Organoleptic Characteristics of Chicken Meatballs that Using Gelatin as a Gelling Agent

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Abstract. Meatballs can be identified as a good product if they had chewy property. To make the meatballs chewy, meatballs producers try to add natural and artificial additives. This research aimed to study the addition effect of the natural gelling agents on organoleptic characteristics of chicken meatballs. This research using a completely randomized design with 4 treatments and 25 trained panelists as replication. The treatments were an additional level of gelatin and they controlled without gelatin (P0), the addition of 1% gelatin of meat weight (P1), the addition of 2% gelatin of meat weight (P2), and addition of 3% gelatin of meat weight (P3). The result showed that addition gelatin as a natural gelling agent up to 3% on chicken meatballs making process did not give any significant effect (P<0.05) on color, aroma, flavor, texture and chewy. It can be concluded that the gelatin addition up to 3% is still lacking and need to be added to give a better chewy sensation.

Keywords: Chicken Meatballs, Gelatin, Organoleptic

1. Introduction

Meat is the main result of poultry that has been slaughtered after the evisceration of non-carcass parts. Poultry meat was attached by bone and skin, so that filleting action was necessary to do to remove meat from bone and skin (boneless). Meat is one of the livestock products that have high nutrition content and has a beneficial effect on the human body. This content cause meat to be easily damaged (perishable food) [1] [2] [3]. Avoiding damage, meat needs to be processed to increase the shelf life and increase economic value through the treatment of processed products such as jerky, shredded, sausage and meatballs.

Meatball is a meat emulsion product in which finely ground meat is added flour and seasoning [4]. Generally, meatballs are formed into circles resembling small balls. The taste of meatballs is delicious and the chewy texture makes the meatballs liked by children to adults. Meatballs are generally processed to serve dishes such as meatballs soup, grilled meatballs, stir-fry meatballs, and other meatballs dishes. Meatballs found in the market and supermarkets are made of various types of meats, such as beef, chicken, and fish.

Chicken meat as a meatballs ingredient has not been used much because of some disadvantages such as pale in color and less in chewy when made into meatballs. However, chicken meat also has some advantages such as cheaper than beef, lower in cholesterol content, softer and smoother in texture [5]. Chicken meat is known to have a fairly good nutrient content because it contains proteins,
water, minerals, and vitamins. Besides, chicken meat has good taste and aroma. Chicken meat also liked by many people so that it can be processed into various kinds of processed food.

In meatballs processing, certain food additives such as sodium tripolyphosphate (STPP), carrageenan, egg whites (albumen), and baking soda (NaHCO) were often added into meatballs dough as a gelling material [6]. The most common food additives used in meatballs processing is STPP. STPP is a synthetic gelling material that has a certain use limit. One of the ingredients that can be used as a substitute for STPP is gelatin. Gelatin is a protein derived product obtained from the hydrolysis of animal collagen. Gelatin can be extracted through acidic and alkaline processes, so that gelatin classified as natural material that is not harmful to the body [7].

Gelatin application on processed meat products functions to increase water connective power, consistency and stability of sausage, corned beef, and ham [8]. The use of gelatin in food products, especially meatballs, has not been used much because in Indonesia gelatin is one of imported material that is quite difficult to obtain. Besides, about 98.5% of gelatin in the world is produced and obtained from pig’s meat, bones and skin [9]. Therefore, gelatin in Indonesia has not too much utilization as food additives. Based on the explanation above, it is necessary to research the organoleptic characteristic of chicken meatballs that are given gelatin as a gelling agent.

2. Methods
2.1. Research Materials
This research was conducted from January to February 2019 in Livestock Technology Laboratory, Faculty of Animal Science, Universitas Halu Oleo, Kendari. The equipment used in the making of meatballs were meat grinder, analytical scale, pots, containers, stove, spoons, knives, and stationery. The equipment used in meatballs physical testing were knives, cutting boards, analytical scale, centrifuge, centrifugal tubes, vortex and Instron tools (Warner Bratzel Shearl). Meanwhile, the equipment used in organoleptic testing were plates, forks, tissue paper, label paper, knives, questionnaire, and stationery. Materials used in this research consist of key ingredients and complementary ingredients. The key ingredients were broiler meat and gelatin, and the complementary ingredients consist of garlic, salt, pepper powder, and ice cubes.

2.2. Meatballs Making
The meatballs formulations used in this research can be seen in Table 1. The making process of meatballs followed the stages done by [10] which have been modified. The process started with refreshed the frozen chicken meat at room temperature and washed with clean water, then chicken meat was cut into small pieces. The cuts of meat were inserted together with salt, ice water, and gelatin (0, 1, 2, and 3%) into the meat grinder, then ground for ±1 minute. Tapioca flour, pepper, and garlic were added into the dough, then ground for ± 1 minute until the dough become homogeneous. The dough was moved into the pot and formed into spheres by hand. The meatballs were boiled in warm water until floated than lifted and cooled down.

| Ingredients         | The treatments (addition of gelatin) |
|---------------------|-------------------------------------|
|                     | 1        | 2        | 3        | 4        |
| Chicken meat        | 100      | 100      | 100      | 100      |
| Gelatin             | -        | 1        | 2        | 3        |
| Tapioca flour       | 20       | 20       | 20       | 20       |
| Garlic              | 2        | 2        | 2        | 2        |
| Powdered pepper     | 0,5      | 0,5      | 0,5      | 0,5      |
| Salt                | 1,5      | 1,5      | 1,5      | 1,5      |
| Iced water          | 2,5      | 2,5      | 2,5      | 2,5      |

Table 1. The ingredients of chicken meatballs and its formulation
2.3. Organoleptic Test

The organoleptic test consisted of color, taste, aroma, texture, and elasticity of meatballs. The organoleptic test was conducted using 25 non-trained panelists by testing each sample and then fill out the questionnaire paper. The scoring questionnaire and organoleptic quality test scheme can be seen in Table 2.

| Variables | Hedonic Score | Criteria |
|-----------|---------------|----------|
|           | 1             | Very dislike |
| Color     | 2             | Dislike |
|           | 3             | Quite like |
|           | 4             | Like |
|           | 5             | Really like |
| Aroma     | 1             | Very dislike |
|           | 2             | Dislike |
|           | 3             | Quite like |
|           | 4             | Like |
|           | 5             | Really like |
| Texture   | 1             | Very dislike |
|           | 2             | Dislike |
|           | 3             | Quite like |
|           | 4             | Like |
|           | 5             | Really like |
| Elasticity| 1             | Very dislike |
|           | 2             | Dislike |
|           | 3             | Quite like |
|           | 4             | Like |
|           | 5             | Really like |
| Taste     | 1             | Very dislike |
|           | 2             | Dislike |
|           | 3             | Quite like |
|           | 4             | Like |
|           | 5             | Really like |

Source: [4] [11] [12]

2.4. Experimental Design

This research used a completely randomized design with 25 non-trained panelists as replication. The treatments used were gelatin addition level: P0 (meatballs without gelatin), P1 (meatballs contain 1% gelatin), P2 (meatballs contain 2% gelatin), and P3 (meatballs contain 3% gelatin). The parameters measured were organoleptic characteristics that consist of color, taste, texture, aroma, and elasticity.

The data obtained were analyzed using analysis of variance and continued using Least Significant Different Test [13].

3. Result And Discussion

3.1. Result

The average hedonic test on color, aroma, flavor, texture, and elasticity of chicken meatballs was shown in Table 3.
Table 3. The average hedonic score of color, aroma, taste, texture, and elasticity of chicken meatballs with the addition of gelatin as a gelling agent

| Variables     | P0 (Without Gelatin) | P1 (Gelatin 1%) | P2 (Gelatin 1%) | P3 (Gelatin 3%) |
|---------------|----------------------|-----------------|-----------------|-----------------|
| Color         | 3.08 ±0.81           | 3.4 ± 1         | 3.48 ± 0.77     | 3.2 ± 1         |
| Aroma         | 3.52 ± 0.71          | 3.32 ±0.85      | 3.24 ± 0.78     | 3.36 ± 0.86     |
| Taste         | 3.76 ± 0.78          | 3.44 ± 1        | 3.8 ± 0.82      | 3.44 ± 0.8      |
| Texture       | 3.2 ± 0.87           | 3.44 ± 0.92     | 3.44 ± 0.82     | 3.56 ± 0.65     |
| Elasticity    | 3.32 ± 0.85          | 3.24 ± 0.72     | 3.36 ± 0.81     | 3.28 ± 0.89     |

3.1.1. Color
Color parameters are indicators of consumer consideration. Beautiful and good colors can attract consumer tastes. Meatballs color can be influenced by various factors such as the addition of filler and spices [14].

Organoleptic testing in Table 3 showed that the hedonic score for chicken meatballs using gelatin as a gelling agent range from 3.3 to 3.48. The result showed that the preference level of panelists on chicken meatballs color was on the same range (neutral).

The result of variance analysis showed that gelatin addition up to 3% did not give any significant effect (P>0.05) on chicken meatballs color. It is caused by the addition of gelatin was too low so it can't affect the color of chicken meatballs. The gelatin used in this research had a yellowish color. According to [15], gelatin obtained from cow’s skin has a yellowish color and smells a little fishy.

3.1.2. Aroma
The aroma is one of the factors that determines the delicacy of the food. The aroma is also called long-distance tasting in which people can smell that out of food because of the cells of olfactory apium on the wall of the nasal cavity that is sensitive to the smell component [16].

Table 3 showed that the level of panelist's preference for the aroma of chicken meatballs using gelatin as a gelling agent was at an average score of 3.24 to 3.52 (quite like). The result of variance analysis showed that the addition of gelatin up to 3% did not affect (P>0.05) the aroma of chicken meatballs. This was possible because the gelatin used does not have a distinctive and sharp aroma so that gelatin does not affect the aroma of chicken meatballs. Besides, the aroma of meatballs was also influenced by the aroma of meat, fillers, and spices used. This result was in accordance with [17] that the aroma of meatballs is influenced by the aroma of meat, filler flour, spices and other ingredients added.

3.1.3. Taste
Taste is a determining factor for consumer's acceptance of food products. In assessing the taste, the sense of taste is more widely used. The sensing of taste is divided into 4 factors: salty, sour, sweet and bitter [18] (Winarno, 1998).

Organoleptic testing of chicken meatballs showed that the level of panelist preference on the taste of chicken meatballs using gelatin as a gelling agent ranged from 3.44 to 3.76.

The result of variance analysis showed that the addition of gelatin up to 3% did not have a significant effect (P>0.05) on the taste of chicken meatballs. According to [19], there is no effect of using gelatin thickeners on taste, because basically, gelatin has a bland taste. Besides the factors that influence the taste of chicken meatballs are the percentage of meat, fillers, and seasonings. According to [20] as well as [6] explanation, the taste of meatball is influenced by all factors as a whole, including spices, tapioca flour, and meat.
3.1.4. Texture
Food texture assessment can be done with fingers, teeth, and palate. The value obtained is expected to be a determinant of food quality. Among the texture, factors are palpation by hand, clapping, and ease when chewed [21].

Table 3 showed that the level of panelists’ preference for the texture of chicken meatballs with the addition of gelatin as a gelling agent was at an average score of 3.2 to 3.56 (quite like). These results indicated that the level of panelist preference for the texture of chicken meatballs is in the same range (neutral).

Variance analysis results showed that the addition of gelatin up to 3% did not give a significant effect (P>0.05) on the texture of chicken meatballs. This is likely influenced by the percentage of gelatin use that is still too low so it can’t affect the texture of chicken meatballs. According to [22], the more gelatin, the more gelatinous matrix and gelatinous fibers that are formed, so that the connections between the binding gelatin fibers become very strong and cause the texture to become stronger.

3.1.5. Elasticity
Elasticity is part of food texture forming that is calculated by consumers in assessing the preference and acceptance of meat and its product. Elasticity is the ability of food products to return to their original form before the product breaks. Chewy meatballs will feel elastic when chewed [4] [23].

Table 3 showed that the level of panelists' preference for chicken meatballs elasticity with the addition of gelatin as a gelling agent was in the average score of 3.24 to 3.26 (quite like). This means that the addition of gelatin up to 3% in chicken meatballs didn't provide a significant increase in meatballs elasticity.

The result of the analysis of variance showed that the addition of gelatin up to 3% had no significant effect (P>0.05) on the chicken meatballs elasticity. This was probably caused by the low percentage of used gelatin. The percentage of the use of gelatin was too low so that it didn't affect the chicken meatballs elasticity. According to [22], one of the most important factors in gel formation is the concentration of gelatin added in the manufacture of jelly candy. If the concentration of gelatin added is too low, the texture of the jelly candy formed will be soft, whereas the concentration of gelatin is too high causing the texture of the jelly candy to become chewy. So if the concentration of gelatin is too low, the texture of the meatballs will become soggy, on the contrary, the high gelatin concentration causes the texture of the meatballs to become more springy.

4. Conclusion
It can be concluded that the addition of gelatin up to 3% had no significant effect (P>0.05) on the organoleptic characteristic of color, taste, aroma, texture, and elasticity of chicken meatballs. Gelatin dosage up to 3% is still lacking and needs to be added to provide a better chewy sensation.

5. References
[1] Hafid, H. 2011. Pengantar Evaluasi Karkas. Cetakan 1. Unhalu Press. Kendari.
[2] Hafid, H. 2017. Pengantar Pengolahan Daging. Teori dan Praktik. Cetakan pertama. Penerbit Alfabet. Bandung.
[3] Hafid, H., Rahman, Nuraini, Y. Wati, Inderawati, S.H. Ananda and L. Ba’a. 2018. Production of broiler chicken carcass fed on rice bran biomass on different marketed ages. IOP Conf. Series: Earth and Environmental Science. Page 1 – 9.
[4] Hafid, H. dan Nuraini. 2006. Penerimaan konsumen terhadap bakso sapi dari bahan daging dan tepung yang berbeda. Buletin penelitian social ekonomi peertanian. 15 (8):12–17.
[5] Harimurti, S. 1992. Manajemen Karkas II. Pusat Antar Universitas Pangan dan Gizi, Universitas Gadjah Mada, Yogyakarta.
[6] Tiven, N.C dan M. Veerman. 2011. Berbeda Terhadap Komposisi Kimia, Sifatfisik, Dan Organooleptik Bakso Daging Ayam Dalam Jurnal Agrinimal, vol 1 (1), halaman 76-83.
[7] Sasmitaloka, K.S. Miskiyah dan Juniati. 2017. Kajian Potensi Kulit Sapi Kering Sebagai Bahan Dasar Produksi Gelatin Halal. Buletin Peternakan Vol. 41 (3): 328-337.

[8] Ariani. 2015. Pengetahuan Bahan Makanan dan minuman (Seri: Babi dan Kahmr). Gunung Samudra, Malang.

[9] Rapika, Zulfikar dan Zumarni. 2016. Kualitas Fisik Gelatin Hasil Ekstraksi Kulit Sapi Dengan Lama Perendaman dan Konsentrasi Asam Klorida (HCl) Yang Berbeda. Jurnal Peternakan Vol 13 No 1 Februari 2016(26 - 32).

[10] Dewi, N. R. K. dan S. B. Widjanarko. 2015. Studi proporsi tepung porang: tapioka dan penambahan NaCl terhadap karakteristik fisik bakso sapi. Jurnal Pangan dan Agroindustri. 3(3): 855 - 864.

[11] Hafid, H. dan A. Syam. 2007. Pengaruh daging dan lokasi otot terhadap kualitas organoleptik dari kulit sapi. Buletin Peternakan. 31(4); 209 – 216.

[12] Rahayu, W.P. 2001. Penunut Praktikum Penilaian Organoleptik. Jurusan Teknologi Pangan dan Gizi Fakultas Teknologi Pertanian Institut Pertanian Bogor, Bogor.

[13] Gaspersz, D. 1997. Metode Rancangan Percobaan Untuk Ilmu-ilmu Pertanian, Ilmu Teknik dan Biologi. Armico. Bandung.

[14] Hasmiati, H. 2018. Kualitas Fisik, Organoleptik dan Kimia Bakso Ayam Afkir yang Diberi Tauge (skripsi). Universitas Halu Oleo. Kendari.

[15] Youlanda, H. 2016. Ekstraksi dan Evaluasi Gelatin dari Kulit Sapi yang Telah Mengalami Proses Buang Bulu Menggunakan Hidrolisis Asam (Skripsi). UIN Syarif Hidayatullah, Jakarta.

[16] Soeparno. 2007. Ilmu dan Teknologi Daging. Gadjah Mada Universit Press, Yogyakarta.

[17] Sudrajat, G. 2007. Sifat Fisik Dan Organoleptik Bakso Daging Sapi Dengan Penambahan Karagenan Dan Khitosan. Fakultas Peternakan: Institut Pertanian Bogor.

[18] Winarno, F.G. 1988. Kimia Pangan dan Gizi. PT. Gramedia, Jakarta.

[19] Nur’aini, H. 2013. Variasi Penggunaan Bahan Pengenyal Terhadap Karakteristik Permen Tradisional Pulp Kakao (Theobroma Cacao). Jurnal Agroindustri, Vol. 3 No. 2, halaman 71 – 76.

[20] Syam, A. dan H. Hafid. 2002. Pengaruh lokasi otot, bahan tepung dan umur sapi terhadap kualitas bakso sapi. Jurnal penelitian mimbar akademik. 17 (12):127-132.

[21] Hikmah, N. 2010. Sifat fisik dan palatabilitas bakso daging kelinci pada lama postmortem yang berbeda (skripsi). Fakultas Peternakan Institut Pertanian Bogor, Bogor.

[22] Vail G.E., J.A. Philips, L.O. Rust, R.M. Griswold, and M. Justin. 1978. Foods. 7th edition. Houghton Mifflin Company. Boston.

[23] Montolalu, S., Lontaen, N., Sakul, S danA. Dp. Mirah.2013. Sifat Fisiko-Kimia Dan Mutu Organoleptik Bakso Broiler Dengan Menggunakan Tepung Ubi Jalar (Ipomoea Batatas L). Universitas SamRatulangi Manado. Jurnal Zootek (“Zootek” Journal), Vol.32 No.5.