Bantara Journal of Animal Science *p ISSN : 2656-9701*
Vol. 6, No. 2, Oktober 2024 DOI : 10.32585/bjas.v6i2.6049 *e ISSN : 2657-1587*

Effect of Aging Duration Meat of Madura Cattle on The Organoleptic Quality of Meatball Products

Surrotul Mardiyah, *Malikah Umar, Desi Kurniati Agustina and Nurul Hidayati
Department of Animal Husbandry, Faculty of Agriculture, University of Madura
*Corresponding author : Malikah Umar
Email : malikah.umar@unira.ac.id

Abstract

Meat handling and processing are aimed at extending the shelf life of meat and enhancing its distinctive flavor, allowing consumers to enjoy processed meat in various forms and flavors. One of the most popular meat products is meatballs. Meatballs are made by mashing meat, adding spices and flour, shaping the mixture into small balls, and boiling them in hot water. The quality of the ingredients used determines the quality of meatballs, particularly the type and quality of the meat, the type of flour, and the ratio of ingredients in the dough. This study aims to determine the effect of the aging duration of Madura beef on the organoleptic properties of processed meatballs and to identify the aging duration that results in meatballs with the most favorable properties. The research variables included organoleptic tests, namely smell, color, texture, and taste, with 30 respondents as replicates. The experimental design used was a Completely Randomized Design (CRD) with four treatments: P1 (meatballs made from meat without aging), P2 (meatballs made from meat aged for 6 hours), P3 (meatballs made from meat aged for 8 hours), and P4 (meatballs made from meat aged for 10 hours). The results were descriptively tested using hedonic methods. Data were analyzed using Analysis of Variance (ANOVA). The study results showed no significant effect between treatments ($P \geq 0.05$) on smell, color, texture, and taste in processed meatball products made from Madura beef aged for different durations.

Keywords : Meat, Aging, Madura Cattle, Organoleptic Quality

Introduction

Meat is a food source rich in animal protein, offering higher nutritional value than other foodstuffs (Nordiansyah, 2009). Beef, in particular, is a livestock product with a nutrient content of 18.54 g of fat, 27.21 g of protein, 283 kcal of calories, 87 mg of cholesterol, 2.72 mg of iron (Fe), and 2.5 mcg of vitamin B12 (Ningrum, 2017). Several factors influence consumers in choosing specific types of meat for consumption, including taste, cultural preferences, beliefs about nutrient content, and the physical quality of the meat (Sriyani et al., 2015).

Based on quality and origin, Indonesian beef is of two types: imported and local. According to (Fathurrahman, 2008), the main characteristics of physical quality differences between local and imported beef include taste, aroma, color, *marbling*, and texture. The physical quality of local meat is bright red, with very little fat and a relatively smooth texture (Desika, 2022). Madura beef is one of the local beef producers with good beef quality and quality by having a soft texture, bright red color, tender, fine fiber, and also low fat so that it becomes the character of Madura beef, whose savory sensation is always missed (Kutsiyah, 2012).

Beef handling needs to be supported by proper storage methods, one of which is meat processing, to extend the shelf life of meat, add a distinctive flavor, and allow consumers to get processed meat in various forms and flavors (Prihharsanti, 2009). One of the most popular

meat-processing products is meatballs (Sutaryo, 2009). Meatballs are meat that has been mashed first, completed with spices and flour, then formed into small balls, and then boiled in hot water (Montolalu, Lontaan, Sakul, & Mirah, 2013). The quality of the ingredients determines the quality of meatballs used, especially the type and quality of meat, the type of flour, and the ratio in the dough (Firahmi & Dharmawati, 2015).

The process of meat used for making meatballs, preferably fresh beef, which is meat that has not undergone withering because this situation is caused by cows that have just been slaughtered or slaughtered; the beef will experience the *rigor mortis* phase in the carcass due to the depletion of *Adenosine triphosphate (ATP)* from the muscles so that the meat becomes harder, stiffer and more rigid (Anonimous, 2020). *Rigor mortis* consists of 3 phases, namely the *pre-rigor* phase or the process that occurs less than 7 hours after slaughter, *rigor mortis* or occurs after going through 7-15 hours, and *postrigor* occurs after going through 15 hours after slaughter so that after the cessation of *the rigor mortis* process all activities will stop and the texture of the meat becomes softer (Heriyawan & Sandiah, 2020).

Based on the description above, the research with the title Effect of Length of Madurese Beef Cooking on Organoleptic Quality of Processed Meatball Products. The benefits of this research are that it can provide information about the effect of Madura beef aging time in producing good and highly demanded meatballs.

Materials and Methods

The research was conducted in 2024 at the Faculty of Agriculture, Madura University. The materials used in this study were Madura beef quadriceps obtained from the market, fried garlic, fried shallots, tapioca flour, pepper, salt, sapid broth, and ice cubes. The equipment used in making meatballs includes scales, meat grinders, airtight containers, basins, knives, spoons, pots, and stoves.

Madura beef was weighed as much as 500 grams for one dough, then cut into small pieces and ground into a grinding machine. When grinding, 200 grams of ice cubes were added to each dough. After the meat is soft, add spices, one egg white, and 150 grams of tapioca flour and stir until homogeneous. Next, the meatball dough is molded into small rounds by hand, then put into water that has been brought to a boil, and the meatballs are boiled until they float. Then, the meatballs are drained, and after cooling, they are put into the packaging according to the treatment.

The variables observed were aroma, color, texture, and taste using a completely randomized design (CRD) with four treatments and respondents as replicates. The treatments used were different lengths of time for withering, namely:

P1 = meat without tenderisation

P2 = meat with 6 hours of aging

P3 = meat with 8 hours of aging

P4 = meat with 10 hours of aging

Meanwhile, for the organoleptic variables (aroma, color, texture, and flavor), using the organoleptic test procedures, data obtained from the organoleptic test assessment were analyzed using an analysis of variance at the 5% level. If there was an effect of treatment, then the Duncan Area Test was continued.

Results and Discussion

Smell

The smell is a separate parameter in a food product that plays an important role in food production—produced from the volatile compounds that make up the food product. Furthermore, it is said that smell also determines the level of consumer acceptance because odor stimuli become impulses that go to the nerves. Nerves olfactory nerve and describes the characteristics of a product (Ramadhan, 2011 (Niaga, 2023). The result of the calculation of ANOVA respondents' level of liking for the aroma of Madura beef meatballs with the length of aging difference can be seen in Table 1.

Table 1. ANOVA of Meatball smell Madura cattle

	JK	db	KT	F	Sig.
Treatment	1.89	3	0.63	0.86	0.46
Error	84.70	116	0.73		
Total	86.59	119			

The analysis of variance in Table 1 shows that Madura beef meatballs with different lengths of meat aging do not give a significant effect ($P \geq 0.05$) between treatments on the aroma of meatballs with Madura beef base ingredients that are aged at different times. Meanwhile, the results of the descriptive analysis of each treatment (Figure 1) show that the aroma of Madura beef meatballs with a 10-hour aging period (P4) is highly favored by respondents. Meanwhile, Madurese beef that was not marinated (P1) was not much liked, and the marinating period was 6 and 8 hours, with an average number of panelists of 10 people.

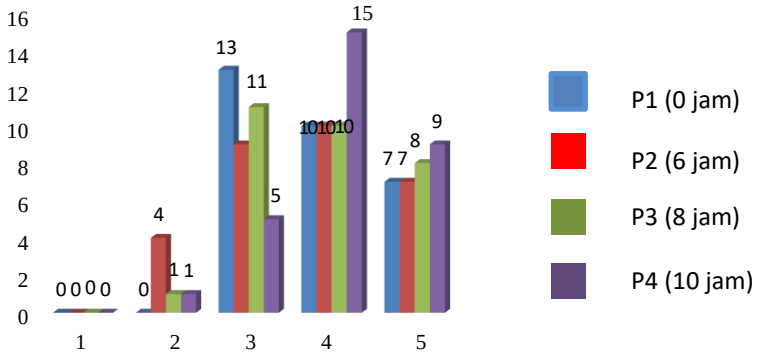


Figure 1: Graph of Number of Test Respondents Meatball smell

The treatment that meets the acceptance criteria for the aroma of Madura beef meatballs in this study is P4 (10 hours of meat aging); this is because meatballs P1 (meatballs with meat without aging) tend to give a distinctive aroma of meat (fishy) so that it covers the smell of spices or meatball additives that are less preferred by respondents. According to Sutaryo et al. (2009), the meat used to make meatballs should be fresh (0-12 hours after slaughter). The length of aging in this study still includes fresh meat; the most extended aging is 10 hours.

According to Mulyana (2013), the storage period can affect the aroma due to the oxidation process, contraction with air, and evaporation so that the aroma is reduced. The sensory quality of meatballs has a dominant smell of fresh boiled meat, without rancid, sour, stale, or rotten odors, and a relatively sharp smell of spices, which shows that the aroma of meatballs is also strongly influenced by the color of meatballs made from Madurese beef that is aged for different times.

The results of the descriptive analysis in Figure 2 show that the respondents' level of liking for the color of the meatballs is highest in the dark grey meatballs of treatment P1. The color of meatball products is influenced by meat myoglobin; the higher the meat myoglobin, the redder the meat color. The color of good fresh beef is bright red (Soeparno, 2005). by the

amount of meat and other ingredients used (Wibowo, 2005). The results of this study showed that the level of consumer acceptance analyzed descriptively showed that respondents preferred the aroma with a fresh, stale, or rotten smell weathering period 10

Color

Color is one of the product requirements for consumers to be accepted and has a significant influence (Dewi & Ermawati, 2011). In processed meat, the color formed is the result of various processes and reactions that are very diverse (Lawrie, 2003). According to Sudrajat (2017), the color of meatballs is influenced by multiple factors, such as the freshness of the meat and the addition of food additives such as seasonings.

Table 2 shows the results of the Anova calculation of respondents' level of liking for the color of Madura beef meatballs with different lengths of aging.

Table 2. Anova of Color of Madura Beef Meatballs

	JK	db	KT	F	Sig.
Treatment	0.82	3	0.27	0.43	0.73
Error	73.16	116	0.63		
Total	73.98	119			

The analysis of variance in Table 2 shows that Madura beef meatballs with different lengths of meat aging do not give a significant effect ($P \geq 0.05$) between treatments. Based on the picture above, the results of the organoleptic test on the color of the meatballs, the score of the results liked the meatballs P1, namely 18 out of 30 respondents. So, the treatment that meets the criteria for acceptance by respondents in this study is meatballs with treatment P1.

The results of this study indicate that the longer the meat is aged, the paler the color of the meat will be, and grey meatball products will be produced. This is in line with the research of Sriyani *et al.* (2018) that the longer the aging, the paler the meat color, thus reducing the respondents' level of liking. The pale color of the meat in this study is due to the longer the aging, the more meat water comes out *(weep)*. The release of meat water usually coincides with the release of several proteins that give meat its red color (Kristiawan *et al*., 2019).

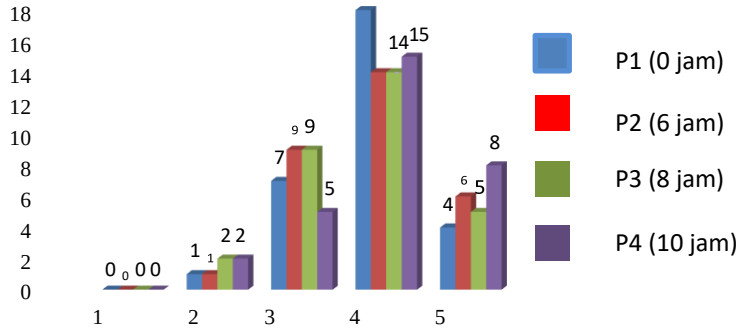


Figure 2: Graph of Number of Test Respondents Meatball Color

Texture

The texture is the taste of food ingredients from several physical properties, namely shape, size, and elements that can be felt by the senses of taste or touch, including the senses of taste (mouth) and touch (hands) (Ningrum et al., 2021). The aspect assessed from the texture of meatballs is characterized by the roughness or smoothness of the resulting product, namely chewiness, which is a part of the texture that is taken into account by panelists in assessing the liking of meatballs with elastic characteristics when chewed (Nurhayati, 2009). The results of

Anova's calculation of respondents' level of liking for the texture of Madura beef meatballs with different lengths of aging can be seen in Table 3.

Table 3. ANOVA of Texture of Madura Beef Meat balls

	JK	db	KT	F	Sig.
Treatment	0.42	3	0.14	0.19	0.89
Error	82.56	116	0.71		
_Total	82.98	119			

Based on the results of the analysis of variance in Table 3, it shows that Madura beef meatballs with different lengths of meat aging do not give a significant effect ($P \geq 0.05$) between treatments on the texture of meatballs with Madura beef base ingredients that are aged at different times.

Based on the results of the descriptive analysis, the total score for each treatment of Madura beef meatballs is shown in the following figure. Based on the picture above, the results of the organoleptic test on the texture of the meatballs, the score of the results liked the meatballs P4, namely as many as 18 people out of 30 respondents so that the treatments that meet the criteria for acceptance by respondents in this study are meatballs with P4 and P3 treatments.

The highest panelist preference for meatball texture was found in the treatment with 10 hours of aging (P4) with a chewy texture in as many as 18 people (60% of the 30 respondents). According to Wibowo (1999), the texture of good beef meatballs is compact, elastic, and chewy but not rigid or bulky, not fibrous, mushy, wet, and not brittle. The results of this study (Figure 4.4) show that the longer the meat is aged, the longer the meatball texture tends to increase in chewiness. The results of this study are in line with the research of Sutaryo et al. (2009) on Balinese beef that was weathered increased with the length of weathering because muscle protein undergoes proteolysis in meat weathered for a certain period, further explaining that the longer it is weathered, the longer proteolysis will occur and the more tender the meat will be.

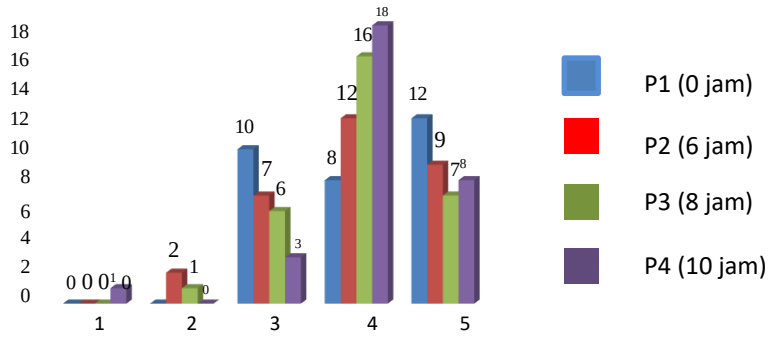


Figure 3: Graph of Number of Test Respondents Meatball texture

Flavor

Food products can be obtained by adding ingredients such as spices or from the product itself through processing. It is further said that flavor is a significant factor in determining consumer acceptance and plays an essential role in decision-making on the level of liking for a product (Agustin, 2018). Table 3 shows the results of an ANOVA calculation of respondents' level of liking for the texture of meatballs Madura beef with different lengths of aging.

Table 4. ANOVA of Madura Beef Meatballs Flavour

	JK	db	KT	F	Sig.
Treatment	2.06	3	0.68	0.89	0.45
Error	89.80	116	0.77		
Total	91.86	119			

The results of this study based on analysis of variance showed that Madura beef meatballs with different meat tenderisation did not give a significant effect ($P \geq 0.05$) between treatments on the taste of meatballs; this is due to the raw materials and meatball seasonings used such as garlic that can enhance and modify the flavor. The descriptive analysis results are based on the total score of each treatment of Madura beef meatballs as in the following figure, i.e., crispness, saltiness, and meat flavor (Andayani, 1999).

The results of this study indicate that the longer the meat is aged, the more the respondents like the flavor of the meatballs. According to Soeparno (2011), the taste of cooked meat is strongly influenced by the length of storage time and storage conditions.

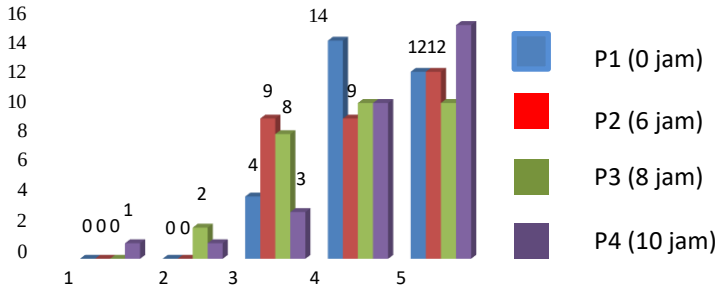


Figure 4: Graph of Number of Meatball Flavour Test Panelists

The highest level of respondents' liking for the taste of meatballs was meatballs in treatment P4 (10 hours of meat aging) as many as 15 people (Figure 4.5). The increase in taste from P1 (0 hours) to P4 (10 hours) is due to the general savoury taste during the cooking process and the increase in meat flavour which is also influenced by the breakdown of meat amino acids during aging Sinaga et al. (2020). According to Winarno (1997), flavour is a determining factor in consumer acceptance. However, in general, there are three kinds of meatball flavours that determine consumer acceptance.

Conclusion

Statistically, meatballs with 10 hours of meat aging did not affect panelists' liking of aroma, colour, texture and taste. Based on the descriptive analysis of aroma and colour of Madura beef meatballs, the most preferred meatballs by the panelists were meatballs using meat that had been aged for 10 hours. The texture that the panellists liked the most was the meatballs with 0 hours of aging with a very chewy texture and the meatballs with a very chewy texture. with 10 hours of aging with a chewy texture, and the least preferred meatball flavour was meatballs with 8 hours of meat aging. Advice: This research needs to be done Further research is needed for future researchers with a longer aging time and using pH.

References

Abustam, Nur, M., & Akbar, A. Pengaruh Lama Perendaman Asap Cair Konsentrasi 10% dan Lama Penyimpanan terhadap Daya Ikat Air dan Daya Putus Daging. JIIP, 1(2):141-149, 2014.

Anonimous. Keistimewaan Daging Sapi Madura Untuk Kurban. Retrieved from SapiBagus.com: https://www.sapibagus.com/keistim ewaan-daging-sapi-madura-untuk-kurban, 2020.

Anonimous. Proses Pelayuan untuk Tingkatkan Mutu Daging. Retrieved from Fakultas Peternakan IPB: file:///E:/My%20Documents/Proses %20Pelayuan%20untuk%20Tingkatkan%20Mutu%20Daging%20Sapi. html, 2020.

Anonimous. Protein Hewabi dan Protein Nabati : Perbedaan dan Sumbernya. Retrieved from KOMPAS.com: https://amp.kompas.com/sains/read/ 2021/09/23/140200823/protein- hewani-dan-protein-nabati-- perbedaan-dan-sumbernya, 2021.

Arhandhi. Aktivitas Antioksidan, Sifat Fisik dan Sensoris Marshmallow Melon (Cucumis Melo L.) dengan Penambahan Ekstrak Bit Merah (Beta Vulgaris L. Var. Condition). Jurnal Ilmiah, Vol 3 Hal 4, 2018

Budiyono, H. Analisis Neraca Perdagangan Peternakan dan Swasembada Daging sapi. Jurnal Agribisnis dan Pengembangan Wilayah, 1(2):64-70, 2014.

Chakim, & Kusrahayu. Tingkat Kekenyalan, Daya Mengikat Air, Kadar Air, dan Kerusakan pada Bakso Daging Sapi dengan Substitusi Jantung Sapi. Semarang: Fakultas Peternakan dan Pertanian Universitas Diponegoro, 2013.

Deptan. Pemilihan dan Penanganan Daging Segar. Retrieved 2024,from www.pustakadeptan.go.id/agritek/li p50019.pdf, 2009

Desika. Ternyata Ini Beda Daging Sapi Lokal dan Impor. Retrieved from CHAT NEWS: https://chatnews.id/read/ternyata- ini-beda-daging-sapi-lokal-dan- impor, 2022.

Dewi, & Ermawati. Pengaruh Warna Cahaya Tambahan Terhadap Pertumbuhan dan Pembungaan Tiga Varietas Tanaman Krisan (Chrysanthemum morifolium) Potong, 2011.

Faisol, A. Ini Keistimewaan Tekstur Daging Sapi Madura.Retrieved November Selasa, 2023, from SURYA.co.id: https://surabaya.tribunnews.com/a mp/2023/06/25/ini-keistimewaan- tekstur-daging-sapi-madura- sehingga-pedagang-ternak-luar- daerah-serbu-bangkalan

Fathurrahman, E. Penanganan daging sapi. Retrieved from foodReview: http://www.foodriview.biz, 2008.

Firahmi, N., & Dharmawati, S. Teknologi Pengolahan Pangan Hewani Tepat Guna. Sifat Fisik dan Organoleptik Bakso yang Dibuat dari Daging Sapi dengan Lama Pelayuan Berbeda. 2015.

Gusnadi, D., Taufiq, R., & Baharta, E. Uji Organoleptik dan Daya Terima pada Produk Mousse Berbasis Tapai Singkong sebagai Komoditi UMKM di Kabupaten Bandung. Jurnal Inovasi Penelitian, Vol 1 No. 12, 2021.

Harapin, H., & Heriyawan. Pengaruh Rigor Mortis terhadap Kulitas Kimia Daging Sapi. Jurnal Ilmiah Peternakan Halu, Vol.2 No.4:409- 414, 2020.

Heriyawan, & Sandiah, N. Pengaruh Fase Rigormortis terhadap Kalitas Kimia Bakso Sapi. Jurnal Ilmiah Peternakan Halu, Vol.2 No.4:409- 414, 2020

Herlambang. Karakteristik Fisik dan Uji Organoleptik Produk Bakso Tepung Singkong sebagai Substitusi Tepung Tapioka. Jurnal Keteknikan Pertanian Tropis dan Biosistem, Vol. 7 (3) : 253-258, 2019

Kasih, N. Pengaruh Lama Penyimpanan Daging Ayam Segar dalam Refrigerator terhadap pH, Susut Masak dan Organoleptik. Program Studi Peternakan, Fakultas Pertanian, 2013.

Kemalawaty, M. Pengaruh Jenis Ikan dan Metode Pemasakan Terhadap Mutu Abon Ikan.

Jurnal Teknologi Hasil Perikanan, 146, 2018.

Kemp, S., Hollowood, T., & Hort, J. Sensory Evaluation : A Practical Handbook. Wiley Blackwell, United Kingdom, 2009.

Kutsiyah, F. Analisis Pembibitan Sapi Potong di Pulau Madura. Retrieved from Wartazoa: http://medbup.litbang.pertanian.go.i d/index.php/wartazoa/issue/archive, 2012.

Montolalu, S., Lontaan, N., Sakul, S., & Mirah, A. D. Sifat Fisiko- Kimia dan Mutu Organoleptik Bakso Broiler Dengan Menggunakan Tepung Ubi Jalar. Jurnal Zootek, Vol.32 No.5, 2013.

Negara, J. K., & A., K. Aspek Mikrobiologis serta Sensori (Rasa, Warna, Tekstur, Aroma) pada Dua Bentuk Penyajian Keju yang Berbeda. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan, 1/5, 2016.

Niaga, T. Analisa Mutu Organoleptik Nugget Ayam dengan Variasi Penambahan Rebung Munti (Schizostachyum Sp) dan Tareng (Gigantochloa Altroviolancea). Agrofood Jurnal Pertanian dan Pangan, 19, 2023.

Nur, A. Karakteristik Fisiko-Kimia Bakso Daging Sapi yang Diolah Menggunakan Metode Pemanasan Ohmik. Makassar: Tesis, 2021.

Nurgiartiningsih. Evaluasi Genetik Pejantan Boer Berdasarkan Performans Hasil Persilangan dengan Kambing. Jurnal Ternak Tropika, Vol 12 No. 1 : 82, 2011.

Prihharsanti, A. Populasi Bakteri dan Jamur pada Daging Sapi dengan Penyimpanan. Jurnal Sains Peternakan, Vol. 7 N0.2 : 66-72, 2009.

Ramadhanti, F., & Gusnita, W. The Effect Of Meat Storage Of Rendang Quality. Jurnal Pendidikan Tata Boga dan Teknologi, Vol 1 No.3:118, 2020.

Sandiah, N. Pengaruh Rigormortis terhadap Bakso. Jurnal Ilmu Peternakan, Vol. 2 No. 4:409-414, 2020.

Sinaga, & Suarta, I. G. Kualitas Organoleptik Daging Sapi Bali yang Dilayukan dengan Lama Waktu yang Berbeda. Jurnal Ilmiah Peternakan, Vol 24 No. 2, 2021.

Soeparno. Ilmu dan Teknologi Daging. Yogyakarta: Gadjah Mada University Press, 2009.

Soeparno. Ilmu dan Teknologi Daging. Yoyakarta: Gajah Mada University Press, 2015.

Steel, R., & Torrie. Prinsip dan Prosedur Statistika. Jakarta: Gramedia Pustaka Utama, 1995.

Sutaryo. Pengaruh Lama Pelayuan terhadap Kekenyalan, Tekstur dan Kesukaan Bakso Daging Sapi. Jurnal Teknologi Pangan dan Hasil Pertanian, Vol. 6 No. 1, 2009.

Winarno. Ilmu Pangan dan Gizi.Jakarta: PT. Gramedia Pustaka. 2008.

Zakaria. Retrieved Juni 2024, from http://wisudawatyprisca03.blogspot .com/2010/12/laporan-baso-daging- sapi.html, 2010.