The Proportion of Meat and Tapioca Flour to Produce the Healthy High Protein Meatballs

Marini Damanik[1], Ida Duma Riris[1], Moondra Zubir[1], Esi Emilia[2], Izzatul J. Sihaloho[1] and Angel Fransisca Manurung[1]
[1]*Chemistry Department, Faculty of Mathemathics and Science, State University of Medan, Indonesia*
[2]*Department of Family Welfare Education, Faculty of Engineering, State University of Medan, Indonesia*

Keywords: Chicken Meatballs, Tapioca Flour, Composition.

Abstract: The purpose of this study was to determine the physical, chemical, and sensory characteristics of chicken meatballs to find the proportion of tapioca flour and chicken meat to form meatballs. This study used a randomized block design (RBD) method with 5 treatments and 2 replications as a group. The substitution treatments for tapioca fruit flour and chicken meat consisted of 20%, 25%, 30%, 40%, and 50%. The parameters observed included chemical analysis consisting of moisture, ash content, protein, and fat. While the physical analysis consists of a texture test (elasticity), as well as a hedonic sensory test (appearance, color, aroma, and texture). The results showed that the fat content at each concentration showed a difference in fat content where at a concentration of 20%, 25%, 30%, 40%, 50% respectively 0.07%, 0.08%, 0.08%, 0.095% , 0.09%. Meanwhile, the protein was 12.3%, 10.9%, 9.3%, 8.1%, 7.2%. and the results for moisture at each concentration of 69.75%, 70.00%, 66.06%, 61.78%, 55.21%. for the ash content in the meatballs in each concentration 0.045%, 0.04% 0.04%, 0.20%, 0.03%. The results of this study are a good proportion is used to make meatballs at a concentration of 25% and 30% by SNI standards.

1 INTRODUCTION

The purpose of this study was to determine the physical, chemical, and sensory characteristics of chicken meatballs to find the proportion of tapioca flour and chicken meat to form meatballs. This study used a randomized block design (RBD) method with 5 treatments and 2 replications as a group. The substitution treatments for tapioca flour and chicken meat consisted of 20%, 25%, 30%, 40%, and 50%. The parameters observed included chemical analysis consisting of moisture, ash content, protein and fat. While the physical analysis consists of a texture test (elasticity), as well as a hedonic sensory test (appearance, color, aroma, and texture). The results showed that the fat content at each concentration showed a difference in fat content where at a concentration of 20%, 25%, 30%, 40%, 50% respectively 0.07%, 0.08%, 0.08%, 0.095%, 0.09%. Meanwhile, the protein was 12.3%, 10.9%, 9.3%, 8.1%, 7.2%. and the results for moisture at each concentration of 69.75%, 70.00%, 66.06%, 61.78%, 55.21%. for the ash content in the meatballs in each concentration 0.045%, 0.04% 0.04%, 0.20%, 0.03%. The conclusion obtained from the results of this study is that a good proportion is used to make meatballs at a concentration of 25% and 30% in accordance with SNI standards.

2 INSTRUMENTS AND MATERIALS

The instruments and materials used in this research include:

2.1 Instruments

The tools used in the study were a meat grinder and kneading device (food processor), electric scales, spoons, plastic containers, knives, and cutting boards. The equipment used to perform the chemical characterization of meatballs is a pH-meter, electric scale, blender, measuring cup, Whatman 42 filter paper, oven, desiccator, water bath, fume hood, kjeldah flask, statif, measuring flask, destilator,

Damanik, M., Riris, I., Zubir, M., Emilia, E., Sihaloho, I. and Manurung, A.
The Proportion of Meat and Tapioca Flour to Produce the Healthy High Protein Meatballs.
DOI: 10.5220/0010547100003108
In *Proceedings of the 6th Food Ingredient Asia Conference (6th FiAC 2020) - Food Science, Nutrition and Health*, pages 152-155
ISBN: 978-989-758-540-1

beaker glass, erlenmeyer, food processor, oven, refrigerator and tongs. The equipment used for the organoleptic test of meatballs were plates, forks, cups, tissue paper, knives, questionnaire paper and stationary.

2.2 Materials

The ingredients used in this study were chicken meat and tapioca flour purchased from traditional markets in Medan. Chemicals such as: H_2SO_4 (p.a), Aquadest, Phenophtalein, NaOH, HCl (p.a), n-Hexan (p.a), Boric Acid, and Methyl Red.

3 PROCEDURES

The research procedure carried out for the first time was making meatballs by optimizing the addition of chicken meat and tapioca flour.

3.1 Optimization of Addition of Chicken Meat and Tapioca Flour

Fresh chicken meat that has been cleaned of fat, chopped into small pieces, then added 20% ice by weight of meat, then added spices consisting of pepper as much as 0.3% and table salt as much as 2.5% by weight of the meat. Then add tapioca flour according to 20%, 25%, 30%, 40%, and 50% by weight of meat, mixed until homogeneous. The homogeneous dough is then shaped like balls and boiled in boiling water for 15 minutes. The next step was tested chemical characteristics to get an optimum percentage of meatballs.

3.2 Protein Analysis (AOAC 2005)

Half of the Kjedahl tablet was added to 2 grams of lightened material for catalyst analysis and 15 ml of H_2SO_4 was added. After that, the material is digested for 1 hour until a clear liquid is formed, then cooled, 25 ml of cold distilled water, 4 drops of pp indicator, and 100 ml of NaOH solution (40%) are added until the sample is brown. The distillation was carried out and the distillate was collected in an erlenmeyer containing 20 ml of 3% saturated solution of boric acid and 4 drops of methyl red indicator. The distillate is then titrated with standardized 0.10 N HCl until the color changes from yellow to pink.

3.3 Moisture Analysis (AOAC 2005)

Measurement of moisture content was carried out by weighing the sterile porcelain plate using an analytical balance to determine the empty weight. About 10 grams of the meatball sample are weighed in a porcelain dish. The meatball samples were dried in an oven at 105 ℃ for the first 3 hours, the second 1 hour, and the third 1 hour and were cooled in a desiccator, then weighed until a constant weight was obtained from the plates and dry samples.

3.4 Ash Content Analysis (AOAC 2005)

A sample of 2 grams was weighed in a porcelain dish. The sample is evaporated on a hot plate for 30-60 minutes until dry. Then put in a furnace at 600 ℃ for 2 hours until white ash is formed, then cooled in a desiccator and weighed.

3.5 Fat Content Analysis (AOAC 2005)

10 grams of meatball samples were spread on cotton covered with filter paper and rolled into a thimbke, then put into the Soxhlet apparatus. Then extracted for 3 hours with a fat solvent in the form of n-hexane as much as 155 ml. The extracted fat was dried in an oven at 100 ℃ for 1 hour.

4 RESULTS

4.1 Test the Water Content of the Meatballs

Data from the analysis of the water content value of chicken meatballs from each treatment can be seen in Table 1.

Table 1: Water Content Analysis.

No	Sample concentration	Water content %
1.	20 %	69.76
2.	25 %	70.01
3.	30 %	66.06
4.	40 %	61.78
5.	50 %	55.21

This shows that the higher the addition of flour to chicken meatballs affects the moisture content. Table 4.1 shows that the water content of the meatballs with various amounts. The concentration of adding tapioca flour is around 55.21% - 70.010 %. From the table, it

can be seen that the highest water content is at a concentration of 25% because this is following the statement of Widyastuti (1999) which states that increasing the amount of tapioca flour in the process of making meatballs will reduce the percentage of meatball water content. which is added in the form of carbohydrates (starch/amylopectin) which results in increased binding of starch grains with protein. The increase in the bonds of starch and protein grains results in water not being absorbed optimally because the hydrogen bonds that should be used to bind water have been used for the bonding mechanism of tapioca (starch) with meat protein, every one increase in the addition of tapioca flour will decrease the six units of water-binding power (MgH_2O) meatball which can reduce the percentage of meatball water content. Komariah et al. (2004).

4.2 Ash Content Test

Data from the analysis of the Ash content value of chicken meatballs from each treatment can be seen from the Table 2.

Table 2: Ash Content Analysis.

No	Sample concentration	Ash content %
1.	20 %	0.05
2.	25 %	0.04
3.	30 %	0.04
4.	40 %	0.20
5.	50 %	0.03

The ash content in food is used as an indicator of the number of mineral elements in a material (Estiasih et al., 2015). The ash content of the meatballs in the study ranged from 0.03% - 0.20%. Based on Table 4.2 , it can be seen that the highest ash content is found in meatballs with a concentration of 0.20%. The ash content of substituted meatballs where the weight of flour is 40% and chicken meat is 60%. Besides, the low ash content is thought to be related to the flour processing process. The ash content of the meatballs produced in this study had met the predetermined standards. The quality requirements for meatballs for ash content based on SNI 01-3818-1995 are a maximum of 3%.

4.3 Protein Test

Data from the analysis of the protein content value of chicken meatballs from each treatment can be seen in Table 3.

Table 3: Protein Levels.

No	Sample concentration	Protein content %
1.	20 %	12.3
2.	25 %	10.9
3.	30 %	9.3
4.	40 %	8.1
5.	50 %	7.2

The highest protein content was found in 20% treatment at 12.3% and the lowest in 50% treatment at 7.2%. Table 4.3 shows that the higher the addition of tapioca flour, the lower the protein content of chicken meatballs. This is due to the composition of tapioca flour which has a low protein content with high carbohydrate content so that the more tapioca flour is added, the lower the protein content of the chicken meatballs. According to Usmiati (2009).

4.4 Fat Content

Data from the analysis of the Fat content value of Chicken meatballs from each treatment can be seen in Table 4.

Table 4: Fat Content.

No	Sample concentration	Fat content %
1.	20 %	0.07
2.	25 %	0.08
3.	30 %	0.08
4.	40 %	0.095
5.	50 %	0.09

The highest fat content was found in treatment 40% at 0.095% and the lowest in treatment 20% at 0.07%. in Table 4.4 The results of testing the fat content of meatballs show that there is an effect of increasing the amount of tapioca flour in beef meatballs on fat content. This can be seen from the treatment used, the higher the level of tapioca flour is added, the higher the fat content will be.

The aroma of the meatballs with a concentration difference of 20%, 25%, 30%, 40%, 50% The aroma in this chicken meatball is like the aroma of fresh chicken meat. The use of tapioca flour does not make a difference in the aroma of the meatballs because tapioca flour does not have a high fat component so it does not affect the aroma produced by chicken meat.

The color of the meatballs with a concentration difference of 20%, 25%, 30%, 40%, 50% is not much different when raw has a pink color, while after cooking it changes to a light gray color, but changes are seen in the texture in each concentration where at a concentration of 20 %, 25%, 30%.

The texture before cooking is more solid (fused) and does not dissolve when you want to make the meatball shape easier and the meatball is more fibrous for the concentration of 40%, 50%. The texture is more dispersed and a bit difficult to form into meatballs not fibrous due to the concentration of more flour. Meanwhile, the best level of chewiness is also at a concentration of 20%, 25%, 30%, while the meatballs at a concentration of 40% and 50% look not chewy and like gritty because of the large amount of tapioca flour in the meatballs.

5 CONCLUSIONS

This study concludes that a good proportion was to make meatballs at a concentration of 25% and 30% by SNI standards. The fat content at concentration 25%, 30% showed respectively 0.08%, 0.08% thus, the protein was 10.9%, 9.3%. The results for moisture at 25% and 30% concentration was 70.00% and 66.06%. On the other hand, the ash content in the meatballs in concentration 25% and 30% was 0.04% and 0.04%.

ACKNOWLEDGEMENTS

Thank you to the Research Institute and Community Service of State University of Medan which has provided financial assistance to the author to conduct research.

REFERENCES

Estiasih T, Putri WDR, Widyastuti E. 2015. Komponen Minor dan Bahan Tambahan Pangan. Bumi Aksara. Jakarta.

Komariah., Ulupi N., and Fatriani., 2004, Pengaruh Penambahan Tepung Tapioka dan Es Batu Pada Berbagai Tingkat yang Berbeda Terhadap Kualitas Fisik Bakso. *Buletin Peternakan, 28(2): 80-86.*

Kusnadi, D. C. 2011. Daya Ikat Air, Tingkat Kekenyalan Dan Kadar Protein Pada Bakso Kombinasi Daging Sapi Dan Daging Kelinci. Fakultas Peternakan. Universitas Brawijaya. Malang.

Usmiati, S., 2009. Bakso Sehat. Warta Penelitian dan Pengembangan Pertanian. Vol. 31. Bogor.

Widyastuti, E.S. 1999. Studi Tentang Penggunaan Tapioka, Pati Kentang, dan Pati Modifikasi Dalam Pembuatan Bakso Daging Sapi. Tesis. Prog Studi Ilmu Teknologi Hasil Ternak, Prog Pasca Sarjana Universitas Brawijaya. Malang.