, which provides opportunities for the growth of spoilage microbes and results in a decrease in the quality and shelf life of the carcass. Broiler carcasses should be immediately put in the refrigerator (refrigerator) to prevent the growth of spoilage microbes. Even carcasses that will be stored at cold temperatures should be protected by wrapping because this treatment can affect shelf life and prevent a decrease in carcass quality during storage in the refrigerator.(Risnajati, 2010).

Cooling at refrigerator temperature is the simplest and most frequently used way to preserve and extend the shelf life of chicken meat. Cooling can inhibit the growth of germs, because cold temperatures will reduce the kinetic energy of all molecules in the system, thereby reducing the speed of chemical reactions including the metabolic activity of germ cells. Even so, cooling or storing in the refrigerator still allows certain germs to live(Jaelani et al., 2014). The length of storage of chicken meat in the refrigerator for up to six days shows a decrease in pH up to 5.70, an increase in the percentage of cooking loss of 34.48%, a change in color to reddish white, the aroma tends to rot and has a soft texture(Jaelani et al., 2014). It is suspected that with the use of packaging the shelf life will be longer than 6 days.

METHODOLOGY

Location and Time of Research

Research on raising broiler chickens was conducted at the Experimental Station of the Faculty of Agriculture, Warmadewa University, and the characteristics of broiler chicken meat were carried out at the Laboratory of Basic Sciences, Faculty of Agriculture, Warmadewa University, located in Tanjung Bungkak, Sumerta Village, East Denpasar District, Denpasar City. The research time starts from April – June 2023.

Research methods

The research method used a factorial Completely Randomized Design (CRD) consisting of 2 factors. Factor 1 was the treatment of bean sprout waste concentration in the ration consisting of 4 levels, namely chicken meat containing ration without fermented bean sprout waste (P0), chicken meat containing 3% fermented bean sprout waste ration (P1), chicken meat containing fermented bean sprout waste ration 6 % (P2), and chicken meat containing fermented bean sprouts ration 9% (P3). Factor 2 was the length of storage of broiler meat which consisted of 4 levels, namely storage day 0 (T0), storage day 4 (P1), storage day 8 (P2), storage day 12 (P3). Based on these treatments, 16 treatment combinations were obtained and each was repeated 2 times so that there were 32 treatment combinations.

Materials and tools

This study used 100 grams of broiler chicken meat. The materials used are distilled water, benzene petreleum and filter paper. The tools used are knives, plastic, cutting boards, basins, stoves, pans, pH meters, beaker glass, scales, thermometers, stirring rods, porcelain dishes, ovens, chromameters.

Research Implementation

The research was conducted in several stages, namely the preparation stage, the treatment stage and the data collection stage. The preparatory stage is collecting information on feed ingredients making up the ration, fermenting bean sprout waste, mixing broiler rations. In the treatment stage, broiler chickens were reared for 5 weeks by giving rations with the addition of fermented bean sprout waste flour at a predetermined concentration.

Furthermore, the process of harvesting chickens and treatment of slaughtering chickens. In the data collection stage, the breast part of the broiler chicken was used for physical and chemical analysis. Broiler chicken meat was stored at 4-8 °C and observed every 4 days, namely on days 0, 4, 8 and 12 so that data on the characteristics of broiler chicken meat that was given fermented bean sprout waste rations during storage could be produced.

Observed Variables

pH value

The pH value is measured using a pH meter and calibrated with a buffer solution with a pH value of 4 and 7. The cathode of the pH meter is inserted into the sample and left until the number printed on the digital measurement does not change anymore. The cathode of the pH meter was rinsed with distilled water and dried before being used again.

Water Binding Power (DMA)

Meat sample weighing 0.3 kg is placed on paper, filtered between two stainless steel plates, then given a weight of 35 kg for 5 minutes. On the filter paper you will see an area covered by the meat sample which has become flat and wet around it. The wet area is obtained by the area of both meat covered areas from the total area which includes the wet area on the filter paper. DMA is calculated based on the percentage between wet areas of the total area

MgH 2O = x 8.0 %

Shrink cooking

A bimetal thermometer was inserted into the breast meat sample until it penetrated into the meat, then it was put into boiling water so that the thermometer showed 76°C, the meat sample was removed and dried at room temperature until it reached a constant weight. Weighing is done after the sample has cooled. Measurements were made based on the comparison between the weight of the meat before and after it was cooked.

Color

The color test was performed using the Hunter L* (white) color system, a* (red), b* (yellow). The chromameter is first calibrated with the white standard contained in the tool. The results of the analysis of the degree of whiteness produced are in the form of L*, a*, b* values.

Meat Moisture Analysis

Water content analysis is carried out to determine the water content or the amount of water contained in a material. The first step in analyzing the water content was to dry the porcelain cup in an oven at 105oC for 1 hour. The cup was then stored in a desiccator for 15 minutes and allowed to cool and then weighed. Weigh 1 gram of sample and then grind it. The sample is put into a cup and baked at 102-105oC for 5-6 hours. After 5-6 hours, the cup and sample were removed from the oven and put in a desiccator, left for 30 minutes to cool and then weighed.

Data analysis

The data obtained were analyzed by analysis of variance, if there were significantly different results (P <0.05) then it was continued with Duncan's smallest real distance test.

RESEARCH RESULT

Based on the results of statistical analysis, the provision of fermented bean sprouts showed no significant effect (P>0.05) on the quality of broiler meat, while storage time had a very significant effect (P<0.01) on the moisture content of broiler chicken meat and a significant effect (P<0.05) on pH and cooking shrinkage of broiler meat. The interaction of fermented bean sprout waste and storage time showed no significant effect (P>0.05) on the quality of broiler chicken meat. The average values of water content, ash content, pH, cooking losses, water holding capacity and color of broiler chicken meat can be seen in Table 1.

The results showed that the treatment with fermented bean sprouts had no significant effect (P>0.05) on the moisture content of broiler chicken meat. The highest water content tends to be obtained in the treatment of administrationfermented bean sprout waste ration 3%with a water content of 75.45% which was not significantly different from the other treatments, while the lowest water content was obtained in the administration treatmentfermented bean sprout waste ration 6%with a water content of 74.62%. Storage duration treatment showed a very significant effect (P<0.05) on the moisture content of broiler chicken meat. The highest water content was obtained on the 12th day of storage with a moisture content of 76.22 which was significantly different from other treatments.

Provision of fermented bean sprouts and storage time showed no significant effect (P>0.05) on the ash content of broiler chicken meat. The highest ash content tends to be obtained in the treatment of administrationration without fermented bean sprouts wastewith an ash content of 2.48% which was not significantly different (P>0.05) with other treatments. In the long storage treatment, the highest ash content was obtained on day 0 of storage with an ash content of 2.38 which was not significantly different from the other treatments.

The results showed that the treatment with fermented bean sprouts had no significant effect (P>0.05) on the pH of broiler chicken meat. The lowest pH values tend to be obtained in the treatment of administrationfermented bean sprout waste ration3% with a pH of 5.42 which was not significantly different from the other treatments. Storage duration treatment showed a significant effect (P<0.01) on the pH of broiler chicken meat. The lowest pH value was obtained on the 12th day of storage with a pH value of 5.37 which was not significantly different from the treatment on the 8th day of storage with a pH value of 5.43, but significantly different from the storage time on days 0 and 4 with a pH value of 5.48 and 5.46 respectively.

The results showed that the treatment with fermented bean sprouts had no significant effect (P>0.05) on the cooking loss of broiler chicken meat. The highest cooking losses tend to be obtained in the treatment of

administrationfermented bean sprout waste ration9% with cooking losses of 34.06% which was not significantly different from the other treatments. Treatment of storage time showed a significant effect (P<0.05) on cooking loss of broiler chicken. The highest cooking loss was obtained on the 12th day of storage with a cooking loss value of 34.68% which was significantly different from the other treatments.

Provision of fermented bean sprouts and storage time showed no significant effect (P>0.05) on the water holding capacity of broiler chickens. The highest water binding capacity tends to be obtained in the treatment of administrationration without fermented bean sprouts wastewith a water holding capacity of 28.54 which was not significantly different from the other treatments. In the long storage treatment, the highest water holding capacity was obtained on the 12th day of storage with a water holding capacity of 28.14 which was not significantly different from the other treatments.

Provision of fermented bean sprouts and storage time showed no significant effect on the color of broiler chicken meat. The highest color tends to be obtained in the treatment of administrationfermented bean sprout waste ration 9%with a color value of 43.37 which was not significantly different from the other treatments. In the long storage treatment, the highest color value was obtained on the 12th day of storage with a color value of 42.05 which was not significantly different from the other treatments.

DISCUSSION

Water content

Based on the results of the study there was no interaction between the treatment of fermented bean sprout waste and the storage time of broiler chicken meat. Moisture content of broiler meat ranges from 74.62% -75.00%. Provision of fermented bean sprouts in the ration does not affect the moisture content of broiler chicken meat during storage. This shows that fermented bean sprouts waste can be an alternative feed substitute for broiler chickens because it does not affect the chemical quality of broiler meat. Bean sprout waste contains 63.35% water, 7.35% ash, 1.17% fat, 13% - 14% protein, 49.44% crude fiber and 64.65% TDN(Puspitasary et al., 2018). Bean sprout waste has a high enough protein content so that it can increase the growth of broiler chickens. Storage time affects the moisture content of broiler meat (Figure 1).

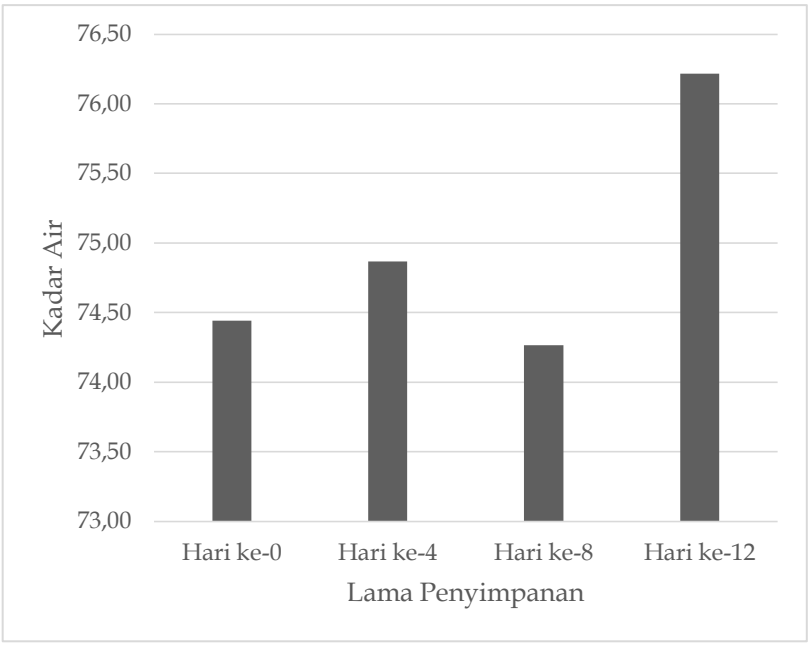

Figure 1. Graph of broiler meat moisture content during storage

Moisture content of chicken meat was not statistically significantly different from day 0 to day 8 of storage, and increased on day 12. This is due to the presence of microbial activity in the meat(Zhang et al., 2016). This is in accordance with the statement(Mahaputra et al., 2023)that the increased water content is affected by the amount of free water formed as a by-product of microbial activity.(Lestari et al., 2019)states that when microbes reach a constant growth phase, small molecular compounds containing water will be produced. The longer the chicken meat is stored, the food substances contained in the meat will decompose, especially bound water released, causing an increase in free water(Milicevic et al., 2015). This is in line with opinion(Amir, 2020)that meat that is stored for too long will cause the release of bound water to become free water. Thus, the longer chicken meat is stored will cause an increase in the value of the water content(Hamad et al., 2017).

Ash Content

In this study, the provision of fermented bean sprouts waste, storage time and their interactions did not affect the ash content of broiler chicken meat. This shows that the addition of fermented bean sprouts in the ration does not affect the chemical quality of broiler chicken meat because the ash content of broiler meat given the ration with the addition of fermented bean sprouts waste is not statistically significantly different from the ash content of broiler chicken meat and the ration without the addition of fermented bean sprouts waste. Likewise, storage time does not have a significant effect on the ash content of broiler chicken. Ash content is a determining factor for nutritional content

related to mineral content in chicken meat. The factor that affects the ash content is the age of the livestock.(Qurniawan et al., 2017)stated that as the age of broiler chickens increases, the ash content also increases. The amount of ash content is also related to the level of livestock consumption. The higher the level of consumption, the higher the ash content. The amount of ash content also varies based on the species, age and sex of the livestock.

pH

The pH value is the number of hydrogen ion concentrations in a solution which indicates the level of acidity or base of a material. The pH value is one of the criteria in determining the quality of chicken meat. Based on the results of the study, the administration of fermented bean sprout waste did not affect the pH of broiler chicken meat. The pH value of broiler chicken meat in this study was 5.42-5.45. According to(Soeparno, 2011)under normal conditions, fresh broiler meat has a pH range of 5.3-6.5. According to(Masrianto et al., 2019), factors that can affect meat quality are genetics, species, nation, type of animal, sex, age, feed, including additives (hormones, antibiotics, and minerals) and stress conditions. Storage time has a significant effect on the decrease in pH (Figure 2). The pH value of broiler meat on storage day 0 to day 8 was not statistically significantly different, but the pH value of broiler chicken decreased on day 12.

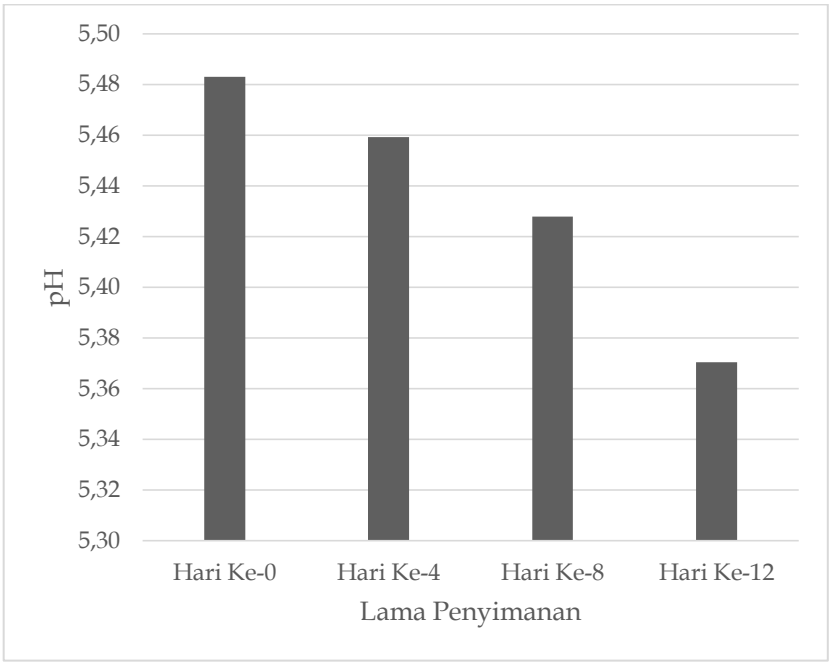

Figure 2. Graph of broiler meat moisture content during storage

This study is in line with the results of the study(Suradi, 2006)which states that the longer the storage is carried out, the pH will decrease. A decrease in pH will affect the physical properties of the meat, the rapid rate of decrease in muscle pH will result in a lower water-binding capacity, due to increased

actomyosin contractions that are formed, thereby squeezing the liquid out of the meat and causing a decrease in the pH value of the meat.(Augustyńska-Prejsnar et al., 2018). The process of glycogen catabolism which results in a buildup of lactic acid causes the pH to drop(Choe et al., 2010). The decrease in pH can cause the fibrils to shrink and the protein loses its ability to bind fluids so that the structure becomes loose. In addition, a decrease in pH also causes protein denaturation, deregulation of proteolysis so that the meat becomes soft, watery and pale.(Sangadji et al., 2019).

Water binding capacity

Water binding capacity is the ability of meat to bind water or added water as long as there is an external force, such as cutting meat, heating, grinding and pressure.(Sriyani et al., 2015). The results showed that the addition of fermented bean sprouts had no effect on the water holding capacity of broiler chickens. The water holding capacity of broiler chicken ranges from 27.13% -28.54%. In this study, the length of storage of broiler meat also had no effect on the water holding capacity of the broiler meat. According to(Soeparno, 2011), the water binding capacity of the meat is around 20-60%. This shows that the water holding capacity of broiler meat in this study was still categorized as normal. The water holding capacity is strongly influenced by the rate and magnitude of the decrease in pH, while changes in pH are related to changes in the microstructure of the meat, including muscle contractions in animals that are still alive. The pH factor, water holding capacity is also influenced by factors of muscle location, age, feed (for example feed additives)(Soeparno, 2011). In this study, the pH of broiler chicken meat was still categorized as normal so that it did not affect the water holding capacity of broiler chicken meat.(Prosperous et al., 2019)stated that the low pH value of the meat resulted in an open meat structure thereby reducing the water holding capacity and the high pH value of the meat resulted in a closed meat structure so that the water holding capacity was high. The value of the binding capacity of the meat is indicated by the amount of meat juice that comes out(Qasim et al., 2023).(Hamad et al., 2017)stated that during storage collagen degradation would occur from the protein that forms cross-links between meat fibers, furthermore it was stated that the main component that functions to hold meat juices is protein. Changes in the structure of protein in meat along with long storage time can weaken the ability of meat to bind the liquid(Puolanne, 2017).

Shrink cooking

Based on the results of the study, the administration of fermented bean sprouts waste did not affect the cooking loss of broiler chicken meat. Meat cooking losses in this study ranged from 31.69-34.06%. The cooking loss value is

the result of the difference in the weight of the meat before and after cooking. According to(Soeparno, 2011)Meat that has low cooking losses has relatively good quality than meat that is high, this is because the loss of nutrients during cooking is less. According to the statement(Soeparno, 2011)that the cooking shrinkage of meat varies from 15% to 54.5%. Thus, the meat cooking losses in this study were still categorized as normal or of good quality.

Storage time has a significant effect on the cooking loss of broiler chicken (Figure 3). Cooking losses experienced a significant increase on the 12th day which indicated a decrease in the quality of the meat.(Prayitno et al., 2012)states that good quality meat has low cooking losses, due to the loss of nutrients and fluids during cooking. According to(Soeparno, 2011), that meat with lower cooking loss has relatively better quality than meat with greater cooking loss, because the loss of nutrients during cooking will be less so broiler meat with low cooking loss will have better quality than broiler meat with high cooking loss. According to(Soeparno, 2011), the factors that affect the value of meat cooking losses are cooking temperature, age of livestock, livestock breeds, and feed consumption. The difference in the value of cooking shrinkage is closely related to the magnitude of the binding capacity of the meat, the lower the binding capacity of the meat to bind the meat water, the higher the value of cooking loss(Rukchon et al., 2014). The high value of cooking shrinkage is an indicator of the weakening of protein bonds, so that the ability to bind meat juices is weakened and a lot of meat juices come out because the binding capacity of meat decreases(Warner, 2017).

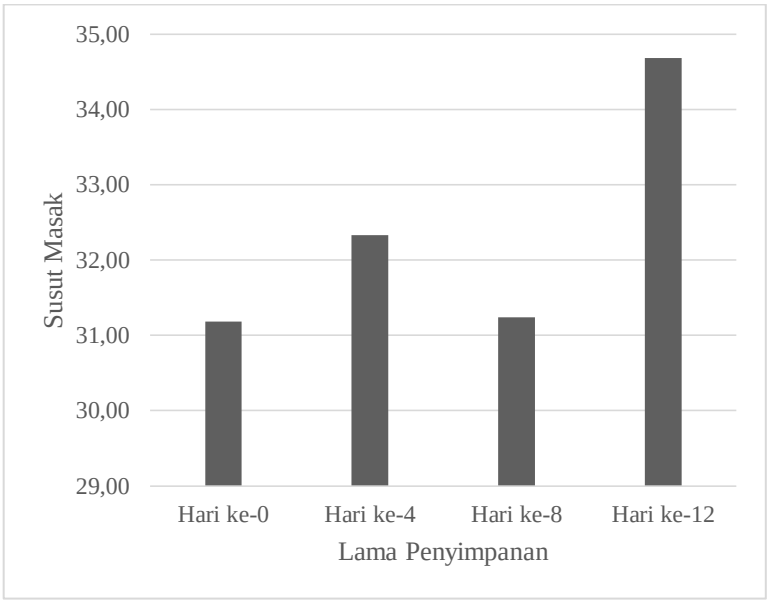

Figure 3. Graph of cooking losses for broiler chicken meat during storage

Color

The color value in this study is the value of L* (brightness) which is observed with a colori meter. The color value L* indicates the brightness level of the broiler meat sample. According to(Kasanah et al., 2016), the value of L* represents the reflected light which produces white, gray and black achromatic colors. The results showed that the provision of fermented bean sprouts in the ration and storage time had no effect on the color value of broiler chicken meat.(Asmara et al., 2006)mentioned the color of fresh chicken meat is yellowish white. Color is an indicator of meat quality, although color does not affect nutritional value(Jaelani et al., 2014). The results showed that there was no significant difference in the L* color value of broiler meat, which means that during storage until the 12th day there was no change in the color of broiler meat.(Jouki & Khazaei, 2012)stated that changes in the color of broiler meat occurred at 24 days of storage where the color of the meat became no longer bright and experienced a dark color change.(Tarladgis, 1962). Color changes can occur because myoglobin will be oxidized to form metmyoglobin and after protein denaturation occurs, the next meat color will form, which is called metmiokromogen. Methmiochromogen has a carboxylate of denatured globin and water as an alligan action. This compound is responsible for the formation of brown color in cured or cooked meat(Jongberg et al., 2014)(Viana et al., 2017).

CONCLUSIONS AND RECOMMENDATIONS

The conclusion of this study was that the provision of fermented bean sprouts showed no significant effect ($P>0.05$) on the quality of broiler meat, while storage time had a very significant effect ($P<0.01$) on the moisture content of broiler chicken meat and a significant effect ($P<0.05$) on pH and cooking loss of broiler chicken meat. The interaction of fermented bean sprout waste and storage time showed no significant effect ($P>0.05$) on the quality of broiler chicken meat. The storage time for broiler meat at 8˚C with good quality is 8 days.

ADVANCED RESEARCH

The author suggests further research on the storage of broiler meat at different storage temperatures and packaging methods on the quality of broiler chickens during storage.

ACKNOWLEDGEMENT

The authors would like to thank the Chancellor of Warmadewa University, Head of the Warmadewa University Research Institute, Dean of the Warmadewa University Faculty of Agriculture, Basic Science Laboratory and Agricultural Analysis Laboratory, Warmadewa University Faculty of

Agriculture, the Lecturer Team in this research and students who have assisted in this research.

REFERENCES

Amir, M. (2020). Meat: Quality, Effect of Cooking Process and Relationship with Health. Edu Library.

Anggorod. (1995). Nutrition of Various Poultry Livestock. PT. Gramedia Pustaka Utama. Jakarta

Asmara, SA, Zuki, ABZ, Hair, BM, & Awang-Hazmi, A. . (2006). Gross and Histological Evaluation of Fresh Chicken Carcass: Comparison Between Slaughtered and Cervical Dislocated Methods. Journal of Animal and Veterinary Advances, 5(11), 1039–1042.

Augustyńska-Prejsnar, A., Ormian, M., & Sokołowicz, Z. (2018). Physicochemical and Sensory Properties of Broiler Chicken Breast Meat Stored Frozen and Thawed Using Various Methods. Journal of Food Quality, 2018. https://doi.org/10.1155/2018/6754070

Bidura, G. (2017). Animal Feed Technology. 1–183. Faculty of Animal Husbandry, University of Udayana Press. Denpasar.

Choe, JH, Nam, K., Jung, S., Kim, B., Yun, H., & Jo, C. (2010). Differences in the quality characteristics between commercial Korean native chickens and broilers. Korean Journal for Food Science of Animal Resources, 30(1), 13–19. https://doi.org/10.5851/kosfa.2010.30.1.13

Christiana, N. (2012). Efficiency and Digestibility of Dietary Fiber Containing Sprout Waste in Growing Period Male Local Rabbits. Faculty of Animal Husbandry. Bogor Agricultural University. (Thesis).

Daghir, NJ (2009). Nutritional strategies to reduce heat stress in Broiler and Broiler breeders. Lohmann Information, 44(1).

DG of Manpower. (2012). Directorate General of Livestock and Animal Health. Jakarta

Hajrah, Hafsan, Zulkarnain, & Makmur, K. (2022). Utilization of biotechnology in the livestock sector to improve the quality of livestock in South

Sulawesi. Technoscience, 16(2), 261–266.

Hamad, A., Anggraeni, W., & Hartanti, D. (2017). Potential of Ginger (Zingiber officinale R) Infusion as a Natural Preservative for Fresh Tofu and Chicken Meat. Journal of Food Technology Applications, 6(4), 177–183.

Hidayat, Masdiana, Padaga, & Suhartini, S. (2006). Industrial Microbiology. Andi Offset.

Jaelani, A., Dharmawati, S., & Wanda. (2014). Various lengths of storage of fresh broiler chicken meat in plastic packaging in the refrigerator (temperature 4. Ziraa'Ah, 39(3), 119–128.

Jongberg, S., Wen, J., Tørngren, MA, & Lund, MN (2014). The effect of high-oxygen atmosphere packaging on oxidative stability and sensory quality of two chicken muscles during chill storage. Food Packaging and Shelf Life, 1(1), 38–48. https://doi.org/10.1016/j.fpsl.2013.10.004

Jouki, M., & Khazaei, N. (2012). Lipid Oxidation and Color Changes of Fresh Camel Meat Stored Under Different Atmosphere Packaging Systems. Journal of Food Processing & Technology, 03(11). https://doi.org/10.4172/2157-7110.1000189

Kartsudjana, R. (2006). Poultry Livestock Management. Spreader. Swadaya. Jakarta

Kasanah, SR, Wardoyo, & Susanto, E. (2016). The Effect of Drying Time at Different Temperatures on the Characteristics of Ground Jerky Chicken Meat. Livestock Journal, 7(2).

Leasa, H., & Matdoan, MN (2015). The Effect of Fermentation Time on Total Acetic Acid of Palm Vinegar (Arenga pinnata Merr.). BIOPENDIX: Journal of Biology, Education and Applied, 1(2), 140–145. https://doi.org/10.30598/biopendixvol1issue2page140-145

Lestari, A. (2019). Rice Bran Fermentation Time on Final Body Weight and Carcass Percentage in Broiler Chickens. Bosowa University, Makassar.

Lestari, T., Setiawan, B., Praja, RN, Damayanti, R., Prastiya, RA, & Wibawati, PA (2019). Effect of Soaking Beef in Turmeric Rhizome Solution (Curcuma domestica val.) with a Combination of Concentration and Storage Time on Total Bacterial Count. Journal of Veterinary Medicine, 2(1), 55. https://doi.org/10.20473/jmv.vol2.iss1.2019.55-59

Mahaputra, IM, Bolla, NE, Roby, IM, Juniartini, WS, Nazara, AL, & Swacita, IBN (2023). Evaluation of the Quality of Meat and Processed Meat Products from the Kumbasari Traditional Market and Cokroaminoto Market, Denpasar City, Bali. Udayana Veterinary Bulletin, 158, 222. https://doi.org/10.24843/bulvet.2023.v15.i02.p09

Makmur, A., Sugito, S., & Samadi, S. (2019). The Effects of Various Types of Feed additives on The Chemical Composition of Local Chicken Meat (Gallus domestica). Animal Production, 20(2), 87. https://doi.org/10.20884/1.jap.2017.19.3.666

Masrianto, Arief, II, & Taufik, E. (2019). Analysis of Antibiotic Residues and Quality of Broiler Chicken Meat and Liver in Pidie Jaya District, Aceh Province. Journal of Production Science and Technology of Animal Husbandry Products, 07(3), 102–110.

Milicevic, D., Trbovic, D., Petrovic, Z., Jakovac-Strajn, B., Nastasijevic, I., & Koricanac, V. (2015). Physicochemical and Functional Properties of Chicken Meat. Procedia Food Science, 5(October), 191–194. https://doi.org/10.1016/j.profoo.2015.09.054

Murtidjo. (2003). Broiler Breeding Guidelines. Kanisius. Jakarta

Prayitno, AH, Suryanto, E., & (Zuprizal), Z. (2012). Physical and Sensory Quality of Meat of Broiler Chicken Fed with The Addition of Virgin Coconut Oil Waste. Livestock Bulletin, 34(1), 55. https://doi.org/10.21059/buletinpeternak.v34i1.107

Puolanne, E. (2017). Developments in Our Understanding of Water-Holding Capacity in Meat. In New Aspects of Meat Quality: From Genes to Ethics. Elsevier Ltd. https://doi.org/10.1016/B978-0-08-100593-4.00009-6

Puspitasary, D., Mangisah, & Pujaningsih, RI (2018). The Effect of Feeding

Contains Fermented Waste Green Bean Sprouts To Feed Consumption, Weight G. Agromedia, 36(1), 57–66 .

Qasim, MA, Al-Azzami, AA, & Yaseen, AA (2023). Improving the Water Holding Capacity of Chicken Meat and Reducing Waste During Cooking by Using Rhizome Extracts of (Alpinia officinarum). IOP Conference Series: Earth and Environmental Science, 1158(11). https://doi.org/10.1088/1755-1315/1158/11/112026

Qurniawan, A., Arief, I., & Afnan, R. (2017). Broiler Production Performance on the Different Breeding Altitude in South Sulawesi. Veterinary Journal, 17(4), 622–633. https://doi.org/10.19087/jveteriner.2016.17.4.622

Risnajati, D. (2010). The Effect of Long Storage Time in the Refrigerator on PH, Water Holding Capacity, and Cooking Shrinkage of Broiler Carcass Packed in Polyethylene Plastic. Scientific Journal of Animal Sciences, 8(6), 309–315.

Rukchon, C., Nopwinyuwong, A., Trevanich, S., Jinkarn, T., & Suppakul, P. (2014). Development of a food spoilage indicator for monitoring the freshness of skinless chicken breast. Talanta, 130, 547–554. https://doi.org/10.1016/j.talanta.2014.07.048

Sangadji, I., Jurianto, J., & Rijal, M. (2019). The Storage Time Of Broiler Chicken Meat Against Its Quality In View Of Protein Content And Total Bacterial Plate Number. Biocell: Biology Science and Education, 8(1), 47. https://doi.org/10.33477/bs.v8i1.846

Sari, NA, Sustiyah, A., & Legowo, AM (2014). Total solids, protein content, and preference value of mozzarella cheese from a combination of buffalo and cow's milk. J. Food Technology Applications, 3(4), 152–156.

Soeparno. (2011). Meat Science and Technology. Gadjah Mada UniversityPress.

Sriyani, N., Tirta, A., Lindawati, & Miwada, INS (2015). Rice Bran Fermentation Time on Final Body Weight and Carcass Percentage in Broiler Chickens. Animal Husbandry Scientific Papers, 18(2), 48–51.

Suradi, K. (2006). Changes in Physical Properties of Post Mortem Broiler

Chicken Meat During Room Temperature Storage. Journal of Animal Science, 6(1), 23–27.

Surung, M. . (2008). The Effect of Em-4 (Effective Microorganisms-4) Dosage in Drinking Water on Body Weight of Domestic Chickens. Agrisystem, 4(2), 109–113.

Tarladgis, BG (1962). Interpretation of the spectra of meat pigments. 1.—cooked meats. Journal of the Science of Food and Agriculture, 13(9), 481–484. https://doi.org/10.1002/jsfa.2740130906

Viana, FM, Canto, ACVCS, Costa-Lima, BRC, Salim, APAA, & Conte-Junior, CA (2017). Color stability and lipid oxidation of broiler breast meat from animals raised on organic versus non-organic production systems. Poultry Science, 96(3), 747–753. https://doi.org/10.3382/ps/pew331

Warner, RD (2017). The Eating Quality of Meat-IV Water-Holding Capacity and Juiciness. In Lawrie's Meat Science: Eighth Edition. Elsevier Ltd. https://doi.org/10.1016/B978-0-08-100694-8.00014-5

Yulianto, J. (2010). The Effect of Using Mung Bean Sprout Skin in Ration on Dry and Organic Matter Digestibility in Vlaams Reus Male Rabbits. Eleven March University, Surakarta.

Zhang, H., Wu, J., & Guo, X. (2016). Effects of antimicrobial and antioxidant activities of spice extracts on raw chicken meat quality. Food Science and Human Wellness, 5(1), 39–48. https://doi.org/10.1016/j.fshw.2015.11.003