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Improving the Quality of Meatball Products Using Transglutaminase Enzyme to Increase Selling Value

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INFO ARTIKEL

Abstract

Keywords:

Meatballs, Enzymes, Quality

Meatballs is a processed animal product that is very popular and consumed by most people in Indonesia. According to the results of the national socio-economic survey conducted by the Central Bureau of Statistics in 2017, the daily consumption of beef meatballs in Indonesia from 2013 to 2017 has increased by 0.58 percent per year, this is due to an increase and change in people's lifestyles that tend to choose processed products that are practical and ready to serve. One of the aspects used by consumers to determine whether a product is good or not is quality, because quality is an important factor that influences the decision of every consumer to buy a product. The quality that needs to be considered in meatball products is elasticity. The chewy texture of meatballs is determined by the meat used as the main ingredient in its manufacture and can also be influenced by food additives such as Sodium Tripolyphosphate (STTP). STTP is a chemical that has the ability to thicken food. Therefore, in an effort to reduce the use of chemicals, this study aims to improve the quality of meatballs by modifying proteins using enzymes, namely transglutaminase enzymes, which can improve the quality of texture and specific volume of meatballs so as to increase the selling value of these products. The results of protein modification show that the increase in the quality of the texture of 39% chewiness compared to without modification, so that the more the addition of enzymes will make the texture quality more chewy. while the flavour increased by 11,90% and brightness increased by 35%.

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Introduction

Meatball products are animal-based processing that is very popular and consumed by most Indonesians. International trade is one of the efforts to improve the growth and development of the economy. (Priyadi et al., 2022) According to the results of the national socio- economic survey conducted by the Central Bureau of Statistics in 2017, the daily consumption of beef meatballs in Indonesia from 2013 to 2017 has increased by 0.58 percent per year (BPS, 2017). Strategy in marketing plays a strategic role in the success of a product in reaching consumers. (Fathor & Fatmariyah, 2023) Several studies emphasize customer loyalty as the core of sales. (Jannah & Pranjoto, 2023) This is due to an increase and change in people's lifestyles that tend to choose processed products that are practical and ready to serve. The quality requirements for meatballs according to SNI are a normal meatball smell or a distinctive smell of the meat used, a savory taste, a normal color (grayish), a chewy texture, and does not contain harmful food additives (National-DSN, 1995). Economic growth is the process of increasing output per capita in the long term. (Wildan et al., 2020) The good taste and chewy texture cause meatballs to be favored by all groups.

One of the aspects of determining the quality of meatballs used by the public to determine whether a meatball product is good or not is the level of chewiness. Because chewiness is the most important parameter of the texture- forming part that consumers consider in determining the quality of meatball products. According to Chakim et al. (2013). Digitalization empowers customers more and makes businesses think about how to win the market. (Jannah, 2021) The quality of meatballs can also be based on their physical and sensory properties. Human resources have so far been the most important asset for organizations. (Safrizal et al. 2020) The physical and sensory properties of a product are important to note because they will affect product quality and also public acceptance of the product. Physical properties of meatballs include tenderness while sensory properties include color, texture, aroma and taste. Bright color and distinctive aroma are the characteristics of making meatballs.

The chewy texture of meatballs is determined by the meat used as the main ingredient in making meatballs. In addition, it is also influenced by additional ingredients such as chewy ingredients that are commonly found and used by meatball makers, namely the addition of Sodium Tripolyphosphat (STPP). The current sources of competitive advantage are innovation and creativity. (Safrizal, 2023) STTP which is a chemical that has the ability to develop and thicken food. The use of Sodium Tripolyphosphat (STPP) can cause bitterness if excessive and if consumed continuously it will interfere with health.

Efforts to reduce the use of chemicals can also improve the quality of meatballs by modifying proteins using enzymes. High quality of service and client-based communication with AI-enabled services are determined by Quality of Experience (QoE). (Padmapriya et al., 2023) One of them is the enzyme transglutaminase. The company must ensure quality for its sustainability. (Wildan, 2020) Transglutaminase works by catalyzing the transfer of acyl groups from lysine amino acid residues on one protein to carboxamide groups on glutamine amino acid residues on the same protein or other proteins (Nuraisyah et al., 2018). The enzyme can be applied to various products from the food, non-food and health fields (Sidauruk et al., 2017). Another study explains that hospitality is not an absolute factor that can enhance a tourist destination. (Arief et al., 2022) Therefore, this research tries to study the transglutaminase enzyme that can improve the texture and specific volume of meatballs.

RESEARCH METHODS

Tools and Materials

Some of the tools needed in the implementation of this research include texture analyzer, color reader, pH meter, erlenmayer, oven, desiccator, thermometer, analytical scales, meat grinder (blender) knife, cutting board, spoon, pot, basin, stirrer and stove. The materials used in this study were meat transglutaminase enzyme, ice cubes, tapioca flour, salt (NaCl) and garlic.

Procedure

a. Sample collection

The samples used in this study are meatballs, where the main raw material used in the form of beef is obtained from the kamal market in the village of bangkalan kab. Bangkalan. Samples that have been obtained are tested at the Madura Trunojoyo University Laboratory.

b. Milling I

The initial stage in making meatballs is the grinding technique. The meat milling process is one of the most important processes in making meatballs. The meat milling process is one of the meat processing processes that aims to crush and smooth the meat for further processing. Fresh meat that has been selected and removed veins, then cut into small pieces to facilitate the grinding process. Furthermore, ice cubes are added during the grinding process to maintain the elasticity of the meat, so that the resulting meatballs will be more chewy.

C. Milling II

The second grinding in making meatballs usually involves the addition of additional ingredients. Meat that has been pulverized is mixed with spices that have been mashed and tapioca flour. Furthermore, it is ground again so that the meat, spices and tapioca flour can mix until homogeneous by forming a smooth dough. The addition of tapioca flour in making meatballs serves to increase volume (meat substitution), thereby increasing water binding capacity and minimizing shrinkage.

d. Enzyme addition

The next process is adding enzymes to improve the chewiness texture of the meatballs. The process of adding enzymes is carried out after the meatball dough is mixed until smooth. Mix the enzyme evenly into the dough. Make sure to mix evenly, so that the enzymes work effectively.

e. Hand molding

The next technique is the molding process can be done by hand, namely by clenching the dough and then pressing it so that the dough that has solidified will come out in the form of a circle, it can also be used with a small spoon to print it. Printing meatballs aims to produce a uniform size and shape of meatballs when boiling.

F. Boiling I

60°C and 70°C Next, the boiling process I, namely the meatball dough that has been molded, is put into a pot that already contains hot water with a temperature of 60 °C and 70 °C then let stand for 30 minutes.

g. Boiling II

100°C (Meatball maturation) The next process of boiling II is by increasing the temperature to 100 °C which is carried out until the meatballs are cooked which is indicated by the floating of the meatballs on the surface of the water.

Testing Parameters

Texture Test

Texture is the quality of food ingredients that can be seen by the level of chewiness. In addition, chewiness or springiness is a forming part of the texture that consumers take into account in assessing the liking and acceptance of meat and its products.

Color Test

The color test is an important factor in determining a product's visual appeal and consumer perception of it. Color is also a very important component to determine the quality or degree of acceptance of a product. Unattractive food will create a bad impression of the food.

Organoleptic Test

Organoleptic testing needs to be done to see the level of consumer acceptance of a product. The panelists used in this study were 10 people. Taste is an important factor for determining consumer acceptance of food products.

RESULT

Texture Test

The results of testing the texture of chips using a texture analyzer are shown in Table 1.

Table 1
Texture Test Result

No	Suhu Perebusan		
	Sampel	60 ^o C	70 ^o C
1.	Kontrol	16,26%	8,05%
2.	(E1) 0,5%	12,3 %	18%
3.	(E2) 1%	22%	23,39%

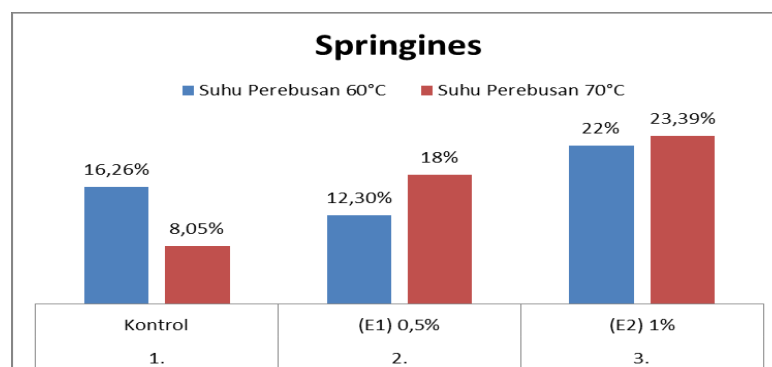


Figure 1
Graph of Texture Test

The results of texture testing using a textur analyzer showed that the results of meatball products without treatment or control with a boiling temperature of 60^oC were 16.26%, the control sample with a boiling temperature of 70^oC obtained a result of 8.05%. Based on the results of texture testing on samples with the addition of 0,5% transglutaminase enzyme with a boiling temperature of 60^oC, the result was 12.3%, with a boiling temperature of 70^oC, the result was 18%. While the sample of adding 1% transglutaminase enzyme with a boiling temperature of 60^oC obtained a result of 22% and a boiling temperature of 70^oC obtained a result of 23.39%. So it can be concluded that the addition of 105% transglutaminase enzyme in meatballs has a chewier texture than the addition of 87% transglutaminase. Based on the results of the table data and the texture test graph, it shows that the addition of transglutaminase enzyme to the quality of meatballs has increased (has a significant effect), the higher the concentration of transglutaminase enzyme added will make the meatballs more chewy. This is because transglutaminase stimulates the formation of protein cross-links (cross linking) so that it causes a denser texture and improves textural properties (Nugroho & Rianingsih, 2019).

Table 2
Meatball Color Test Results

No	Suhu Perebusan		
	Sampel	60 ^o C	70 ^o C
1.	Kontrol	36.4	38.3
2.	(E1) 0,5%	40	42.5
3.	(E2) 1%	38.26	40.63

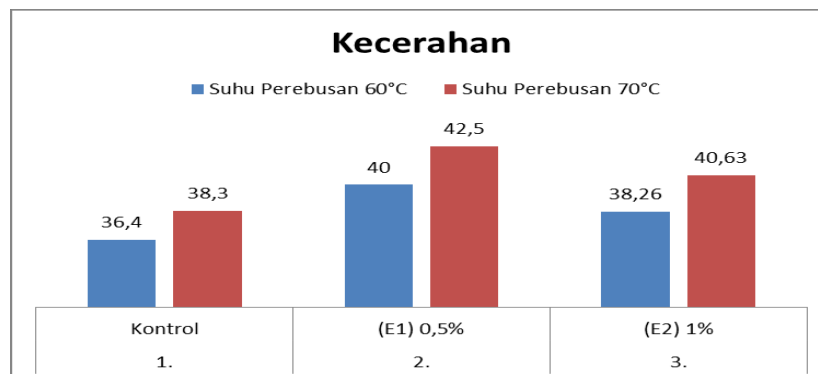


Figure 2

Graph of Color Test Results

The results of testing the color of meatball products using a color reader get different results, where the parameters produced are *L or the level of brightness, *a which shows red and green colors, and *b shows yellow and blue colors. The results obtained from meatball products with a control sample of boiling temperature 60 °C resulted in a color brightness of 36.4; this indicates that the sample has a moderate level of brightness. The control sample with a boiling temperature of 70 °C produces 38.3 which shows brightness. The color results obtained in meatball products with 0.5% transglutaminase enzyme with boiling temperature 60 °C is to have a brightness level of 40. The 70 °C temperature boiling sample has a brightness of 42.5. The color results obtained in meatball products with 1% transglutaminase enzyme with a boiling temperature of 60 obtained a brightness of 38.26. While the 70 temperature boiling sample obtained a brightness result of 40.63. Based on the results of the table data and the color test graph, it shows that the higher the boiling temperature will produce a brighter color. This is caused by the Maillard reaction during the meatball boiling process, resulting in a brighter color in the meatball product. Maillard reaction occurs due to the reaction between carbohydrates (reducing sugars) with amino groups (Winomo, 2004).

Organoleptic (Taste)

The results of testing the color of meatball products using 10 panelists are presented in table 3.

Table 3.
Organoleptic Test
Results (Taste)

No	Sampel	Suhu Perebusan	
		60°C	70 °C
1.	Kontrol	3,7%	3,4%
2.	(E ₁) 0,5%	3,8%	3,8%
3.	(E ₂) 1 %	3,8%	3,9%

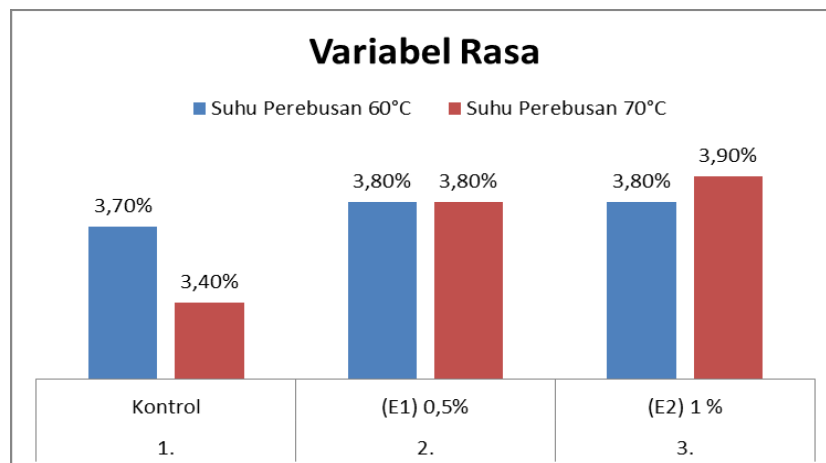


Figure 3
Organoleptic Test Results (Taste)

Table 3 shows that the results of organoleptic testing on the taste parameters of meatballs show that the control treatment meatballs with the addition of transglutaminase enzyme have no effect on the taste of meatballs. The results of the organoleptic test on the taste parameters of meatballs with a taste that is somewhat preferred by panelists. This is because the percentage of raw materials and additives used between treatments in the process of making meatballs is not different. So that the taste of the meatballs produced also has the same taste. The flavor formed in the meatballs is caused by the presence of seasonings such as salt and garlic in the dough. According to Ardianti et al. (2014), it explains that meatballs that are generally liked are meatballs that still have the flavor of the meat used. The flavor is largely determined by the constituent ingredients or composition. The more concentration of additional ingredients that are given, the more the resulting flavor will be felt when felt by the tongue. According to Purwanto et al. (2013), the flavor of the product is strongly influenced by the constituent ingredients. The high and low composition added will affect the taste.

CONCLUSION

Improving the quality of meatball products can be an effective strategy to increase selling value and create added value for consumers, so that the quality of meatball products is improved through enzymatic modification with the addition of transglutaminase enzyme. Based on this study, the addition of transglutaminase enzyme with a concentration of 0.5% and 1.0% using a temperature of 60 oC and 70 oC showed a significant effect that the best treatment of meatball products was with the addition of transglutaminase enzyme 1.0%, resulting in a more chewy meatball quality. While the brighter color was obtained at 70 oC. The average improvement in texture quality of meatball products is 39%, taste 11.90% and color or brightness 35%.

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REFERENCE

- Ardianti, Y., S. Widyastuti, Rosmilawati, Saptono, and D. Handito. 2014. Effect of Carrageenan Addition on Physical and Organoleptic Properties of Tongkol Fish Meatballs (*Euthynnus affinis*). *Agroteksos*, 24(3), 159- 166.
- Aulawi, T., & Ninsix, R. (2009). Physical properties of beef meatballs with different bulking agents and storage duration. *Journal of Animal Husbandry*, 6(2). 44- 52.

- Arief, M., Mustikowati, R.I., Fathor, A.S., Syarif, M. (2022). Tourist Destination based on SMEs Innovation: A Lesson from Madura Island, Indonesia. *WSEAS TRANSACTIONS on BUSINESS and ECONOMICS*, 19, 1008-1018, DOI: 10.37394/23207.2022.19.88
- Chakim, L., Dwiloka, B., & Kusrahayu, K. (2013). The Level of Chewiness, Water Binding Capacity, Moisture Content, and Favorability of Beef Meatballs with Beef Heart Substitution. *Animal Agriculture Journal*, 2(1), 97-104.
- Fathor and Fatmariyah. 2023. Exploration of Salt Farmers' E-Marketing Strategy: A Lesson from Madura Island, Indonesia. *International Review of Management and Marketing*, 2023, 13(3), 25-32.
- Jannah, M., & Pranjoto, G. H. 2023. Why Do Tourists Have Revisit Intention? The Effect of Customer Experience as a Marketing Strategy. *Proceedings of the 2nd Maritime, Economics and Business International Conference*.
- Jannah, M. (2021). ZMOT marketing strategy during the Covid-19 pandemic. In *Contemporary Research on Business and Management* (pp. 166-169). CRC Press.
- Leksono, A. A., & Jayanti, Q. D. (2022). The Effect of Price, Taste, and Kuslitas on Consumer Satisfaction Services (At Bakso Omen Again Surabaya). *Executive Journal*, 19(02), 166-183.
- National-DSN, D. S. (1995). Meat Meatballs. DSN.
- Nugroho, H. C., Amalia, U., & Rianingsih, L. (2019). Chemical physicochemical characteristics of raw fish meatballs with the addition of transglutaminase at different concentrations. *Journal of Fisheries Science and Technology*, 1(2), 47-55.
- Nuraisyah, A., Raharja, S., & Udin, F. (2018). Chemical Characteristics of Rice Flour Bread with Added Transglutaminase Enzyme. *Journal of Agricultural Industrial Technology*, 28(3), 319-330.
- Purwanto, R. O., B. D. Argo, and M. B. Hermanto. 2013. Effect of Glucose Syrup Composition and Drying Temperature Variation on Physico-Chemical and Sensory Properties of Seaweed Dodol (*Eucheuma spinosium*). *Journal of Tropical Commodity Bioprocessing*, 1(1), 1-12.
- Priyadi, U., Atmadji, E., Artiani, L. E., Nordin, S. M., Abdullah, M. R. T. L., Imron, M. A., ... & Omar, R. C. (2022). Sustainable Energy Economic Policy: Population, Energy Consumption, and Macroeconomic Conditions. *International Journal of Energy Economics and Policy*, 12(6), 80.
- Padmapriya, T., Salameh, A. A., Wildan, M. A., & Kishore, K. H. (2022). AI Enabled-6G: Artificial intelligence (AI) for integration of 6G wireless communications. *International Journal of Communication Networks and Information Security*, 14(3), 372-379.
- Sidauruk, S. W., Nurhayati, T., Suptijah, P., & Laksono, U. T. (2017). Characterization of endogenous transglutaminase enzymes from the liver of crayfish (*Congresox talabon*). *Journal of Indonesian Fishery Products Processing*, 20(3), 582-591.
- Safrizal, H. B. A. (2023). Innovative Behavior as an Antecedent of Employee Performance. *resmilitaris*, 13(3), 904-915.
- Safrizal, H. B. A., Eliyana, A., Usman, I., & Gunarsa, F. A. (2020). The effect of transformational leadership on job satisfaction: The mediation effect of self-efficacy and work engagement. *Systematic Reviews in Pharmacy*, 11(8).
- Winarno, F. G., 2004. Food Chemistry and Nutrition. Gramedia Pustaka Utama. Jakarta.
- WILDAN, M. A., IMRON, M. A., SYARIF, M., & JAKFAR, A. A. (2021). Palm oil export management and dynamic macroeconomic. *Journal of Tianjin University Science and Technology*, 54, 51-63.
- Wildan, M. A. (2020). Employee's productivity at the operation of Indonesian railway. *The Indonesian Accounting Review*, 10(1), 47-50.